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Odour Guidance for Local Authorities

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APPENDICES

1. INTRODUCTION

1.1. Using this Local Authority Guide

This Guide is designed primarily for use by Environmental Health Practitioners (EHPs). However, it should also be useful to other local authority professionals, regulators and industry professionals who are engaged in any of the following: preventing, investigating and managing odours. It is structured as a reference document allowing practitioners to identify information quickly, thus avoiding the need to read the Guide from cover-to-cover. In this manner, each section contains a brief introductory paragraph and conclusion summarising the key points to be taken away.

The Guide recognises that there is a need for flexibility in the approach to odour investigation and control. EHPs are well placed to understand the many complex local issues involved and to adopt a holistic approach in each case requiring investigation.

- **Section 1** sets out the rationale for this guide;
- **Section 2** focuses on the most commonly encountered sources of odour and presents an overview of how odour is perceived, including how people sense the presence of odours and how they may respond in terms of their emotions, sensitivity, tolerance and adaptation. The main attributes of an odour (intensity, quality/character and hedonic tone) are explained, as well as introducing the concepts of odour thresholds and odour concentration units;
- **Section 3** addresses the legal context of odours and the basis for preventing and regulating odours;
- **Section 4** outlines the assessment techniques that can be used to anticipate potential problems as well as investigative methods for controlling existing problems from operations. This includes a range of odour assessment tools to address odour issues from the planning, permitting and statutory nuisance perspectives;
- **Section 5** explores the mitigation measures that can be employed to control odours based upon current best practice;
- **Section 6** outlines the benefits and methods of communication with the public that can be employed by local authorities to address odour issues;
- **Sections 7** describes the regulatory strategies and planning policy available to local authorities aimed at preventing odour problems arising at the outset;
- **Section 8** describes the reactive regulatory strategies aimed at controlling and abating odour problems;
- **Section 9** describes how such services can effectively be implemented; and
- Finally the appendices contain supporting and more detailed information including practical templates and sources of further reading.

1.2. Background

In defining an approach to the prevention and management of odour, this Guide identifies two distinct methods, namely: (i) proactive measures to be considered at the outset in preventing nuisance odour and loss of amenity through the use of the environmental

permitting and planning regimes, and (ii) reactive measures that can, through intervention, achieve satisfactory control, such as the abatement of statutory nuisances from odours.

The subjectivity of the human response to odour means that it is often not easy to set objective odour exposure standards. However, these difficulties must not preclude the use of objective measurements, in assessing potential nuisance and in identifying control measures, where these can be justified and are considered to be appropriate. This Local Authority Guide does not seek to be prescriptive, but rather provides practical guidance on preventing and managing problems from odour sources in order to reduce the incidence of public complaint. In so doing, it provides an understanding of:

- the special characteristics of odour as an air pollutant;
- how local authorities can act to prevent unacceptable impacts from odours arising from new developments under the town and country planning regime;
- how local authorities can undertake effective investigations of complaints relating to odour, by applying the relevant assessment tools;
- how statutory nuisance powers can be effectively applied to resolve public complaints; and
- how local authorities can liaise more effectively with the Environment Agency (EA) to achieve improved regulation of the facilities the EA regulate.

1.3. The Need for this Local Authority Guide

Complaints about odours from industrial facilities, agricultural practices, wastewater treatment and commercial premises are all common.

Guidance on odour assessment and control for many environmental permit regulated facilities is contained in the relevant Sector Specific Guidance Notes and Horizontal Guidance for A(1) facilities regulated by the EA; and Process Guidance Notes for Part B activities and Sector Guidance Notes for Part A(2) activities regulated by local authorities. The A(2) and B statutory guidance notes contain sector-specific guidance on odour where appropriate and this, coupled with the guidance in the Pollution Prevention and Control (PPC) General Guidance Manual constitutes the primary source of odour guidance for these regulated activities.

However, there are many other activities that fall outside these specific environmental regimes and odours from these premises are 'regulated' by local authorities under the statutory nuisance provisions of Part III of the Environmental Protection Act (EPA)1990.

This Guidance document draws heavily upon the advice contained in various sources of published material which are duly cross-referenced within the body of the document. A comprehensive list of published sources of guidance on odour is presented in **Appendix 1**.

Often the local authority, as regulator, is in the position of having to arbitrate in effect by having to strike a balance between the needs of trades or businesses and in particular the legitimate concerns of those living or working in the nearby vicinity. This role is important for dealing with odour problems after they have arisen, when the statutory nuisance regime is usually the most appropriate mechanism for resolving problems. But this role is equally important at the planning stage before problems have been manifested. The earlier that a potential problem can be dealt with, the better for all concerned.

This Guide should prove helpful to local planning authorities or other decision makers by providing guidance on odour issues they can refer to when determining planning applications for new development.

1.4. Scope, Aims and Objectives

The purpose of this Guide is to support local authorities in their regulatory roles in preventing, regulating and controlling odours. The Guide recognises odour as potentially having a significant impact upon individuals and local communities. The Guide, therefore, aims to:

- explain the basic properties of odour;
- explain the legal and regulatory framework for preventing and controlling odours;
- identify the most common sources of odour and the methods that can be used to investigate and assess them; and
- explain the administrative and practical control measures available to local authorities and to provide guidance on how best to implement the service.

For environmental permit regulated facilities reference should be made to the appropriate Sector, Process and General guidance as the primary source of guidance.

The primary aim of this Guide is to provide a toolkit for local authorities to assist them in providing a consistent, effective and fair approach to their regulatory duties with regard to odours. This must be done in a transparent manner, and both industry and the public should be kept informed. In particular, they are entitled to know what measures have been taken and agreed, and the rationale for such measures. This is particularly important in the context of controlling odours, where a complete solution from the point of view of residential neighbours may not always be achieved notwithstanding the employment of Best Practicable Means (BPM).

This Guide provides advice on what constitutes good practice for local authorities in fulfilling their statutory duties. Local authorities are encouraged to develop their own policies and service performance standards and to review from time to time their services to identify any areas where under-performance may be a concern and improvements may be possible. It remains the responsibility of each local authority to make its own arrangements to comply with its legal obligations and to seek legal and technical advice on fulfilling its statutory duties.

This guidance document is compliant with the Code of Practice on Guidance on Regulation - see http://www.berr.gov.uk/files/file53268.pdf, page 6 of which contains the "golden rules of good guidance". If you feel this guidance breaches the code, or notice any inaccuracies within the guidance, or have any queries please contact the Atmosphere and Local Environment Programme on: helpline@defra.gsi.gov.uk or ring on 08459 33 55 77.

2. DEFINING ODOUR AND ITS SOURCES

This section provides an overview of what is meant by an odour, in terms of how we sense, and describe odours, and how we react to offensive odours. It includes a description of approaches which can be used to define, describe and quantify odours.

Guidance is provided about some of the more common types and origins of problem odours. The examples given focus on the most typical problems experienced by local authorities. It is not intended as an exhaustive list but a starting point as experience across local authorities will vary widely depending on the unique mix of urban, industrial and agricultural activities within each local authority.

2.1. What is Odour?

An odour is the organoleptic attribute perceptible by the olfactory organ on sniffing certain volatile substances[1]. It is a property of odorous substances that make them perceptible to our sense of smell. The term odour refers to the stimuli from a chemical compound that is volatilised in air. Odour is our perception of that sensation and we interpret what the odour means. Odours may be perceived as pleasant or unpleasant. The main concern with odour is its ability to cause a response in individuals that is considered to be objectionable or offensive.

Odours have the potential to trigger strong reactions for good reason. Pleasant odours can provide enjoyment and prompt responses such as those associated with appetite. Equally, unpleasant odours can be useful indicators to protect us from harm such as the ingestion of rotten food. These protective mechanisms are learnt throughout our lives. Whilst there is often agreement about what constitutes pleasant and unpleasant odours, there is a wide variation between individuals as to what is deemed unacceptable and what affects our quality of life.

An odorant is a substance which stimulates a human olfactory system so that an odour is perceived[2]. Odorants may be a single chemical but more typically are a complex mixture of compounds and can also be associated with fine particulates. This complex mix often makes reliable "chemical" analysis or measurement at source difficult.

Typically, odours are detected at very low concentrations of chemicals and compounds in air. The human nose is very sensitive with on average over 5 million scent receptors. Humans can detect concentrations as low as a few parts per billion (ppb), or less in air. This illustrates the difficulty of quantifying odour objectively, and is one of the key reasons why olfactometry, referred to in **Section 4**, is useful to measure odours, commonly for odours at the source. Small changes in the chemical composition of an odour can change the smell that is perceived by the receptor. For this reason chemical detectors are rarely used to describe the smell that we perceive for most applications.

2.2. Odour Characteristics and Attributes

From first detection, the need to describe odours is essential and this requires reference to a number of different attributes of smell, described below and summarised in **Table 2.1.**

[1] ISO 5492:2008: Sensory Analysis - Vocabulary

[2] BS EN13275: 2003, Air Quality – Determination of odour concentration by dynamic olfactometry

Table 2.1 - Basic Sensory Properties of Odour

Detection (at Threshold)	Concentration of an odour when first detectable
Recognition	Human ability to differentiate between odours, e.g. wine or vinegar
Intensity	Perceived strength at differing concentrations, e.g. faint, distinct, strong
Hedonic Tone	Pleasantness / offensiveness, e.g. pleasant, unpleasant, offensive
Odour Quality or Character	Association & complexity, e.g. the many 'tones' and associations we have with an odour such as flowers, coffee, waste, sewage, etc.

2.2.1. Odour Thresholds and Odour Units

The concentration at which an odour is just detectable to a "typical" human nose is referred to as the "threshold" concentration. This concept of a threshold concentration is the basis of olfactometry in which a quantitative sensory measurement is used to define the concentration of an odour. Standardised methods for measuring and reporting the detectability or concentration of an odour sample have been defined by a European standard (BSEN 13725:2003). The concentration at which an odour is just detectable by a panel of selected human "sniffers" is defined as the detection threshold and as an odour concentration of 1 European odour unit per cubic metre (1 ou_E m^{-3} or 1 ou_E/m^3), see **Appendix 4**.

At the detectability threshold, the concentration of an odour is so low that it is not recognisable as any specific odour at all, but the presence of some, very faint, odour can be sensed when the "sample" odour is compared to a clean, odour-free sample of air.

For a simple, single odorous compound (e.g. hydrogen sulphide), the "amount" of odour present in a sample of air can be expressed in terms of ppm, ppb or in mg/m^3 of air. More usually, odours are very complex mixtures of compounds and the concentration of the mixture can be expressed in European odour units per cubic metre (ou_E m^{-3} or ou_E/m^3).

Odour Unit

An odour unit is a sensory measurement of the concentration of a mixture of odorous compounds in a sample of odour. The procedures for measuring odour concentrations by means of olfactometry are described in more detail in **Section 4** of this Guide.

The concept of odour concentrations, as odour units per cubic metre, is based on a correlation between a physiological response that is when odour is detected by the nose, and exposure to a particular sample at a specific concentration. The results of this assessment are expressed in terms of a single number. The odour sample assessed can be one of many individual odorous substances or a complex mixture of many substances, and so the odour unit or concentration will vary between test samples. A defined measurement standard for the odour unit is prescribed in a standard method set out in the BSEN standard on olfactometry using n-butanol (BSEN 13725). This gas is used to select and "calibrate" odour panel members.

An odour unit is defined by the BSEN 13725 standard as 1 ou_E, a European Odour Unit.

An odour at a strength of 1ou_E m^{-3} is in reality so weak that it would not normally be detected outside the controlled environment of an odour laboratory by the majority of the population (that is individuals with odour sensitivity in the "normal" range). As an odour becomes more concentrated, then it gradually becomes more apparent. Some guidance as to concentrations when this occurs can be derived from laboratory measurements of

intensity. The following guideline values[3] may help provide some context for discussion about exposure to odours:

- 1 ou_E m^{-3} is the point of detection;
- 5 ou_E m^{-3} is a faint odour; and
- 10 ou_E m^{-3} is a distinct odour.

However, it is important to realise that these values are based on laboratory measurements and in the general environment other factors affect our sense of odour perception, such as:

- the population is continuously exposed to a wide range of "background" odours at a range of different concentrations, and usually people are unaware of there being any background odours at all due to normal "habituation". Individuals can also develop a "tolerance" to background and other specific odours. In an odour laboratory the determination of detection threshold is undertaken by comparison with non-odorous air, and in carefully controlled, odour-free, conditions. Normal background odours such as those from traffic, vegetation, grass mowings etc, can provide background odour concentrations from 5 to 60 ou_E m^{-3} or more;
- the recognition threshold, that is the concentration at which a person might be able to recognise or describe a specific odour may be about three odour units per cubic metre, although it might be less for offensive substances or higher if the receptor is less familiar with the odour or distracted by other stimuli; and
- an odour which fluctuates rapidly in concentration is often more noticeable than a steady odour at a low concentration.

Detection Threshold

The threshold of detection is the concentration at which an odour just becomes strong enough to produce a sensation of odour within the controlled conditions of an odour laboratory. As there is variation in sensitivity between different individuals, the threshold value defined in olfactometry is a statistically derived value that represents an "average" response from 50% of selected odour panellists.

Odours, which are effectively mixtures of odorous compounds are treated in the same way as the n-butanol test gas, in so much as the "strength" is considered in terms of the number of times that a sample of the mixture has to be diluted before it becomes just detectable to 50% of the panel of "sniffers". This concentration is equivalent to one odour unit per cubic metre (1 ou_E m^{-3}). The concentration of the test sample is expressed in terms of the number of dilutions or in odour units per cubic metre. In the past the same value has been expressed as a Threshold Odour Number (TON) or Dilutions To Threshold (DTT).

A number of different olfactometry methods have been used both historically in the UK and elsewhere, so there can sometimes be incompatibility between the quoted threshold of odour detection (and hence the magnitude of one odour unit) for the same substance or mixture. More recent values are likely to provide more reliable and comparable information than older data.

Recognition Threshold

The concentration at which an odour becomes recognisable, as a specific odour, is not the same as the concentration at which it is detectable. Whilst the detection threshold is the

[3] Environment Agency, Draft 2009, H4 - Odour Management , Technical Guidance

concentration at which some odour can be sensed, a higher concentration is usually required before the odour can be recognised, i.e. it can be categorised or described by an observer. The recognition threshold is generally about three times the detection threshold, although this factor may be considerably higher outside the controlled environment of a laboratory.

The ability to "discriminate" one odour from another is an important attribute when describing an odour. We rely on being able to discriminate between odours for a whole range of reasons such as fresh and stale food, the addition of flavourings and when determining the source of an odour. This is a human ability to distinguish between odours and is important when needing to identify a source of odour.

2.2.2. Intensity

The "intensity" of an odour is also relevant. Intensity refers to the perceived strength of an odour when described by a recipient. Low concentrations of some compounds in a sample are capable of being perceived as having a high intensity even when close to threshold concentrations. These compounds are common in naturally unpleasant odours such as hydrogen sulphide (rotten eggs) and skatole (faeces).

Using a scale of very faint to extremely strong, the perceived intensity or magnitude of perception of an odour increases as concentration increases. This relationship is typically logarithmic with concentration. However, changes in concentration do not always produce a corresponding proportional change in the odour strength as perceived by the human nose. This can be important for purposes of control where an odour has a strong intensity at low concentration since even a low residual odour may cause odour problems. The method of measuring intensity is derived from the German Standard VDI 3882, Part 14. **Table 2.2** shows a qualitative score used by panellists for an odour sample compared to an intensity scale.

Table 2.2 - Odour Intensity Scale

Score	Intensity
0	No odour
1	Very faint odour
2	Faint odour
3	Distinct odour
4	Strong odour
5	Very strong odour
6	Extremely strong odour

2.2.3. Hedonic Tone

Importantly, the hedonic tone (pleasantness or unpleasantness of an odour) can be responsible for the perception leading to complaint. Here the relative pleasantness or unpleasantness of the odour alongside the association of its source, or the context in which it is received are relevant to investigating odour complaints.

This judgement on the relative pleasantness or unpleasantness of an odour forms our common language when reporting unpleasant odours. Methods to make comparative

[4] VDI 3882:1997, Part 1: Olfactometry; Determination of Odour Intensity, Beuth Verlag Dusseldorf, Germany

judgements for such subjective reports have been established for assessors to analyse samples as part of an odour panel. A method for measuring hedonic tone is suggested below, derived from the German guideline VDI 3882, Part 2[5].

Outside of a laboratory setting, this parameter can be subject to substantial variation between individuals. Some odours may be pleasant when weak but unpleasant when strong, or when exposure is frequent. **Table 2.3** shows a qualitative score range used by panellists for an odour sample compared to an offensiveness scale.

Table 2.3 - Hedonic Tone Scale

Score	Perceived Hedonic Tone
+4	Very pleasant
+3	Pleasant
+2	Moderately pleasant
+1	Mildly pleasant
0	Neutral odour / no odour
-1	Mildly unpleasant
-2	Moderately unpleasant
-3	Unpleasant
-4	Very unpleasant

2.2.4. Quality or Character

This attribute is expressed in terms of 'descriptors', e.g. 'fruity', 'almond', 'fishy'. This can be of use when establishing an odour source from complainants' descriptions. Alternatively, it may be possible to identify key chemical components by a description of the specific odour.

Odour quality, hedonic tone and concentration influence the potential for annoyance, although the response to a particular odour will vary between individuals.

The attribute most commonly used is concentration, but the hedonic tone which is a consideration in 'offensiveness' is also important. The odour wheel in **Appendix 2** may aid the description of the character profile of an odour.

2.3. How We Sense Odour

The human olfactory system consists of the olfactory epithelium, the olfactory bulb, the hypothalamus and the olfactory cortex[6]. The olfactory epithelium and the olfactory bulb are located at the top of the nasal cavity behind and between the eyes.

The olfactory epithelium is external to the cranium with an area of only a few square centimetres. The human epithelium has several million receptor neurons across its surface, terminating in several fine hairs, termed cilia which extend into a thin mucus layer. The cilia are host to receptor proteins to which odorant molecules bind, and form the initial stage of odour detection. There are about 350 different types of receptors, each with specific response characteristics. These receptor neurons are connected via bundles of

[5] VDI 3882: 1997, Part 2: Olfactometry - Determination of Hedonic Odour Tone, Beuth Verlag, Dusseldorf, Germany

[6] Pearce T.C. (1997a) Computational parallels between the biological olfactory pathway and its analogue 'The Electronic Nose': Part I. Biological olfaction. BioSystems 41, 43-67.

axons to glomeruli (nerve bundles) in the olfactory bulb. Each type of receptor is connected to a specific glomerulus. These in turn connect to mitral cells, which then connect via the olfactory nerves to the olfactory cortex of the brain. The brain can identify thousands of different odours using the pattern of the stimuli received from the receptor type specific glomeruli.

2.4. How We Respond to Odour?

Individual responses to odour vary greatly and not all unpleasant odours are considered offensive at all times. Examples of this are well established where communities have become accustomed to 'healthy farmyard odours' or 'comforting coal fire smells'. Equally these same odours can trigger complaints and can impact upon people's daily lives where exposure to 'manure odours' or 'soot' is perceived as unwanted and objectionable. A feature of these differences amongst humans is the phenomenal range of choice in foods, perfumes and products linked to olfaction that are available and continue to be developed.

When an individual exposed to odour perceives this as unwanted it is argued that the following factors are the main determinants[7]:

- Offensiveness of the odour;
- Intensity of the odour;
- Duration of exposure to the odour;
- Frequency of the odour exposure; and
- Tolerance and expectation of the exposed subjects.

The human sense of smell is an important early warning mechanism as well as a means for us to assess our environment, food and each other. Unpleasant odours are difficult to ignore particularly where these are strong or evoke a negative or harmful view of our surroundings. Our reactions to odour can be short-term or prolonged, and intense or mild in the same way as the exposure and unpleasantness of the sensation. Studies of communities exposed to unwanted odours show that exposure can lead to evidence of stress induced symptoms such as sleep disorders, headaches, respiratory problems, nausea and anxiety as well as less extreme but equally prolonged complaints, but learned responses may play a role in the impairment of mood[8]. If exposure to odours with negative appraisal occurs repeatedly, this can affect our well being and cause stress related symptoms, i.e. a public health concern.

When exposed to odours that are then perceived as unwanted or unpleasant, these cause us to have a 'negative appraisal' of our local environment. This effect is regarded as an 'environmental or ambient stressor' in just the same way as other environmental stressors such as noise or unwanted lighting. When exposed to such a stressor the individual requires some form of coping behaviour to respond and adjust.

Reviews of the physiological, psychological and sociological mechanisms highlight two main types of coping strategy[9]:

[7] Environment Agency (2002) Assessment of Community Response to Odorous Emissions, R&D Technical Report P4-095/TR, ISBN 1 857059 247, available at http://publications.environment-agency.gov.uk/pdf/SP4-095-TR-e-p.pdf [accessed 3-Nov-08]

[8] Shiffman S.S., E.A. Sattely Miller et al (1995). The Effect Of Environmental Odors Emanating From Commercial Swine Operations On The Mood Of Residents Nearby. Brain Research Bulletin, Vol. 37, Pages 369- 375.

[9] Review by Cavalini (1992) reported in EA (2002) R&D Technical Report P4-095/TR, cited earlier.

- Problem focussed coping – this leads to attempts to control the problem by developing active behaviour aimed at removing the cause of stress, e.g. closing windows, calling authorities or operators to complain, keeping diaries and submitting complaints etc.
- Emotion focussed coping – this is not aimed at changing the environment by removing the unpleasant stimulus, but consists of modulating the emotional response that is the result of the appraisal, e.g. denial, seeking distractions, reducing one's mental focus on the problem, making a positive choice to ignore the stressor, etc.

Studies of environmental exposure to odour at differing concentrations over differing periods of time have led to a series of conclusions about the way in which individuals perceive odour, and how this is established and then retained in memory. Surveys of communities show that where an odour nuisance is abated, the perception of odour impact is reported for prolonged periods by those living in the area, even years, after the odour is no longer present[10]. It is evident that:

- the nuisance suffered is not caused by short-term exposure to environmental odours and similarly not reduced by short periods of mitigation or prevention;
- the association between an individual's perception and experience of nuisance from an odour is persistent and prolonged. For these individuals, exposure to the same odour at lower concentrations causes greater nuisance than for others with no history of exposure; and
- the perception of annoyance/nuisance appears to be cumulative, developing over long periods of time. Memory of periods of heightened or intense exposures alongside other unwanted outcomes such as the disturbance to well being or lack of influence are all important. These appear to dominate the overall perception of the odour impact and perceived history of the complaint.

Studies to define predictors of annoyance/nuisance have highlighted a number of factors which are difficult to relate to each other but recognised to be influential, as follows[11]:

- Perceived health status - individuals with health complaints have a higher probability of experiencing nuisance/annoyance than healthier people, at the same exposure level;
- Anxiety - Individuals who feel anxiety that odour is related to health risks have a higher probability of experiencing odour-induced annoyance;
- Coping strategy - Individuals who employ 'problem-focussed' coping are more likely to experience odour annoyance/nuisance than those employing emotion-focussed coping;
- Economic dependence - Individuals with an economic interest in the activity associated with the source of odour are less likely to experience annoyance than others;
- Personality - Individuals who believe themselves to have the focus of control over their environment may in some circumstances be more likely to experience annoyance/nuisance;
- Age - the probability of experiencing odour-induced annoyance/nuisance decreases with age;

[10] Steinheider, B., Both, R., Winneke, G., (1998) Field studies on environmental odours inducing annoyance as well as gastric and general health related symptoms, Journal of Psychophysiology Supplement, pp. 64-79.

[11] see Environment Agency (2002) op.cit.

- Residential satisfaction - The more satisfied an individual is with their residential situation the lower the probability of experiencing odour induced annoyance/nuisance; and
- History of exposure and annoyance - individuals with a history of odour-induced annoyance/nuisance have a long term, heightened sensitivity to exposure, i.e. up to three years after significant abatement has been in place.

Summarising these sensory, cognitive and behavioural processes in such a way inadequately reflects both the complexity of the process being considered as well as the limited understanding of the true mechanisms taking place.

Evidently, exposure to unwanted odour for prolonged periods can detrimentally affect the well-being of individuals and can sensitise individuals within a community. Where this is allowed to continue for sustained periods the perception of impact continues beyond the direct period of exposure.

2.5. Sources of Odour

Defining the origin of an odour, as well as recognising common odour sources, and utilising methods for assessing the concentration and emission rates from the source, are all important aspects of defining the problems presented by odours. The ability to recognise and discriminate between potential sources is important to determine the sources of the odour problem and the relative effectiveness of mitigation measures. Odour sources vary greatly in concentration, hedonic tone and quality even for the same source types.

2.5.1. Source Types

Odour sources and their impacts are characterised by their sensory properties; i.e. threshold, discrimination, intensity, hedonic tone and quality; as well as their origin, i.e. the type of emission. Almost all of these properties can be quantified or objectively assessed, but in the context of environmental management and impact assessments, odour concentration is the most commonly used parameter. Each odour source will have different emission characteristics such as in the case of odours released from the surface of a body of material such as compost or from a ventilation duct serving a process. **Table 2.4** lists some common sources of odour and examples of problems which may be common to a number of industries and operations which have been associated with odours. The problems listed are not exhaustive but illustrative only since each process can have a number of sources and reasons for odour emission.

Table 2.4 - Common Sources of Odour and Problem Types

Odour Source	Example Problems
Sewage treatment	Increased treatment volumes & flow rates e.g. from storm conditions Increased proximity of sensitive development such as housing Inadequate maintenance of odour control systems
Food processing and commercial kitchens	Extraction system design e.g. inadequate discharge height, absence of odour control at source and / or poor “filtration” system maintenance
Paints & solvents	Odour control system design, building leakage and poor positioning of vents (garages and workshops)
Animals, livestock & poultry	Proximity of sensitive development e.g. housing Waste management on-site, building & odour control system design, ancillary operations. Poor dispersion of odours during early morning and evening.

Odour Source	Example Problems
Spreading of slurry / sludge to land	Unfavourable wind conditions exacerbate problems When spread on grassland unable to plough-in.
Slaughter houses / abattoirs & rendering plants	Material exposed during loading and unloading vehicles, e.g. not operating in an odour controlled area.
Industrial / chemical processes	Extraction system design, system maintenance and accidental discharges.
Storage & spills	Unplanned losses, e.g. vehicle accidents; poor provision for on-site containment & clean-up.

Key Points

- The human sense of smell is generally much more sensitive than any "chemical" analysis in detecting and quantifying odours.
- The sensitivity of the human nose is exploited, by the use of human "sniffers" to measure odour concentration in olfactometry; such that where odour quantification is required this is most often the measurement technique of choice.
- Odour perception and sensitivity to odours varies widely between different individuals. This has implications for EHPs, both in terms of their own sensitivity when investigating odours, and also when assessing complaints made by residents who may be more or less sensitive than the general population. EHPs should ascertain that their olfactory acuity is within the range of the 'normal population', preferably by performing a test for olfactory acuity.
- Residents' perception of the source of an odour, e.g. if it is from an 'undesirable' source such as a sewage works or an animal rendering plant, may well influence their complaint behaviour and expectations of resolution. In some cases social and psychological factors have a greater bearing on odour perception than actual exposure.
- Absence of complaints, or only small numbers of complaints about a specific source, may be caused by 'complaint fatigue', habituation or a resigned expectation that nothing can be done about an odorous premises, rather than there being no odour problem.
- Prompt (and decisive) investigative and regulatory action should help prevent 'complaint fatigue'.

3. LEGAL AND REGULATORY FRAMEWORK

This section aims to provide an overview of the framework for regulating odours. It examines the purpose and limitations of the relevant systems of regulation i.e. planning, permitting and statutory nuisance. It primarily advises on enforcement under the statutory nuisance regime, on the use of abatement notices and Best Practicable Means (BPM) defences.

3.1. Introduction

The control of odour impact from new and existing commercial and industrial premises falls under three discrete regulatory regimes:

1. The Town and Country Planning Act 1990 sets out the regulatory framework for land use planning within which local authorities need to operate and additionally Planning Policy Statement 23, (PPS23) *Planning and Pollution Control* advises local authorities that they should take account of the impacts that a new development will have on the quality of air, including odour.

2. The Pollution Control regimes under the Environmental Permitting (EP) Regulations 2007[12] (as amended) set out a single regulatory regime for the control of the most polluting process industries and waste management operations. PPS 23, states that:

   'Pollution control is concerned with preventing pollution through the use of measures to prohibit or limit the release of substances to the environment from different sources to the lowest practicable level [….] The planning system should focus on whether the development itself is an acceptable use of the land, and the impacts of those uses, rather than the control of processes or emissions themselves'.

   These two regimes should therefore complement each other and are aimed at preventing and controlling odours from potentially odorous operations.

3. The local authority has powers and duties to address issues arising from odours through the statutory nuisance provisions of the Environmental Protection Act 1990 (EPA). Regulation through the use of statutory nuisance provides a crucial level of protection in respect of problems that were not anticipated at the planning or permitting stage.

These three regulatory frameworks should provide the local authority with the necessary tools aimed at preventing, controlling and abating odours. It is essential that local authority practitioners, including environmental health practitioners (EHPs), have a full appreciation of all three regimes in order that local authorities can satisfactorily discharge their statutory responsibilities with regard to unacceptable odours.

3.2. Planning Controls

In some cases it may be appropriate to use planning conditions to control aspects of a development including the impacts of odour. Consultations with the relevant pollution control authority / EHPs should ensure that any planning conditions are necessary and appropriate and based on valid information, and do not duplicate conditions more appropriately imposed through the pollution control / permitting regime.

[12] The Environmental Permitting (England and Wales) Regulations 2007 No. 3538 (as amended).

Further advice on planning conditions can be found in Circular 11/95: The Use of Conditions in Planning Permissions - Planning, building and the environment - Communities and Local Government.

It follows that drafting appropriate conditions in relation to odour emissions requires an understanding of how effective odour controls can be and of what conditions are likely to be effective in maintaining the amenity of residents living in the vicinity. EHPs' advice on odour control will usually be needed to ensure that planning conditions are properly constructed and the right decisions taken.

The drafting of appropriate planning conditions to the individual circumstances of a development is a complex and skilled process. Getting it wrong can damage the relationship between the planning authority, the industry and the community. It may result in time-consuming legal proceedings, creating unnecessary stress and additional costs. Where there are new development proposals covered by the planning regime, for example in the case of new plant or facilities, or proposals to extend existing facilities, it is quite likely that the local authority will be responsible for determining the planning application. The main planning issue may be perceived to be limited to decisions relating to the suitability of the application site itself for the intended land use being proposed, rather than any direct controls over odour emissions likely to emanate from the site. It might be reasoned that control of emissions would subsequently be controlled by the pollution control regimes (the EA and the environmental health service of the local authority), but in practice there should be a coordinated approach between planners and environmental regulators at the planning application stage. Pollution controls need to be considered as an integral part of planning applications, not added as an afterthought.

In all cases where the generation of odours from the development can be readily anticipated, the local authority should expect to be provided with objective evidence that demonstrates that odour emissions will be adequately controlled to prevent any significant loss of amenity to neighbouring sensitive land users. This is important not least because possible odour mitigation measures could in themselves have land use and amenity implications.

Where a proposed development is considered 'EIA development' under the Town and Country Planning (Environmental Impact Assessment) (E+W) Regulations 1999 (as amended) the impact of odours may be carried out as part of the formal Environmental Statement (ES) required to identify, assess and mitigate against potential significant environmental effects.

For major infrastructure consented under the Planning Act 2008 (e.g. qualifying sewage treatment works) the impact of odours again may form a key part of an assessment required under the Infrastructure Planning (Environmental Impact Assessment) Regulations 2009. The Local Planning Authority will play a key role during the consultation process and through the requirement under section 60 of the Act to produce a Local Impact Report.

Equally, careful consideration needs to be given to the location of new odour sensitive developments such as residential developments, schools and hospitals near to existing odour sources. Encroachment of odour sensitive development around such sites may lead to problems with the site becoming the subject of complaint, essentially creating a problem where there was not one before.

Controls such as the prescription of defined odour mitigation measures at the planning stage should protect residents and receptors from any significant adverse impact on amenity. The best that can be hoped for through retrospective control under the EPA 1990 statutory nuisance regime is the employment of BPM. It is important to understand that in

practice this does not necessarily equate either to an absence of odour, or even an absence of impact on amenity.

It is therefore far more effective to address odour at the design and planning stage of a new plant or process than to seek to abate a statutory nuisance from odours retrospectively.

Where odour is likely to be an issue, it is important that planning officers consult at an early stage with their EHP colleagues regarding the adequacy of any information provided by the applicant in connection with anticipated odour impacts and the odour mitigation measures being proposed. Planning officers or EHPs may suggest suitably worded planning conditions, or where it is not appropriate to use planning conditions they may suggest that a Planning Obligation be drawn up under Section 106 of the Town and Country Planning Act 1990 to help ensure that odour impacts can be adequately controlled, both at the completion of the proposed scheme, and also subsequently throughout the working life of the development, see **Section 7**.

In practice, it is often the case that a higher level of odour protection can be achieved when new premises are built, (or existing premises modified) through the use of appropriate planning controls, as described above. Planning consent will be granted in conformity with development policies enshrined in the Local Development Framework (LDF) and Local Development Documents (LDD), and one factor that may be material in the consideration of individual planning applications is the possible impact of the development on health and general amenity. It is very important that local authorities thoroughly evaluate planning applications concerning premises which may generate odours and that they control odour emissions through the judicious use of planning decisions and conditions.

3.3. Pollution Prevention and Control

Local authorities regulate certain activities under the EP Regulations by issuing permits. These permits must include conditions which constitute the Best Available Techniques (BAT) to minimise air emissions, including odour. Chapter 17 of the General Guidance Manual states that 'generally speaking where permit conditions targeting odour are considered necessary, the overall aim should be – subject to the application of BAT in each case – that there is no offensive odour beyond the boundary of the installation'. BAT conditions should not be any less stringent than what is achievable under the statutory nuisance system including the application of BPM.

Since 6 April 2008 the following pollution prevention regimes have been included (these were previously regulated under the Pollution Prevention and Control Regulations 2000):

- Local authority Integrated Pollution Prevention and Control (LA-IPPC), A(2) installations; controlling emissions to air, water (including discharges to sewer) and land, plus a range of other activities with an environmental impact; and
- Local authority Pollution Prevention and Control (LAPPC), Part B installations, controlling emissions to air only.

Within these regulatory regimes there are a number of potentially odorous activities such as animal by-product rendering, maggot breeding, and solvent and metal processes etc. Further guidance on BAT can be found in the Process Guidance Notes for Part B activities and Sector Guidance Notes for Part A(2) activities.

Note: The EA also regulate activities and waste operations under the EP Regulations including: Integrated Pollution Prevention and Control (IPPC), Part A activities, waste

management permitted sites and exemptions, see **Sections 3.12 and 6.5** regarding advice on the interaction between local authorities and the EA.

3.4. Odour (smell) as a Statutory Nuisance

Nuisances caused by odours are regulated by the statutory nuisance provisions in the EPA 1990. Section 79(1)(d) of the EPA consolidated various types of atmospheric pollution that had been previously regulated under the Public Health Act 1936. It also added smell and steam to the list. Section 79(1)(d) EPA sets out this statutory nuisance as:

'Any dust, steam, smell or other effluvia arising on industrial, trade or business premises and being prejudicial to health or a nuisance'.

Note that this provision is confined to industrial, trade or business premises and has no application where the odour source is from residential premises.

This form of statutory nuisance is a separate provision from the emission of fumes or gases from premises which may constitute statutory nuisances under s.79(1)(c) EPA1990. Section 79(1)(c) also originated in 1990 and only applies to private dwellings.[13] Section 79(7) defines 'fumes' as 'any airborne matter smaller than dust'. This subsection defines 'gas' as including 'vapour and moisture precipitated from vapour'. This provision is not aimed at controlling smoke from domestic appliances, such as coal fires or boilers, for which section 79(1)(b) dealing with smoke nuisances is more appropriate.[14] Where a complaint arises from the emissions of fumes or gases – whether or not they were additionally odorous – then s.79(1)(c) is the appropriate type of statutory nuisance. Emissions from gas or oil boilers would thus come within its scope.

Local authority environmental health services have a duty to 'inspect' their districts from time to time for statutory nuisances. Additionally they have a duty, wherever reasonably practicable, to investigate any complaint about alleged odour nuisance made by a member of the public/resident. Section 79(1) states:

'…and it shall be the duty of every local authority to cause its area to be inspected from time to time to detect any statutory nuisances which ought to be dealt with under Section 80 below and, where a complaint of a statutory nuisance is made to it by a person living within its area, to take such steps as are reasonably practicable to investigate the complaint'.

3.4.1. Distinguishing Odours from Smoke

Distinguishing between the different forms of pollution making up a statutory nuisance coming within the scope of s.79(1)(d) EPA 1990 may present problems for the EHP. A decision may need to be made as to whether the problem caused by emissions is due to smoke or smell. For example, coffee roasters emit both particles from smoke and odours. Complainants may be affected by both of these and local regulators may need to decide whether either or both comprise a statutory nuisance.

The most important principle is to ensure that the subject of the complaint falls within the scope of the provision. Of secondary importance will be the requirement to identify precisely the category of atmospheric pollution within s.79(1)(d). Where this includes more than one, then this should be identified. So if it is decided that the statutory nuisance results from both the smoke and the smell of the emission, then it would be good practice to state both in the requisite abatement notice. In many cases involving smoke – perhaps the majority of cases – the release of odour is secondary to the nuisance caused by the

[13] EPA 1990, s.79(4).

[14] Smoke from coal and wood burning appliances would also come within the scope of the Clean Air Act 1993.

smoke.[15] The statutory nuisance thus falls more squarely with smoke nuisance for which a different sub-section is provided under s.79(1)(b) EPA, namely: 'smoke emitted from premises'. 'Premises' is widely defined to include domestic premises, land and any vessel.[16] It should be noted that a BPM defence is only available for smoke emitted from a chimney but not otherwise.[17]

3.4.2. Distinguishing Odours from Effluvia

Section 79(1)(d) EPA 1990 refers to 'other effluvia' and this term can be seen as referring to an odour of the more offensive kind, or to one posing a risk to health linked to sewerage systems or to the ineffective treatment of sewage. In the case of *Hounslow LBC v Thames Water Utilities Ltd*[18] the local authority had described the nuisance as resulting from 'malodorous gases' being emitted from a sewerage treatment works. This case also confirmed that such works constituted premises coming within the scope of the EPA. The *Oxford English Dictionary Online* defines 'effluvium' as:

'chiefly applied to the (real or supposed) outflow of material particles too subtle to be perceived by touch or sight', or 'an "exhalation" affecting the sense of smell, or producing effects by being received into the lungs. In modern popular use, chiefly a noxious or disgusting exhalation or odour.'

Arguably, effluvia adds nothing to 'smell' in s.79(1)(d) EPA . The term originated when legislation was based on the 'miasma' theory of disease: the idea that infection was spread by the transmission of minute faecal particles suspended in droplets of breath. This theory prevailed until the 1870s. Case law on effluvia tends to be old and based in a period when nuisance law provided the only form of regulatory control.[19]

3.5. The Two Limbs of Odour Statutory Nuisance

The odour provisions are two-limbed, like all the other statutory nuisances set down in s.79 EPA 1990. The requirement for statutory nuisance under s.80 EPA is for the local authority to decide whether the odour is prejudicial to health *or* a nuisance (it could be both). The nuisance limb includes public as well as private forms of nuisance. The requirement for private nuisance is whether the emission takes place from industrial, trade or business premises and affects other premises. The emission would also have to interfere, in a material or substantial way, with the victim's use of his property.

The interference must have some quality which makes it unreasonable for the victim. Under the nuisance limb, interference in a person's 'personal comfort' is required.[20] The standard is an objective one. So, where a particularly sensitive victim experiences as significant an interference in his personal comfort which an average person would not, there can be no statutory nuisance.

The victim of a statutory nuisance can be a residential or business occupier. Any person sufficiently affected is included, including a visitor to the premises. There is no requirement

[15] Where the problem is caused by dark smoke then the provisions in the Clean Air Act 1993 apply. Section 2 prohibits the emission of dark smoke from any industrial or trade premises.

[16] EPA 1990, s.79(7).

[17] EPA 1990, s.80(8)(b).

[18] [2003] EWHC 1197 (Admin).

[19] For example, in *Malton Board of Health v. Malton Manure Co.* (1879) 4 Ex D 302 it was decided that the treatment of bones and coprolites (fossilized reptile faeces) with sulphuric acid for the manufacture of artificial manure resulted in the release of effluvia.

[20] *Salford CC v McNally* [1976] AC 379, at 389).

(as there would be in a civil action in private nuisance) for a complainant to have any interest in the land, such as a tenancy or ownership of premises.

Odour statutory nuisances are often geographically widespread, having the potential to affect a large number of people. The local authority should consider whether the problem is so substantial that it amounts to a public nuisance. To be a public nuisance it is necessary to prove that the odour materially interferes with the comfort and quality of life of a 'class' of the public. In *A-G v PYA Quarries Ltd* [1957] 2 QB 169, this meant:

'a nuisance which is so widespread in its range or so indiscriminate in its effect that it would not be reasonable to expect one person to take proceedings on his own responsibility to put a stop to it, but that it should be taken on the responsibility of the community at large'.

The 'health limb' and the 'nuisance limb' are different formulations of Section 79(1) EPA. The standard required to show prejudice to health is higher. In *Birmingham CC v Oakley*[21] the following distinction was made:

'[Prejudice to health] covers what may be actually injurious as well as what may be likely to be injurious and [is] in either case something over and above what may be seen as a "nuisance".'

The standard required to prove prejudice to health is objective. In practice, this requires convincing scientific evidence to show that, on the balance of probabilities, the odour is injurious to health, or there is a significant risk that exposure to the odour would be. Such evidence will be rarely available in an odour nuisance case, so proceeding under the nuisance limb is the more likely path. If the health effects are sufficiently serious and can be proved then it would be better to proceed under the health limb than under the nuisance limb because this better reflects the reality of the situation.

3.5.1. Alternatives

A local authority has standing under s.222 Local Government Act 1972 to prosecute or to commence civil proceedings for public nuisance where it considers this 'expedient for the promotion or protection of the inhabitants of their area'. It could apply for an injunction in the county courts or High Court to abate a public nuisance requiring immediate relief.[22] Where use of the usual abatement notice procedure has proved ineffective – for example if the perpetrator continues the nuisance in spite of a conviction for breach of the abatement notice - and the local authority considers that proceedings under section 80(4) EPA 1990 would not be an effective remedy - the local authority has the power under s.81(5) EPA 1990 to seek an injunction from the High Court to abate a statutory nuisance.

3.6. Use of the Abatement Notice Procedure under Section 80 EPA 1990

Once a local authority has formed the view that a statutory nuisance exists, the local authority is under a duty to serve an abatement notice.[23] Section 80(1) EPA 1990 provides that:

'Where a local authority is satisfied that a statutory nuisance exists, or is likely to occur or recur in the area of the authority, the local authority shall serve a notice….'

[21] [2001] 1 All ER 385, 399.

[22] *City of London Corp. v Bovis Construction Ltd* [1992] 3 All ER 697.

[23] *R v Carrick DC, ex p Shelley* [1996] Env LR 273.

The standard of proof required at this stage of serving the notice is a civil standard – on the balance of probabilities. The burden is on the local authority. The authority for taking decisions on behalf of the council can be delegated to a properly authorised officer. Delegation may be effected by Council resolution or standing orders. An officer authorised to sign notices should be able to produce, if required, the minutes of the meeting at which this delegation was made.

The validity of the notice may be appealed by the recipient of the notice in civil proceedings in the magistrates' court under section 80(3) EPA. By contrast, proceedings for breach of the notice are criminal proceedings in which the burden of proof rests with the prosecution to prove that the notice was breached. The standard of proof for succeeding in a prosecution is 'beyond reasonable doubt'; the same standard applies where the prosecution is brought by a 'person aggrieved' under s.82 EPA 1990.

3.7. Best Practicable Means

In certain cases, the defence of BPM will be available to the perpetrator of the alleged nuisance. BPM provides a way of balancing the interests of industry and residents. It is a defence for many forms of statutory nuisance arising on industrial, trade or business premises and this includes odour nuisances.[24] BPM can be raised at two stages: in appealing against an abatement notice or as a defence in a prosecution. In either case, it will be up to the perpetrator to prove, to a civil standard, that BPM have been used to prevent or to counteract the effects of the nuisance.

The burden of proof is on the defendant in a prosecution for breach of the notice (or on the appellant in an appeal against the notice itself) to prove the defence to the civil standard: on the balance of probabilities. It may be that an officer considers that, although a nuisance exists, the defence will succeed in the particular case. Whether the defence is made out is a matter for the court. If an officer wrongly anticipates that a court will decide that BPM is in place, and wrongly concludes that a statutory nuisance does not as a consequence exist, then the authority is potentially exposed to an action for judicial review, or a complaint to the Local Authority Ombudsman.[25]

A particular difficulty arises when the polluter has taken all reasonable steps to reduce the aggravating quality of the emissions, but the problem remains and still constitutes a nuisance in the eyes of the local authority. The extent of the odour or alleged nuisance may have been diminished by steps taken by the company, which may only 'just about' constitute a nuisance. This situation, though not uncommon, seems to be rarely litigated probably because companies and local authorities usually co-operate in seeking a solution in order to avoid litigation.

Only the courts can make the final judgment as to what constitutes BPM in a particular case. It remains the responsibility of the site operator, who is alleged to be responsible for generating odours, to demonstrate that he/she is employing BPM to control odour nuisance, taking account of the BPM criteria set out in s.79 EPA:

a) *"practicable" means reasonably practicable having regard among other things to local conditions and circumstances, to the current state of technical knowledge and to the financial implications;*

[24] EPA 1990, s.80(7).

[25] See Complaint 88/C/1373 against Sheffield City Council, 19th September 1989, Commission for Local Administration.

b) *the means to be employed include the design, installation, maintenance and manner and periods of operation of plant and machinery, and the design, construction and maintenance of buildings and structures;*

c) *the test is to apply only so far as compatible with any duty imposed by law;*

d) *the test is to apply only so far as compatible with safety and safe working conditions, and with the exigencies of any emergency or unforeseeable circumstances.*

In making a decision about what constitutes BPM the court would be expected to consider and weigh the evidence from both the operator of the premises and the local authority.

There is a number of industry specific Codes of Practice and other published regulatory guidance for individual odorous industry sectors, see **Appendix 1**. These provide good practice guidance on managing and controlling odour emissions, and guidance on the investigation and assessment of odour problems. It must be pointed out, however, that even full compliance with any particular regulatory or industry guidance does not provide any guarantee that a court will agree with the operator that this necessarily constitutes a BPM defence. Each case has to be considered on its own merits, taking into account all the relevant circumstances, including local circumstances.

3.7.1. Service of the Abatement Notice

There is no authority for the view that the service of an abatement notice should be delayed to allow sufficient time for alternative solutions to be explored: the trigger is the decision that the odour problem amounts to a statutory nuisance.[26] Any significant delay after the decision has been made that a statutory nuisance exists or could occur or recur would effectively give the local authority a discretion to which it is not entitled and be in conflict with *Ex parte Shelley*.[27] A certain amount of time would be allowed to consult with the perpetrator of the alleged nuisance, but EHPs need to be careful to avoid long drawn out discussions. In *Ex parte South West Water*, Simon Brown LJ opined[28]:

'Often, certainly, it will be appropriate to consult the alleged perpetrator, at least on some aspect of the matter, before serving an abatement notice, but the enforcing authority should be wary of being drawn too deeply and lengthily into scientific or technical debate, and warier still of finding itself fixed with all the obligations of a formal consultation process.'

It may be that the authority needs to consult in order to determine the initial question of whether a statutory nuisance exists; it might need to consult to decide whether to specify works in the abatement notice (and, if so, what works) or to determine the length of time to be given for those works to be undertaken. All of the above would be reasonable grounds to take an appropriate amount of time before serving an abatement notice, as would sufficient time in order to obtain scientific evidence. However, the reasons for any delay must be justified and must be proportional. An indefinite delay or a delay without having in mind a clear purpose cannot be justified.

3.8. Standard of Abatement

Local authorities need to avoid interpreting their duty under Part III of the EPA 1990 as a way of obliging businesses to adopt too high a standard of abatement. Requiring the most expensive, best available, or 'state of the art' technology to reduce problems to a minimum,

[26] Section 86 Clean Neighbourhoods and Environment Act 2005 enables a delay of up to 7 days to serve a noise abatement notice in order to allow alternative ways of dealing with a statutory nuisance. This provision only applies to noise nuisances.

[27] *R v Carrick DC, ex p Shelley* [1996] Env LR 273.

[28] *R v Falmouth and Truro Port Health Authority, ex p South West Water Ltd* [2000] 3 All ER 306,at 318.

risks being an unreasonable exercise of power. The requirement is that enough is done to reduce the problem to below the nuisance threshold. Practitioners should note that the BPM requirements under the Act include 'counteracting the effects' of the odour nuisance, so full abatement is not the test.[29] It should also be noted that one of the grounds for appealing an abatement notice is that BPM were used to prevent, or to counteract the effects of, the nuisance.[30]

3.8.1. Wording of Abatement Notices

There is a discretion to serve either a simple notice under s.80(1)(a) EPA requiring the abatement of the nuisance or prohibiting or restricting its occurrence or recurrence or one requiring works to be specified or steps to be carried out under s.80(1)(b).[31]

Local authorities are advised to consider very carefully whether to specify in the body of the notice any works that are required to be carried out. This may mean that councils have to pay for specialist advice early on to enable them to specify precisely what is required, see **Section 9.4**. Alternatively they may decide to rely on specialist advice paid for by the company. Service of a simple notice which is unspecific may be considered by the court to be unreasonable or inadequate. Prosecuting for breach of a simple abatement notice can be complicated because it requires proof to the criminal standard that a statutory nuisance existed at the time of breach. With a specific works notice, proof of breach of the notice will be more confined: to evidence that the works had not been carried out. However, specifying steps may result in compliance with the abatement notice but non-resolution of the statutory nuisance if the steps specified are not right.

The discretion is to consider which type of notice to serve but not to dis-apply specific works notices altogether.

3.8.2. Appeals against Abatement Notices[32]

The recipient of an abatement notice may appeal to a magistrates' court[33] within 21 days of service to have it quashed or to have the requirements varied to make them less onerous.[34] The appeal is a civil matter which is commenced by way of making a complaint to the court. The grounds for appealing the notice need to be specified and are set down in the Statutory Nuisance (Appeals) Regulations 1995.[35] All relevant grounds of appeal should be included. A 'person aggrieved' can take their own proceedings under s.82 of the EPA against a person causing a statutory nuisance. They will not be prevented from doing so because a local authority has served a notice under s.80 of the EPA, irrespective of whether that notice is appealed against.

The purpose of bringing an appeal is to test the local authority's justification for serving the abatement notice. The local authority becomes the defendant in an action brought by the person served with the notice, who is the appellant. The court should not be considering whether a breach of the notice has occurred. The court is concerned about such matters as whether a statutory nuisance existed, or was likely to occur or recur at that time, or whether

[29] EPA 1990, s.80(7).

[30] Statutory Nuisance (Appeals) Regulations 1995, SI 1995/2644, reg. 2(2)(e).

[31] *R v Falmouth and Truro Port Health Authority, ex p South West Water Ltd* [2000] 3 All ER 306.

[32] The appeals procedure is fully considered in chapter 13 of R. Malcolm & J. Pointing, *Statutory Nuisance: Law and Practice* (OUP: 2002).

[33] EPA 1990, s.80(3). In Scotland, appeal is by summary application to the sheriff.

[34] Statutory Nuisance (Appeals) Regulations 1995, SI 1995/2644, reg 2(5).

[35] SI 1995/2644.

the notice is drafted in the correct form and was properly served on the right person or persons. Failure to appeal against a defective notice will usually mean that the defect cannot be grounds for a defence in a future prosecution for breach of that notice.[36]

The powers of the magistrates' court are to vary the notice in favour of the appellant, to quash the notice, or to dismiss the appeal. Reasons must be given for their decisions. Either party may appeal, to the Crown Court against any decision of the magistrates' court.[37]

3.9. Statutory Authority

Statutory authority can provide a defence to activities which would otherwise be a nuisance. Statutory authority will be sufficient justification particularly where the public benefit is great and the nuisance comparatively small.[38] The scope of the defence depends on the statute which provides the statutory authority. Railway operations are generally exempt from common law nuisance actions, subject to operators exercising reasonable diligence in avoiding making unnecessary noise.[39] Statutory authority does not apply to all operations, however. Thus, a statute authorising tramways did not authorise the setting up of stables for horses. Even though such stables were necessary to the operation of the tramway, they were not included in the statute and therefore they did not attract statutory authority.[40] Where a nuisance is incidentally committed whilst carrying out an authorised act and the nuisance was a necessary consequence of the act, then the courts have been prepared to find that statutory authority does apply.

The Planning Act 2008 established a new planning regime for nationally significant infrastructure projects (NSIPs). Under the Act, national policy statements (NPSs) will be produced for key infrastructure sectors to ensure there is a clear, robust policy framework for planning decisions on NSIPs. NPSs will make clear the need to limit and mitigate any harmful impacts arising from proposed NSIPs. The Act also established a new independent body, the Infrastructure Planning Commission (IPC). The IPC will in future be responsible for determining applications for NSIPs.

Section 158 (1) and (2) of the Planning Act 2008, confers a defence of statutory authority for the purpose of providing a defence in any civil or criminal proceedings for nuisance for which development consent has been granted.

3.10. Making a Decision on Statutory Nuisance and Odour Effects

Whether a situation complained of amounts to a statutory nuisance or when an inspection results in the conclusion that a statutory nuisance exists, or is likely to occur or recur, will be decisions for the local authority.[41] It is a decision requiring consideration of a number of relevant factors based on professional judgement.

[36] *A. Lambert Flat Management Ltd. v Lomas* [1981] 2 All ER 280.

[37] EPA 1990, s.81, Sch.3, para.1(3).

[38] *Edgington v Swindon BC* [1939] 1 KB 86.

[39] Previous unreported cases indicate that railway companies have been successfully prosecuted for breach of s.80 notices for making excessive noise in associated activities, such as track repairs. In February 1993, the London borough of Kensington and Chelsea successfully prosecuted the British Railways Board for disturbing the sleep of local residents because of track re-alignment works (cited in C. Penn, *Noise Control*, 3rd ed (Shaw & Sons, 2002) p.95).

[40] *Rapier v London Tramways* [1893] 2 Ch 588.

[41] EPA 1990, s.80(1).

Making a decision about statutory nuisance does not depend on the number of complaints, though this is likely to be one of the factors that an EHP will take into account in making a judgement about the existence of a statutory nuisance. Neither does the justification for the decision depend on the number of complainants.

In nearly all cases of odour statutory nuisance EHPs have to decide whether it falls under the nuisance limb.[42] It would be extremely rare to find sufficient evidence to satisfy the prejudicial to health limb. Where it is thought reasonably likely that the prejudicial to health limb is engaged, specialist advice would normally be sought to assist the local authority. In such cases consultation with the Health Protection Agency (HPA) or the Health and Safety Executive (HSE) may be appropriate for deciding what the next steps for the local authority to take should be.

Generally with regard to potential health effects, it is widely accepted that the human sense of smell is so sensitive that the concentration of odorous compounds in the atmosphere which could give rise to detected odours are much lower than the thresholds which would normally be associated with any detrimental health effects. This reflects evolutionary developments in the human sense of smell that function as an 'early warning' mechanism to help humans detect offensive or harmful odours, even at low concentrations. Humans have, for example, an aversion to odours from decaying food or organic wastes which may carry disease organisms or other potential health risks. The practical implication is that in almost all cases, odour will become a statutory nuisance by virtue of being a 'nuisance' rather than because it is 'prejudicial to health'.

There may be reports from complainants about the impact from odours on their health including symptoms such as dry throats, headaches, running eyes, nausea and vomiting. However there is little, if any, persuasive or objective scientific evidence to link odours to such health effects. Apparent or reported health effects linked to offensive or objectionable odours, such as nausea or vomiting are more likely to reflect a heightened 'aversion' reaction to an offensive odour in affected individuals.

3.10.1. When does an Odour become a Statutory Nuisance?

Candidate odours for consideration as statutory nuisances include those which cause obvious and active changes in receptor behaviour, such as avoiding use of the garden, closing windows, making complaints, and keeping odour diaries. However, the determination of a statutory nuisance has also to take account of the frequency and duration of odour episodes or events, as well as the characteristics of the odour.

The opinion and judgement of EHPs is usually one of the most important factors in determining if, or when, an odour constitutes a statutory nuisance. The opinions and evidence of EHPs will also constitute important evidence before magistrates in any court proceedings involving statutory nuisance, so it is crucial that EHPs are appropriately objective, competent and thorough in their investigations as to alleged statutory nuisances, see **Section 9.3**.

In assessing the odour in a particular area an EHP might well look at the proportion of the population who complain. He/she could be justifiably less influenced by a small number of complaints from a large or high density residential area where one would expect a high level of reports or complaints to be made.

[42] There is authority that since the EPA 1990 does not require the local authority to set down in an abatement notice whether the alleged statutory nuisance comes under the nuisance limb or the prejudicial to health limb that a failure to stipulate which will not render the notice defective [*Lowe & Watson v South Somerset DC* [1998] Env LR 143].

The characteristics of the odour are very important. At one extreme, almost all receptors could be expected to find a strong odour of sewage sludge or pig slurry to be both objectionable and offensive, even with fairly regular exposure for short periods. The concentrations at which these odours become a statutory nuisance could be relatively low if they are persistent and frequent. However, short term exposure to these offensive odours might be less likely to be considered a statutory nuisance.

Even relatively pleasant odours, such as the smell of baking bread, may become objectionable, if not offensive, to almost all sectors of an exposed population by virtue of its persistence and intensity, particularly where the receptor population lives in close proximity to a bakery having inadequate odour control measures in place.

The odour impact of these examples could be assessed in a more structured way using the FIDOL factors approach described in **Section 4**.

3.11. Section 82 Applications for Abatement Orders

Section 82 applications for abatement orders form an important way in which a member of the public can bring an action in statutory nuisance. They form an alternative to civil proceedings brought in the county courts for private nuisance.

Where a member of the public is aggrieved by the existence of a statutory nuisance, he/she can apply under the provisions of s.82 EPA 1990 for the magistrates' court to issue an order to abate the nuisance. Where the local authority is taking action under s.80 EPA, or considering whether to do so, this would not prevent an 'aggrieved person' from prosecuting an alleged statutory nuisance under s.82. Neither would that person be precluded from commencing a civil action in the county court (or High Court). A defendant subject to parallel prosecutions could apply to the magistrates' court to have the s.82 proceedings stayed where the summons had already been taken out by the local authority. Where there are parallel criminal and civil proceedings, the usual practice is to apply to the civil court to stay those proceedings to await the outcome of the criminal trial. As the purpose of criminal prosecutions is different from civil cases, the civil proceedings would progress once the prosecution is completed.[43]

Where an investigation has taken place by the local authority under s.80 EPA and a decision has been made that a statutory nuisance does not exist, then a 'person aggrieved' (or the alleged perpetrator of the nuisance) can ask the EHP to give evidence in court in s.82 proceedings. Such a witness can be obliged to give evidence; the party may apply for a witness summons if the witness refuses.

3.12. Enforcement Boundary between the Local Authority and Environment Agency

Section 79(10), EPA 1990, as amended and relevant to England and Wales, states:

'A local authority shall not without the consent of the Secretary of State institute summary proceedings under this Part in respect of a nuisance falling within paragraph (b), (d), (e), (fb) or (g) of subsection (1) above if proceedings in respect thereof might be instituted

[43] Injunction proceedings are civil proceedings even though the civil court can order a prison sentence for breach of an injunction order. In some circumstances this remedy can protect a situation where an abatement notice has already been served. In *LB Hammersmith & Fulham v Magnum Automated Forecourts Ltd* [1978] 1 WLR 50, CA an injunction was sought to control noise emitted from a taxi cab centre where the abatement notice was suspended pending an appeal. Here the purpose of the injunction was to protect the situation until the appeal was decided. Caution is required in seeking an injunction. It is a remedy of last resort and an injunction will normally only be granted after there has been non-compliance with a notice (The *Barns (NE) Ltd & Suleman v Newcastle CC* [2005] EWCA Civ 1274).

under Part I or under regulations under section 2 of the Pollution Prevention and Control Act 1999.'

The EP Regulations were made under section 2 of PPC 1999, and therefore Section 79(10) applies where proceedings might be instituted under this regime, for example, through the enforcement of a condition in an environmental permit[44].

This applies therefore to odour nuisance but also the following statutory nuisances:

(b) smoke emitted from premises so as to be prejudicial to health or a nuisance;

(d) any dust, steam, smell or other effluvia arising on industrial, trade or business premises and being prejudicial to health or a nuisance;

(e) any accumulation or deposit which is prejudicial to health or a nuisance;

(fb) artificial light emitted from premises so as to be prejudicial to health or a nuisance;

(g) noise emitted from premises so as to be prejudicial to health or a nuisance.

By their very nature waste management operations and regulated facilities can be a significant source of odour nuisance. Close working arrangements and co-operation between each local authority and the EA aimed at finding a resolution to any odour issues that arise from permitted facilities or exempt sites are encouraged, see **Section 6**.

3.13. Complaints to the Local Authority Ombudsman

The scope for a complaint being investigated by the Ombudsman is limited to the actions of the public authority having been wrongful. They include a local authority:

- taking too long to take action without good reason;
- not following its own rules or the law;
- breaking its promises; and
- giving wrong (inaccurate), misleading or insufficient information.

Delay, which may be coupled with some other fault such as not complying with a legal requirement, seems to be the most common form of complaint. For example, a delay of five months between an initial visit to interview a complainant and carrying out a technical evaluation was held to be excessive.[45] And before *Ex p Shelley*,[46] the Commissioner had held that a delay of 20 months between deciding whether the activity constituted a statutory nuisance and serving an abatement notice was excessive.[47]

The Commissioner has no power to quash or amend any notice. Recipients of abatement notices have other means of redress through a right to appeal against the service of a notice. Where the Commissioner provides a report which upholds, at least in part, a complaint, the local authority is under a duty to consider the report and to notify him within three months of the basis of any action taken. The report will be principally concerned with

[44] Technical Guidance dealing with the interrelationship between the Environmental Permitting regime and the local authority's statutory nuisance powers under the Environmental Protection Act 1990 (the 'EPA 1990'), is being drafted by Defra, 2010.

[45] Complaint 88/A/1864 against London Borough of Barnet, 3 May 1990, Commission for Local Administration in England.

[46] *R v Carrick DC, ex p Shelley* [1996] Env LR 273.

[47] Complaint 88/C/1373 against Sheffield CC, 19 September 1989, Commission for Local Administration in England.

putting right the injustice and may include recommending a payment being made to the complainant. However, decisions made in reports are not legally enforceable and the local authority cannot be obliged to accept the Commissioner's views.

Key Points

- There are three discrete regulatory regimes available for the control of odours, planning, permitting and statutory nuisance.
- It is more effective to address odour at the design and planning stage of a new plant or process than to seek to abate a statutory nuisance from odours retrospectively.
- EHPs need to be appropriately objective, competent and thorough in their investigation of alleged statutory nuisance. The FIDOL factors are a useful framework to facilitate such investigations.
- EHPs should understand the enforcement boundaries between the local authority and EA in light of the EP Regulations.
- The standard of protection from problem odours is higher when this is derived from planning control than from the statutory nuisance regime.
- The requirements for establishing the nuisance limb for odour statutory nuisance are onerous: a substantial interference in personal comfort or amenity is required.
- Odours that are prejudicial to health are likely to be rare; establishing statutory nuisance under this limb requires specialist scientific evidence and opinion.
- EHPs have a discretion whether to serve simple abatement notices or ones that require works to be carried out or steps to be stipulated; they do not have a discretion not to consider serving any particular form of notice.

4. ODOUR ASSESSMENT TECHNIQUES

4.1. Introduction

The human response to recognisable odours in the environment is essentially subjective, and can be influenced by emotion and perception as well as, or as much as, by real and obvious sensory responses. Unlike noise, there are no "simple" instruments which can be used to objectively measure odours in the field. However, environmental health practitioners (EHPs) should try to evaluate actual and potential odour impacts in an impartial and objective way that will be fair and reasonable to both site operators and odour sensitive receptors. The following Guidance sets out some methods that can be used by EHPs to help improve the objectivity of odour assessments, both in terms of consideration of planning/permitting applications and compliance.

Useful tools available to an EHP assessing the possible impact of a new, potentially odorous process at the planning application stage may be quantitative dispersion modelling techniques or industry specific risk assessment methods, such as the one set out in the Defra's Guidance on the Control of Odour and Noise from Commercial Kitchen Exhaust Systems Click here to view Guidance.

Typically, the most useful tool for EHPs assessing odours will be the on-site "sniff" test type assessment (ideally by two or more officers) at the complainants/receptors locations. EHPs may consider the FIDOL factors in assessing their findings.

Further assessment tools for EHPs investigating alleged statutory odour nuisance include diary sheets and complaint records (ideally with some wind/weather record analysis for corroboration). Complaints monitoring can provide EHPs with a measure of both the significance of an alleged statutory nuisance (numbers of complaints) and the progress in controlling any trends in complaint numbers, see **Section 8.5.2**. Direct measurement of odour emissions by olfactometry supported by odour dispersion modelling can also help EHPs and plant operators investigate alleged complaints, assess long-term odour exposure levels and clarify the source of offsite odours.

4.2. Matching Assessment Tools to the Requirements

Planning applications for developments which have the potential to cause off-site odour impact should be supported by an evaluation of the expected odour impact and proposals for mitigation measures, where necessary. The degree of detail provided in such assessments should be proportionate to the risk of odour impact, taking account of factors including the proximity of receptors, the scale of the proposed activity and the nature of the proposed development.

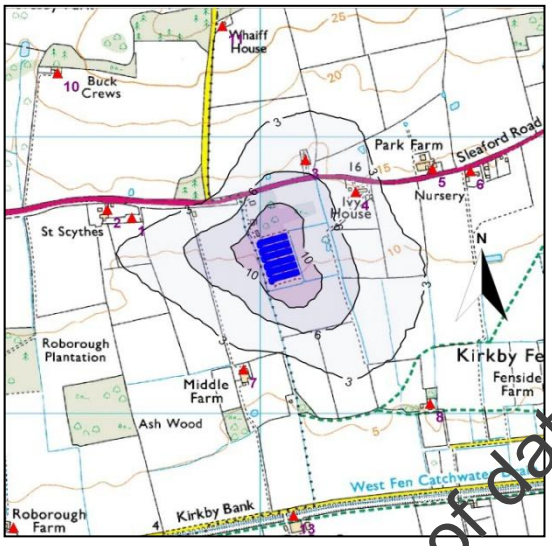
At one extreme, for small scale developments such as a new hot food take-way, a relatively simple risk assessment based approach is likely to be appropriate, providing it is carried out in a thorough manner. An example of an Odour Risk Assessment Protocol for commercial kitchens is provided in 'Guidance on the Control of Odour and Noise from Commercial Kitchen Exhaust Systems', DEFRA, January 2005'

In higher risk examples such as a new sewage treatment works, a more rigorous approach to evaluating odour impact may be appropriate. Odour Impact Assessments are typically based on computer models which predict odour dispersion from the proposed development based on local weather records and estimated or predicted odour emissions from the proposed development. The outputs from dispersion modelling are usually presented as odour contours or "isopleths" on a base map of the area, and this allows potential odour impact to be predicted at odour sensitive receptor locations such as residential

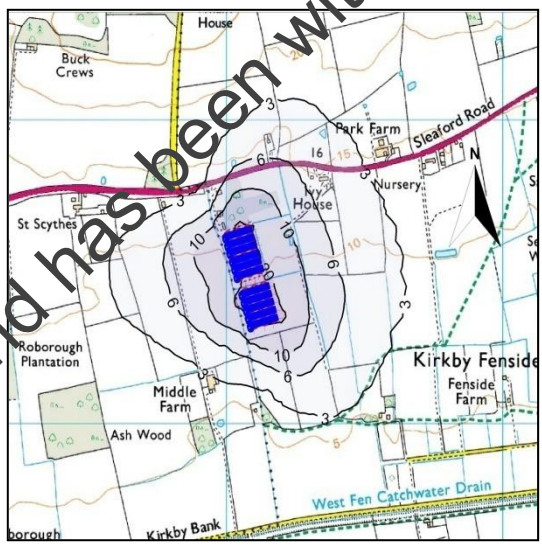
developments in the area and for this impact to be compared with 98th percentile impact benchmarks. Dispersion models can also be used to determine the level of odour mitigation required to control odour impact, or to determine the maximum permissible odour emissions from a site to avoid off-site impact or loss of amenity. These predictions, and the mitigation measures which can be prescribed as a result of objective measurement, can play a key role in preventing many years' experience of odours downwind of the site.

Figure 4.1 - Simple Odour Contour Maps for an Existing and Proposed New Free Range Poultry Unit

(a) Existing



(b) Proposed



One of the first stages in determining whether an odour constitutes a statutory nuisance is to assess if the odour has any deleterious impact on sensitive receptors (usually the complainant's property), taking into account a wide range of factors, see summary provided in **Table 4.2**. In the first instance, this assessment can be made simply by visiting the complainant and collecting information about the nature and frequency of the odour, and the manner in which the odour affects their daily lives i.e. the ways in which they have to adapt their behaviour as a consequence of being exposed to the odour. There are a number of tools which may support this process, which are summarised in **Table 4.1**.

Each of these tools has its own advantages and limitations that must be taken into account when considering an effective assessment strategy. For example, some of these techniques are predictive, while some tools may be able to draw inferences from historical events. Some techniques are qualitative, whilst others give quantitative, numerical data. In practice, it can sometimes be difficult to predict when a situation will lead to a statutory nuisance. Many tools involving prediction e.g. modelling, are less effective for the endpoint of statutory nuisance than they are for a planning impact assessment "*no significant loss of amenity*". However, real-time tools e.g. direct sensory assessments in the field by the EHP using a "sniff test" and retrospective techniques e.g. complaints monitoring are more likely to be effective. It is important not to consider these tools/techniques in isolation. Such assessments work best when brought together with other assessment techniques and confidence in the conclusions reached can generally be improved by using multiple assessment tools.

Table 4.1 - Main Tools Available to Estimate the Significance of Odour Impact

Tool	Comments
Source emission characterisation combined with computer dispersion modelling	Usually used as a predictive tool to assess the impact of proposed plant but also successfully used to identify causes of off-site odour impact , establish long-term odour exposure levels and to rank relative efficacies of odour abatement strategies. Requires the input of source emission data (in odour units) that may not be easily available to EHPs and requires specialist input. Allows comparison with numerical odour standards, see **Sections 4.3 and 4.6**, for advantages and disadvantages of this. Source emissions can be characterised using measurement at source EN 13725:2003.
Field odour assessment using "sniff test"	In practice this is likely to be the main tool used by EHPs to corroborate, odour impact.
Complaints monitoring - the level of complaints from surrounding sensitive receptors.	See **Section 8.5** for further details.
Odour diaries, etc.	Diaries can provide the opportunity to record short term odour episodes, to show changes and trends in odour impacts.
Ambient air quality monitoring at the receptors	This is very difficult to carry out in a way that enables valid conclusions to be drawn. In fact in the vast majority of situations it will be impractical because gas concentration instruments and analysis techniques are generally much less sensitive than the human nose. Note that dynamic olfactometry cannot be used for ambient monitoring.
Measurement of odour exposure, expressed as frequency of 'odour hours'	Direct measurement of the frequency of 'odour hours' on a grid of receptor points, using trained observers. This method offers the option of directly assessing the odour exposure levels around a site over the long-term and is therefore very useful in terms of providing a definitive answer on odour impact. The method is however cumbersome, because of the long period required for observations (6 months minimum). Standardised method according to German standard VDI/DIN3940:2006[48].

4.3. Source Characterisation and Modelling for New Developments

Odour impact standards are now widely used in the UK in the assessment of potential odour impacts when new, potentially odorous facilities such as sewage treatment works are planned. The odour impact standards used are largely based on custom and practices, and on standards which have been accepted by planning inspectors in public inquiries. There is also been some guidance in the Environment Agency (EA), Draft 2009, H4 - Odour Guidance.

Typical standards might be for emissions to be controlled at source to such a level that modelled odour exposures should not to exceed a 98th percentile hourly mean concentration of 1.5, 3 or 5 ou_E m^{-3} at receptor locations. These standards are not normally used in the context of statutory nuisance control, and have no statutory basis. However they provide a useful tool to allow local authorities to assess and control the odour impact of new developments through the planning control regime, and this can be a very effective means of protecting amenity and therefore preventing or controlling future statutory nuisance from odours at the planning stage.

[48] VDI 3940, Part 1: 2006, Measurement of Odour Impact by Field Inspection – Measurement of the impact frequency of recognisable odours – Grid Measurement . Verein Deutscher Ingenieure, Dusseldorf.

There are some good reasons for this approach being adopted. Firstly there is a very wide distribution of sensitivities to odour across the population. Even if one ignores those people who are anosmic and hypersensitive, there is still a very wide variation in the population with "normal" odour sensitivities. The problem with setting any kind of limit value for odour is that even when compliance is achieved, there could well be individuals in the local community who would be likely to detect the odour more frequently or more intensely than others. Despite meeting the limit values, these people may still perceive the odour as unwanted or annoying. Some people may even be sufficiently annoyed to complain.

This concern has not prevented the adoption of limit values and guidelines in other countries with odour regulatory systems, notably the Netherlands, Germany, Australia, New Zealand and the USA, and effectively these countries appear to have set their limits at levels which aim to protect the majority of the population.

As a matter of clarification, it should be noted that the odour impact standards used in impact assessments DO NOT relate directly to receptor experience because of the statistical methods used in dispersion modelling.

Where planning applications concern developments which have not been built, then odour emission rate model inputs may have to be based on measurements made on other similar plants elsewhere. Alternatively the modelling might more simply be used to define maximum permissible emissions limits to achieve a required level of odour impact protection.

Impact criteria used in interpreting modelling exercises are usually expressed as 98th percentiles because this represents a small proportion of time (around 14 hours per month) during which odour concentration might reach or exceed the specified concentration. The use of 98th percentiles is also consistent with criterion used to assess environmental impacts of other air "contaminants".

It is necessary to appreciate that the 98th percentile hourly mean odour concentrations used to interpret dispersion modelling predictions are not directly analogous to odour concentrations measured in an odour laboratory. In free field conditions, the momentary odour concentrations will vary and the actual concentration within one inhalation may be orders of magnitude higher or lower than the hourly average, as described by the 'peak to mean' ratio of the variations within that hour. Dispersed odour concentrations predicted by modelling are the results of complex statistical calculations which take account of variations in odour perception over hourly time periods. Dispersion modelling results are normally interpreted using either some kind of site specific analysis of dose-response relationships in the community or area around an odour source[49], or more commonly, by "custom and practice" benchmarks.

4.4. Sniff Tests / Field Assessments by EHPs

Sniff Tests are designed for assessing the odour impact by recording some or all of the FIDOL factors, **see Section 4.4.1**, including odour strength (as intensity), the type of odour/hedonic tone, the hourly, daily and seasonal distribution of nuisance, and consideration of odour in the affected area. Methods vary in the degree of sophistication of the test, some allowing subjective estimates of the ambient odour intensity to be compared with intensity criteria.

[49] H.M.E Miedema, J.I Walpot, H. Vos, C.F. Steunenberg Exposure-annoyance relationships for odour from industrial sources, Atmospheric Environment 34 (2000) 2927-2936

This technique forms the mainstay of the EHP's toolkit to assess whether statutory nuisance from odour exists. The Intensity & Offensiveness scoring tables in **Section 2 (Table 2.2 and 2.3)** and the Odour Wheel used to characterise the odour detailed in **Appendix 2** can provide useful assessment tools for use by EHPs.

EHPs are likely to carry out sensory field odour assessments using the sniff test for the following:

i) **Area Inspection/Investigation** – possibly**,** to a planned schedule to assess environmental impact of odour. A single survey can only provide a subjective snapshot assessment of the impact of an odour at the test locations at a particular time and date. Therefore, for a representative assessment of the odour impact of an installation on the surrounding environment, repeat surveys must be carried out over a suitably representative period of time. There is guidance below suggesting the best times to carry out such investigations.

ii) **Reactive - In response to a complaint.** Regulators and site operators are making increasing use of Odour Complaint Hotlines together with a Complaints Response Procedure. The latter usually requires some form of follow-up of the complaint. Sensory field odour assessment by sniff test is suitable as a tool for following up odour complaints and tracking odour sources.

An EHP carrying out a sniff test as part of investigations into an alleged odour nuisance needs to collect sufficient information to help decide if any detected odour does constitute a statutory nuisance and, if so, to identify the source/premises from where the odour is being emitted. This information should be collected in the knowledge that there is the possibility that any evidence collected may be used in legal proceedings for statutory nuisance. The observations made and recorded should address the following:

a) Is there a level of odour which might be classed as a statutory nuisance? This assessment should take account of factors such as odour strength, how objectionable or offensive the odour is, and the intensity, persistence and duration/frequency (and/or likely duration and frequency of the odour or if it may recur in future).

b) What is/are the source or source premises of any odours identified?

c) Are there any other odour sources in the area which might also be affecting or influencing the olfactory sense of the EHP and complainants? Can these sources be eliminated from the investigation?

d) What are local wind and weather conditions at the time of the site investigations? This information may help corroborate or eliminate the suspected source or sources of alleged statutory nuisance.

The investigating EHP who is carrying out sniff testing should make it clear to residents or complainants at a very early stage that there is a much better chance of resolving continuing or chronic odour issues if the residents provide timely and objective complaint information. For example, if an EHP is to investigate an alleged odour incident it is far more likely that the odour can be witnessed if the residents notify the local authority at the time when the odour is actually being experienced, rather than making a complaint later in the day or on the following day. The first visit should be to the location of the alleged complaint to try to gain a perception of the alleged odour impact as soon as possible after the complaint is made.

4.4.1. FIDOL Factors

The FIDOL factors have been defined to highlight to EHPs and others which general principles and factors may be important in assessing when, or if, a specific odour source is likely to constitute a statutory nuisance. The same factors can also be used as a basic means of assessing the potential odour impact of proposed developments.

The FIDOL factors are defined as **F**requency, **I**ntensity (and therefore concentration), **D**uration, relative **O**ffensiveness (hedonic tone/character) and **L**ocation, along with any aggravating characteristics. Although an odour does not have to be offensive in order for it to constitute a statutory nuisance, there are similarities between the criteria. **Table 4.2** below outlines the 'FIDOL' factors that are useful in determining potential odour impact or "offensiveness", and some of the important factors that should be taken into account when assessing a case of potential statutory odour nuisance.

Table 4.2 - Relating Odour Impact (or Offensiveness) to Statutory Nuisance

The 'FIDOL' factors determining offensiveness	Factors determining Statutory Nuisance	Comments
FREQUENCY (How often an individual is exposed to odour)	Frequency (How often an individual is exposed to odour)	Even an odour with quite a pleasant hedonic score can be perceived as a statutory nuisance if exposure is frequent. At low concentrations a rapidly fluctuating odour is more noticeable than a steady background odour, i.e. this is an aggravating factor
INTENSITY (The perceived strength of the odour, proportional to $\log_{10}$ concentration)	Level of odour	Factors are equivalent
DURATION (The length of a particular odour event or episode. Duration of exposure to the odour)	Duration	Factors are equivalent
OFFENSIVENESS (relative)/character (Offensiveness is a mixture of odour character and hedonic tone at a given odour concentration/intensity)	Type of odour	Some odours are universally considered offensive, such as decaying animal matter. Other odours may be offensive only to those who suffer unwanted exposure in the residential intimacy e.g. coffee roasting odour.
LOCATION (The type of land use and nature of human activities in the vicinity of an odour source. Tolerance and expectation of the receptor.)	The characteristics of the neighbourhood where the odour occurs	Factors are essentially equivalent
	The sensitivity of the complainant	Statutory nuisance uses the concept of the response of the average, reasonable person

4.4.2. Timing of Inspection Sniff Tests

It is important to be aware that variations in perceived odours at a receptor location can be driven as much, if not more by variations in meteorological conditions as they can be by variations in odour emission rate.

There are some important observations which follow from these correlations in relation to investigation of alleged nuisance complaints and the times of day (and weather conditions) when residents are likely to experience the strongest or most annoying odours:

a) The worst odour dispersion conditions ("poor" and "very poor") usually occur overnight between dusk and dawn under stable and very stable atmospheric stability conditions. These conditions are sometimes referred to as a temperature inversion. This can mean that receptors may experience the strongest odours through the hours of darkness, and that they may therefore suspect that plant operators are releasing more odour overnight when people are not around. In reality this is usually not the case. During the cooler months of the year, receptors are more likely to be in their houses during the hours of darkness, and are less likely to have windows open, so the fact that odours may not be so well dispersed is less important. However in the warmer months of the year poor dispersion characteristics may lead to receptors experiencing stronger odours through open windows in summer evenings or when sitting outside or enjoying the garden / amenity in the late evening.

   The implications for investigating EHPs are that they are only likely to be able to witness the highest levels of odour impact from odorous premises if they are available for out-of-hours complaint investigations. The clear inference is that some of the odour "inspection" activities required under Section 79 of the EPA should be carried out in the late evening and early night during the warmer months of the year at least, **see Section 9.2**. Odours are likely to be most persistent under these conditions. Stable conditions can also occur on clear, calm frosty mornings, so these can also be good conditions for investigating alleged odours.

b) More than 60% of day and night time falls under either neutral or slightly unstable conditions which are associated with breezy/windy weather with slight/moderate sunshine or overcast skies. These are probably the conditions which account for most of the remainder of odour complaints, and they are likely to cause receptors to experience odours as odour plumes intermittently as these move around and mix in the atmosphere.

4.4.3. Wind Directions

It is helpful for investigating EHPs to be aware of, and to make observations about wind direction (and speed) at all stages of their investigations into odour episodes. Wind direction observations and measurements using a simple wind vane anemometer can be used both on site and retrospectively on a local map to track the likely origins of odours.

4.4.4. Records and Equipment

If an EHP is visiting a site it may be useful to take along a copy of a local map so that the location of observations can be marked on the map, together with local wind directions on the day. Any map marked up in this way should be dated and linked by a reference number to the complaint sheet.

A pocket compass is very useful to help define wind direction and the convention is that wind direction is recorded as the direction **from** which the wind is blowing. A simple hand

help anemometer can also be used to provide more information about weather data, which may subsequently be useful in corroborating sniff test observations or complaints.

On sites with known histories of odour problems, it may be helpful to suggest that the operator installs a simple, high visibility 'wind sock' attached to a pole at high level in order that local wind conditions can be determined immediately by the site operator and by the EHP on each visit to the site.

4.4.5. Eliminating Other Sources

The operators of plants which have chronic odour histories frequently allege that they get the blame for all local odours, so it is important that EHPs investigating odour events take steps to investigate or eliminate other possible causes of odours as well as specifically investigating the suspected source. As an example, odour complaints which are alleged to be caused by, for example, a sewage treatment works or an abattoir may actually be caused by other "organic" odour sources in the area, such as land spreading of agricultural manures. This can occur even though the odours may be quite different. The investigating EHP should, therefore ideally make an assessment of odours "upwind" of the alleged source if there is any possibility of another cause of the odours, before more thoroughly investigating odours downwind of the suspected activity.

4.4.6. Hypersensitivity

It is important that all EHPs investigating odours are aware of the way that their sense of smell, and that of residents/receptors, can become affected by exposure to specific odours.

Firstly there is the possibility that the human "nose" (sense of smell) can become "hyper-sensitive" to an offensive or persistent odour to the extent that one can almost anticipate a familiar odour, even when it is at very low concentrations. In reality hypersensitivity to a particular odour is unlikely to be a true heightened physiological response (that is in terms of a more sensitive olfactory detection response), but it is quite possible that individuals become more "alert" to the characteristics of a familiar odour, and are therefore more able to recognise it at low concentrations. Apparently enhanced responses may also be caused by an association with a particular place or activity where or when the odour has been perceived on previous occasions. A commonly quoted example of this phenomenon relates to residents complaining about slurry spreading odours when the farmer involved reports that he had only driven through the area with an empty slurry tanker. There may also be more rational explanations for apparent odour recognition by EHPs and others, such as the possibility that the suspect odour has become "attached" to clothes or footwear, or by being in, or in close proximity to, the odorous premises.

4.4.7. Habituation and Adaptation

A more important factor which is very relevant to EHPs investigating odour complaints is the very real phenomenon that the human sense of smell can alter relatively quickly (in some cases within just a few minutes), to become so familiar with, or used to, an odour to the extent that it does not elicit a response at low to moderate concentrations. The most obvious example of this is the observation by people who work in odorous places that they are not aware of the plant odours because of odour "habituation" and their apparent surprise that off-site receptors or residents are complaining about odours from their plant. The practical point for EHPs is that they should make off-site odour assessments before getting close to, or visiting, the suspected source of odours, otherwise there is a distinct possibility that they will lose the ability to detect and assess low concentration off-site odours because of the process of odour "adaptation" which is the physiological decrease in sensitivity after exposure to a strong stimulus through saturation of the nasal receptors.

4.4.8. EHP Odour Sensitivity and Corroboration

As explained earlier, there is a wide range of odour sensitivity within the population. To take account of this variation there is merit in at least two EHPs witnessing odours from premises alleged to be generating odour problems, either independently or jointly during the course of the assessment. This helps guard against the possibility that an individual officer is unduly sensitive or insensitive to odours, either generally or to the site specific odour under investigation.

EHPs can have their sense of smell tested against the n-butanol test gas used to select and validate odour panellists in olfactometry. This provides EHPs with the opportunity to find out if their odour response is at, or around, "average" levels, or if they may be more or less sensitive than the population in general. An EHP with a very sensitive sense of smell, or a low sensitivity should not necessarily be precluded from sniff testing, but their findings from field sniff assessments may need some interpretation. For officers routinely engaged in making assessments of odours, it may be appropriate for their olfactory acuity (their senses of smell) to be objectively tested under laboratory conditions, using a panel selection procedure as described in the British/European Standard BSEN13725:2003. **Appendix 4** provides a summary on methods employed to test olfactory acuity.

4.4.9. Suggested Order of Assessment

The following order of odour assessment is suggested for EHPs investigating an odour complaint, although this approach may need to be adapted for individual investigations when, for example there is no uncertainty at all about the cause or source of alleged complaints:

i. Visit the complainant's property at the earliest opportunity after a complaint is received if there is any possibility that the alleged odour may be continuing. Interview the complainant to ascertain their own perception of the odour in terms of its FIDOL factors. Make an initial assessment of the strength, nature and character of any odours at this location, taking account of wind or weather conditions which may cause odour concentrations to fluctuate. Make observations and measurements, where practicable, of wind direction and record this information.

ii. If there is any possibility of there being another cause of odours, other than an obvious suspect premises, then at this stage make an assessment of background odours upwind of the suspected source to help eliminate other possible causes.

iii. If other sources are (or have been) eliminated then return to the complainants location and assess odours upwind of this location and make further assessments between the receptor location and the suspected source or premises. These assessments should be made by walking across any odour plumes at various intervals between the suspected source and receptors. By moving progressively from the receptor or complainant location, where the odour can be expected to be weakest, towards the suspected source, and at any distance from the source the EHP should exit the odour plume and enter again, there should be minimal risk of an EHP losing his/her sensitivity to the odour see **section 4.4.7** – Adaptation. This assessment will help provide evidence of a link between the alleged odours (at the receptor) and the suspected premises. Careful tracing of odour plumes can sometimes also help identify the exact source or points of release of the odour from the suspected premises.

iv. Visit site and attempt to confirm source, either from tracing plume back to premises or by subjective sniffing around the site to try to recognise odour. Note that because assessors may lose sensitivity to odour while on site it may be very difficult to identify

the source of an alleged odour if there are a number of processes treating the same or similar materials.

v. "Sniffing" or assessment locations should be selected with due regard to wind direction at the time of the assessment. There can be some merit in having a number of "sniff points" at which odour assessments are routinely made. However, observations should only be made at a number of pre-planned points (including the complainants location) if the wind is blowing odours away from the suspect premises towards another location. Some sniff assessments could be made at similar separation distances (to that between the source premise and complainants), but in the downwind direction.

4.5. Odour Diaries

Odour diaries can be used whether there are small or large numbers of receptors or complainants. Volunteers record details using a standard format diary record sheet which enables information to be captured in a consistent manner on a daily or weekly basis with a particular emphasis on odour episodes. It is important the diary provides details of their perception of the odour and any effects that the odour has on their behaviour.

Diaries provide the opportunity to record short term odour episodes, to show changes and trends in odour impacts. They may also be useful to help distinguish between two or more sources of odour, if the reporter/complainant keeps good records of the nature or description of odours. Similarly simple local wind or weather records can also help identify or confirm the source of alleged odours. See **Appendix 5** for an example of an Odour Diary Sheet.

One of the significant challenges may be to keep the residents/receptors motivated to carry on completing diaries, especially where the investigation continues for some time. Regular contact by EHPs, with progress updates, should help maintain receptor enthusiasm.

Table 4.3 - Suggested Instructions to be given to Diarists to Help Them Record Information[50]

Same-day events	Odour impacts that occur on the same day should be entered as separate events when (a) the time between the odours occurring is much greater than their duration, or (b) there has been a significant wind change between the different observations of odour. If, for example, the odour was noticed first in the morning and it persisted for most of the day, this can be recorded as a single event.
Location	The idea is to quantify the extent of odour impacts at a residential location or some other premises, so recorded events must be restricted to those experienced at one fixed location where the diarist will routinely be present for a significant part of the day or evening.
Date and time of odour event	The date and time of day the odour was first noticed and when it ceased should be recorded. This allows for future analysis of recorded wind conditions so that potential sources upwind of the receptor location can be checked.
Duration of odour event	It is necessary to provide clear details about the overall duration of the odour event. This information allows for an estimation of the percentage of time that odour impacts occur, which is central to the assessment of comprehensive diary programme results. The duration needs to be recorded in hours, or as a time range (for example 8.30 am to 2.30 pm.)
Continuity of each odour event	It is useful to record whether or not the odour during an event is continuous or intermittent. A number of options are available on the sheet for each odour event to indicate this.

[50] Odour Measurement and Control – An Update, Woodfield and Hall D, AEA Technology for the DoE, 1994

Character/ description of odour	Diarists are required to describe the character or type of odour they experience. Examples include 'strong mouldy smell', 'blocked-drain smell', 'cooking meat smell', 'sulphurous, mothball smell', 'wet wool smell' or 'burning grease smell'. Note that descriptions such as 'horrible', 'sickening', 'awful' or 'not bad' are not useful in determining character. Inconsistent and confusing descriptions of odour character for the same industrial or trade source can be expected, because individual diarists are typically untrained in odour sensory analysis. Because of this, it is often incorrectly assumed that people are not good at discerning different sources of environmental odours. However, although the odour description information in diary programmes is often inconsistent with the source and other diarists` descriptions of that source, it should not be assumed that information from community members about the perceived source of a specific odour is not reliable. This is particularly true when a diarist's location has been confirmed to be downwind of the alleged source, and no other obvious sources of odour can be implicated.
Source of odour	Diarists are asked to record what they consider to be the likely source of the odour, or state if they do not know.
Effect of Odour	Diarists are asked to record how the odour affected their behaviour e.g. had to close windows, "tainted" washing on line, was aware of odour while gardening, kept getting intermittent whiffs, had to finish barbeque early.
Strength of odour event	This record relates only to the intensity of the odour and should use a similar rating scale as recommended for field investigations see **Table 2.2** in **Section 2.2.3**
Wind conditions	The general wind direction (for example, 'blowing from the north-west and hot summer's day' or 'cold overcast day with southerly winds') should be recorded as a compass direction (N, NE, etc) followed by the approximate wind strength (still/calm, light breeze, medium breeze, moderate wind, or strong wind).

4.5.1. Odour Descriptions and Scoring

As well as providing some subjective description of odour character, records should include an assessment of the intensity or unpleasantness of any odours detected, see **Section 2.**

4.6. Odour Investigation using Source Characterisation & Modelling

Olfactometry and dispersion modelling can be used to help identify and prioritise the sources of odour, and to then assess, specify and test improvement measures on sites with numerous odour sources. The following points list a typical approach which could be adopted as a series of steps, in whole or in part, to identify remedies to nuisance problems.

1. Attempt to identify the most odorous parts of the operation. This can be achieved by using odour sampling, see **Appendix 6,** and olfactometric analysis to compare the odour concentrations of emissions from different stacks, air outlets and/or building air spaces (where fugitive emissions are suspected).

2. Attempt to characterise nuisance odours with assistance from the complainants. Where there are a number of potential nuisance sources there can be merit in trying to get some of the complaints to "sniff" odours at different parts of the works - either during a site visit or preferably by collection of samples (in sample bags) for "blind" sniffing by complainants off site.

3. Calculate comparative odour emission rates for different odour sources. This is accomplished by multiplying the measured odour concentrations (as at 1. above) by measured ventilation rates (stacks and air outlets) or estimated air exchange rates (fugitive emissions).

4. Use dispersion modelling to assess the odour impact of calculated odour emission rates. The output from computer modelling can then be compared with agreed acceptability criteria - e.g. an hourly average of, say, 3 or 5 $ou_E\ m^{-3}$ for no more than

2% of time (the 98th percentile). See an example odour contour map at **Section 4.2.**

5. Use "screening" dispersion model runs to assess the feasibility of possible solutions. Typically improvements which could be considered include process changes to reduce odour emission at source, improved dispersion (e.g. taller stacks, higher discharge velocities) or odour abatement (e.g. biofilters, scrubbers and filters). This modelling provides low cost answers to "what if" questions.

6. Undertake full dispersion model(s) runs to demonstrate the effectiveness of the proposed solution(s). The model output can be compared with the original modelled scenario (at 4. above) to demonstrate potential improvements.

7. Determine a performance specification for process changes or other improvements. The modelling will provide a good basis for design of revised stack heights, discharge velocities and odour abatement plant performance. "Chemical" analysis of the constituent odorants in odorous airstream by high resolution GC-MS may also be helpful at this stage.

8. Define odour emission rate limits for individual sources, as a benchmark for establishing compliance with improvement requirements

9. Post improvement or installation performance testing using odour sampling and olfactometry. Measurements should be used to confirm plant performance meets relevant specifications, both initially and periodically thereafter.

This approach has been successfully used at premises such as pet food factories and chicken processing plants to quantify and rank odour emissions from different sources. For example in the case of a chicken processing plant, emissions from the lairage area, scald tank extract fans, an effluent treatment plant, blood storage tanks, sludge storage tanks and an on-site rendering plant can be quantified so that their relative contribution to off-site odour impact can be determined. In this specific example it transpired that the major cause of off-site odours was a large biofilter which was intended to control odour emissions from the rendering plant, and yet several years of subjective "sniffing" around the site had failed to identify the biofilter as the cause of the problem.

The results of such measurements can then be used as inputs to a dispersion model to visually represent odour impacts on contoured maps. Emission rate data and model outputs can be used by the plant operators to identify and prioritise odour control and mitigation improvements. The same approach has been used very successfully on sewage and sludge treatment works.

In many cases, process or management changes to reduce odour emissions, and/or improvements in arrangements for odour dispersion (e.g. tall stacks) are much better alternatives than increasingly complex odour abatement technology. There is less to go wrong and the running costs are usually lower, and modelling allows these options to be fully explored.

Odour impact appraisals of this type are normally commissioned and funded by the plant operators rather than local authorities. EHPs may encourage operators to carry out such assessments voluntarily, or may include a requirement to carry out such assessments as part of the "steps" or "measures" prescribed in an abatement notice where an operator has been unable to identify the cause of alleged odours.

4.7. Field Panel Sniff Testing

Some European countries have drawn up and published formal protocols for sensory field odour assessments using panels of human “sniffers” out in the environment around odorous premises.

As an example, a formal national standard exists in Germany, VDI method 3940, Part 1: 2006, Measurement of Odour Impact by Field Inspection. This is a very comprehensive assessment protocol, but it requires at least 6 months of measurements and can require substantial more resources, including multi-person “sniffing squads, than are likely to be available for routine checking for Statutory Nuisance. As yet there is no national standard in the UK.

The Comité Européen de Normalisation (CEN) is understood to have established a working group (WG27) under technical committee TC264 ‘Air Quality’ to draft a European standard for sensory tests in the field.

At the current time this approach is very unlikely to be a practicable enforcement tool for local authorities in England and Wales, not least because of the potentially significant cost and resource implications, but also because the EPA regulatory framework is currently focused on EHP observations.

Key Points

- The most important yard stick in considering if an odour constitutes a statutory nuisance is the opinion of EHPs making assessments in the field.
- EHPs should make objective observations of upwind and downwind odours, as well as wind and weather conditions, when making “sniff test” assessments.
- EHPs should ascertain that their olfactory acuity is within the range of the ‘normal population’, preferably by performing a test for olfactory acuity.
- EHPs should take account of the FIDOL factors and try to put any odours they perceive while making sniff tests in the context of residents who live in the area.
- Odour diaries can provide very good evidence in statutory nuisance cases providing that the residents understand and comply with the requirements for accurate and records.
- It is far more effective to prevent potential nuisance from odorous developments at the planning stage than it is to attempt to retrospectively control odour impact through statutory nuisance legislation.
- Planning applications for potentially odorous developments should be accompanied by some form of objective assessment of odour impact.

5. ODOUR CONTROL MEASURES

5.1. Overview

This section considers how odours are transmitted from source to potential receptors, and how this transmission can be controlled or impeded to prevent odour nuisance. It also explains the various ways in which the link between odour source and receptor can be interrupted by management and engineering measures, there is also an explanation as to how such controls are assessed in relation to "Best Practicable Means" (BPM) criteria. Finally there is a brief description of some of the main techniques for mitigating and abating.

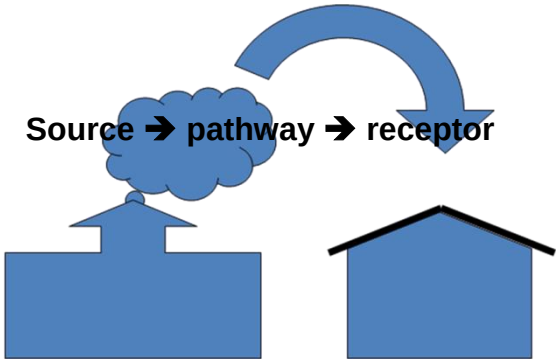
Opportunities to control odour can be categorised into three components: source, pathway and receptor. All three of these components must be present and connected at the time of the event to result in exposure to odour. If the chain is broken, either because one component is missing, or because it is not connected at the time to the next component, then exposure cannot occur and there will be no odour impact.

To prevent exposure, one of the components in the chain needs to be removed or the connectivity of the chain needs to be broken, e.g. the source of the odour is removed by substituting an odorous raw material with a non-odorous one.

To reduce exposure (and therefore the impact), control measures are used to reduce the importance of one or more of these components. For example, an odorous mixture could be released from a very high chimney stack, weakening the pathway between the source and the receptor by introducing more dilution and dispersion as the plume travels through the air.

Preventing or controlling odour emissions at source remains the most direct method of achieving control. For many processes this is straightforward but for large, diffuse sources this can be a significant problem and can be costly. Influencing the pathway of odour dispersion is commonly done by containment of the odour generating processes and channelling and dispersing odours through a chimney or stack. Preventing receptors from being exposed to an odour is much more difficult and challenging where people have access to or live within range of the exposure pathway, see **Figure 5.1**.

Figure 5.1 - Odour Exposure Chain



The options to influence and inform receptors about the emission of odour, and the extent of control and mitigation measures applied can contribute to reducing the perceived impact and this nuisance. **Section 2** highlights the different coping responses of individuals to exposure, particularly for sensitive receptors. Where it is possible for an operator or regulator to inform receptors that they are aware of an unacceptable level of odour and that

this is being addressed, this demonstrates control over the process and contributes to reducing anxiety. This can be a modest and short-term measure but important when managing the expectations of receptors and demonstrating the potential for intervention. In situations where adverse health effects are believed to be associated with the odour impact, the response to the odour and the associated stress levels may be exacerbated. Providing adequate and transparent information may, in those circumstances, alleviate the level of impact, see **Section 6**.

The option of preventing and controlling odours relies on an ability to intervene effectively at one or more stages of the "source – pathway – receptor" process, as follows:

- Preventing the formation of odorants in solid and liquid material within a process;
- Preventing the transfer of odorants from a mixture to gas phase [air];
- Preventing the release of odorous air to the atmosphere by containment and odour control
- Preventing the transportation of odorants from the source reaching receptors;
- Influencing the quality of the odour to reduce the perception of odours as a nuisance by receptors; and
- Ensuring effective communication and transparency between those responsible for the source of the odours and the exposed receptors can help to reduce the level of conflict and related stress.

Measures to control odour may use one or more of the above principles and each has advantages and disadvantages for individual situations. The control of point sources is typically more straightforward than is the case for large, dispersed area or volume sources.

Decisions on what measures are appropriate will need to considered within the relevant statutory context such as, where appropriate, BPM.

5.2. Best Practicable Means

For facilities which lie outside the EP Regulations regime operators should consider employing BPM to control odours from the site. As already detailed in **Section 3** there is a defence available to operators of commercial/industrial sites under the EPA to demonstrate that they have employed BPM to prevent, or to counteract the effects of, the nuisance. In practice, this means that the operator must show that they have employed up to date, cost effective measures to control odours from on site processes when designing and operating the site taking account of local conditions, if an operator chooses to use this defence to the court. BPM does not only involve the design and installation of the most up to date and cost effective odour control technology to minimise the environmental impact of odours from a premises, it also involves the implementation of **ongoing** management systems aimed at preventing or reducing offensive odour emissions.

Therefore, operators should not just consider discrete, physical abatement techniques for each particular odour source but consider procedures and techniques to manage odours across the whole of the process, and odour exposure chain, and document this through the production of an Odour Management Plan (OMP).

5.3. Odour Management Plan

An OMP is a documented, operational plan detailing the measures to be employed by a site operator to anticipate the formation of odours and to control their release from the site.

The OMP should show how odours are being managed and controlled so as prevent or minimise the release of odours from the site. It should also assign managerial and operational responsibilities for maintaining the OMP, implementing the OMP and responding to odour related incidents and the response of the community.

In the case of a planning application for a new development, an OMP may help demonstrate a commitment by the owner/operator that they will employ BPM to control odours from the future operation of the premises. This should help instil confidence with the local authority and neighbouring community that odours from the site will be proactively managed.

The level of complexity required of an OMP will be dependent on the complexity of the processes and the potential impact of a release of odour on neighbouring premises. Where a process may produce particularly offensive odours, then the OMP will necessarily be detailed and thorough. Conversely, for a process with a lower potential odour impact, a simpler OMP will suffice.

The OMP should address the management of odours at each stage of the odour exposure chain and include the following aspects (but not exclusively):

- Identification of sources of odours on the site and their location. The operator should understand what sources of odours they have on site, and provide a site / location plan identifying sources;
- Control measures employed on the site including odour abatement systems and techniques. See later in this section for good practice examples;
- Management procedures. These should describe the roles and responsibilities of personnel on site and the procedures for materials handling, storage, use of equipment etc;
- Repair and maintenance of plant and equipment should be undertaken in accordance with manufacturer's recommendations. The availability of equipment and spares should be considered;
- Monitoring should be systematically planned and address what, where, when and how such monitoring should be undertaken. Monitoring may include source sampling of emissions, site inspections and surveys, complaints, meteorological conditions, etc, see **Section 4.**
- Communication with relevant interested parties. This will include methods used, content and frequency of communication with, for example, the local authority and local community, see **Section 6.**
- Emergency and incident response procedures. The OMP must consider the potential for odour emission being released. It should describe the types of scenarios that could happen and the measures to be employed to reduce their impact. Scenarios may include, breakdown of abatement equipment, spillages, 'extreme' meteorological conditions etc;
- Staff Training detailing training required and undertaken by site personnel;
- Identification of receptors. It is essential to understand the area of influence and where receptors may be impacted. Again, a site/ location map may be useful; and

- Record keeping. Throughout the whole of the OMP, accurate and thorough record keeping are essential. Records should include maintenance of plant, monitoring results, communication, incidents, training etc.

Where an OMP is used this should be regarded as a 'live' document which is reviewed, updated and informed by the ongoing operation of the process. Examples include an analysis of complaints, site investigation reports and information from staff that could inform and prevent future occurrences. The plan should allow the anticipation of problems such as equipment failure, as well as recognise the routine requirements of odour control system maintenance. Staff training, the sharing of complaint information and mechanisms for gaining feedback from the community are all relevant. Maximising the information available to a site operator on when and where odour is emitted can provide the basis for improved intervention. Where investment choices need to be made to improve odour control on a large process the OMP can be used to help inform these decisions.

5.4. Good Practice Odour Control Principles

5.4.1. Proactive and Reactive

Opportunities for control are available at each stage in the development and operation of a process. Planning policies that identify developments with potential to cause odour emissions and define the location of these away from sensitive receptors have been successful in preventing nuisance odours. Similarly, the specification and means of implementation of the design, layout and control of process operations can prevent higher cost controls being implemented at a later stage. Such proactive measures have the potential to significantly reduce the costs for local authorities in intervening to resolve complaints at a later stage.

The principles of good practice for odour control can be judged alongside the source-pathway-receptor model of exposure as described earlier in this section.

Table 5.1 summarises a range of approaches that can be applied proactively in different situations i.e. anticipating the development of a process with the potential to cause nuisance from odour, as well as retrospectively by reacting to a problem. Note: None of the following measures qualify as PPC guidance on BAT and reference should be made to the appropriate Process or Sector Guidance.

Table 5.1 - Proactive and Reactive Control Measures

Odour Source	Proactive / Planned Measures	Reactive Control Measures
Sewage treatment	Closed-containment process over high emission areas; Odour control systems / filters.	Retrospective covering and chemical dosing; Scheduled odour control maintenance and management plan.
Food processing and commercial kitchens	Ventilation design; Extraction & filtration system; Vents located away from residents.	Retro-fit of ventilation system; Restricted operating hours.
Paints & solvents	Ventilation design; Solvent extraction & recovery system; Vents located away from residents.	Retro-fit of ventilation system; Restricted operating hours; Closed containment of solvents.
Animals, livestock & poultry	Site assessment and building design for odour control; Stocking density planned and agreed;	Retro-fit of ventilation system; Increased wash-down, manure/slurry treatment and disposal/spreading operations;
Spreading	Communication / negotiation with local	Ploughing in to land as soon as practicable;

Odour Source	Proactive / Planned Measures	Reactive Control Measures
slurry/sludge to land	authority re: optimum times and weather conditions for spreading	Stop spreading; Limit quantities spread
Industrial / chemical processes	Ventilation design; Extraction & filtration system; Vents located away from residents;	Retro-fit of ventilation system and abatement plant ; Restricted operating hours; Suitable storage of odorous materials
Storage & spills	Design of containment and covered areas for moving liquid;	Use of absorbents and bunds to control run-off and emissions.

5.4.2. Methods for Odour Control at Source

In the first instance the approach should aim towards the elimination or reduction of odours as exemplified by:

- replacing the raw materials to minimise the generation of odorous emissions;
- changing the production process to reduce the generation of odorous compounds; and
- optimising the diet of animals to limit odour produced from livestock wastes

However once generated, the impact of odours can be reduced by improving mixing and dispersion e.g. by the use of tall stacks, or odours can be treated using the following distinct approaches:

- Physical: containment, dilution, physical adsorption, masking;
- Chemical: scrubbing, oxidation, incineration; and / or
- Biological: bio-scrubbers, biological, bio-filtration.

Table 5.2 at the end of this section gives a summary of odour control measures applicable to some of the more common odorous processes.

a) Odour Containment and Extraction

There are two main routes by which odours can escape from plant buildings and cause off-site odour impact, these are:

- Stack/Extracted Emissions - Inadequately treated or abated process/building odours, which are intended to be extracted and treated by an odour abatement systems, such as a biofilter or a scrubber, before stack release; and
- Fugitive leaks from the building structure, such as might occur through joints in cladding and around poorly sealed doors.

It is a widely held view that if buildings are fairly well sealed and subject to some odour extraction then they will be “under negative pressure” and that fugitive odour leaks will be controlled. However, in practice it is extremely difficult to control all air/odour leakage from buildings, even with quite high rates of overall room extraction and apparently well-sealed buildings. Odour leakage can be created by both wind “suction” effects as wind currents move over external building surfaces, and also by the internal thermal buoyancy (or chimney) effects which result from warmth or heat sources within buildings causing air to rise and escape through gaps or holes in the building structure.

Attempting to provide a well-sealed building environment does help to contain fugitive emissions but the most effective means of controlling fugitive odour releases is to make every effort to minimise odour concentrations within the building headspace, by covering or containing odour sources inside the building. Extraction of odours can then be focused on these covered or contained sources with the most concentrated air extracted to odour abatement plant. Localised covering and extraction provides control of potential fugitive building odour leaks at lower rates of extraction. This means that lower airflow capacity extraction and odour abatement/mitigation plant can be used, with the benefits of lower abatement plant capital costs and running costs. The principles of containment and localised extraction, rather than overall building extraction can also be important with regard to protecting personnel from exposure to odours and other contaminants within the working environment of the overall building envelope.

There are some situations where localised enclosure and extraction of odour emissions at source within a building structure are not feasible, but in general the main approaches to controlling fugitive leaks are summarised as:

- Minimising odour concentrations within the overall building headspace air, particularly by covering/enclosing odorous process sources and concentrating localised extraction directly from the covered odour sources.
- Constructing and maintaining well-sealed buildings, with doors kept closed at all times when access is not required. Doorways may need to be protected by fast acting doors, self closers, air “curtains” or, in the extreme, air lock compartments.

b) Dispersion Through Stacks

Dispersion through stacks increases initial atmospheric mixing and dispersion, and thereby provides a reduction in ground level odour concentrations in all surrounding areas. In a proportion of odour control applications, if a tall enough stack is feasible, then a stack can provide complete odour mitigation without any need for abatement plant. In other cases, a stack can provide the final degree of mitigation between an abated odour source with some residual odour (e.g. from a scrubber outlet) and potential odour receptors.

The potential benefits of stacks as a means of improving dispersion and mitigation of odours are:

- Stacks are inherently very simple and in effect this simplicity provides a very reliable and low input method of mitigating odour emissions with minimal maintenance and management.
- Enhanced dispersion can provide a means of mitigating “residual” odours after (partial) treatment by abatement systems, without the need for a secondary odour “polishing” stage; and
- A tall dispersion stack, or stacks, provide some in-built safety margin for potential short-term failures or reductions in the performance of abatement plant due to unforeseen circumstances. In effect a tall stack divides odour mitigation effects (from source plant to receptors) into an abatement component and a dispersion component. The enhanced dispersion provided by a stack can allow for some short-term failure or reduction in the performance of an abatement unit without causing a catastrophic increase in perceived off-site odours.

As an illustration of the benefits of tall stacks, many recent biofilter installations in the sewage/sludge sector have been fitted with an activated carbon filter to provide a secondary, polishing, treatment for treated air off small biofilters. This approach involves environmental "costs" from additional pressure drops and the energy use in blowing or "sucking" the odour stream through carbon filters, the energy and other resources in preparing the activated carbon filter media. It also means that there is an additional waste stream in the form of the saturated or spent carbon media. However, a similar level of additional mitigation (to that provided by carbon) may be achieved at low environmental costs by the use of a simple dispersion stack.

The major reservations or objections about tall stacks, as an alternative or addition to enhanced odour abatement plant, normally focus on visual impact.

Optimising stack height and dispersion arrangements, which can be provided for treated air off odour abatement plant, should be one of the primary design decisions in setting odour, control performance specifications for any abatement plant. If a tall stack is permissible then it follows that there is scope to deploy systems with lower energy and/or resource requirements, and to thus provide a more sustainable mitigation system in the longer term.

c) Adsorption

Adsorbers commonly use empty activated carbon or aluminium pellets impregnated with permanganate. These materials are highly porous and consequently there is a large surface area upon which adsorption of odorous compounds may occur.

Activated carbon is generally considered for organic gases and vapours, some inorganic gases and some metallic vapours. Activated carbon operates most effectively with reasonably dry air streams (relative humidities lower than 75-80%) and at temperature of 40 ^{o}C or less. There are reports of enhanced or complementary treatment effects with humid air streams where activated carbon is used as a secondary treatment after the odour stream is treated with ozone (see below).

As explained above, odorous streams may need to be pre-treated before being passed through activated carbon when the air stream temperature is high, if the humidity/moisture content is high or if it contains grease or dusts. Odorous streams should be free from grease or dust in order to prevent the surfaces of the activated carbon from becoming "clogged".

Activated carbon needs to be replaced before it is saturated. The used activated carbon can be regenerated; otherwise it should be disposed of.

Case Study 5.1

Good Practice Example of Adsorption

A very common application of activated carbon is in the abatement of cooking odours from commercial kitchens, restaurants and takeaways. Success is very dependent on:

1. The installation including a large enough volume of activated carbon to provide an adequate residence time within the filter
2. Suitable pre-filtration and pre-treatment to protect the activated carbon from grease, particulates and steam.
3. Conscientious cleaning and maintenance of system, with particular attention to the upstream grease and particulate filters.
4. Periodic replacement of the activated carbon filters when they are spent/saturated with odour.

d) Liquid Scrubbing

Liquid scrubbing of gases for the removal of odours can involve either absorption in a suitable solvent or chemical treatment with a suitable reagent. Liquid scrubbing typically becomes economically attractive compared with incineration and adsorption onto activated carbon when the volume of odorous gas to be treated is greater than 5000 m^3 per hour.

Liquid scrubbing of gases involves bringing the odorous gas stream into intimate contact with the scrubbing liquid. The liquid scrubber needs to be well designed to ensure adequate contact between the gas and liquid phases. The treatment applied should be sufficient to treat the odorous gases generated.

The principal types of gas absorption equipment include packed towers, plate or tray towers, spray towers, venturi and fluidised-bed scrubbers. Packed towers are usually more effective than simple spray towers.

It is important that hot moist vapour streams be cooled before contacting scrubbing solutions. Direct or indirect condensers can be used to condense the moisture from the odorous stream (the indirect condenser is preferred).

The most frequently used absorbing solutions are:

- sodium hydroxide - ideal for absorbing hydrogen sulphide and mercaptans;
- amine - used to trap hydrogen sulphide or hydrocarbon gases from petroleum refineries;
- chlorine, sodium hypochlorite, potassium permanganate, ozone or hydrogen peroxide - effective to absorb unsaturated organic compounds; and
- diluted sulphuric acid - used to absorb ammonia.

Case Study 5.2

Good Practice Example of Liquid Scrubbing

Wet scrubbing has been successfully deployed in a number of sewage sludge processing applications, where the high ratio of soluble odorants in the odour streams treated is amenable to this type of abatement.

e) Biofiltration

For biological odour control, the odour is removed by biological processes - the action of bacterial cultures. The bacteria grow on an inert media, which should have a large surface area to allow intimate contact between the odorous gases passing through the media and the bacterial “film” supported on the media. The process is effectively self-sustaining, providing there is no degradation of the support media. Typically the media can comprise materials such as soil, peat, a peat and heather mix, wood chips, sea shells, lava rock/pumice stone, aerated “clay” spheres, calcified seaweed, or some mixture of these materials. There is usually a requirement to irrigate or water the media bed at regular intervals to maintain a “wet” environment for the bacteria and to provide a removal mechanism through drainage to remove breakdown products.

Biofilters are most effective in treating odour streams which are contaminated with “water soluble” gases, such as ammonia and hydrogen sulphide, but they can also be quite effective with lower solubility odorants with longer air residence times (calculated from the media volume divided by the air flow through the media) and

other design features. To this extent long residence time biofilters can be more effective than wet scrubbers where there are low solubility compounds in an odour stream. Residence times need to be selected with due consideration given to media particle size, expected solubility of odorants, possible fluctuations in odour load and the proposed irrigation regime.

It is often assumed that providing the untreated air stream is very humid, or if there is some humidification of the supply air, then irrigation will not be needed. This is rarely the case as media beds can still dry out even with fully saturated air streams.

Biofilters are simple and have relatively low management requirement, but they do require some basic checks, to ensure that the media is kept wet (in some installations frequent irrigation is absolutely critical) and media condition needs periodic checking. Some mediums, such as wood chip and heather (and sea shells in acidic odour applications) degrade naturally and will have to be periodically replaced. They also have to be checked for fissuring and other causes of uneven air distribution.

Case Study 5.3

Good Practice Example of Biofiltration

Biofilters are widely used across a range of industries which generate "organic" odour, including sewage sludge installations, composting installations and pet food factories.

The nature of these biofilters can range from little more than ventilated "heaps" of compost through to fully enclosed plants with sophisticated controls and sensors.

f) Bioscrubbers

Bioscrubbers use the combined principles of liquid scrubbing and biofiltration in order to remove vaporous pollutants from waste gases. Bioscrubbers can only be used successfully if the contaminants can be removed from the waste gas by absorption in a water/activated sludge mixture. Furthermore, the contaminants must be biologically degradable.

Odour abatement performance has been seen to be lower than that achieved by biofilters or wet chemical scrubbers in a number of sewage related applications, despite relatively good removal of hydrogen sulphide.

Management and maintenance requirements are likely to be similar to those for biofilters, but constant liquor circulation is even more critical than irrigation on biofilters.

Case Study 5.4

Good Practice Example of Bioscrubbers

Bioscrubbers are not widely used, but they have been used, with only mixed success, in sewage sludge applications.

g) Ozone & Ultra Violet (UV)

Ozone is a relatively cheap and convenient oxidising agent which can react with a wide range of odorants, including alkenes, amines and organic sulphur compounds to produce non-odorous compounds. There are a number of different treatment options, but the most common and convenient approach is direct injection of ozone generated on-site by controlled electrical discharge. UV light/radiation tubes can be used to generate UV excited radicals which have a similar mode of action to ozone.

Each possible application should be assessed using either pilot scale trials or experience from similar applications as these technologies are unlikely to be as universally successful as wet scrubbers, biofilters, activated carbon or thermal oxidation. Experience has shown odour abatement levels in some sectors of 60-70% with residence or treatment exposures of around 7 seconds or more.

The advantages of ozone include:

- simple and robust technology;
- low operating energy costs (for ventilation) because of the very low system resistance. Energy requirements are likely to be less than 15-20% of those of equivalent biofilter systems; and
- adaptability to varying ventilation rates.

The main limitations on the uptake of ozone as an abatement technique include:

- The long air residence time which means that large treatment chambers are required;
- The highly corrosive nature of ozone;
- The possible health and safety issues of ozone, which is a potentially toxic gas. Treated air could/should be discharged at high level to help address potential health and safety concerns for operators at ground level;
- Potentially pungent residual odours from unreacted ozone; and
- Selective oxidation effects which are high with some groups of odorants, such as alkenes, amines and organic sulphur compounds, but relatively unreactive (with practical treatment times) for other groups, like ketones, carboxylic acids and esters.

h) Thermal Oxidation

Odorous compounds are destroyed by high temperature combustion, typically with exposure to several hundred degrees Celsius for a period of between 0.5 and 2 seconds, although lower temperatures are possible with catalytically assisted thermal oxidation systems. The treatment equipment is usually quite simple and compact, and thermal oxidation can be extremely effective in terms of odour abatement with more or less complete destruction of odours. Thermal oxidation is particularly useful where the odorants have low aqueous solubility, such air streams carrying odorous “oily” compounds and hydro-carbons.

However, capital costs can be very high especially if the incineration plant includes energy recovery technology, and without heat recovery, energy use can make it prohibitively costly. In practice energy costs are a major issue, even with regenerative systems, which are best suited, commercially, to highly concentrated odour streams. Capital costs and running costs rule out this technology for most odour control applications, unless thermal oxidation plants are built in close proximity to some other development with a year-round requirement for heat, hot water or steam.

Some processes are able to use thermal oxidation in an economic way because there is an ancillary requirement for heat. Perhaps the best illustration is the rendering industry where thermal oxidation is really the only effective means of

destroying or abating the high intensity odours generated by the rendering process. These odour streams are used as combustion air for either boilers (traditionally) or dedicated thermal oxidisers (more recently) which provide heat in the form of steam for the rendering process.

i) Plasma (Corona Streamers)

This is a fairly recent development based on “electrical” plasma created between two concentric electrodes. When a high voltage is pulsed between the electrodes, corona streamers are set up. The resulting high energy electrons and UV light lead to ionisation, molecular fragmentation and chemically active radicals. Odorous compounds can be destroyed by direct fragmentation or by reaction with chemical reactions mediated by active radicals.

Aside from moderate electrical energy requirements the resource requirements are relatively low, and it is a compact system which is well suited for “end-of-pipe” abatement applications.

The technology has had some success with the pet food and tobacco industries in the UK, but is otherwise relatively untried. At the current time these systems could not be recommended for other applications without some preliminary trials to both optimise treatment variables (suitable voltages, energy requirements and residence times etc.) and to demonstrate suitably consistent abatement performance.

J) Odour Neutralising and Counteracting Agents

There is a wide range of proprietary products on the market that are claimed to ‘neutralise’ or “counteract” odours by spraying or misting a solution of the product into an odorous air stream e.g. misting in a stack or misting in the area around an odour source e.g. misters situated around a sludge stockpile or compost windrow. Some of these products claim to use “essential oils” derived from plants and others appear to be based on “surfactants”. Counter-acting agents, as the term implies are apparently intended to reduce the response of the human nose to the target odour by reducing the perceived odour intensity, or effectively de-sensitising the nose. Most of the products marketed for this application include some form of “perfume” or artificial odour, such that there is some risk that if they are used at too high a concentration, and/or in close proximity to receptors, they may themselves cause an unwanted odour. There is little objective evidence to demonstrate how effective these products and systems are, but there are anecdotal accounts from many plant operators that they do help control odour impact, especially in industries dealing with organic “wastes”.

Common uses are around composting installations and sludge handling areas, but they are applied in a wide range of industries, and are often used to help control short-term or “temporary” odour problems.

Table 5.2 - Odour Control Method for Types of Odour Emitting Processes

	Containment & extraction	Dispersion through stacks	Adsorption	Liquid scrubbing	Biofiltration	Bioscrubbers	Ozone & UV	Thermal oxidation	Plasma	Neutralising agents
Sewage treatment*	✓✓✓	✓✓	✓✓	✓✓	✓✓✓	✓✓	✓	✓	-	✓
Food processing and commercial kitchens	✓✓✓	✓✓	✓✓✓	✓	✓✓✓	✓	✓✓	-	-	✓
Paints & solvents	✓✓✓	✓✓	✓✓	✓✓	✓	✓	✓	✓✓	✓	✓
Animals, livestock & poultry	✓✓✓	✓✓	✓✓	✓	✓✓✓	✓	✓	-	-	✓
Spreading slurry/sludge to land	Soil injection	-	-	-	-	-	-	-	-	✓
Industrial / chemical processes	✓✓✓	✓✓✓	✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓	✓✓	✓✓	✓✓
Storage & spills	✓✓✓	✓✓	✓✓✓		✓	✓	✓	✓	✓	✓✓✓
Pet food Manufacture	✓✓✓	✓✓	✓	✓✓	✓✓	✓	✓	✓	✓	✓

✓✓✓ = most common / preferred method; ✓✓ = method used but may be limited to specific scale or process type; ✓= rare use / limited data.

*NB many processes are listed for sewage treatment as this reflects multiple processes at multiple scales.

Key Points

- The priorities in odour impact mitigation should be:
  a) Preventing the formation of odorants at source within the process;
  b) Preventing the release of odorous air to the atmosphere by containment and odour control;
  c) Preventing or controlling the transportation of odorants from the source reaching receptors, e.g. by stack dispersion; and
  d) Influencing the quality or concentration of the odour to reduce the perception of odours as an impact on receptors, e.g. by "end of pipe" abatement.
- Where odour mitigation of process odours is required, then optimising stack height and dispersion arrangements should be one of the first design decisions in drawing up odour control performance specifications for abatement plant.
- OMP should be drawn up by operators of odorous processes. The minimum requirements should be identification of management responsibilities for controlling odour emissions, a routine for periodic checks of odour control equipment, and contingency plans for odour control equipment failures and breakdowns.
- Plant operators and regulators should be aware that odour abatement plant rarely provides total odour control.

6. COMMUNICATIONS

As detailed in the preceding section, ensuring effective communication and transparency of information exchange between those responsible for the source of the odours and the potentially exposed receptors can help to reduce the level of conflict and related stress. This section details a number of methods of communication available to the local authority when determining planning applications or investigating odour complaints. Emphasis is placed on early and inclusive communication between all stakeholders, not least between the regulators.

6.1. Methods of Communication

For any formal communication process it is essential that it is based on the inclusion of all interested parties: operator, regulators, residents and neighbours alike. Where necessary, and in order to ensure the success of any formal dialogue, there should be the close cooperation between all enforcement agencies including Environmental Health, Planning and the Environment Agency (EA).

Open, uninhibited dialogue between all interested parties should be encouraged at the earliest possible stage. This could mean before the site is even operational and ideally before it has been granted planning permission or an environmental permit. The earlier that odour control regimes can be agreed, local residents' concerns addressed and misunderstandings resolved, the greater the benefit to all parties in the long term.

From the outset of any formal communications, it should be accepted that each party will have different interests, expectations and attitudes. It is however essential that all interested parties play an active role in any communication process. Interested parties will include: the site operator including management and staff; local residents; other neighbours; community and other interest groups; the local authority and local councillors; and, in certain situations, the EA.

The most appropriate communication methods to use in a given situation will be dependent on individual circumstances and will include factors such as, whether the site is operational, the relationship of the operator with the local authority and community, the history of the site and the relative complexity of the operation.

As stated previously, see **Sections 3 and 5**, communication with interested parties should be considered as early as possible. For potential developers/future site operators where odour may be a contentious issue, pre-application discussions with the appropriate authorities are encouraged. In some circumstances it may be appropriate for pre-application discussions to extend to relevant local interest groups.

If the local authority receives odour complaints about an existing site then there are a number of formal communication routes that are available. These will include one-to-one interviews with both the complainants and the site operator, and formal meetings with relevant local interest groups, as necessary.

Where there is a particularly long history of complaints about a site and where entrenched positions have been adopted there may be a need to consider more inclusive approaches to engage with the relevant parties such as arranging site visits and setting up liaison groups.

In addition to communication between the operator, regulator and resident, it is essential that there is good coordination and cooperation between relevant regulators in particular the Local Planning Authority (LPA), Environmental Health Department and the EA.

Whichever method of communication is employed, the process should allow the exchange of information and views which lead to decisions being made with the inclusion of all relevant parties.

6.2. Pre-application Discussions and Site Visits

When a developer/future operator submits a planning application, there should be sufficient information accompanying the application to enable determination by the LPA. Pre-application discussions with the local authority should help establish the scope and type of information required and provide the operator with the opportunity to identify and address potential issues of concern with the site early in the planning process, see **Section 7.1**.

Where odour issues are likely to arise in relation to a new development, applicants should be encouraged to discuss their proposals with Officers of both the local planning authority and Environmental Health Department. Under certain circumstances it may also be prudent to encourage the future operator to consult local interest groups before submitting an application; this may help establish dialogue with the local community and help avoid future conflict.

Consulting widely from the outset can help avoid time consuming and sometimes costly and avoidable objections to the planning application. Even if objections are received, at least the objectors are better informed about the application itself.

The scale and complexity of the new development and the community's sensitivity to the proposed site will inform the level of engagement required at the pre-application stage. Consultation can take the form of formal meetings with interested parties or written submissions to the local planning authority, but can also include information leaflets or information posted on an operator or local authority website, see **Section 6.8**.

Benefits of early communication between interested parties include:

- reduced time spent by the local authority 'regulating' through the consent or permit determination and ongoing compliance monitoring;
- less of the operator's management time addressing neighbour complaints and local authority liaison;
- avoidance of costly and possibly inappropriate retro-fitting of odour control measures on the site;
- avoidance of costly and time consuming litigation; and
- reduced stress and anxiety experienced by neighbours right from project inception through to operation of the installation.

6.2.1. Pre-Application Site Visits

Where operators own or are aware of a similar site to the one proposed they may be able to organise a site visit for officers from the local authority and future neighbours to demonstrate a site in operation. Such proactive site visits can:

- help demonstrate a commitment by management to address potential adverse odour impacts associated with their operations;
- show how practical measures can be employed to address odour issues at the new site; and

- identify potential issues at the new site and provide the operator with the opportunity to incorporate suggestions received into the design of the new development.

Site visits are a useful communication tool at both the pre-application stage and where complaints arise about an existing site, see **Section 6.3.4.**

6.3. Coordination between Planning and Environmental Health Departments

As described in **Section 7**, planning decisions involving pollution control matters require close working arrangements between the local authority Planning and Environmental Health Departments, especially in those instances where the planning authority is the County Council. Without robust and duly considered procedures and protocols in place, the following problems may be experienced:

- issues relating to odours may be missed during application determination;
- the application process can become protracted and costly for all parties (applicant, local authority and residents);
- applications may be granted without appropriate conditions;
- new developments may lead to complaints about odour which may be technically difficult to resolve retrospectively; and
- applicants and residents may lose confidence in the planning process.

6.3.1. Application Screening

Ideally a robust screening process at the application submission stage should help to identify new developments where adverse odour impacts may arise. Screening should aim to identify applications where odours are a potential issue, whether the application site is the source, or the application site is close to potential odour sources. If such new developments are identified early on, this allows early consultation with the environmental health practitioner (EHP).

6.3.2. Inter-departmental Liaison

'The value of effective inter-departmental communication, co-operation and information exchange cannot be overstated'.[51] Establishing good working relationships and a better understanding of the work of each respective department should help ensure that odour, and potentially other pollution issues relating to new development applications are satisfactorily addressed and ideally at the earliest practical stage. This could be implemented through formal arrangements such as a service level agreement or informally through regular liaison meetings between relevant planning and Environmental staff or through a single point of contact in each department.

[51] Development Control: Planning for Air Quality, 2006, National Society for Clean Air, (Now EPUK)

Case Study 6.1

Good Practice Example – Liaison between Planning and Environmental Health

Some local authorities have established formal Service Level Agreements (SLA) between the two departments setting out:

- standards of service in relation to consultation on applications, timescales for responses;
- assistance with enforcement issues, appeals and potential public enquiries; and
- attendance at committees to answer member's questions.

There are also examples of local authorities holding regular liaison meetings to supplement the day-to-day communication between Planning Officers and EHPs on particular cases. These meetings occur every 1-2 months to ensure managers have a good overview of contentious/complex cases, processes and procedures are being followed and working relationships are effective between the two departments.

6.4. Investigation of Complaints

Where it has not been possible to address odour issues at the planning stage and where complaints arise from neighbours about an established site, effective communications at the earliest stage of an odour investigation is essential with both the complainants and the operator.

Once a complaint has been received by a local authority, it is important for all parties to be aware of the tools that are available. One-to-one meetings are probably the best way to start the process but other methods of complaint resolution such as formal meetings, liaison groups and site visit(s) may all be appropriate.

In the event of complaints being received by the local authority about odours from an existing operational site, again, early and well structured dialogue can also have significant benefits including:

- the avoidance of entrenched and opposite positions of interested parties;
- maintenance of reputation by the site operator;
- continued good relationships with neighbouring community groups;
- the possible avoidance of statutory enforcement action; and
- continued confidence in the site management by the local authority.

There is always the expectation that investigations by the local authority may result in enforcement action being instigated where a permit condition has been breached or statutory nuisance established. But, before enforcement action is warranted, and under certain circumstances even after the instigation of formal proceedings, there still remains the opportunity to address matters through dialogue and constructive communication with all interested parties.

6.4.1. One-to-one Interviews

One-to-one interviews, preferably in person, with the complainant and operator are an opportunity to identify their concerns, expectations and any constraints. One-to-one interviews provide the opportunity for the EHP to spend time with each party and gain a better understanding of the issues from both sides, see **Section 8.4**.

The objective of the first meeting with the complainant is to establish the exact nature of the complaint and the application of the FIDOL framework, see **Section 4.1.1**, which may help structure the interview. It should also be an opportunity to determine if there are any issues unrelated to odours from the site such as noisy operations or the perceived attitudes of the operator or on-site personnel, see **Section 8.4.1**.

The EHP should make it clear to complainants at a very early stage that there is a much better chance of resolving continuing or chronic odour issues if the residents provide timely and objective complaint information. For example, if an EHP is to investigate an alleged odour incident it is far more likely that the odour can be witnessed if the residents notify the local authority at the time when the odour is actually being experienced, rather than making a complaint later in the day or on the following day.

It is important that operators themselves are notified immediately when a complaint is received so that they can investigate the possible causes of complaint and/or take timely remedial action where possible. This is best articulated through the operators OMP. It is not uncommon for plant operators to claim that they were not told about, and therefore unaware of, odour complaints issues.

Given the complexity of some odour investigations, following interviews with both parties, it may be appropriate or local authorities to establish, through negotiation, realistic time horizons, milestones and expectations on possible future action plans and outcomes.

6.4.2. Formal Meetings

For complex and lengthy investigations, a meeting between operator and local residents/neighbours may be the first opportunity for both sides to exchange views and state respective positions in a suitably structured open forum. The initial meeting should be used as an information exchange and gathering exercise by all parties and not necessarily an opportunity to explore solutions. The EHP or Planning Officer might be best placed to organise such a meeting and to encourage attendance by all relevant stakeholders.

The meeting may be complex in nature and the outcomes unpredictable. Each party may adopt entrenched positions and all consider that theirs to be most valid. The meeting should be managed in such a manner that allows the views of all interested parties to be expressed.

A formal meeting may provide the opportunity to start to build relationships and to send a positive message from all parties that there is a willingness to be involved in a process involving two way dialogue.

The initial meeting should provide the opportunity for all parties to get a reasonable understanding of each other's opinions, concerns and expectations. Following the meeting, a summary of the main findings and outcomes should be circulated to all interested parties.

The complexity and scale of the issues to be addressed will determine whether further meetings are required with subsequent ones aimed at exploring and working through solutions.

6.4.3. Liaison Groups

One step further on from a formal meeting is to set up a Liaison Group. Liaison Groups can prove to be an effective vehicle for ensuring that the concerns of the community are addressed on an ongoing basis by providing an effective two-way flow of information. The establishment of Liaison Groups may be more applicable for companies who operate large complex sites or where the control of odours is an ongoing and challenging problem.

A Liaison Group could include a local authority Planning Officer, EHP, Elected Members, representative of the local residents association, and neighbouring residents or businesses. The frequency and content of the meetings would be defined by the complexities of the issues and larger sites, where odour will always be a challenging issue, may benefit from regular meetings involving a wide range of stakeholders.

Case Study 6.2

Good Practice Example – Sewage Treatment Works Liaison Group

One local authority is communicating with over 40 complainants concerning odours from one a particular site. A liaison group has been formed which includes the Operator, LA Officers, Councillors and EA Environment Officers and local residents who meet regularly and discuss planning issues, results of surveys undertaken and discussions on the recommendations of any reports produced. Minutes of the meetings are circulated to all relevant stakeholders.

6.4.4. Site Visits

As described in **Section 6.2.1**, site visits can help to build trust between all parties. Where an existing site is the subject of odour complaints, organised site visits are again a good opportunity for the operator to show interested parties that they are prepared to consider and address odour issues generated by the site.

Site visits are an opportunity to explain the processes that take place, identify the potential odour sources and possibly dispel myths about what happens on site. On a complex site where there may be a number of potential odour sources a site visit may be an opportunity for neighbours to develop experience in pinpointing discrete odour sources and subjective yet valuable opinions on which particular odours are problematic, and which are not.

6.5. Liaison between the Local Authority and Environment Agency

Earlier in the guide, see **Section 3.12**, it was stated that because of the provisions of s79(10) EPA 1990 the local authority can only institute summary proceedings for statutory odour nuisance from facilities or waste exempt operations regulated under the EP Regulations with the Secretary of State's consent.

Prior to April 2008 local authorities will have investigated complaints regarding odour nuisance from waste management sites or exemptions under the statutory nuisance provisions of the EPA 1990. For local communities the local authority has therefore become a recognised point of contact when problems have arisen at such sites. Given these long established links with local communities it is likely that local authorities will continue to receive odour complaints about regulated facilities and waste operations.

A liaison system between the local authority and the nearest/appropriate EA area office (s) should therefore be established to ensure complaints are handled in an efficient and consistent manner. The Local Authorities Coordinators of Regulatory Services (LACORS) has produced a useful guidance document[52] which recommends roles and responsibilities of each organisation and how both should work together. The principles include:

- sharing of information;
- implementing consultation arrangements for new permits;
- arrangements for transfer of complaint details;

[52] Working Together Agreement between Environment Agency and LACORS, EP Regulations

- response times; and
- a commitment to improving joint working arrangements.

Case Study 6.3

Good Practice Example – Local Authority and Environment Agency Liaison

Local authority officers in Cumbria meet with EA Environment Officers from the local Area Offices twice a year to discuss current issues. These meetings have proved to be a useful route for information exchange and improving working relationships between relevant officers and managers.

6.5.1. Co-operation with other Regulatory Bodies

There may be circumstances where other regulatory bodies are contacted to provide advice on certain aspects of an odour investigation for example, where health concerns have been expressed by local residents. The remit of the Health & Safety Executive (HSE) is primarily to ensure that health and safety risks at work are properly controlled; however in circumstances where exposure to potentially harmful chemicals for example, from a factory or industrial premises to members of the public then it is advisable that the local authority seeks advice from the HSE during any investigation.

6.6. Co-ordination of Complaints

Situations will arise where complainants will direct their complaints to different regulatory bodies i.e. the local authority or EA, or even the operator if they have resourced a telephone 'hotline'. Whatever arrangements are made by each of the regulatory authorities and the operator to log and respond to complaints, it is important to ensure that there is coordinated and consistent tracking of the complaints between them. Ideally the primary regulator should take responsibility for this and ensure they have a full appreciation of the type, frequency and numbers of complaints made about a particular site. This should ensure that the complaints are adequately addressed and any potential odour issues on the site are properly managed.

6.7. Other Communication Tools

In addition to the tools above there are other, potential less resource intensive, tools available to both the regulators and operators to communicate with the local community as set out below.

6.7.1. Websites

Websites are a useful cost effective tool for the regulator and operator to disseminate useful information to the public.

Case Study 6.3

Good Practice Example – Website use

One rural local authority uses its website to provide information relating to slurry spreading which can cause seasonal odour problems. It details good practice to be followed and the likely duration of odour episodes, information which is of use to both farmers and the rural community. It may also save time for EHPs dealing with routine telephone enquiries.

6.7.2. Newsletters

On a larger site, periodic newsletters may be a useful means of communication for an operator to impart information both to its employees and to local residents and interest groups as a means of keeping them updated on new initiatives / developments on site.

6.7.3. Press Releases

Press releases are an opportunity for the Operator and even the local authority to communicate through the local news media on new initiatives that have been instigated such as the formation of a liaison group or significant capital investment projects etc.

6.7.4. Telephone Hotline

These are useful in allowing neighbours to register their complaints directly with the operator at the time of the odour event, allowing the operator to investigate the possible cause. It is essential however that the appropriate regulator is kept informed of the number and nature of complaints.

Key Points

- Communications relating to new planning applications should commence at the earliest opportunity and ideally at the pre-application stage of project.
- Communication should be inclusive of all interested parties including regulator, developer, operator, residents and local interest groups.
- It is essential that Planning and Environmental Health Departments work closely together to address odour control issues.
- The local authority should make arrangements with the EA area office(s) for the purposes of consultation on permits and handling of complaints about permitted sites and exemptions.

7. PROACTIVE INTERVENTION STRATEGIES

7.1. Overview

This section describes the strategies that can be deployed by a local authority aimed at preventing negative impacts from odours arising from new development proposals:

(i) through the Town and Country Planning regime; and

(ii) through the EP Regulations.

It describes how the environmental health practitioner (EHP) can work corporately in the land use planning process and advocates the 'twin tracking' of applications for planning consent and environmental permits. Operations commonly associated with odours are considered: hot food premises; sewage treatment works, factories and composting plants.

It is important for odour issues to be satisfactorily addressed proactively by a local authority through the land use planning or environmental permitting regimes, since the adage 'prevention is better than cure' is particularly apposite in this context.

It is important to emphasise that where applicants have not adequately addressed odour concerns and where there is significant risk of unacceptable odour exposure to neighbouring properties, the local authority has the discretion to refuse any application for a permit or planning consent.

In this context, the assessment tools detailed in **Section 4** are considered to be useful in the following circumstances:

- Planning policy development;
- Planning application determination; and
- LA-IPPC and LAPPC environmental permit determination;

Through the land use planning process, and in conformity with the policies contained within their Local Development Frameworks (LDFs) and Local Development Documents (LDDs) local authorities are able to assess the likely impact from potentially odorous developments. Such assessments may include both desk top assessments, together with on-site assessments or investigations.

7.2. Planning Policy Development and Application Determination

Throughout the land use planning process it is important for EHPs to provide technical support and specialist advice on matters relating to odour. This may include:

- drafting policies relating to odour for inclusion in LDFs and LDDs;
- assessing the localised odour impacts of new development proposals by vetting planning applications, attending pre-application meetings with developers, assisting in the scoping of any Odour Impact Assessments (OIA) deemed to be required of the developer, evaluating the adequacy of any OIA submitted with planning applications, and drafting, where appropriate, relevant planning conditions and informatives; and
- contributing to the decision making process by preparing or contributing to committee reports and attending committee meetings where necessary; providing technical input into the assessment of compliance with planning conditions, as these relate to odour; and contributing to the planning enforcement process, as necessary

The planning system plays a key role in determining the location of development which may give rise to pollution or odours, and in ensuring that other land uses and developments are not, as far as possible, affected by major existing or potential sources of pollution.

Government guidance on these matters is provided in *PPS23, Planning and Pollution Control,* which states that pollution issues should be taken into account as appropriate in planning decisions, having regard to development plan documents and all material considerations.

Local planning authorities should adopt a strategic approach to integrate their land use planning processes with plans and strategies for the control, mitigation and removal of pollution, as far as it is possible and practicable to do so.

Polluting activities that are necessary for society and the economy should be so sited and planned and subject to such planning conditions that their adverse effects are minimised and contained within acceptable limits.

Odour controls, in the guise of odour abatement systems and techniques, may need to be incorporated into new odour-producing developments – see **Section 5 -** 'Control Measures.' Discussions with developers and local interested parties should help to identify and address any odour issues early on in the planning process.

7.2.1. Odour Impact Assessments

At the pre-application or application stage, sources of odour from or near to proposed developments need to be identified and assessed for potential impact. OIA is a useful tool in support of applications where the potential for odour problems has been clearly identified and where such studies are considered to be necessary and proportionate to the extent of odour problems. A properly structured OIA will need to identify:

- all potential sources of odour and their estimated rates of emission from the new development;
- the potential for fugitive emissions of odour together with the means to control these emissions;
- the location of sensitive receptors;
- a wind rose for the site in question;
- potential pathways to sensitive receptors;
- a description of the potential impacts including evidence provided by dispersion models taking cognisance of topographical features;
- details of any necessary odour abatement systems or other mitigation measures with justifications for the measures being proposed; and
- details of an odour management plan (OMP) with contingency arrangements for responding to any unforeseen or unusual odour emission episodes.

Any conditions attached to a planning consent aimed at controlling potential problems from odours need to be drafted in conformity with the advice contained in *DoE Circular 11/95 The Use of Conditions in Planning Permission*. Specifically, conditions should only be considered where it can be demonstrated that they are:

- necessary;

- relevant to planning;
- relevant to the development to be permitted;
- enforceable;
- precise; and
- reasonable in all other respects.

Case Study 7.1

Good Practice Example – Use of Planning Condition to control odours from an extract system

No air extraction system shall be used on the premises until a scheme which specifies the provision to be made for the control of odour emanating from the site has been submitted to and approved by the local planning authority. The scheme may include such combination of measures as may be approved by the LPA. The said scheme shall include such secure provision as will ensure that the said scheme endures for use and that any and all constituent parts are repaired, maintained and replaced so often as occasion may require.

In certain circumstances, it may be appropriate for the local authority to negotiate with the developer a scheme of measures to control odours through both parties entering into a legal agreement known as a planning obligation made under Section 106 of the Town and Country Planning Act 1990. Such arrangements can be particularly helpful in achieving positive outcomes where the necessary control measures are complex, detailed and expensive or in circumstances where suitable conditions cannot be attached to a planning consent since they would not meet the strict tests applied by Circular 11/95, as described above.

Case Study 7.2

Good Practice Example of use of s106 Planning Obligation - Sewage Treatment Works (STW)

A new waste water treatment facility is proposed to be built in a coastal urban area. The main treatment processes are to be housed within a large shell and this shell and external tanks have been architecturally designed to be accommodated within a sculptured earth mound which is to be landscaped. As part of the planning consent process, the local authority entered into a Planning Obligation under s106 of the Town and Country Planning Act 1990 with the water utility. The following key points relating to odour emissions were enshrined within the Planning Obligation:

1. the company shall submit an Emissions Management Plan (EMP) for the approval of the council before commencing the waste water treatment works;
2. the EMP shall include an undertaking to inform the council of any changes or deviations from the EMP and the EMP shall incorporate the following requirements:
   - the building is to be maintained under negative pressure at all times with all air leaving the building passing through the two line 3-stage odour treatment process and stack;
   - the odour treatment process must be operated and maintained efficiently at all times;
   - the council to be notified immediately whenever one line of the odour treatment process is closed down for maintenance or repair;
   - Full details of the monitoring arrangements for the pressure release valves on the digester tanks to be forwarded to the council;
   - The council to have access to all the company's monitoring information after giving 7 days' notice;
   - The council will have access to the site to undertake its own monitoring should it so wish; and
   - The company will carry out the requirements referred to in the EMP, as approved by the council, strictly in accordance with the said plan.

7.2.2. Hot Food Premises

Perhaps the most common planning applications with odour implications will be for restaurants, hot food take-aways and similar establishments where food is cooked. Defra's 'Guidance on the Control of Odour and Noise from Commercial Kitchen Exhaust Systems', January 2005' provides a means by which appropriate mitigation measures can be defined for each specific site. Compliance with this guidance should be the minimum requirement.

It may therefore be reasonable to expect planning applications to be supported by an appropriate odour impact assessment (OIA), **see section 4.2**, and for suitable mitigation measures identified in this assessment to be included within the proposed development. Possible planning conditions could then be based around compliance with implementation of the designed mitigation plant.

Consideration should also be given to conditions requiring on-going maintenance and servicing, as outlined in the Guidance. While such conditions may be difficult to subsequently enforce under the planning process, any blatant breaches could lead to statutory nuisance complaints, and would be very good evidence that BPM was not being used, and could be considered to be supportive evidence in justifying any decision to serve and enforce an abatement notice.

Case Study 7.3

Good Practice Example – Ventilation/Extraction Statement

"Details of the position and design of ventilation and extraction equipment, including odour abatement techniques [and acoustic noise characteristics], will be required to accompany all applications for the use of premises for purposes within Use Classes A3 (i.e. restaurants and cafes used for the sale of food and drink on the premises), A4 (i.e. drinking establishments such as public house, wine bar etc), A5 (i.e. hot food takeaways used for the sale of hot food for consumption off the premises), B1 (general business) and B2 (general industrial)."

7.2.3. Sewage Treatment Works

It is common practice for planning applications to be supported by detailed odour impact assessments based on measured or estimated odour emission rates and upon dispersion modelling to determine "downwind" odour impacts at possible sensitive receptor locations. The outputs from such models are commonly represented as odour contours or maps, based on 98th percentile odour concentrations. These are the odour concentrations which are not expected to be exceeded for more than 2% of time.

It should be pointed out that planning conditions which attempt to control the odour impact of new STW or new facilities at existing STW should NOT be based on a limit expressed as a 98th percentile odour concentration of, for instance 1.5, 3 or 5 $ou_E\,m^{-3}$ at the plant boundary or at the nearest sensitive receptor. Such a condition would not be enforceable because it could not be measured. Such low concentrations are problematic to measure and are certainly difficult to differentiate from other, background odours which may be present in the air.

Dispersion modelling can, be used to assess odour impact, and the outputs can be used in a regulatory setting to establish maximum emissions from source, or sources on a plant or installation at the source itself. Thus where there is a defined process or stack outlet at a STW or sludge processing facility it can be very relevant to set an emissions limit, based on a maximum air flow rate (m^3/s) and a maximum outlet odour concentration ($ou_E\,m^{-3}$). The magnitude of these limits will be site specific depending on extraction rates, distance to receptors, stack height and a number of other variables. Compliance can be determined during commissioning tests. In very sensitive sites these conditions could be extended into

a requirement for continuous in-stack monitoring of an odour surrogate gas (typically H_2S) combined with annual performance testing by olfactometric sampling. In such cases these requirements may be best dealt with under a Section 106 planning obligation.

The requirement is not necessarily that local authorities impose an odour emission limit that they can test at will to assess compliance, but that the prescription of outlet odour concentration values can serve to demonstrate that the odour abatement plant is capable of achieving the proposed levels of abatement, both when it is first commissioned and also during on-going use. The benefit of having a s106 planning obligation in place is that there is likely to be a greater level of co-operation and compliance from the operator than might otherwise be the case with a planning condition aimed at achieving the same outcome.

7.2.4. Factories and Composting Plants etc.

The approach outlined above for STWs may also be appropriate for developments such as ready-meal food factories, in-vessel composting plants, and other factory premises involving odorous processes to ensure that applicants provide adequate information to allow local authorities to fully evaluate odour impacts and set appropriate planning conditions where odour is likely to be an issue.

There are also benefits for process operators using such an approach to assess odour impacts in so much as the dispersion modelling may also effectively derive objective performance specifications which can be used in the selection of specific odour abatement plant. Again these performance specifications can also be used to draft planning conditions or s106 planning obligations, or for commissioning performance tests on abatement plant to ensure that modelled odour impacts can be achieved with the plant operating correctly.

As well as controls on obvious process emissions from proposed new factories, EHPs should also seek details of how fugitive odours (leaks through the building structure) are to be controlled. Although proposals often state that buildings will be held “under negative pressure”, because there is provision for some odour extraction, true negative pressure is not often achieved in practice. Fugitive odours are best addressed by control of odour emissions at source within the building by effective enclosure and localised extraction from these enclosures. Simple extraction hoods may not be adequate for highly odorous processes.

7.3. LA-IPPC and LAPPC Permit Application Determination

As already identified in **section 3.3** of this guidance, local authorities are responsible for the permitting of Part A(2) and Part B installations under the EP Regulations.

Permits must include conditions which constitute the Best Available Techniques (BAT) to minimise air emissions, including odour. Chapter 17 of the General Guidance Manual states that ‘generally speaking where permit conditions targeting odour are considered necessary, the overall aim should be – subject to the application of BAT in each case – that there is no offensive odour beyond the boundary of the installation’. BAT conditions ought not to be any less stringent than what is achievable under the statutory nuisance system, including the application of BPM.

Further guidance can be found in the Process Guidance Notes for Part B activities and Sector Guidance Notes for Part A(2) activities.

Planning Policy Statement, PPS23 states that planning and pollution control systems are separate but complementary and should not duplicate each other. The land use planning system controls the development and use of land in the public interest. It plays a key role in

protecting and improving the natural environment, public health and safety, and amenity, for example by attaching appropriate conditions to allow developments which would otherwise not be environmentally acceptable to proceed, and preventing harmful development which cannot be made acceptable even through conditions. Pollution control is concerned with preventing pollution through the use of measures to prohibit or limit the releases of substances to the environment from different sources to the lowest practicable level.

PPS 23 recommends that operators of regulated facilities should submit applications for permits at the same time as applications for planning permission. This 'twin tracked' approach means that the processing and determination of applications are co-ordinated and streamlined across both regimes so that pollution prevention measures and land use planning measures can be addressed simultaneously.

Key Points

- Developers should be encouraged to provide sufficient information in support of planning applications to assess the impact of odours.
- Planning conditions drafted to control odours from new developments will need to satisfy the six tests of Circular 11/95 and the use of s106 Planning Obligations should be considered, where necessary.
- The planning and pollution systems should compliment not duplicate each other.
- Twin tracking of applications for planning consent and environmental permitting should be the norm.

8. REACTIVE INTERVENTION STRATEGIES

8.1. Overview

This section provides guidance on responding to cases (usually the subject of complaint) of non-compliance with planning or environmental permit conditions as these relate to odour, together with the investigation of alleged statutory nuisances due to odour. It provides an explanation on how complaints about odour should be investigated and witnessed on the gathering of evidence and on how allegations of statutory nuisance from odour may be evaluated and determined. This section also provides advice on the drafting of abatement notices and on the options for enforcement proceedings including High Court injunctions. Finally this section presents a structure for the resolution and closure of cases.

As can be seen throughout this guidance document, through the planning, permitting and statutory nuisance regimes there are a number of regulatory and practical tools that are at the disposal of the local authority to address and tackle odour issues. These tools are there to ensure that odours are prevented, adequately controlled or abated.

If preventative strategies have not succeeded in addressing an odour issue, there remain a number of reactive regulatory tools available to the local authority to invoke; these are:

- Compliance assessment;
- Enforcement of planning conditions;
- Enforcement of environmental permit conditions; and
- Enforcement of statutory nuisance.

8.2. Compliance Assessment

8.2.1. Planning

There will be occasions where the Planning Department will request the assistance of EHPs to assess whether a site is being operated in accordance with the conditions incorporated in the planning consent.

8.2.2. LA-IPPC and LAPPC

Inspections of permitted installations under local authority regulation will need to be undertaken regularly'. The frequency of inspection will be determined by the risk posed to the environment by the installation which may not necessarily reflect the incidence of public complaint regarding the installation. Guidance on inspection rates for Part A(2) and B activities is included in Chapter 27 of the General Guidance Manual, and documents referred to therein. Environmental Permits will need to be assessed to ensure conditions attached to the permit seeking to control odours are being complied with. Process-related conditions can be assessed by direct inspection of each discrete area of the installation that may give rise to odour. For compliance with an odour boundary condition or to investigate a complaint received about an installation, the assessment tools such as the sniff test and the field panel assessments detailed in **Section 4** will be of use to the environmental health practitioner (EHP).

8.3. Enforcement of a Planning Odour Condition

If a planning condition relating to the control of odours is breached then there are a number of enforcement options available to the Local Planning Authority. EHPs may need to

provide the required technical advice and expert evidence on matters relating to odour in order for the planning department to take the appropriate enforcement action. Further guidance on planning enforcement can be found on the Department for Communities and Local Government (DCLG) website: Planning Policy Guidance 18: Enforcing Planning Control - Planning, Building and the Environment - Communities and Local Government.

8.4. Enforcement of an Environmental Permit Odour Condition

Under the EP Regulations local authorities must exercise their relevant functions so as to ensure compliance with various provisions of the IPPC Directive including odour conditions. Enforcement action taken by the local authority should be proportionate to the seriousness of the offence and the risk posed to the environment. Chapter 28, Enforcement, of the General Guidance Manual provides the primary guidance on the enforcement procedures for LA-IPPC and LAPPC installations.

8.5. Investigation of Complaints Relating to Odour

The local authority should have formal, documented procedures in place for:

(i) the investigation and assessment of complaints relating to odours;

(ii) assessing compliance with conditions relating to a planning consent; and

(iii) discharging their obligations with regard to enforcing the statutory provisions in conformity with the Regulators' Compliance Code[53]:

All public complaints relating to odour should be referred to the Environmental Health Department who will have the technical capability and authority to investigate the complaint.

With regards to complaints about LA-IPPC or LAPPC facilities, reference should be made to the General Guidance Manual as detailed above.

On receipt of a complaint the complainant should be assigned a case officer who will ideally remain the single point of contact for the duration of the investigation. The complainant should be contacted and interviewed to ascertain the nature of the complaint. These details will be useful for the EHP to determine the strategy required and the tools needed to draw on for the investigation.

If the evidence gathered by the EHP is to be used to determine compliance with a planning consent or to establish the existence of a statutory nuisance, then the evidence collected will need to be robust and of good quality in case it is needed for any subsequent enforcement action by the local authority. The best evidence collected is that witnessed first hand by the EHP, although reliable and corroborative evidence provided by a complainant will also be a very important feature of any investigation.

[53] Regulators Compliance Code: statutory code of practice for Regulators, BERR, 2008

Case Study 8.1
Example of Good Practice - Assessment Considerations

1. The EHP carrying out the assessment should not smoke or consume strongly flavoured food or drink, including coffee, for at least half an hour before the assessment is carried out.
2. The consumption of confectionery or soft drinks should be avoided immediately before and during the assessment.
3. Scented toiletries, such as perfume/aftershave should not be applied immediately before or during the assessment.
4. The vehicle used during the assessment should not contain any deodorisers.
5. If the EHP has a cold, sore throat, sinus trouble etc, this should be clearly stated on the assessment report.
6. An assessment should be carried out at each of the locations indicated on the assessment report and should consist of the officer standing at these locations for a minimum of 3 minutes to assess whether any odour can be detected. This should be recorded on the form.
7. Always approach the site from a position upwind of the site, i.e. move towards the site in the direction that the wind is blowing and record the wind strength and direction using a simple compass and wind vane anemometer.

Diary sheets can be a useful means for complainants to describe and record their personal experience of the odour, see **Section 4.5 and Appendix 5**. Diary sheets should be designed in such a way that the complainant can note the date and time of the odours, duration, perceived strength of the odour, description of the smell, impact on the complainant and use of their property. These details will be useful in helping the EHP determine what tools need to be employed during the course of the investigation and can potentially provide good evidence in any subsequent enforcement action.

Case Study 8.2
Good Practice Example – Sludge Spreading to Land

Over recent years, this means of final disposal for sewage sludge has become more common. As a consequence, anecdotal evidence would indicate that public complaint of odour is on the increase throughout the UK.

The local authorities in Cumbria have acted in a co-ordinated fashion with the Environment Agency (EA), the sewerage undertaker and its contractors in order to seek some solutions to this problem. This co-ordinated effort has resulted in the following control measures being developed:

- the sewerage undertaker should consult with LAs with precise information including dates, location plans etc before farms/fields are selected for disposal to allow concerns/comments to be raised;
- a minimum 50 metre stand-off distance to be required for domestic properties;
- a selection of different farms/fields should be used for spreading further afield to prevent the same receptors being constantly affected and to mitigate cumulative odour impacts arising from routine spreading of farm waste;
- stockpiles should be placed as far as practicable away from sensitive receptors on stable plots with little potential for run off;
- quantities of sludge stockpiled should be limited and matched to area of the land;
- arable fields should be sourced in preference to grassland to allow sludge cake to be ploughed in and grassland should be used only as a last resort;
- on arable land all sludge cake to be ploughed in by the end of the spreading day with spreading matched to available ploughing capacity;
- the percentage of paper lime ash in the sludge cake to be increased up to 20% to further reduce odours; and
- where major odour problems are experienced, agreement should be reached on the frequency of return to farms in question and on how much limed sludge cake is to be spread.

These measures collectively have resulted in a large reduction in complaints which have vindicated this combined approach, where the establishment of good communication between all parties is cited as a crucial factor.

8.5.1. Complainant's Behaviour

Where an odour has affected residents for some time there is the possibility that receptors can apparently become hyper-sensitive to an unwanted or persistent odour to the extent that one can almost anticipate a odour nuisance, even when it is at very low concentration, see also **section 4.4.6**. Repeated exposure to an odour may mean that what used to be a faint odour can become a signal for annoyance or complaint if an association develops in an individual's mind between any occurrence of a detectable odour and significant "annoyance". This association might develop from repeated, previous exposure when a faint odour has escalated to beyond the annoyance level, so that the individual subsequently reacts to the possibility that a faint odour will escalate again in the same way. This enhanced sensitivity may lead to the individual making a complaint about odours which are only very faint or transient. An EHP or indeed any other independent observer, might well not consider the same odour exposure episode to be worthy of complaint, and certainly not a statutory nuisance. This phenomenon can mean that some odour complaints may be seen by an EHP as unjustified. There is also the possibility that receptors will continue to complain even after very effective odour mitigation measures have been put in place.

As has been explained above, sensitivity to odours varies very widely between different individuals, so EHPs need to be aware of the possibility that one or more persistent complainants may have an exceptionally sensitive sense of smell.

At the other extreme, residents who have been brought up, or lived in an area close to significant odour source, such as a large sewage treatment works, may be so used to, and tolerant of, relatively strong "background" odours that they do not experience sufficient annoyance or impact to complain for most of the time. Typically an established community will tolerate odour for many years with no more than an occasional complaint, but this complaint pattern can be quickly interrupted if new and less tolerant residents move in to the area, especially if the new residents move in to new housing the same area. Odour complaints can suddenly assume a much higher profile in such circumstances.

A substantial degree of apparent, rather than real odour tolerance can also build up where residents have been exposed to alleged nuisance odours for many years and despite repeated complaints, there is no real perception of any real improvement. This reticence to complain, because complaints do not seem to result in any improvement, is often referred to as *complaint fatigue*, and can lead to EHPs mistakenly concluding that a complaint issue has been resolved. Complaint fatigue can also make it very difficult to persuade residents to complete Odour Diaries where an EHP is attempting to collect evidence of an alleged nuisance. In such circumstances EHPs should stress to residents the importance of such evidence, and they should also only ask residents to take the trouble complete odour diaries when there is a good prospect that some effective enforcement action will be taken. The most effective means of preventing odour complaint fatigue, where significant odours do exist, is for the EHP to take decisive investigative and follow-up regulatory action at an early stage. Local authorities should also make it "easy" for residents to register complaints and to make sure that they get feedback when complaint episodes are investigated

8.5.2. Odour Complaint Monitoring

Monitoring the frequency, timing and total number of odour complaints about a particular premise or operation can help EHPs in a number of ways.

Firstly, numerous odour complaints about a particular premises or activity may provide an indication that there is a potential statutory nuisance issue. For sites where there is a history of complaints, then subsequent on-going monitoring of total complaint numbers from year to year can provide a measure of the relative success of control measures implemented by the operators.

Records about the time of day when complaints occur can help the plant operator and/or EHPs identify specific causes of alleged nuisance. As an example of such relationships, it may become apparent that odour complaints about a slaughterhouse occur at the same time of day as blood collections by a waste contractor's tanker. This is quite a common cause of short term complaint episodes, because highly odorous air can be displaced from the blood tanker headspaces by the tanker vacuum pump. On other sites, odour complaints might be found to occur at the same time of day as vehicle access doors are open for deliveries or collections of odorous materials.

Finally, good quality complaint records will help provide evidence of a statutory nuisance in court in the event of a plant operator appealing against either an abatement notice, or defending a prosecution for a breach of a notice. Complaint records should be kept in a readily understood format and be readily accessible.

8.5.3. Witnessing the Odour

Efforts should be made by the EHP to witness the offending odour, wherever possible, including reactive visits at the time(s) when it is alleged that the odour occurs, or programmed visits at times when the odour is likely to occur, as suggested by the completed diary sheets, see **Section 4.5**. Whilst the importance of the EHP witnessing the offending odour first hand cannot be over emphasised, where attempts made to witness the odour have been unsuccessful, consideration should, equally, be given to the cogency of other evidence, particularly that of the complainant, before taking a decision to close the case.

8.5.4. Gathering Evidence

The assessment of a complaint of statutory nuisance should be undertaken with due regard to the advice presented in **Section 4** of this Guide.

It is important to encourage thoroughness and consistency in the manner in which enforcement officers approach the task of interviewing complainants and operators. One way of achieving this is to use a standardised questionnaire or an *aide memoire* to enable EHPs to ask appropriately focused and directed questions of all parties**. It must be borne in mind at all times that the primary duty of the local authority is not to satisfy the complainants but to determine, objectively, the existence or otherwise of statutory nuisances from odour and to implement the statutory procedures that result in their abatement.**

In tandem with this thorough and consistent approach, EHPs are advised to visit the premises from which the offending odour is alleged to be emanating and to undertake an inspection of the premises with the objectives of:

- alerting the business to the existence of an alleged odour problem;
- developing a working understanding of the business and its modes of operation;
- locating and understanding the precise source(s) of potential odour generation and their means of propagation;
- examining the measures currently in place, if any, to mitigate problems relating to odour;
- jointly exploring with the operator what further practical controls need to be instigated, having regard to published guidance and good practice;
- negotiating with the business realistic timescales for implementing the agreed control measures; and
- advising the business of the next steps in terms of subsequent actions to be considered by the local authority.

8.6. Powers of Entry to Premises under Part III, EPA 1990

Officers authorised by a local authority have powers to enter any premises:

- in order to ascertain whether or not a statutory nuisance exists; or
- for the purpose of taking any action, or exercising any work, authorised or required by Part III of the EPA 1990.[54]

No notice is required for entry to non-residential premises, but the time must be reasonable, such as during normal working hours or times when the premises are open.

There is no right to forced entry, even to unoccupied premises. Where sworn information is placed before a magistrate a warrant to enter by force may be issued. The magistrate must be satisfied that:

- admission to any premises has been refused, or
- refusal is apprehended, or
- the premises are unoccupied, or
- the occupier is temporarily absent, or
- the case is an emergency, or
- an application for admission would defeat the object of the entry.

Additionally, in all cases, the magistrate must be satisfied that there is a reasonable ground for entry into the premises for the purpose for which entry is required.

Paragraph 3(1) of Schedule 3 to the EPA provides that a person who wilfully obstructs any person acting in the exercise of any statutory powers authorised by Part III is liable to a fine not exceeding level 3[55] on the standard scale.

8.7. Application of the Police and Criminal Evidence Act 1984

The scope of the Police and Criminal Evidence Act 1984 (PACE) is limited to situations for the gathering of evidence in order to decide whether to prosecute a person suspected of committing a criminal offence. It does not apply when an EHP visits premises in order to decide whether to serve an abatement notice, since this is an administrative procedure.

Where the officer is interviewing a person suspected of the offence of contravening or failing to comply with a requirement or prohibition imposed in an abatement notice, then consideration needs to be given to the requirement to caution that person. If the recipient of a notice, then they may be at risk of being personally prosecuted. If a company has been served with the notice, then a director, officer or manager being interviewed may be sufficiently senior to be responsible for company actions and thus able to make admissions on its behalf. Interviewing officers need to give particular regard to considering the rights of suspects and other interviewees and to adopt the principles underlying the PACE and the Human Rights Act 1998. Not least to reduce the risk of issues of fairness being raised in court, it is particularly important to ensure that suspects are strongly urged to have a legal representative present when being questioned.

[54] EPA 1990, s 81, Sch 3, para 2(1).

[55] Currently £1,000.

8.7.1. When to Caution

Code of Practice C (made under the PACE) states that a caution must be given if there are grounds to suspect that the person being questioned has committed an offence. The caution must be given if either the suspect's answers or silence (i.e. failure or refusal to answer or answer satisfactorily) are to be given in evidence to a court in a prosecution.

There must be some reasonable, objective grounds for the suspicion, based on known facts or information which are relevant to the likelihood the offence has been committed and the person to be questioned has committed that offence.

There is no obligation to caution a person being questioned merely as a witness. So, where an officer is inspecting premises to determine whether a statutory nuisance exists, or is generally seeking information whilst carrying out his statutory duties, there is no obligation to caution. If, during such an interview, the person makes an admission of guilt, or the answers to the questions provide the grounds for suspicion, the officer must then give a caution. If the person being interviewed then exercises the right of silence, any earlier answers given suggesting that he is responsible for the nuisance may not be used against him.

Code of Practice C states that the caution shall be in the following terms:

"You do not have to say anything. But it may harm your defence if you do not mention when questioned something which you later rely on in court. Anything you do say may be given in evidence."

8.7.2. Interview Records

An accurate record must be kept of interviews with persons suspected of committing an offence. This should preferably be by tape recording, unless circumstances dictate that a written record is more appropriate.

8.8. Service of Abatement Notices under Part III, EPA 1990

In determining whether an odour arising from an industrial, trade or business premises, amounts to a statutory nuisance by virtue of Section 79(1)(d) of the EPA, the following factors should be considered:

- the source(s) of the odour(s);
- the character of the neighbourhood where the alleged nuisance occurs;
- the number of people affected;
- the characteristics of the odour(s) having regard to FIDOL Factors;
- the impact(s) of the odour(s) in terms of the material interference suffered by those exposed to the odour(s), i.e. the qualitative factors impacting upon their quality of life;
- any particular sensitivity or motive of the complainant(s); and
- whether there are any aggravating circumstances.

Once an authorised officer has formed the view that a statutory nuisance from odour exists or is likely to occur or recur, the local authority is under a duty to serve an abatement notice.

Notwithstanding the discretion available to local authorities to serve notices simply requiring the abatement of the statutory nuisance[56] local authorities can also serve specific works notices requiring the business to comply with a schedule of specified measures in order for them to abate the statutory nuisance. Whilst this necessitates greater time and effort being applied at the drafting stage, there could be significant benefits further down the line should enforcement of the notice be sought in the magistrates' court. The test to be applied will be that of compliance with the measures specified rather than the general merits of the existence or otherwise of a statutory nuisance, which is likely to be the case if a simple abatement notice had been served.

In seeking to abate the statutory nuisance, the works schedule should aim to effect reductions of odour through consideration of the following:

i. opportunities for odour reduction by effecting changes in the way in which the plant is operated, e.g. materials storage, throughput, timing, maintenance, change in raw materials or in process parameters, additional training of operatives etc;

ii. better containment of odours e.g. covering tanks and lagoons, keeping doors and windows shut, repairs to buildings, provision of automatic roller shutter doors, containment of transfer lines or conveyors, covering of indoors storage of raw materials or waste;

iii. implementing programmes of preventative maintenance;

iv. good standards of housekeeping e.g. by avoiding the build up of malodorous materials and waste except in purpose designed and dedicated areas e.g. refrigerated storage of organic waste materials etc; and

v. abatement of malodorous air streams, once contained (both process and ventilation air) by the incorporation of suitable 'end-of-pipe' technologies, see **Section 5**.

When drafting the notice, it is instructive to ask the following questions:

- are the requirements clear, unambiguous and capable of being readily interpreted?
- are the measures specified clear, sufficiently precise, reasonable and achievable?
- can the judgement be reached by all parties that the execution of the measures specified in the notice will succeed in abating the nuisance?
- is the overall notice fair?
- has a common sense approach been adopted?
- what is likely to be the attitude of the Magistrates in considering an appeal against the notice?

It is considered good practice for the local authority to write an accompanying letter when serving an abatement notice setting out the context and rationale of their intervention. However, great care should be taken in drafting such documents since the court will consider these to be part of the notice and hence will be subject to the same principles for validity as the principal part of the notice[57]. It is inevitable that such letters or schedules will be called by the court in aid when construing the notice since there remains no prescribed

[56] R v Falmouth and Truro Port Health Authority ex parte South West Water Ltd [2000] Env LR 833.

[57] LB Camden v London Underground Ltd [2000] Env LR 369.

form for statutory notices and it is considered to be sensible to look at any accompanying documents in order to determine objectively how the notice would be received and understood by its recipient.

Case Study 8.4

Good Practice Example - Odours from Hot Food Takeaway

One local authority served an abatement notice on this business requiring the abatement of the statutory nuisance arising from odours emanating from the ventilation extraction system by requiring the execution of works in compliance with the following schedule:

Schedule

Within 1 calendar month of the date of service of this abatement notice, employ the services of a suitably qualified ventilation engineer to produce a scheme designed to abate the statutory nuisance from odours.

Within 2 weeks thereafter and prior to any measures being implemented, submit the scheme to the Pollution Control Division of the Environment Department for written approval.

Within 1 calendar month of receiving such approval ensure that the approved scheme is properly installed and commissioned.

8.9. Enforcement and Injunctions

Contravention or failure to comply with any requirements or prohibitions imposed by an abatement notice is a criminal offence subject to a fine for industrial, trade or business premises of up to £20,000 as prescribed by s80(6) of the EPA 1990.

Section 81(5) of the EPA provides that if a local authority is of the opinion that summary proceedings under the act would afford an inadequate remedy in the case of statutory nuisance, the authority may take proceedings in the High Court for the purpose of securing the abatement, prohibition or restriction of the nuisance and the proceedings shall be maintainable notwithstanding the local authority have suffered no damage from the nuisance. This would be in the form of an application by the local authority for an injunction against the author of the nuisance. The local authority would need to come to the conclusion that the provisions of s.80(4) of the EPA would afford an inadequate (as opposed to an inconvenient) remedy before it could successfully invoke s81(5)[58]. It would also be necessary to show that the decision to seek an injunction was a last resort. The stages the local authority needs to go through were set down by the Court of Appeal in *The Barns*[59] case by Sir Christopher Staunton (at 17):

'I consider that there is a series of provisions here which was intended to be consecutive steps in a line. First of all, there is to be an abatement notice. Then, if there has not been compliance, there is to be either a prosecution in the Magistrates' Court or self-help by the Council and the requirement of payment to compensate the Council for its expenses; or, as a last resort … the action in the High Court and an injunction.'

In addition injunctive proceedings may be brought by the local authority for public nuisance in the High Court or in the County court by virtue of s 222 of the Local Government Act

[58] *Vale of White Horse DC v Allen [1997] Env LR 212.*

[59] *The Barns (NE) Ltd & Suleman v. Newcastle CC [2005] EWCA Civ 1274.*

1972: 'where the local authority considers it expedient for the promotion or protection of the interests of the inhabitants of its area.'

The local authority should be satisfied that without an injunction, a statutory nuisance would occur, continue or be repeated and the likely consequences of the nuisance would be serious. In the case of odour nuisance, examples of circumstances which might be appropriate for an injunction include:

- urgency, e.g. where the local authority receives intelligence of some future activity likely to generate offensive odours and whose effects would be widespread;
- where there has been a deliberate and flagrant flouting of the law, for example where previous proceedings have been instituted but without achieving a resolution; and
- where there is evidence that the nuisance offender intends to carry on with the conduct being complained of, come what may.

8.10. Resolution/Closure of a Case

The resolution of an odour complaint case can be defined as being where the policy and procedure adopted by the local authority for dealing with this type of complaint have been followed through to completion, resulting in one of the following outcomes:

- A complainant withdraws their complaint and no instance of statutory nuisance has been identified;
- informal action has been taken e.g. a warning letter or mediation resulting in the nuisance being abated or the breach of planning condition being remedied;
- formal action has been taken such as the service of a statutory notice, or the institution of criminal proceedings that has resulted in the abatement of the nuisance or compliance with a breach of permit/planning condition ;
- the matter has been referred to the appropriate external agency e.g. the EA;
- the local authority investigates the complaint and determines that the matter complained of does not amount to a statutory nuisance or a breach of permit/planning condition; or
- the local authority determines that the investigation of the complaint or that effective local authority action is not reasonably practicable.

The above model may need to be modified in the circumstances of on-going, protracted cases that are the subject of multiple and repeated complaints. It is important for local authorities to have in place procedures for regularly reviewing the progress of cases and to be disciplined in resolving cases in a timely and efficient manner and where cases are not allowed to 'drift along' unresolved. The Local Government Ombudsman has found that it is not acceptable for the local authority to assume that a case has been resolved merely because a complainant has not contacted them after the initial contact with the local authority's staff. As an alternative, it is advised that local authorities should continue to manage the case, to maintain contact with the complainants and to keep them appraised of progress in the case [Local Ombudsman's Complaint 88A/1864 against LB Barnet 3.5.90 Commission for Local Administration in England]. If complainants are simply 'left in the dark' about their case, they may rightly or wrongly assume that there is nothing the council can or will do about the problem and as a consequence they resign themselves to living with an on-going odour problem.

Key Points

- EHPs should be prepared to act corporately to assist in the enforcement of planning conditions relating to odour.
- Sites subject to local authority environmental permits need to be regularly inspected.
- EHPs investigating odour complaints should use a structured protocol, wherever practicable.
- Odour statutory nuisances should be evaluated and determined using an impartial, structured and objective approach.
- Local authorities should regularly review cases and seek to resolve cases in a timely and efficient manner in accordance with a structured set of defined outcomes.

9. IMPLEMENTATION OF SERVICE

This section offers advice on how local authorities can draw up service policies and standards sufficient to meet its statutory duties with regard to odours. The section provides specific advice on responding to complaints of nuisance odours out of hours, on the competence and training of local authority officers.

9.1. Service Standards

For the environmental health service of a local authority to discharge its statutory duties with regard to odours, see **Section 3**, minimum levels of service need to be resourced, applied, monitored and reviewed. It is recommended that service policies and standards relevant to meeting these duties need to be drawn up by each local authority with the aim of establishing:

- a response policy, including target response times and out of hours service provision within the exigencies of the service as a whole;
- the provision of suitably qualified and competent enforcement officers;
- the health and safety of officers including matters relating to bio-security;
- administrative support at all stages of processing the complaint, including a system for recording and prioritising all complaints relating to odour;
- communications between the service, the complainant and the site generating the odours;
- links between the environmental health service and other council departments and with external agencies such as, the EA;
- maintenance, servicing and calibration of instruments;
- routine review(s) and evaluation(s) of individual cases and of the service as a whole; and
- transparent enforcement policies.

Such documented policies and standards should provide for specific and measurable outputs wherever possible. It is accepted that local authorities must provide a variety of services from a resource base that is finite and hence the proportion of this resource that needs to be directed to dealing with odour problems can best be guided by the local authority undertaking a robust and objective assessment of the current and anticipated demand for this specific service, a so called 'local needs assessment.' Such an assessment may include the consideration and evaluation of the following elements:

- Data on complaints, planning application referrals, PPC permits and liaison with the environment agency (EA);
- Any trends emerging from this data, including temporal, seasonal and geographic distribution and any repeat complaints about the same sites;
- An evaluation of the balance of resources deployed pro-actively and reactively;
- The current levels of statutory enforcement activity, including outcomes;

- An objective evaluation of the performance of the service against other comparable service providers e.g. by using Benchmarking exercises as part of a 'Best Value' or similar review; and
- The results of any consultation exercise with key stakeholders.

9.2. Out of Hours Service

In setting up and resourcing the service so as to reflect any objectively conducted local needs assessment, consideration will need to be given to the provision of an 'out of hours' service to deal with complaints of nuisance odours occurring outside of the traditional Monday to Friday 09.00 hrs to 17.00 hrs working day. The majority of local authorities now resource some out of hours service to provide for the investigation and resolution of public complaints outside of the traditional working day.

With regard to odour nuisances such a service could provide huge benefits by, for example, enabling local authorities to deal efficiently with complaints such as muckspreading to land over the weekend; emissions from restaurant kitchen extract systems during the evening; weekend composting operations etc. The scale and level of resource directed to out of hours provision is for each local authority to determine based upon an objective assessment of the local need, but the minimum level of service provided will need to take cognisance of the authority's statutory duties, see **Section 3**. Models may be adjusted for seasonal variation in demand, where complaints are often higher during the summer months and it will be necessary to establish detailed arrangements and operational protocols.

Lack of an out of hours service does not mean a local authority cannot investigate a complaint made out of hours. A local authority still has to take reasonably practicable steps to investigate complaints which are made about alleged nuisances which occur out of hours.

9.3. Competence and Training of Officers

Critical to the effectiveness of the environmental health service in dealing with problems relating to odours is the training and competence of its staff. For officers engaged in odour control work, it is recommended that skills profiles be developed in order that individual training needs can be identified so as to allow such essential training to be undertaken. In many instances, adequate in-house training can be developed within the local authority or through formal partnership agreements with neighbouring authorities allowing the respective authorities to work together; this approach very often yielding cost efficient solutions.

Only those officers who are judged to be competent to perform the authority's functions in relation to odour investigations should be appointed and authorised. It will be a matter for each authority to judge who is, or is not, to be authorised, but caution should be exercised in allocating powers. Appointments should be made through the authority's formal procedures and be recorded with officers issued with appropriate documented authorisations.

Key Points

- Local authority should prepare suitable written service policies and standards aimed at tackling odour problems based upon a robust and objective assessment of need and which includes transparent enforcement policies.
- The local authority will need to consider the provision of services out of hours and the minimum level of service provided will need to reflect the statutory duties imposed upon a local authority as set out in **Section 3**.
- The competence and training of officers is key to the effectiveness of the service provided and only those officers judged to be competent should be appointed and authorised.

GLOSSARY OF TERMS

Adaptation

The phenomena of reduced sensitivity to a stimulus after prolonged exposure. Unlike habituation this refers to a reduced physiological as opposed to psychological response to a stimuli.

Amenity

A standard of protection provided by planning legislation for individuals residing in the vicinity of a development who may be adversely affected by the unneighbourliness of that development

Anosmia

Lack of sensitivity to olfactory stimuli – unable to detect odours at all (compare with hyposmia).

Area Source

A surface-emitting source, which can be solid e.g. the spreading of wastes, material stockpiles, surface of a biofilter, or liquid e.g. storage lagoons, effluent treatment plant.

Detection Threshold

The point at which an increasing concentration of an odour sample becomes strong enough to produce a first sensation of odour in 50% of the people to whom the sample is presented. The measurement of odour concentration is based on determining the detection threshold. This is a laboratory-based test and should be conducted according to the BS EN13725 European standard. The odour concentration at the detection threshold is one odour unit (per cubic metre).

Diffuse Sources

Sources with defined dimensions (mostly surface sources) which do not have a defined waste air flow, such as waste dumps, lagoons, fields after manure spreading, un-aerated compost piles.

Dilution Factor

The dilution factor is the ratio between flow or volume after dilution and the flow or volume of the odorous gas.

European Odour Unit $ou_E\ m^{-3}$

That amount of odorant(s) that, when evaporated into 1 cubic metre of neutral gas at standard conditions, elicits a physiological response from a panel (detection threshold) equivalent to that elicited by one European Reference Odour Mass (EROM), evaporated in one cubic metre of neutral gas at standard conditions. One EROM is equivalent to 123 µg n-butanol.

Exposure

The dose received by a receptor, determined by the strength (concentration or intensity), time (duration and frequency) of a particular character odour.

Fugitive Releases

Unintentional emissions from e.g. flanges, valves, doors, windows – that is, points which are not designated or intended as release points.

Gas Chromotography

This analytical technique is a form of chromatography that separates and detects compounds by the rate in which they move through an inert or un-reactive carrier gas such as nitrogen, helium or carbon dioxide. The time taken (residence time) to move through the glass or metal tube called a column is used to determine the type of compound present within the sample.

Habituation

A psychological term used to describe the process of decreasing behavioural response after repeated exposure to a stimulus such as odour over a prolonged period of time. This phenomena is particularly noticeable in commercial and industrial settings where occupational exposures to strong odours are no longer found offensive or even noticed by operational staff, e.g. rendering plants, livestock, sewage and food processing.

Hedonic Tone

A judgement of the relative pleasantness or unpleasantness of an odour made by assessors in an odour panel. A methodology is described in VDI 3882 part 2. Odours which are more unpleasant will have a negative hedonic score whilst odours that are less unpleasant will tend towards a positive score.

Hyposmia

Partial inability to detect odours (compare with anosmia).

Isopleth

A contour line showing odour concentrations at a defined concentration and frequency normally overlaid above a land map. Isopleths join all points that are predicted at the boundary of a defined concentration. Typically this is presented as an hourly mean concentration for a year. An example would be a line showing a 5 $ou_E\ m^{-3}$ concentration at the 98 percentile. This refers to all points likely to be exposed to at least 5 odour units for more than 2% of hours in the year (175.2 hours).

Mass Spectometry

This is an analytical technique used to identify the chemical composition of a compound. The technique determines particles of the same type from the principle that particles with the same mass and charge will move in the same path in a vacuum when subjected to the same electric and magnetic fields. This principle of determining electronic mass and ionic charge allows the chemical composition of a sample to be determined from a database of existing compounds or unknown compounds to be detected. Three basic components make up a mass spectrometer; an ion source, a mass analyser and a detector.

Odorant

A substance which stimulates a human olfactory system so that an odour is perceived.

Odour Concentration

The amount of odour present in cubic metre of sample gas at standard conditions. The odour concentration is measured in European odour units ($ou_E\ m^{-3}$). The odour concentration at the detection threshold is defined to be 1 $ou_E\ m^{-3}$. If an odour sample has been diluted in an olfactometer by a factor of 10,000 to reach the detection threshold, then the concentration of the original sample is 10,000 odour units.

Odour Detection

To become aware of the sensation resulting from adequate stimulation of the olfactory system.

Odour Impact Assessment

A study for a specific site designed to present the current or predicted odour emissions along with the likely implications for the local population. Studies of current operations are used to assess the extent to which a process causes or has caused nuisance or loss of amenity within the locality. A variety of methods can be used to suit the local site conditions. Reports on impact can include emissions measurements, dispersion modelling, walk-over surveys, household questionnaires and complaint reports. For planned sites, the methods are likely to include an emissions assessment for a similar process, dispersion modelling and an interpretation of the likely dose-response.

Odour Panellist

An assessor who is qualified to judge samples of odourous gas, using dynamic olfactometry within the scope of this standard.

Odour Unit

European Odour Unit is that amount of odorant(s) that, when evaporated into 1 cubic metre of neutral gas at standard conditions, elicits a physiological response from a panel (detection threshold) equivalent to that elicited by one European Reference Odour Mass (EROM), evaporated in one cubic metre of neutral gas as standard conditions.

Olfactometry

Measurement of the response of assessors to olfactory stimuli.

Point Source

An intentional point of release of odour such as a vent or chimney. It may well be possible to obtain a sample in order to quantify the concentration and determine the mass release rate.

Private Nuisance

An unreasonable use of land caused or permitted by one user that interferes in the enjoyment of land of the proprietor of other real property.

Public Nuisance

A common law nuisance that affects a significant section of the public

Sample

The odorous gas sample which is assumed to be representative of the gas mass or gas flow under investigation, and which is examined to determine the odour concentrations, to characterise the odour or to identify constituent compounds.

Sensitive Receptor

Locations such as residential properties hospitals, schools, offices etc where people may be exposed to odour released from a given source, or have the potential to be so exposed.

Statutory Odour Nuisance

An odour or smell deemed to be a statutory nuisance by virtue of Section 79(1)(d) of the Environmental Protection Act 1990.

Volatile Organic Compound

Organic substance that will readily evaporate and transfer from a liquid into a gas phase.

LIST OF ABBREVIATIONS

BAT - Best Available Techniques

BPM – Best Practicable Means

BS – British Standard

CEN - Comité Europeén de Normalisation

CIEH – The Chartered Institute of Environmental Health

D/T - Dilutions to threshold

EHP – Environmental Health Practitioner – (the use of term EHP in the guidance includes appropriately qualified technical staff)

EIA – Environmental impact assessment

EP REGULATIONS – Environmental Permitting Regulations 2007 as amended (2009, 2010)

EROM - European Reference Odour Mass

FIDOL – Frequency, intensity, duration, offensiveness and location

GC-MS – Gas Chromotography- Mass Spectometry

HPA – Health Protection Agency

HSE – Health and Safety Executive

IPC - Infrastructure Planning Commission

IPPC – Integrated Pollution Prevention and Control (Directive)

LACORS – Local Authorities Coordinators of Regulatory Services

LAPPC – Local Authority Pollution Prevention and Control (regulatory regime)

LLD – Local Development Documents

LDF – Local Development Framework

LEL – Lower Explosion Limit

NSIPs – Nationally Significant Infrastructure Projects

OIA – Odour Impact Assessment

OMP – Odour management plan

$ou_E\ m^{-3}$ - European odour units per cubic metre of air.

ppb - Parts per billion

ppm - Parts per million

PPS - Planning Policy Statement

QA/QC – Quality assurance/quality control

VDI - Verein Deutscher Ingenieure (standards)

WHO - World Health Organisation

APPENDIX 1
Sources of Information and Further Reading

Government Guidance

Environmental Permitting, General Guidance Manual on Policy and Procedures for Part A(2) and Part B Installations, Local Authority Pollution Prevention and Control (LA-IPPC) and Local Authority Pollution Prevention and Control (LAPPC), Department for Environment Food and Rural Affairs, Revised July 2008, General Guidance Manual

Process Guidance Notes, Part B Activities, Process Guidance Notes

Sector Guidance Notes, Part A(2) activities, Sector Guidance Notes

Code of Practice on Odour Nuisance from Sewage Treatment Works, Defra 2006 Code of Practice

Guidance on the Control of Odour and Noise from Commercial Kitchen Exhaust Systems, DEFRA, January 2005. Click here to view Guidance.

The Validation of Planning Applications – Guidance for Local Planning Authorities, Department of Communities and Local Government, 2007. Click here to view Guidance.

Planning Policy Statement 23: Planning and Pollution Control, Office of the Deputy Prime Minister (ODPM), 2004. Click here to view.

Planning Policy Statement 23: Planning and Pollution Control - Annex 1: Pollution Control, Air and Water Quality, Office of the Deputy Prime Minister, 2004. Click here to view.

Code of Good Agricultural Practice, MAFF, October 1998. Click here to view.

Protecting our water, soil and air – a code of good agricultural practice for farmers, growers and land managers, Defra 2009. Click here to view.

Statutory Code of Practice on Sewerage Nuisance No 1 – Assessment and Control of Odour from Waste Water Treatment Works – Scottish Executive 2005. Click here to view.

Legal References

Statutory Nuisance: Law & Practice, R. Malcolm & J. Pointing, OUP 2002.

Statutory Nuisance, R. McCracken, G.J ones, J. Pereira & S. Payne, 2nd ed., Tottel 2007.

Law of Statutory Nuisances, Ormandy, D, Chadwick House Group Limited, 1997

Environmental Protection Act 1990, HMSO

Environment Agency Guidance

H4 - Odour Management, Environment Agency, 2009 (Consultation Draft). Click here to view.

R&D Technical Report, P4-095/TR, Assessment of Community Response to Odorous Emissions, Environment Agency, 2002. Click here to view.

Environment Agency's 2007 "Review of Dispersion Modelling for Odour Predictions" (Science Report: SC030170/SR3). Click here to view.

Odour Guidance, Internal Guidance for the Regulation of Odour at Waste Management Facilities, Environment Agency, July 2002.

IPPC SRG 6.02 (Farming) Odour Management at Intensive Livestock Installations, Environment Agency. Click here to view.

UK and EU Standards

BS EN 13725: 2003. Air quality – Determination of odour concentration measurement by dynamic olfactometry, British Standards

VDI 3882:1997, Part 1: Olfactometry; Determination of Odour Intensity, Beuth Verlag Dusseldorf, Germany

VDI 3882: 1997, Part 2: Olfactometry - Determination of Hedonic Odour Tone, Beuth Verlag, Dusseldorf, Germany

VDI 3940, Part 1: 2006, Measurement of Odour Impact by Field Inspection – Measurement of the impact frequency of recognisable odours – Grid Measurement . Verein Deutscher Ingenieure, Dusseldorf, Germany.

Industry Specific

Specification for Kitchen Ventilation Systems DW/172 Heating and Ventilation Contractors Association 2005

An industry guide for the prevention and control of odours at biowaste processing facilities ISBN 0-9547797-2-X Published 2007 Composting Association (Now The Association for Organics Recycling)

Odour Control in Wastewater Treatment - A Technical Reference Document - UKWIR (UK water Industry research)

Best Practicable Means (BPM) - A Guidebook for Odour Control at Wastewater Treatment Works UKWIR (UK Water Industry Research)

General

Pollution Handbook 2009 published by Environmental Protection UK.

Odour Control – a Concise Guide edited by FHH Valentin and AA North published by Warren Spring Laboratory 1980

Pollution Causes Effects and Control 4th edition edited by Roy M Harrison published by Royal Society of Chemistry 2001

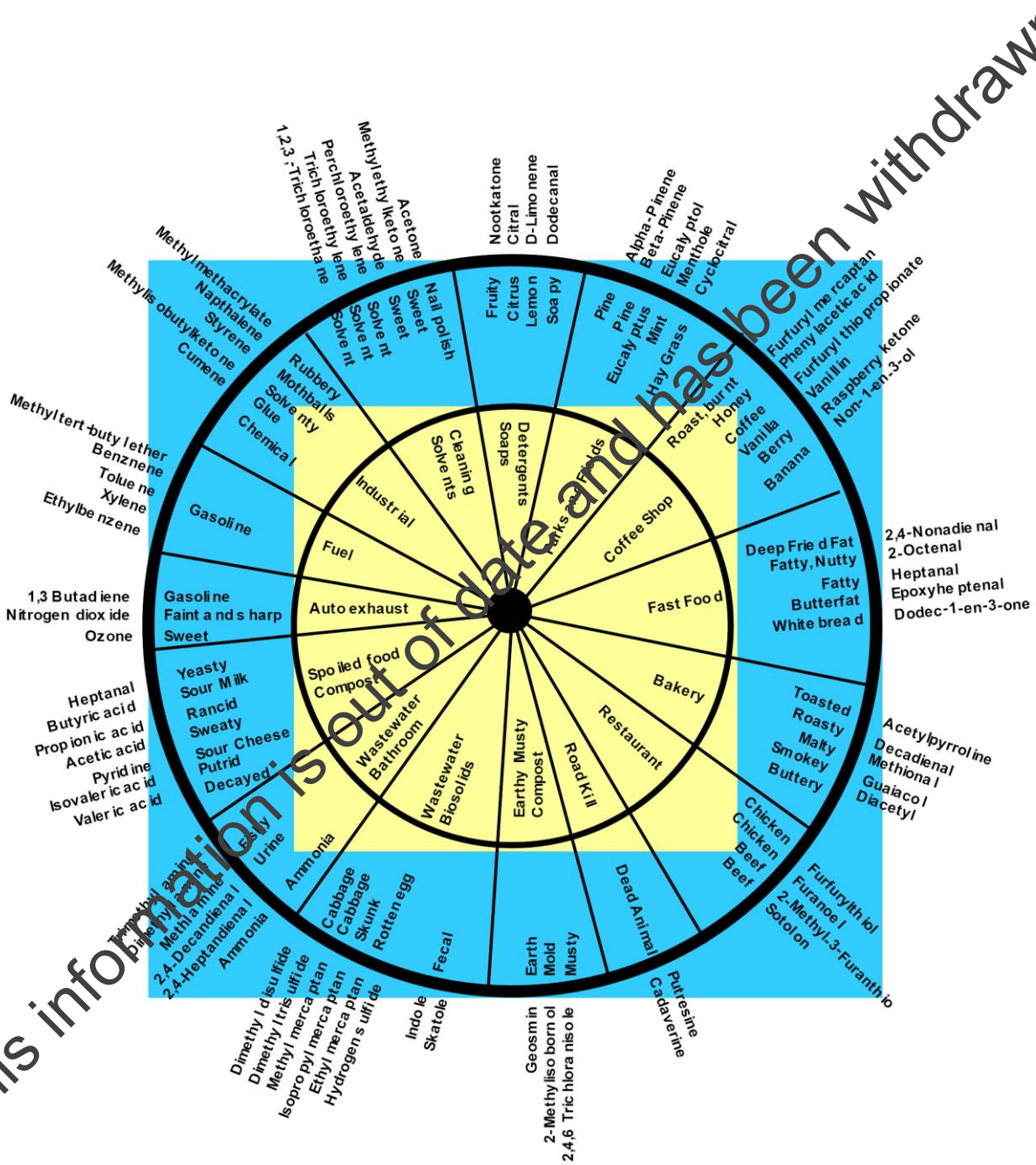
Odour Nuisances and Their Control, Denis Artis published by Shaw & Sons 1984.

Pollution Control: The Powers and Duties of Local Authorities, Neil Hawke, Brian Jones, Neil Parpworth, Katharine Thompson published by Shaw & Sons 2007

Ventilation of Kitchens in Catering Establishments CAIS10(rev1) HSE 2007

APPENDIX 2
Odour Wheel

Odour Descriptor Wheel
UCLA School of Public Health



APPENDIX 3
Olfactometry - Measuring Odour Concentrations

Olfactometry and Odour Units

Olfactometry has been recognised by the adoption of a European Standard measurement protocol (BSEN 13725:2003 – Determination of odour concentration measurement by dynamic olfactometry). The most important requirement of this European Standard concerns quality criteria for the overall performance of the sensory measurement method. A testing laboratory shall comply with all the quality criteria specified in the Standard and can only claim compliance with this standard if it has assessed the quality of its performance by means of performance testing (Ring test).

Olfactometry is the technique used to measure the concentration of an odour, by taking samples of odorous air and evaluating the number of dilutions at which the sample has a probability of 0,5 of being detected under the conditions of the test. The number of dilutions required to achieve this odour threshold is expressed as odour units per cubic metre of air ($ou_E\,m^{-3}$). Thus, by definition, an (undiluted) odour sample with a concentration of 1 (European) odour unit per cubic metre ($ou_E\,m^{-3}$) could be expected to be just detected by 50% of an odour panel within the controlled conditions of an odour laboratory.

Procedures used to select odour panellists and to present the diluted sample to the panellists must be closely controlled. Odour panellists are pre-screened for both the sensitivity and repeatability of their responses to a test gas (n-butanol) and odour analysis has to be undertaken in a low odour environment. For these reasons, samples are best analysed in a dedicated odour laboratory, with access to a pool of pre-screened panellists, rather than trying to take olfactometers out to sites.

In practice, odour samples are collected using sampling equipment and sample bags constructed from inert materials and are transported to an air conditioned, odour free laboratory for analysis. In the laboratory samples are presented, through an olfactometer at a range of dilutions to a panel of six or more human sniffers. Forced choice olfactometers present samples through one of a pair of sniffing ports. The sniffing horn emitting the diluted sample is randomly selected and the other port of the pair is supplied with clean odour-free air. Each of the panellists makes a choice as to which of the two ports is being supplied with the diluted sample. This process is repeated with a range of dilution rates. Typically six dilution steps are used; each differing from the next by a factor of two, and all dilutions are made with dry, odour free air.

A statistical analysis of the results of the odour panellists' responses allows an individual threshold estimate (ITE) to be calculated. The sample's concentration is calculated as the geometric mean of the ITEs of all of the panel members who give valid responses.

The Unit of Measurement

The European odour unit [ouE] is that amount of odorant(s) that, when evaporated into 1 m^3 of neutral gas at standard conditions, elicits a physiological response from a panel (detection threshold) equivalent to that elicited by one European Reference Odour Mass (EROM), evaporated in 1 m^3 of neutral gas at standard conditions.

One EROM, evaporated into 1 m^3 of neutral gas at standard conditions, is the mass of substance that will elicit the D50 physiological response (detection threshold), assessed by an odour panel in conformity with this standard, and has, by definition, a concentration of 1 $ou_E\,m^{-3}$.

For n-butanol (CAS-Nr. 71-36-3) one EROM is 123 µg. Evaporated in 1 m^3 of neutral gas, at standard conditions, this produces a concentration of 0,040 µmol mol^{-1} (which is equal to a volume fraction of 40 parts per billion).

There is one relationship between the ou_E for the reference odorant and that for any mixture of odorants. This relationship is defined only at the $_{D50}$ physiological response level (detection threshold), where:

1 EROM ~ 123 µg n-butanol ~ 1 ou_E for the mixture of odorants.

This linkage is the basis of traceability of odour units for any odorant to that of the reference odorant. It effectively expresses odour concentrations in terms of 'n-butanol mass equivalents'.

The odour concentration can only be assessed at a presented concentration of 1 $ou_E\,m^{-3}$. As a consequence the odour concentration is expressed as a multiple of one ouE in 1 m^3 of neutral gas. The odour concentration, in $ou_E\,m^{-3}$, can be used in the same manner as mass concentrations (kg/m^3).

Odour Emission Rates

Odour emission rate information is needed as an input for dispersion modelling to assess odour impacts. Emission rates, expressed as odour units per second (ou_E/s), are calculated as the product of an odour concentration ($ou_E\,m^{-3}$) and a ventilation or air exchange rate (m^3/s). Emission rates can be fairly readily measured from enclosed process with fixed rate extract ventilation, e.g. the exhaust air from an odour scrubber. Area sources such as open tanks, channels and percolating filters are less readily quantified but a range of techniques is available. These methods include micro-meteorological assessment (where odour emissions are measured across a fetch strip of emitting surface), mechanically ventilated sampling hoods and temporary process covers with natural, process or forced ventilation at measured rates.

There are occasions where sampling is not practical, e.g. where new works or processes are being considered, or where cost precludes sampling on existing works. In these instances emission rate data collected from similar processes or sites can be used as model inputs. Historical emission rate data can also be used for comparison and validation when physical sampling is undertaken.

APPENDIX 4
Olfactory Acuity Testing for EHPs and Field Staff

Acuity Testing

Prospective odour assessors are screened to determine their sensitivity to n-butanol, the reference material specified in the BS EN13725:2003. If these assessors meet the criteria in the standard they qualify to be odour panellists and work in the odour laboratory. It is useful if EHPs and Field Staff are tested in the same way so that their odour acuity can be compared with one-another and with the panel that may make measurements of the odour source in question.

The test involves using the same method as required by the standard. In particular:

- to make new assessors familiar with the olfactometric procedures they are first trained by performing one complete measurement. This result is then discarded.
- then at least 10 individual threshold estimates (ITE) for the reference gas 60ppb n-butanol in nitrogen are collected. For selection of assessors for an odour panel the data for each assessor is collected in at least 3 sessions on separate days with a pause of at least one day between sessions. For this test the data is collected in three sessions on one day with two short breaks.

To become a panel member, the data collected for that assessor shall comply with the following criteria:

- the antilog of the standard deviations ITE calculated from the logarithms of the individual threshold estimates, expressed in mass concentration units of the reference gas, has to be less than 2.3
- the geometric mean of the individual threshold estimates ITE substance, expressed in mass concentration units of the reference gas, has to fall between 20 and 80ppb n-butanol.

The table below contains data from an acuity test.

	Candidate A	Candidate B
	n-butanol ppb	n-butanol ppb
	19.0	19.0
	43.4	12.2
	19.0	5.3
	19.0	19.0
	19.0	19.0
	66.1	8.2
	104.2	19.0
	104.2	19.0
	66.1	43.2
	66.1	29.6
	43.4	12.2
	43.4	43.4
Mean ppb	42.4	17.6
St Dev	1.93	1.86

Comments

Candidate A came within the BSEN13725 sensitivity and variability criteria for odour panellists.

Candidate B was too sensitive.

Both candidates were consistent in their responses to meet the standard deviation requirements of the standard.

It is understood that these candidates may be asked to assess odours escaping from a factory. Both are suitable for this task since they both meet or exceed the sensitivity criteria of odour panellists indicating that they are in the more sensitive half of the general population. However they have not tested for their sensitivity to the odours emitted from the factory.

APPENDIX 5
Example Odour Diary Sheet

Example Odour Diary Sheet

In order to assist officers of this department in investigating your complaint you are asked to keep a record of the odour problem that is troubling you. Please keep a note below daily and on a separate sheet if necessary of the date when this occurs, the time it starts and finishes severity of the incident and any other comments.

Your Details

Name.....

Address.....

Tel No.....

Alleged Source of the problem

Name.....

Address.....

Tel No.....

Date	Time Start/ Finish	Intensity *	Offensiveness **	Wind Direction	Weather Conditions	Character ***	How it affects you

***Intensity Scale**

Score	Intensity
0	No odour
1	Very faint odour
2	Faint odour
3	Distinct odour
4	Strong odour
5	Very strong odour
6	Extremely

****Offensiveness**

Score	Perceived Hedonic Tone
+4	Very pleasant
+3	Pleasant
+2	Moderately pleasant
+1	Mildly pleasant
0	Neutral odour / no odour
-1	Mildly unpleasant
-2	Moderately unpleasant
-3	Unpleasant
-4	Very unpleasant

*** For Character description use Odour Wheel (See **Appendix 2**)

This Statement is true to the best of my knowledge and belief and I make it knowing that, if it is tendered in evidence, I shall be liable to prosecution if I have wilfully stated in it anything which I know to be false or do not believe to be true. I understand that this evidence may be provided to the defendant/perpetrator and that if the matter goes to court, I may be required to attend court to give evidence.

Signed..... Date.....

APPENDIX 6
Odour Source Sampling

Odour Sources and the Implications for Sampling

Differences in odour sources directly affect the choice of method for assessing and sampling emissions. Recognising the differences in the way that sources are released is as important as the method used for measurement. There are two main issues in odour sampling. The first issue is the collection of the odours from the source in a controlled manner, and the second is the transfer of the sampled odours to the measuring instrument. In many cases, the measuring instrument will be remote from the sampling site, so sample storage becomes an issue. The following points mainly centre on the sampling of odours for threshold olfactometry.

Source Sampling

When sampling odour sources, it is not usually sufficient to measure odour concentration in isolation. It is also necessary to measure the airflow associated with the source, because in most cases the odour concentration and airflow are linked. The important parameter is the odour emission rate, this being the product of airflow and odour concentration. Emission rates are used directly as design inputs for odour control and abatement equipment, or as inputs for impact assessments in dispersion modelling.

The ease of source sampling depends on the generic type of the source. Point sources are where the odours are emitted from a single point, usually a stack. These are the easiest types of source to measure, as the emission is confined within a duct, and representative concentrations and flow rates can easily be determined. Volume sources are typically buildings where odorous air escapes either intentionally through ducts or unintentionally through doors, windows or other openings (so called fugitive emissions). Emission measurement is more complicated in this latter case since the emission points are less well defined and controlled. Area sources consist of surface emissions from a relatively large area. Examples would be landfill sites, emissions from wastewater tank/lagoon surfaces or from slurries applied to farmland. Emission rate estimation is difficult for these sources as it is not easy to measure a representative odour concentration, and there is no well defined airflow.

Point Source Sampling

Point sources are the most easily identified emissions. Typically these are flues or chimney stacks, fixed vents or fans. These sources are usually the controlled points at which ducted odours escape to atmosphere, usually through a stack. Emission rate measurement is relatively easy for these sources, although care is needed to ensure that the flow rate is measured accurately. Odour samples are obtained by inserting a sampling probe into the stack and withdrawing the sample from the air flow. Flow rate is usually measured using anemometers or pitot tubes at several positions across the area of the stack, the flow rate being the product of velocity and cross-sectional area. Measurement of flow rate in ducts is an established technique[60].

Volume Sources Sampling

Volume sources describe emissions that escape or are ventilated from buildings across the volume of the entire building. Examples of this type of emission would be slatted agricultural buildings for livestock, or covered and shielded working areas for treatment processes that allow ventilation across the entire working area. As for stack emissions, both airflow and odour concentration must be known. Unlike stacks, there are likely to be multiple inlet and outlets to the building and these are likely to be relatively uncontrolled.

[60] Covered in ISO 10780 (ISO, 1994)

The principle problem in determining building emission rates is the determination of the ventilation rate. Ventilation rates can be measured either by the use of anemometers at inlets and outlets to the building, or by the use of tracer gases such as carbon monoxide [CO], carbon dioxide [CO_2] or specific gases used as 'tracers' such as sulphur hexafluoride [SF_6].

Area Sources Sampling

Area sources are common problems for many industries with large surfaces or open tanks, most typically sewage treatment works, landfill sites or agricultural processes such as slurry spreading to land. There are a number of established industries operating large surface area processes where for many years there has been limited consideration of odour in the design of the process or its operation. These sources present particular difficulties in sampling because, unlike point and volume sources, there is no well defined airflow associated with them. Because of this, special methods have to be employed for emission rate measurement. There are two classes of measurement which are commonly employed, notably:

- Micro-meteorological methods: whereby the emission rate is inferred from downwind measurements of odour concentration and wind velocity, or;
- "Hood" methods: whereby a hood or wind tunnel type apparatus is placed on the emission surface and air is blown through it. The emission rate is then given by the airflow through the hood and the odour concentration of the exit air.

Compounds Used to Simplify Measurement

It is often found that, although many odorants are present for a particular odour source, a single odorant is dominant. This can be very useful since a measure of the single odorant can be indicative of the odour as a whole. It is particularly advantageous if the dominant odorant is easy to measure. Hydrogen sulphide is often used as a 'marker' odorant for these reasons. Hydrogen sulphide is a dominant odorant for many waste processes, and is particularly associated with sewage treatment. It can be measured down to low parts per billion concentrations using hand-held instrumentation, allowing many measurements to be made in a short period of time without the need for sample preservation and transportation to an offsite facility.

However, EHPs and others need to be aware that marker gases are usually only one of several tens of gases in a typical organic odour, and the marker gas may not even be the main component of the odour. As an example, some very concentrated an offensive odours off treated sewage sludge may contain very low concentrations of, if any, hydrogen sulphide.

- The human sense of smell is generally much more sensitive than "chemical" analysis in detecting and quantifying odours.
- The sensitivity of the human nose is exploited by the use of human "sniffers" to measure odour concentration in olfactometry, such that where odour quantification is required this is most often the measurement technique of choice.
- Odour perception and sensitivity to odours varies widely between different individuals. This has implications for EHPs, both in terms of their own sensitivity when investigating odours, and when assessing complaints made by residents who may be more or less sensitive than the general population.
- Residents perception of the source of an odour, e.g. if it from an "undesirable" source such as a sewage works or an animal rendering plant, may well influence their complaint behaviour and expectations of "nuisance" resolution. In some cases social and psychological factors have a greater bearing on odour perception than actual exposure.

- Absence of complaints, or only small numbers of complaints about a specific source may be caused by “complaint fatigue”, habituation or a resigned expectation that nothing can be done about an odorous premises, rather than there being no odour problem.
- Prompt (and decisive) investigative and regulatory action should help prevent “complaint fatigue”.
- The limitations of the use of “marker” gases should be recognised in cases involving complex organic odours.

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