WEST OXFORDSHIRE DISTRICT COUNCIL

## Supplement for

**LOWLANDS AREA PLANNING SUB-COMMITTEE - MONDAY, 27TH FEBRUARY, 2023**

| Agenda No | Item |
|---|---|
| 4. | **Applications for Development (Pages 3 - 28)** |

Attached is an additional note on the odour impacts in relation to the following application:

22/01384/OUT - Land North East Of Ducklington Farm Course Hill Lane, Ducklington

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RSK ADAS Ltd
Unit 1 Rubicon Square
4205 Park Approach
Thorpe Park
Leeds
LS5 8GB

## Application Ref 22/01384 OUT

## Notes on Interpretation of the Olfasense Odour Impact Assessment for Witney WwTW and Odour Aspects of the Officers Report

**Executive Summary**

1. I have been asked to review documents relating to odours and a planning application for development on land to the South and East of Witney Wastewater Treatment Works (WwTW), and in particular I have been asked to comment on suggestions by the local planning authority, in the Officers Report, that residential development should be limited to areas exposed to 98$^{th}$ percentile modelled odour impacts ≤1.5 $ou_E/m^3$.

2. The Officers position is based on the proposition that odours from the WwTW should be allocated to the "most offensive" odour category because there are sludge facilities on the WwTW, whereas the Olfasense Odour Impact Assessment commissioned by the Applicants and Thames Water is based on the assumption that WwTW odours are in the moderately offensive category.

3. In providing commentary I have considered my knowledge of relevant odour guidance and I have reviewed:

a) an odour impact assessment by Olfasense commissioned by Thames Water and the Applicants, (which was carried out under instruction from Thames Water) dated April 2022,
b) A response from Olfasense to queries raised by the Council (dated 23 August 2022).
c) A response from Olfasense to queries raised by the Council (dated 31 October 2022).
d) An Air Quality consultee response by Susan McPherson
e) The Officers Report set out in the Committee Agenda reports.
f) A number of previous planning appeals decisions relating to odour impact standards.

4. I have reviewed a number of guidance documents and the weight of this odour guidance suggests that a 98$^{th}$ percentile odour impact standard of ≤3.0 $ou_E/m^3$ is an appropriate benchmark for use in assessing the potential for adverse impacts on residential amenity from odours in the default "moderately offensive" odours.

5. I have reviewed a number of relevant planning appeal decisions and the majority support the use of an odour impact benchmark value of 3 $ou_E/m^3$ for use in the determination of planning applications, such as this one, concerning odours from WwTWs where the objective is to protect residential amenity.

6. With respect to IAQM odour guidance, it was concluded and confirmed by Olfasense, as one of the UK's most experienced odour specialist consultancies, and in the light of extensive site survey and measurement work at the WwTW, that odours from the Witney WwTW should be assessed as being in the moderately offensive category. It would be unreasonable to reject this opinion without very well-reasoned justification.

7. On the basis of the views set out by Olfasense it can be concluded that IAQM Table 7 is the most appropriate benchmark to use in considering the potential effects of WwTW odours on the proposed development. The use of a 3 $ou_E/m^3$ benchmark standard for assessing odour impacts on the proposed residential development is consistent with IAQM amenity effects assessment of no worse than "sight adverse" effects for moderately offensive odours in "high" sensitivity receptor areas.

8. The Officers Report suggests that there is some uncertainty about relevant or suitable odour impacts standards in the Olfasense report. Whilst Olfasense recognise that some judgement has to be made about the risks associated with any particular benchmark, I believe that their report and follow up responses to a queries from the Council are quite deliberate and definitive in their recommendations and opinion on an appropriate benchmarks in this case.

9. Olfasense provided a response on suitable odour impact standards based on their long-term involvement in odour measurement and modelling at page 13 of their report where they refer to odour impact standards and the potential for adverse impacts:

   *"In Olfasense's experience, the potential for adverse odour impact, at highly sensitive receptors, typically starts to occur at odour exposure levels of* $C_{98,\ 1\ hour}$ *= 3 to 5* $ou_E/m^3$ *for odours which are generally classified as moderate to highly offensive (e.g. well operated sewage works where most raw sludge handling operations or septic influent are well contained, and odour controlled)."*

   There was NO suggestion that impacts standards of less than 3 are appropriate.

10. Later, Olfasense were more definitive in their response to the Council Queries in a reply dated 23 August 2022. Olfasense said:

*Based on the assumption that odours from Witney STW are classified as "moderately offensive" which is typically considered appropriate for well operated STWs an odour exposure of $C_{98,\ 1\ hour}$ = <3 $ou_E/m^3$ for highly sensitive receptors ( e.g. residential dwellings ) and $C_{98,\ 1\ hour}$ <5 $ou_E/m^3$ for medium sensitivity receptors ( e.g. green space/ recreational) would both correspond to a "slight" odour effect and generally be considered acceptable and/or insignificant in planning terms*".

This conclusion is provided by one of the UK's most experienced odour specialist consultancies and was made in the light of extensive site survey and measurement work at the Witney WwTW. It would be unreasonable to reject this opinion without very well-reasoned justification.

11. The IAQM guidance clearly sets out that the selection of appropriate impact standards is a matter of professional judgment and Olfasense have made such determinations. Again I confirm that in my opinion it would be unreasonable to reject these opinions without very well-reasoned justification based on equivalent levels of experience and expertise.

12. The Officers Report includes (e.g. paragraphs 5.107 and 5.108) commentary which attempts to justify allocation of odours from the Witney works as being "most offensive" based on the proportion of odours emitted from sludge related sources. It is clear that Olfasense had access to the very same data (as they produced it) and their opinion, based on that data, was that allocation to the moderately offensive category was most appropriate. Considerable weight should be given to this allocation given their extensive experience in this area of odour assessment. The reality is that practically all WwTW generate some sludge related odours and this is a factor which has been taken into account in planning appeal precedent cases. I concur with this allocation having been involved in the extensive discussion of this topic in the Stanton planning appeal in which I was involved as an expert witness.

13. In my opinion the Officers Report does not introduce any substantive new evidence or reasoning to overturn the opinion and conclusion of Olfasense, as highly experience odour specialists, that the mixture of odours from Witney WwTW should be allocated as "moderately offensive" and that ≤3 $ou_E/m^3$ is an appropriate benchmark for residential development.

## 1. ODOUR MODELLING IN LAND USE AND PLANNNING DECISION MAKING

1.1 Dispersion modelling has been very widely used in two main sets of circumstances to inform planning decisions. The first area of use is in assessing the potential odour impact of a new facility which may generate odours on existing local receptors (dwellings) where the source of odour has not been built. The most widely used applications of odour dispersion modelling studies in this arena have been in evaluating the potential odour impacts of proposed new pig or poultry farms on the living conditions of existing local residents. Modelling has also been used to evaluate the effects of new sewage or wastewater treatment works (WwTW) or additional to existing WwTWs.

1.2 The second main area of application of modelling is to evaluate the potential impact of an existing odour source, such as a WwTW on a proposed new residential development. These "encroachment" circumstances typically, and quite frequently, arise where a landowner or developer is promoting a potential residential development site in proximity to a WwTW. Typically concerns may be that: a) Odours from a WwTW may impact on amenity or living conditions of any potential new residents, and/or b) New residents occupying propose new developments may lead to nuisance complaints and additional regulatory burdens on the WwTW operator.

1.3 Odour impact evidence derived from dispersion modelling has been extensively tested in planning appeals and public inquiries involving both the potential impact of proposed new intensive livestock/poultry farms on existing developments, and the potential encroachment of residential developments in the area around WwTWs. Examples of Inspector's conclusions on odour impact benchmarks from appeal decisions for both of these situations are set out below at section 2.

1.4 In this case the application concerns development which might be seen as potential encroachment of residential development into potentially odorous areas to the South and East of Witney WwTW.

**Odour Emission Measurement/Quantification and Modelling**

1.5 Since the early 1990s the technique of odour dispersion modelling has become very well established as a means of assessing the off-site odour impact of a very wide range of odorous activities and particularly sewage/wastewater and intensive livestock farming (poultry and pigs).

1.6 The techniques that have been developed have been widely accepted by local authorities and planning inspectors in the planning arena as set in the examples is section 2 below. From my professional experience I am also aware that dispersion modelling is used in England, Wales and Scotland by environmental health officers, and by the Environment Agency, Natural Resources Wales and the Scottish Environmental Protection Agency in regulatory and permitting applications. Permitted odorous activities where modelling has been used in my experience

includes installations such as rendering plants, sludge treatment centres, anaerobic digestion plant and slaughterhouses. Odour modelling has also been used extensively to justify and prioritise OFWAT "approval" for significant investments in odour controls in the regulated wastewater sector, where there is a need for the sewage operators to provide objective cost benefit analyses to OFWAT to justify potentially large capital investments in odour control.

1.7 There is no question in my mind that odour modelling provides a suitable and proper basis for informing decisions on odour related planning issues, and the findings of dispersion modelling techniques have, as noted above, been accepted by planning inspectors in numerous cases.

1.8 Dispersion modelling has been promoted as a means of assessing odour impacts by the Environment Agency in a regulatory context since the first consultation draft of the H4 odour guidance was published in 2002. It has continued to be recognised for use in assessing odour impacts through a second consultation draft of H4 in 2009 and was also included as an accepted assessment method in the finalised 2011 H4 guidance.

1.9 Dispersion modelling techniques have considerable merit as an objective means of predicting, assessing and comparing the off-site odour impact of a whole range of odour sources including pet food factories, chicken processing plants, intensive livestock farms and WwTWs (and other odour sources) under a wide range of circumstances. One of the greatest benefits of modelling is that such assessments can be carried out prior to construction when developments are at the planning stage, and therefore before any odour is generated.

1.10 Odour modelling is typically based on some measured or estimated assessment of odour emissions, with measurements made by odour sampling and olfactometry. There are quite extensive databases of odour emission rate data for frequently modelled odour sources, including housed pigs and poultry and WwTWs. In other cases, such as in this application, emissions rates have been measured and the results of these site-specific measurement provided data that has been used to predict off-site odour impacts and effects of over the area which would be occupied by the proposed new developments.

**Odour Measurements as the Basis for Modelling**

1.11 In order to assess the off-site impact of the calculated or estimated emissions a series of proprietary odour dispersion models have been developed. These dispersion models predict how odour emissions of a known magnitude (e.g.10,000 $ou_E/s$) will be dispersed in the atmosphere, so that it is possible to predict the likely impact of the quantified emission in the area around the source.

1.12 Dispersion models take account of a range of factors which affect the way that odours mix and disperse in the atmosphere, including local topography, the nature of the odour release (e.g.

a tall fan outlet stack or a ground level open tank source), and long term local weather records. Dispersion models typically calculate downwind odour concentrations at each point on a grid of receptor locations around the emission source for every hour in every year in the modelling period. The model outputs are usually calculated as an hourly mean odour concentration which is not exceeded for 98% of time at each point.

1.13 These so-called 98$^{th}$ percentile odour concentrations can then be plotted as odour contours. Thus, the output of a dispersion model might show that a particular property or point on a map is exposed to 98th percentile hourly mean odour concentration of, for example, 3 $ou_E/m^3$. In simple terms this means that for 98% of the time at that location the hourly mean odour concentration will be below 3 $ou_E/m^3$, or for around 2% of time the hourly mean odour concentration exceeds 3 $ou_E/m^3$.

1.14 The 98$^{th}$ percentile hourly mean odour concentrations predicted by modelling are a statistical convenience to compare odour impact with established benchmarks. The fact that any point or location is predicted to have a 98th percentile hourly mean odour concentration of 3 $ou_E/m^3$ does not imply that for the remaining 2% of time odour concentrations will be significantly or unacceptably higher than 3 $ou_E/m^3$. A 98th percentile hourly mean odour concentration of 3 $ou_E/m^3$, or any other concentration, is purely a benchmark, and a benchmark that can be corroborated or correlated by reference to local perceptions of odour over longer periods of time. Odour impacts are almost always expressed as 98th percentile hourly means.

1.15 The use of hourly mean odour concentrations takes full account of the natural variations in odour concentration between source and receptor which occur as a result of mixing and dispersion within the atmosphere. As an example, a kitchen extraction fan may emit odour continuously at a fixed rate of, say, 1,000 $ou_E/s$ throughout any particular hour. An observer or receptor standing at a fixed location at, for example, 100m away on the downwind side of the kitchen may detect the kitchen odour at various times within the hour, and at varying strengths or intensities.

1.16 As the emission rate at the kitchen is constant it can be appreciated that these variations in perceived odour within the hour are simply caused by variations in wind, atmospheric conditions and the weather generally during the observation hour. At times the atmosphere will be quite turbulent, so that the odour plume will be very well mixed and dispersed between the kitchen fan outlet and the observer. Under these circumstances little, or no, odour will be detected. At other times within the hour the odour plume may be carried quite effectively, with little vertical mixing, by more stable air currents/wind and the odour may appear quite strong or distinctive. At another instant the wind might veer just slightly to another direction, and/or the atmosphere may become

more unstable, and again no odour will be detected at all. It is these "peaks and troughs" in downwind odour concentration that actually make an odour perceptible.

1.17 As an illustrative example, the variations in actual odour concentrations at a receptor location, within any hour, may vary from a minimum of <0.3 $ou_E/m^3$ (well below the level of perception and recognition) up to perhaps a maximum (and more obvious) 20 $ou_E/m^3$ or 30 $ou_E/m^3$ for a few seconds before again subsiding to a lower level which may or may not be perceptible. The "peaks" of odour are likely to be very short term and not persistent, as are the very low odour concentrations at the other end of the scale. Without this natural variation in odour mixing and dispersion in the atmosphere between odour source and receptor/observer we quickly become oblivious to an odour. In reality the situation is that if the hourly mean odour concentration is 3.0 $ou_E/m^3$ at a particular receptor, then any occasional excursions up to, say, 20 or 30 $ou_E/m^3$ within any hour will be very short term, and not at a level that causes any harm. It follows that these short-term peaks will also not at be a level that causes any harm which has not been already taken into account in the setting of odour modelling benchmarks which are discussed in more detail in section 2 below.

1.18 Natural variations in downwind odour concentrations between source and observer are fully accounted for in the odour impact benchmarks which have been developed to interpret the outputs of odour dispersion models. This means there is no need to take any further account of the natural variations in downwind odour concentrations within each hour. The short-term variations in perceived odour within any hour are already accounted for in the research or observational work from which published and accepted odour impact standards or benchmarks have been derived. Typically, these impact standards have been derived from "dose–response" studies where a populations' response to odours has been calibrated or correlated with 98$^{th}$ percentile hourly means.

1.19 The 98$^{th}$ percentile hourly mean odour concentration at which an odour might start to cause annoyance or complaints and/or become nuisance is influenced by various factors, which primarily include the offensiveness of the odour and the sensitivity of the exposed population to that particular odour. In terms of the offensiveness of an odour, it is fairly obvious that most of the population would find sewage or sewage sludge odours more offensive than the smell of baking bread or fresh coffee at the same concentration. Thus odour annoyance might be expected to occur at a lower 98$^{th}$ percentile hourly mean odour concentration (a weaker odour strength) for sewage odours than it would with bread baking odours. On the other hand, odours from anaerobic (starved of oxygen) sludge or decaying animal remains might be expected to be more offensive, at the same concentration, than normal sewage or wastewater odours.

1.20 Various benchmarks have been used to assess the modelled impact of odour emissions at receptor locations (e.g. at housing). An assessment of the history, use and applicability of these benchmarks is set out in section 2 below in approximately chronological order, and a summary is set out below in Table 2.

## 2. ODOUR IMPACT CRITERIA IN ODOUR ASSESSMENTS

2.1 It might be inferred that the most relevant current guidance on odour impact standards and benchmarks for use in the planning arena is that in the IAQM guidance, but it is important to understand that the IAQM guidance does not in itself present any new evidence on the selection and determination of impact benchmarks or standards.

2.2 A summary of the development and use of odour impact benchmarks used in planning and regulatory contexts is set out below to explain how precedents have been set and how benchmark standards established since the early 1990s. Some of these benchmarks have been established or evolved for the sewage or WwTW sector because it was one of the first odour sectors to adopt objective odour assessment, and experience in this sector is particularly important because the water and sewage utility companies have over the years been more focused on the correlations between modelled odour impacts and complaints from local communities.

### The Newbiggin Standard

2.3 This empirical standard, of 5.0 ou/$m^3$ at the 98$^{th}$ percentile, has been widely used historically in the intensive livestock and wastewater (sewage) sectors in the UK and elsewhere, to assess the likelihood of community annoyance. This standard was derived from an early 1990s planning appeal decision relating to an appeal by Northumberland Water for the construction of a wastewater treatment facility at Newbiggin-by-the-Sea in Northumberland in which evidence on the potential off-site odour impacts was presented using odour dispersion modelling. The decision in this appeal case was the origin of the now well-established “Newbiggin” criterion that has been used, and is still used to this day, for odour impact assessment.

### UKWIR Research

2.4 In 2001 the UK Water industry Research (UKWIR) organisation undertook research into correlations between (dispersion) modelled odour impact and the distribution of odour complaints around wastewater (sewage) treatment works. The findings of this work are concisely summarised as:

> *“The main source of research into odour impacts in the UK has been the wastewater industry and the most in-depth study published study in the UK of the correlation between of modelled odour impacts and human response (dose-effect) was published by UK Water industry Research (UKWIR) in 2001. This was based on a review of the correlation between reported odour complaints and modelled odour impacts in relation to 9 wastewater treatment*

*works in the UK with ongoing odour complaints. The findings of this research (and subsequent UKWIR research) indicated the following:*

*At modelled exposures of below $C_{98,\ 1\text{-hour}}$ $5ou_E/m^3$, complaints are relatively rare, at only 3% of the total registered;*

*At modelled exposures between $C_{98,\ 1\text{-hour}}$ $5ou_E/m^3$ and $C_{98,\ 1\text{-hour}}$ $10ou_E/m^3$, a significant proportion of total registered complaints occur; 38% of the total;*

*The majority of complaints occur in areas of modelled exposure greater than $C_{98,\ 1\text{-hour}}$ $10ou_E/m^3$, 59% of the total."* (UKWIR, 2004)

2.5 In effect these findings demonstrated that with appropriate modelling, potential odour impacts and in particular the potential for annoyance is effectively controlled at 98th percentile hourly mean odour impacts of 5 $ou_E/m^3$ or less. These findings were consistent with the Newbiggin standard and with our experience in ADAS of correlating odour impacts/complaints (and the absence of complaints) with dispersion modelling results.

**H4 Odour Guidance**

2.6 The EA published guidelines on odour regulation, assessment and control (H4: Odour Management) in March 2011. Odour detection thresholds and consideration of whether or not an odour is offensive are discussed in Appendix 2 of H4. In Appendix 3 (of H4), modelled odour concentration benchmark levels are presented for odours of varying degrees of offensiveness. Expressed as a 98th percentile of the hourly mean odour concentrations over a one-year period, a threshold value of 6.0 European Odour Units per cubic metre of air ($ou_E/m^3$) is suggested in H4 as being appropriate for the least offensive odours. This means that a situation should be acceptable, provided that a 98th percentile impact of 6.0 $ou_E/m^3$ is not exceeded on more than 2% of occasions.

2.7 Of more relevance to less desirable odours, equivalent threshold values of 3.0 $ou_E/m^3$ and 1.5 $ou_E/m^3$ are set out in H4 for moderately offensive and highly offensive odours respectively. This means that a situation should be acceptable, provided that the value of 3.0 $ou_E/m^3$ or 1.5 $ou_E/m^3$ is not exceeded on more than 2% of occasions. Examples of the types of odours allocated to each category are included in the H4 guidance and these descriptors are set out in Table 1 below.

**Table 1 H4 Odour Benchmark Levels**

| Relative Offensiveness of Odour | Benchmark Level as 98$^{th}$%-ile 1-hour mean ($ou_E/m^3$) |
|---|---|
| Most offensive odours:<br>• Processes involving decaying animal or fish<br>• Processes involving septic effluent or sludge<br>• Biological landfill odours | 1.5 |
| Moderately offensive odours:<br>• Intensive livestock rearing<br>• Fat frying (food processing)<br>• Sugar beet processing<br>• Well aerated green waste composting | 3.0 |
| Less offensive odours:<br>• Brewery<br>• Confectionery<br>• Coffee roasting<br>• Bakery | 6.0 |

2.8 In terms of allocating WwTW odours to these categories, it is noted that such odours are not regarded as being in the most offensive category unless they are dominated by septic effluent or sludge. Although there are normally some odours emitted from sludge in WwTWs, it is noted that in this case Olfasense, who carried out on-site odour observations and measurements have implicitly recommended that the Witney WwTW odours should be allocated to the **moderately offensive** category.

**Irish Environmental Protection Agency**

2.9 The Environmental Protection Agency (EPA) commissioned research and subsequently set benchmarks of 6 $ou_E/m^3$ and 3 $ou_E/m^3$ for the moderately offensive odours from existing and new intensive livestock units respectively. Subsequently researchers at the University of Dublin (Hayes et al, 2006) determined that even the 6 $ou_E/m^3$ EPA impact standard advocated by the EPA was precautionary and that adverse off-site impacts would be avoided at odour exposures up to 9.7 $ou_E/m^3$.

**IAQM Guidance**

2.10 The Institute of Air Quality Management (IAQM) "Guidance on the assessment of odour for planning" (Bull et al., 2018) refers to the odour impact benchmarks discussed above but notes that the body of research to support numerical odour assessment criteria is still somewhat incomplete. However, it recommends that "*an appropriate criterion could lie somewhere in the range of 1 to 10 $ou_E/m^3$ as a 98$^{th}$ percentile of hourly mean odour concentrations.*"

2.11 The IAQM guidance recognises that the air quality practitioner should decide on what constitutes an appropriate criterion taking into account underlying exposure-response studies that have led to the H4 recommended indicative criteria and more recent research work. The IAQM guidance also proposes odour effect descriptors for impacts predicted by modelling for 'most offensive' odours and 'moderately offensive' odours, and this is considered below in relation io the determination of the significance of odour effects.

**Findings on Impact Standards/Benchmarks**

2.12 Table 2 below summarises relevant guidance and impact standards for the interpretation of dispersion modelling:

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**Table 2 Summary of 98th Percentile Hourly Mean Impact Standards for WwTW and/or Intensive Livestock Farming Odours**

| Document/Guidance | Date | Impact Standard | Purpose/Objective |
|---|---|---|---|
| Newbiggin Public Inquiry Decision (see CD.FD20) | 1993 | 2.5-5 $ou_E/m^3$ (5-10$ou/m^3$) | Planning Appeal |
| UKWIR Research | 2001 | 5.0 $ou_E/m^3$ | Nuisance/Complaint control |
| H4 Consultation Draft | 2002 | 1.5 $ou_E/m^3$ | Control of Annoyance (Regulatory) |
| H4 Consultation Draft | 2009 | 1.5 $ou_E/m^3$ | Control of Annoyance (Regulatory) |
| Draft "Large" WwTW National Policy Statement | 2010 | H4 draft standard (1.5 $ou_E/m^3$)* | Impact Control Guidance for Planning Consent |
| CIWEM Position Statement | 2011 | 3.0 $ou_E/m^3$ | No significant detriment to amenity |
| H4 Finalised | 2011 | 3.0 $ou_E/m^3$ | Control of Annoyance (Regulatory) |
| IAQM guidance | 2018 | A range from 1 to 10 $ou_E/m^3$ interpreted with respect to the nature of the odour and receptor sensitivity | Impact Control Guidance for Planning Consent |

2.13 The weight of this odour guidance suggests that a 98th percentile odour impact standard of ≤3.0 $ou_E/m^3$ is an appropriate benchmark for use in assessing the potential for adverse impact on residential amenity from odours in the default "moderately offensive" odours.

**Precedents form Previous Planning Appeal Decisions**

2.14 Odour impact standards or benchmarks have been used in numerous previous planning appeal determinations. Examples of some appeal decisions involving odours from wastewater (sewage) treatment works (WwTW) and intensive livestock farms are set out below. These are both odours which are most commonly attributed to the "moderately offensive" category.

2.15 There are several planning appeal decisions that have applied numerical odour standards in relation to "encroachment" of residential developments around WwTWs or sewage works, and these include:

i) Low Road, Cockermouth, Cumbria CA13 0XE, APP/G0908/A/11/2151737, where the inspector concluded that "should odours fall within medium offensiveness, rather than low, (i.e. 3 $ou_E/m^3$) level modelled by the appellant indicates that it would not impinge on the appeal dwellings" (i.e.3 $ou_E/m^3$ represented acceptable odour conditions).

ii) Land between Upthorpe Road and Hepworth Road, Stanton, APP/E3525/A/11/2162837, where the inspector concluded that "I consider that a more appropriate threshold in this case is 3 – 5 $ou_E/m^3$, the level of the Defra guidance's "faint odour". The Inspector did note that this was for a small sewage works.

iii) Land at Ashley Road, Middleton, Leicestershire. In appeal APP/U2805/A/11/2162384 the Inspector concluded in this case "I believe that it is reasonable to take account of the 1.5 $ou_E/m^3$ contour map in determining odour impact. In my view areas subject to such concentrations are unlikely to provide a reasonable permanent living environment."

iv) The Planning Inspectorate, Appeal Ref: APP/N1215/W/15/3005513, Land South of Le Neubourg Way, Gillingham, Dorset, March 2016. In this case the Inspector wrote: "…..I conclude that the appropriate parameter to apply in this case is the 3 $ou_E/m^3$ contour line; a more restrictive approach would preclude from development areas which are comparable in odour terms with extensive areas of existing housing in Gillingham."

2.16 These decisions show that levels of modelled odour impacts were considered to be acceptable by Inspectors below 5 $ou_E/m^3$ as a 98$^{th}$ percentile in all cases, with three cases where a level of 3 $ou_E/m^3$ was accepted and on one occasion a level of 1.5 $ou_E/m^3$ was advocated by the Inspector.

2.17 Similarly in appeal cases involving intensive livestock farms Inspectors have reached the following conclusions on odour benchmarks:

i) In 2005 in Appeal Ref APP/V1315/A/04/1156833 concerning the development of a free range poultry unit on land at Derwent Oak Farm, Lintzford Road, Hamsterley Mil, NE39 1ND the Inspector noted "*For intensive livestock farms (which, it is common ground produces more highly concentrated odours than do free range chickens), the recommendation is a 98$^{th}$ percentile concentration if three European odour units per cubic metre (3 $ou_E/m^3$)";*

ii) In 2007 in Appeal Ref: APP/D2510/A/06/2016169 concerning Mapleton Farm, Moor Lane, Horsington, LN10 5HH, the Inspector concluded *"….bearing in mind the legitimate planning objectives of the need to protect the reasonable living conditions of nearby occupiers in assessing this proposal, I do not consider it would be acceptable to adopt a threshold value less stringent than 3 $ou_E/m^3$* ";

iii) In 2012 in Appeal Ref: APP/J1860/A/12/2167224 concerning Thorngrove, Sinton Green, Hallow WR2 6NP the Inspector observed "*This would be less than 3 $ou_E/m^3$, which is a level at which people would be unlikely to have reasonable cause for annoyance*.";

iv) In 2014 in Appeal Ref: APP/K3415/A/13/2199283 in relation to Cleat Hill Farm, Syerscote Lane, Haunton, Tamworth, Staffordshire, the Inspector endorsed the use of 3 by reference to both the H4 guidance and previous appeal decision: "*The Environment Agency (EA) has published guidance for the objective assessment of odour impacts: How to Comply with Your Permit- H4 Odour Management. It recommends the use of 98th percentile of hourly average odour concentrations modelled over a year. Appendix 3 provides a benchmark of 3.0 $ou_E/m^3$ for moderately offensive odours, which include those associated with intensive livestock rearing. The use of this threshold is supported by Inspectors in previous planning appeal decisions*."

v) In 2017 in Appeal Ref: APP/R3705/W/16/3158147 the Inspector dealt with an application for a new poultry unit on land at Crown Stables, Nuneaton Road, Mancetter, North Warwickshire CV9 1RF, and based the determination on the H4 standard, and took account of specific site circumstances: "*Environment Agency (EA) guidance defines an appropriate benchmark threshold of C98, 1hour 3.0 $ou_E/m^3$ for moderately offensive odours typically associated with intensive livestock rearing. Evidence submitted by the appellant on a study relating to nine water treatment works suggests that complaints relating to offensive odours may be relatively rare at thresholds below C98, 1hour 5.0 $ou_E/m^3$. Nonetheless, the EA guidance goes on to suggest that the benchmark threshold should be further reduced to C98, 1hour 2.5 $ou_E/m^3$ where a local population has become sensitised to odour. In this instance I am satisfied that this more stringent threshold is justified given the presence of existing odour sources that have been drawn to my attention, namely the Sarval animal rendering plant on Mancetter Road, the Severn Trent Water treatment works on Woodford Lane and the Tarmac stone quarry on Quarry Lane*" (

2.18 These decisions show that there is a well-established benchmark for modelled odour impacts of 3 $ou_E/m^3$ as a 98$^{th}$ percentile for intensive livestock developments, although on one occasion a more stringent level of 2.5 $ou_E/m^3$ was determined to be appropriate.

**Conclusions and Opinion on Odour Benchmarks**

2.19 Throughout my experience in odours, I and colleagues in ADAS have generally found that most odours, including odours from WwTWs and intensive livestock farms are unlikely to cause unacceptable off-site impacts with annual 98$^{th}$ percentile odour concentrations in a range from 5 $ou_E/m^3$ up to 10.0 $ou_E/m^3$. However, as exposure exceeds 5.0 $ou_E/m^3$ at the annual 98$^{th}$ percentile, there is an increasing risk of annoyance, and above 10.0 $ou_E/m^3$ (at the annual 98$^{th}$ percentile), some adverse impact might be expected. These observations are consistent with an empirical standard of 5.0 $ou_E/m^3$ at the annual 98$^{th}$ percentile, that has historically been widely used in the landfill and wastewater industries in the UK and elsewhere, to assess the risk or likelihood of community annoyance.

2.20 It is also noted that Olfasense provided a similar commentary on suitable odour impact standards which is based on their long-term involvement in odour measurement and modelling, as set out at page 13 of their report where they refer to odour impact standards and the potential for adverse impacts:

*"In Olfasense's experience, the potential for adverse odour impact, at highly sensitive receptors, typically starts to occur at odour exposure levels of $C_{98,\ 1\ hour}$ = 3 to 5 $ou_E/m^3$ for odours which are generally classified as moderate to highly offensive (e.g. well operated sewage works where most raw sludge handling operations or septic influent are well contained, and odour controlled)."*

2.21 When assessing the impact of odours in residential areas, such as the proposed development in the area to the South of the Witney WwTW, it is therefore suggested that taking account of the Newbiggin standard, the UKWIR research findings, the IAQM, H4 and EPA guidance and subsequent Irish research, it is reasonable to assess odour impacts against a benchmark range of 3.0 $ou_E/m^3$ (for residential receptors) to 5 $ou_E/m^3$ for other receptors.

**IAQM Assessment of Significance of Impacts**

2.22 The Institution of Air Quality Management (IAQM) published guidance on the assessment of the significance of odour impacts in the planning arena with the IAQM (2014) guidance on the assessment of odour, and this guidance was revised in the 2018 update which is the current guidance. This guidance introduced the concept of evaluating the potential effects of odour impacts on local receptors by combining the sensitivity of odour receptors and modelled or otherwise determined odour impacts. The odour effects magnitude scale is presented in the IAQM guidance for both '**most offensive'** and '**moderately offensive'** odours as set out in IAQM Table 6 and Table 7 respectively, and as reproduced in Tables 3 and 4 below.

2.23 The guidance effectively provides a mechanism by which the significance of odour effects can be assessed in relation to the magnitude of the impact and the sensitivity of the receptor. Such evaluations provide a link between odour "impacts" and the effects of those impacts on existing or possible new receptors.

2.24 The IAQM guidance proposes odour exposure descriptors for the predictions from dispersion modelling assessments, based on the 98$^{th}$ percentile of hourly means and encompassing the 1 to 10 $ou_E/m^3$ criterion range. These are at Tables 6 and 7 in the IAQM guidance and are reproduced below in Table 3, for most offensive odours, and in Table 4 for moderately offensive odours. The guidance recognises that residential receptors are considered to be of high sensitivity, and less sensitive land uses, such as industrial and commercial properties can be expected to "tolerate" or accept higher levels of odour impacts than residents living in and enjoying their homes and gardens. The definitions of high, medium and low sensitivity receptors are set in the IAQM Table 2 on page 12 of the guidance.

**Table 3: IAQM Odour Effect Descriptors for Impacts of 'Most Offensive' Odours Predicted by Modelling (as IAQM Table 6)**

5.

| Odour Exposure, 98th Percenile of Hourly $ou_E/m^3$ | Receptor Sensitivity* | | |
|---|---|---|---|
| | Low | Medium | High |
| ≥10 | Moderate | Substantial | Substantial |
| 5 - <10 | Moderate | Moderate | Substantial |
| 3 - <5 | Slight | Moderate | Moderate |
| 1.5 - <3 | Negligible | Slight | Moderate |
| 0. 5 - <1.5 | Negligible | Negligible | Slight |
| <0.5 | Negligible | Negligible | Negligible |

**Table 4: IAQM Odour Effect Descriptors for Impacts of 'Moderately Offensive' Odours Predicted by Modelling (as IAQM Table 7)**

6.

| Odour Exposure, 98th Percenile of Hourly $ou_E/m^3$ | Receptor Sensitivity* | | |
|---|---|---|---|
| | Low | Medium | High |
| ≥10 | Moderate | Substantial | Substantial |
| 5 - <10 | Slight | Moderate | Moderate |
| 3 - <5 | Negligible | Slight | Moderate |
| 1.5 - <3 | Negligible | Negligible | Slight |
| 0. 5 - <1.5 | Negligible | Negligible | Negligible |
| <0.5 | Negligible | Negligible | Negligible |

2.25 The IAQM guidance can indirectly also be used to help inform the selection of appropriate odour impact benchmarks, but it is important to note, that as IAQM points out, there is relatively limited evidence of the dose related odour impact in the community and therefore assigning significance is not as straightforward as simply following the matrices in Table 3 and Table 4. Although these matrices act as a guide, the IAQM guidance recognises that professional judgement needs to be taken into account. In this case professional judgements have been made by Olfasense in their odour Impact Assessment and in their responses to queries raised by the Council.

2.26 On the basis of data and opinion provided by Olfasense, it can justifiably be reasoned, that the WwWT emits predominantly "moderately offensive odours given the nature of the WwTW and treatment assets on site. This is a view which is set out by Olfasense in their response dated 23 August 2022 (Ref 22 08 23 _DWHO21C_01) in response to queries raised by the Council. Olfasense said:

*Based on the assumption that odours from Witney STW are classified as "moderately offensive" which is typically considered appropriate for well operated STWs an odour exposure of $C_{98,\ 1\ hour}$ = <3 $ou_E/m^3$ for highly sensitive receptors ( e.g. residential dwellings ) and $C_{98,\ 1\ hour}$ <5 $ou_E/m^3$ for medium sensitivity receptors ( e.g. green space/ recreational) would both correspond to a "slight" odour effect and generally be considered acceptable and/or insignificant in planning terms*".

2.27 This conclusion is provided by one of the UK's most experienced odour specialist consultancies and was made in the light of extensive site survey and measurement work at the WwTW. It would be unreasonable to reject this opinion without very well-reasoned justification. On the basis of views set out by Olfasense it can be concluded that IAQM Table 7 (Table 4 above) is the most appropriate benchmark to use in considering the potential effects of the Witney WwTW odours on the proposed development in this application. .

2.28 The IAQM guidance develops the interpretation of the numerical predictions derived from dispersion modelling as set out in Tables 3 and 4 above. As an example, in relation to Table 4 it can be reasoned that odour exposures below 3 $ou_E/m^3$ can be equated to a negligible or slight adverse odour effect for "high" sensitivity, residential, receptors. Odour impact predictions greater than 3 $ou_E/m^3$ odours can be expected to have a moderate or more substantial effect for residential receptors.

2.29 Similarly, it can be reasoned from the IAQM guidance set out in Table 4 that odour impacts in a range up to 3 $ou_E/m^3$ can be allocated as "negligible" effects for medium sensitivity receptors, such as the industrial, commercial and retail land uses and enterprises, and that odour impact up to 5 $ou_E/m^3$ may have a slight adverse effect.

2.30 The criteria in Table 4 (IAQM Table 7) for the most critical residential receptor category determine that for odours in the moderately offensive category, 98$^{th}$ percentile odour impacts predicted at less than 1.5 $ou_E/m^3$ can be said to have a '**negligible**' effect. Similarly odour impacts predicted to be less than 3.0 $ou_E/m^3$ can be determined to have '**slight**' adverse effects.

2.31 In planning and land use determinations it is the accepted convention that 'negligible' and 'slight adverse" effects are considered acceptable, as advised in the Olfasense report.

**Conclusions on Appropriate Impact Standards and Odour Effects**

2.32 Guidance and previous planning appeal decisions support the use of an odour impact benchmark value of 3 $ou_E/m^3$ for use in the determination of planning applications, such as this one, concerning moderately offensive odours from WwTWs where the objective is to protect residential amenity.

2.33 With respect to IAQM odour guidance, it has been concluded by Olfasense, as one of the UK's most experienced odour specialist consultancies, and in the light of extensive site survey and measurement work at the WwTW, that odours from the Witney WwTW should be assessed as being in the moderately offensive category. It would be unreasonable to reject this opinion without very well-reasoned justification. On the basis of the views set out by Olfasense it can be concluded that IAQM Table 7 (Table 3 above) is the most appropriate benchmark to use in considering the potential effects of WwTW odours on the proposed development.

2.34 The use of a 3 $ou_E/m^3$ benchmark standard for assessing odour impacts on the proposed residential development is consistent with IAQM amenity effects assessment of no worse than "sight adverse" effects for moderately offensive odours in "high" sensitivity receptor areas.

## 3. OFFICER COMMENTS AND COMMITTEE REPORT

**Air Quality Officer Consultee Response**

3.1 The Council's Air Quality consultee response is provided in an undated note or memo "signed" by Susan McPherson (ERS Senior Officer). The note explains that the author objects to the development on the following grounds:

a) *The proposed development is located to the south of Thames Water Sewage Treatment Works, and Mutchmeats abattoir. An odour assessments were undertaken by Olfasense to determine the impact of each of these facilities on the development. The assessment were then used to determine the masterplan of the site. WODC raised queries regarding the layout, and further to discussions with Barton Willmore in October 2022, it was agreed to move the multiple use games area (MUGA) to outside the 5$ou_E/m^3$ contour line and include a buffer zone between this contour and the housing to the north west of the proposed development. WODC welcomed the relocation of the MUGA shown on Drawing No. 003, issued on 15th December 2022, however details of the buffer zone have yet to be provided.*

b) *During the consultation process, WODC became aware of upgrading plans for the Thames Water Sewage Treatment Works located to the north of the site. In December 2022, WODC received correspondence from Thames Water confirming the upgrading works would rearrange the layout of the STW, include additional treatment vessels, and potentially increase the odour emissions by 6%. WODC forwarded this information to the applicant and requested a revised odour assessment based on this new information. To date, a revised odour assessment has not been submitted by the applicant. In addition,*

c) *Thames Water were also concerned that although the odour assessment had shown the existing plant would not cause odour issues to residents most of the time (98%), there was still a risk of loss of amenity value from time to time, despite the implementation of odour mitigation at the STW.*

3.2 **Odour Impact Standards** - In relation to the first of these points at a), it is evident and acknowledged by the consultee that the Masterplan for the proposed development was developed taking account of the Olfasense odour impact assessment. There is a query about

the location of a MUGA and a buffer zone, although this is presumed to be a relatively minor matter which could be dealt with by negotiation and/or by a suitable condition.

3.3 However, it is also noted in relation to a) above that Susan McPherson is clearly aware of the significance, and use of, odour impacts standards because she refers to the 5.0 $ou_E/m^3$ odour contours. Despite this acknowledgement of the role of odour contours, there is no mention in this response about the Council having any concerns or reservations about the use of an odour impact benchmark of ≤3.0 $ou_E/m^3$ as a criterion for residential development in the discussions held in October 2022 between the Council and Barton Wilmore. It is quite evident that odour impacts standards were discussed in this meeting by the stated reference to 5.0 $ou_E/m^3$. It therefore seems that it would have been at least remiss of the Council not to raise this potentially more important concern about the 3 $ou_E/m^3$ impact standard in these discussions if it was then to become a more significant factor in the Officers Report to the Planning Committee.

3.4 **Possible Future Addition to the WwTW** - Susan McPherson refers to possible future changes in, or additions to, the treatment assets at the Witney WwTW in the second of her comments, as at b) above. In this note she suggests that these developments would, or could, increase emissions by 6%, and suggests that these changes should have been taken into account in a revised odour impact assessment. However, the Officer Report (at 5.123) describes a less definitive situation about possible future additions to the WwTW "*Officers have also received informal correspondence that the STW is likely to expand by 6% in the next few years. While this expansion is at an early stage, it is a material consideration*."

3.5 Given the apparent informality and vagueness about possible future developments at the WwTW, it seems clear to me that it would be an unrealistic expectation for the Applicant to model the potential odour effects of some "*expansion which is at an early stage*" if this is no more than an informal proposal. Under these circumstances it would be impractical to carry out a revised odour impact assessment without more definitive details from Thames Water about the proposed changes to the treatment assets. Unless Thames Water have brought forward details of these changes, then it would not be possible for the Applicants to commission further modelling.

3.6 Furthermore, it is noted that it was Thames Water who were responsible for commissioning the Olfasense assessment, and if they had concerns about the possible future effects of additions to the WwTW then they should have instructed Olfasense to take these changes into account when the modelling was commissioned.

3.7 The reality is that if Thames Water do bring forward plans for significant additions of changes to the WwTW then they can be expected to at least consult with the local authority,and may

well also be obliged to seek planning consent for those changes. My experience has included provision of odour technical advice to a number of local planning authorities with WwTW development schemes elsewhere. These schemes have included Thames Water WwTWs at Beckton and Riverside, and my experience has been that when Thames Water plan such upgrade schemes they are designed to be odour neutral or slightly odour positive. In other words, Thames Water typically design improvements schemes to ensure that there is no net increase in odour emissions from their WwTWs when extensions or additions in treatment assets are planned. There is no reason to expect that Thames Water would treat any future expansion plans at Witney WwTW in any different way given the fact that there are existing sensitive receptors/developments to the north and east of the works.

3.8 Whilst there is some merit in the Council's suggestion that possible future additions to the treatment assets at the WwTW may affect off-site odour impacts, it is not realistic to suggest that these changes should be modelled and accounted for by the Applicant in this case unless Thames Water have already defined precisely what those changes will be. There is no evidence that such details are available at this stage.

3.9 In any case, Thames Water can be expected to design and implement any changes or upgrades to the treatment assets at Witney in a way which is odour neutral or slightly odour positive given the proximity of existing odour receptors and the Company's normal good practice demonstrated in similar upgrades on other sites.

3.10 I understand that Thames Water have indicated and agreed that the potential odour impacts of possible future additions to the WwTW could be dealt with as requirement for further odour impact assessment under a planning condition.

3.11 **Thames Water Concerns About Modelling Predictions** – The third point raised by Susan McPherson, as set out at c) above, seems to infer that Thames Water has some concerns about the veracity or reliability odour modelling projections.

3.12 These comments seem to be somewhat general and unspecific, but they are surprising and unwarranted under the circumstances that Thames Water commissioned the Olfasense odour impact assessment, and as part of this commissioning process, Thames Water dictate the scope and circumstances of such assessments. It would therefore be disingenuous of Thames Water to criticise the methods and findings of the odour impact assessment, as is apparently suggested by Susan McPherson.

3.13 The reality is that odour modelling assessments based on 98$^{th}$ percentiles have been widely accepted by planning inspectors and this is the normal assessment method.

3.14 It is also important to recognise that the Olfasense odour impact assessment shows odour exposures equivalent to those predicted on the proposed development at existing receptor locations to the North of the A40, and North East of the WwTW as shown in Olfasense Figure 4, Despite these finding of equivalent odour levels in existing developments, there have been very few odour complaints as set by Olfasense in their report at 3.3.

3.15 It is concluded that the Air Quality consultee raised no substantive issues with regard odour effects on the proposed development.

**Panning Committee Report**

3.16 The Officers Report to the Planning Committee deals with odour impacts over a much wider scope and in more depth than the Air Quality consultee, with odour discussed from paragraph 5.87 to 5.129.

3.17 It is concluded in the report at 5.128 that "Officers have found harm to the living conditions of future occupiers of the dwellings, that the quantum of development would be affected……..", but these conclusion seems to be at odds with the consultee response from the Air Quality consultee set out above. Whilst the Air Quality consultee raises some points of objection, these are not set out in the same terms, and certainly do not attempt to propose or justify use of 1.5 $ou_E/m^3$ as a benchmark..

3.18 The crux of the concerns about odour that are set out in the Officers Report seem to be as to whether or not odours from the Witney WwTW should be classified as **moderately offensive** of **most offensive** in the context of the IAQM guidance.

3.19 The Officer Report at 5.105 sets out the position of Olfasense on appropriate odour impact standards:

> *The submitted Odour Assessment explains that 'in Olfasense's experience, the potential for adverse odour impact, at highly sensitive receptors, typically starts to occur at odour exposure levels of C98, 1-hour = 3 to 5 $ou_E/m^3$ for odours which are generally classified as moderate to highly offensive (e.g. well operated sewage works where most raw sludge handling operations or septic influent are well contained, and odour controlled).*

3.20 In my opinion very significant weight should be attached to this opinion, that is that appropriate impacts standards are 3 to 5 $ou_E/m^3$ given Olfasense's unrivalled experience in odour impact assessments on WwTWs in the UK. Olfasense advocates the use of these benchmarks. whether or not odours are "classified as moderate to highly offensive in the phrase "*well operated sewage works where most raw sludge handling operations or septic influent are well contained, and odour controlled*".

3.21 As set out earlier, in response to a query from the Council Olfasense said:

*Based on the assumption that odours from Witney STW are classified as "moderately offensive" which is typically considered appropriate for well operated STWs an odour exposure of* $C_{98,\ 1\ hour}$ *= <3* $ou_E/m^3$ *for highly sensitive receptors ( e.g. residential dwellings ) and* $C_{98,\ 1\ hour}$ *<5* $ou_E/m^3$ *for medium sensitivity receptors ( e.g. green space/ recreational) would both correspond to a "slight" odour effect and generally be considered acceptable and/or insignificant in planning terms*".

3.22 These opinions and conclusions were provided by one of the UK's most experienced odour specialist consultancies and were made in the light of extensive site survey and measurement work at this specific WwTW. The IAQM guidance clearly sets out that the selection of appropriate impact standards is a matter of professional judgment and Olfasense have made such determinations. It would be unreasonable to reject these opinions without very well-reasoned justification, based on a suitable experience and expertise base.

3.23 Olfasense are highly experienced and specialised odour specialist consultants. It is not clear from the Officer Report if any of the Council's officers have equivalent levels of experience and expertise.

3.24 The reality is that the IAQM guidance, which the Officer Report refers to, does not introduce any significant new guidance on odour impact standards or set any different benchmarks other than those which have previously been used in planning determinations and appeal decisions. Prior to the IAQM guidance being released it was custom and practice to interpret odour impacts using the H4 impact standards of 1.5 $ou_E/m^3$ for "most offensive" odours and 3.0 $ou_E/m^3$ for moderately offensive odours and these are directly equivalent to the threshold for "acceptable" slight impacts and negligible in Tables 6 and 7 of the IAQM guidance.

3.25 The IAQM guidance therefore does not provide any substantive reason to overlook or ignore the planning appeal precedents on odour impact benchmarks set out above in Section 2.

3.26 Notwithstanding the advice and opinion provided by Olfasense on appropriate odour impact benchmarks, based on their direct practical experience of the Witney WwTW, the question as to whether or not a WwTW should be considered a source of "moderately offensive" or "most offensive" odours is somewhat subjective. There is clearly a difference between a dedicated sludge treatment centre and more "normal" WwTW, such as Witney which encompasses a mixture of effluent and sludge treatment assets and processes.

3.27 The Officers Report includes paragraphs 5.107 and 5.108 which attempt to justify allocation of odours from the Witney works as being “most offensive” based on the proportion of odours emitted from sludge related sources. It is clear that Olfasense had access to the same data and their opinion was that allocation to the moderately offensive category was most appropriate. The reality is that practically all WwTW generate some sludge related odours and this is a factor which has been taken into account in precedent cases such as those described at section 2. In reaching this opinion I have considered the extensive discussion of this topic in the Stanton appeal (APP/E3525/A/11/2162837) in which I was involved as an expert witness.

3.28 In my opinion the Officers Report does not introduce any substantive new evidence or reasoning to overturn the opinions and conclusions of Olfasense, as highly experience odour specialists, which is that the “mixture” of odours from Witney WwTW should be allocated as “moderately offensive” and that ≤3 $ou_E/m^3$ is an appropriate benchmark for residential development.

Steve Peirson
Principal Odour Consultant
RSK ADAS

24 February 2022

## Author's Details and Experience

1. I am Stephen Peirson and I am employed as a Principal Odour Consultant by RSK ADAS Ltd, of Unit 1, Rubicon Square, 4205 Park Approach, Thorpe Park, LEEDS, LS15 8GB.

2. I have worked with RSK ADAS, ADAS and MAFF (the Ministry of Agriculture Fisheries and Food) for 43 years since graduating with an honours degree in Agricultural Engineering at the University of Newcastle upon Tyne.

3. ADAS was, up until 1997, part of MAFF and provided advisory and research services for the agricultural sector. In 1997 ADAS was privatised under a management buy-out, but it has continued to provide research, advice and consultancy services to Defra, to the agricultural industry, local authorities and companies. More recently ADAS has become part of the RSK consultancy group and I have been attached to a specialist Air Quality team within RSK.

4. For most of my career I have been based in Humberside and East Yorkshire where I have developed special interests in odour emission measurements, odour abatement and odour impact control. I initially became involved in odours because of the large concentration of intensive livestock farms in the East Yorkshire area and because of my then established interests in the ventilation of pig buildings and in farm wastes. East Yorkshire was at that time the most concentrated area for pig production across the entire country.

5. For the last 32 years I have been primarily involved in work to measure and control odour emissions and impacts arising from sewage treatment works, livestock production, commercial composting sites, animal feed plants, abattoirs and food processing factories and a wide range of other industrial processes. This experience routinely includes odour sampling, emission quantification, odour impact assessments, odour control plant testing and specification, as well as the assessment of "best practicable means" (BPM) and Best Available Technology (BAT) controls in nuisance cases. This experience has been built on initial research that I carried out for MAFF (now Defra) to quantify odour emissions from intensive pig and poultry buildings, and to assess the influence of building and management systems on odour emissions from such buildings.

6. In addition to advisory, research and consultancy work involving odours and emissions, I have provided expert evidence on behalf of local authorities, farmers, sewage companies, and industrial companies in numerous planning and "nuisance" cases involving odour.

7. I have carried out odour impact assessments on sewage treatment works (STWs), and/or provided odour consultancy services for sewage utilities companies (and their advisers) including Northumberland Water, Wessex Water, Southern Water, Severn Trent Water, Yorkshire Water, United Utilities (and formerly North West Water), Essex and Suffolk Water, Aberdeen Environmental Services, NI Water Service, Scottish Water, and Thames Water.

8. I acted as an expert witness for the London Boroughs of Bexley and Hounslow in appeals involving abatement notices served as a result of nuisance issues involving the Thames Water sewage treatment works at Crossness and Mogden. More recently I presented expert evidence on behalf Wychavon Council in a statutory nuisance case concerning livestock at Wadborough Park Farm in Worcestershire involving the successful defence of an abatement notice against an appeal by the Operator.

9. I have provided advice to the London Thames Gateway Development Corporation and the London Boroughs of Bexley, Newham, Hounslow, and Havering in relation to proposed odour impact controls in planning applications for major expansion works at the Beckton, Crossness, Mogden and Riverside sewage treatment works in London, and the Lee Valley Tunnel. These projects included the provision of expert advice in drafting objective planning conditions to control odour emissions and off-site odour impacts.

10. I have provided specialised technical advice to MAFF and Defra in relation to the implementation of the EU Integrated Pollution Prevention and Control Directive on pig and poultry farms in England and Wales.

11. Along with ADAS colleagues I have been involved with odour impact appraisals and planning applications. I have provided expert evidence for appeals and appeared as an expert witness in hearings and public inquiries based on the odour impact assessment approaches discussed in my proof below. Our evidence has been found to be robust and accepted by Inspectors. .

12. I was lead specialist "odour" contributor to government guidance on odour in planning and nuisance published by Defra in 2010 for local authorities "Odour Guidance for Local Authorities". Subsequently I provided advice to consultants acting for Defra in drafting of the "National Policy Statement for Wastewater". This document is concerned with planning and development of large wastewater treatment works.

13. I have regularly provided training for Environmental Health Officer and Environment Agency regulatory officers in odour related topic areas.

14. I acted for the Claimants (Dobson and others) in a successful group action against Thames Water Utilities Ltd involving nuisance odours from the Mogden sewage treatment works.

15. I have prepared papers for odour seminars and conferences concerning odours including:

- The Use of Odour Measurement in the Control of Odours (Joint author with A. Buckland & I Barrie of ADAS Agromet Unit). Proc. of Chartered Institute of Waste and Environmental Management Conference "Odour Control", London, 1998.

- Olfactometry: Principles and Use in Specifying and Testing Odour Abatement Technology. Proc. of 2nd European Biosolids and Organic Residuals Conference, Wakefield, November 1997.
- Practical Experience of Odour Abatement Plant Performance (Joint author with C Clarkson) Proc. of CIWEM/aqua-enviro Odour Conference, Nottingham, October 2001
- "Odour Management – Taking it Seriously" at 2nd European Water and Wastewater Management Conference, Birmingham 2008

16. I am a Chartered Engineer and a Chartered Environmentalist. I am a member of the Institution of Agricultural Engineers, and ion the past I was the honorary chairman of the Yorkshire & Northern Branch of the Institution.

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