

Note / Memo

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Water & Maritime**

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From: Dominic Handscomb
Date: 21 May 2025
Copy: Revision 02
Our reference: PC7429-RHD-XX-XX-ME-EV-0002
Classification: Project related
Checked by: Richard Lane

**Subject: Land at Sheep Hey Farm, Leaches Road, Shuttleworth - Odour
Assessment**

1 Introduction

This note provides a qualitative odour assessment for the proposed development of a slurry lagoon at the Land at Sheep Hey Farm, Leaches Road, Shuttleworth (hereafter known as “the Site”).

The proposed slurry lagoon would be 30 m by 20 m in size, 4 m deep and have 45 degree slopes to each side. It would have a hardcore stone base with a 2mm thick black plastic liner to make the pond impermeable. It is proposed that when operational the lagoon will be covered with an impermeable UV-stabilised plastic floating cover, secured at the bank tops of the lagoon. The proposed cover will be as per recommendations from the Department for Environment, Food & Rural Affairs’ (Defra’s) guidance on the *Code of Good Agricultural Practice (COGAP) for Reducing Ammonia Emissions* (Defra, 2024) and *The Industrial Emissions Directive 2010/75/EU Integrated Pollution Prevention and Control on the Best Available Techniques (BAT) Reference Document for the Intensive Rearing of Poultry or Pigs* (European Union, 2017).

The proposed slurry lagoon would be situated to the south of Sheep Hey farm located approximately 500 m west of Shuttleworth. The nearest sensitive receptor is The Paddock campsite located approximately 250 m northeast from the slurry lagoon.

2 Guidance

2.1 Environment Agency H4 Odour Management Permitting Guidance

The Environment Agency published the H4 Odour Management guidance document providing technical support for processes operating under an Environmental Permit was published by the Environment Agency in 2011 (Environment Agency, 2011). It offers a detailed guide to the assessment, quantification, control and management of odours emitted from permitted processes. The guidance sets out benchmark criteria for a wide range of odours, as shown in **Table 1**.

Table 1: H4 Benchmark odour criteria (Environment Agency, 2011)

Criterion, C_{98} ouE /m ³	Offensiveness	Odour Emission Sources
1.5	Most Offensive	- Processes involving decaying animal or fish remains - Processes involving septic effluent or sludge - Biological landfill odours
3.0	Moderately Offensive	- Intensive livestock rearing - Fat frying (food processing) - Sugar beet processing - Well aerated green waste composting
6.0	Less Offensive	- Brewery - Confectionery - Coffee roasting - Bakery

2.2 Institute of Air Quality Management Guidance

The Institute of Air Quality Management (IAQM) guidance on the assessment of odour for planning document was compiled and issued in 2014 by an expert panel of the Institute of Air Quality Management (IAQM) and was subsequently updated in 2018 (IAQM, 2018), on the basis of initial practical experience of its application and implementation. It provides a framework for the identification, assessment and categorisation of the scale and magnitude of the impact of odours emitted from industrial processes and other activities. It has become widely adopted and applied by odour professionals in the UK. The guidance uses the principle of FIDOL factors (Frequency, Intensity, Duration, Odour unpleasantness and Location) to determine the impact of odour at a location. The FIDOL factors are described in **Table 2**.

Table 2: Description of FIDOL factors (IAQM, 2018)

Factor	Description
Frequency	How often an individual is exposed to odour.
Intensity	The individual's perception of the strength of the odour.
Duration	The overall duration that individuals are exposed to an odour over time.
Odour unpleasantness	Odour unpleasantness describes the character of an odour as it relates to the 'hedonic tone' (which may be pleasant, neutral or unpleasant) at a given odour concentration/intensity. This can be measured in the laboratory as the hedonic tone, and when measured by the standard method and expressed on a standard nine-point scale it is termed the hedonic score*.
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 'Location' factor can be considered to encompass the receptor characteristics, receptor sensitivity, and socio-economic factors.
*Hedonic scores are values assigned to the unpleasantness of a smell in order to quantify an odour. This is assigned in laboratory conditions by a panel of trained assessors in line with the German VDI 3882 Part 2 method. Hedonic tone (the degree to which an odour is perceived as either pleasant or unpleasant) is scored on a nine-point scale ranging from very pleasant (a score of +4, such as a bakery smell) through neutral to highly unpleasant (a score of -4, such as rotting flesh).	

3 Methodology

A qualitative risk-based assessment following the IAQM guidance (IAQM, 2018) has been carried out for the Site. A more sophisticated assessment is not practical given the poor characterisation of the potential odour source given the fact the lagoon has not been constructed yet and therefore cannot be monitored.

The qualitative risk-based assessment presented in the IAQM guidance (IAQM, 2018) is underpinned by the basic concept of risk being dependent on the probability of the event occurring and the consequence of the event occurring. For odour assessments, the probability can be characterised by the likelihood of exposure (impact) and the consequence can be characterised as the effect on the receptor if that exposure (impact) was to occur. This is pulled together by the Source–Pathway–Receptor (S-P-R) concept.

The fundamental relationship behind the S-P-R concept is: **Effect $\approx$ Dose x Response**

For an odour assessment, the dose can be considered to be equivalent to the odour exposure (impact). The impact will be determined by FIDO of the FIDOL factors presented in **Table 2**. The effect is the result of the changes upon human (in the case of odour) receptors, taking into account receptor sensitivity (i.e. the responsiveness to odour); the L (location) in FIDOL categorises the sensitivity.

The S-P-R approach considers the strength, how inherently odorous the compounds are and the unpleasantness of the odour source, how the odour will be diluted and dispersed in the open air and the effectiveness of any mitigation, and the sensitivity of affected receptors.

Before an adverse effect occurs, such as a loss of amenity, annoyance, nuisance, or the generation of complaints, there must be exposure to odour. The occurrence of odour exposure relies on the presence of all three components in the S-P-R chain:

- An emission source, which serves as a means for the odour to enter the atmosphere.
- A pathway through which the odour can travel through the air to locations off-site. It is important to note that anything enhancing the dilution and dispersion of an odorous plume during its journey from the source to the receptor will diminish the concentration, consequently reducing exposure. Additionally, increasing the length of the pathway (e.g. by releasing from a high stack) will, under equal conditions, amplify dilution and dispersion.
- The existence of receptors, referring to individuals who could potentially experience an adverse effect. It is important to acknowledge that people vary in their sensitivities to odour.

Table 3 provides the factors to consider and examples for the odour source, the pathway effectiveness and receptor sensitivity.

Table 3: IAQM Examples of Risk Factors for Odour Source, Pathway and Receptor Sensitivity. (IAQM, 2018)

Source Odour Potential	Pathway Effectiveness	Receptor Sensitivity
Factors affecting the source odour potential include: - the magnitude of the odour release (taking into account odour-control measures). - how inherently odorous the compounds are. - the unpleasantness of the odour.	Factors affecting the odour flux to the receptor are: - distance from source to receptor. - the frequency (%) of winds from the source to receptor (or, qualitatively, the direction of receptors from source with respect to prevailing wind). - the effectiveness of any mitigation/ control in reducing flux to the receptor. - the effectiveness of dispersion/ dilution in reducing the odour flux to the receptor. - the topography and terrain.	For the sensitivity of people to odour, the IAQM recommends that the air quality practitioner uses professional judgement to identify where on the spectrum between high and low sensitivity a receptor lies taking into account the following general principles:
Large Source Odour Potential - Magnitude – Larger Permitted processes of odorous nature or large Sewage Treatment Works (STWs); materials usage hundreds of thousands of tonnes/m³ per year; area sources of thousands of m². - The compounds involved are very odorous (e.g. mercaptans), having very low Odour Detection Thresholds (ODTs) where known. - Unpleasantness – processes classed as “Most offensive” in Table 1; or (where known) compounds/ odours having unpleasant (-2) to very unpleasant (-4) hedonic score. - Mitigation/ control – open air operation with no containment, reliance solely on good management techniques and best practice.	Highly Effective Pathway for Odour Flux to Receptor - Distance – receptor is adjacent to the source/ site; distance well below any official set-back distances. - Direction – high frequency (%) of winds from source to receptor (or, qualitatively, receptors downwind of source with respect to prevailing wind). - Effectiveness of dispersion/ dilution – open processes with low-level releases, e.g. lagoons, uncovered effluent treatment plant, landfilling of putrescible wastes.	High sensitivity receptor Surrounding land where: - users can reasonably expect enjoyment of a high level of amenity; and - the people would reasonably be expected to be present there continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land. Examples may include residential dwellings, hospitals, schools/ education and tourist/ cultural locations.
Medium Source Odour Potential - Magnitude – Smaller Permitted processes or small STWs; materials usage thousands of tonnes/m³ per year; area sources of hundreds of m² - The compounds involved are moderately odorous. - Unpleasantness – processes classed in Table 1 as	Moderately Effective Pathway for Odour Flux to Receptor Distance – receptor is local to the source. Where mitigation relies on dispersion/dilution – releases are elevated but compromised by building effects.	Medium sensitivity receptor Surrounding land where: - users would expect to enjoy a reasonable level of amenity, but wouldn't reasonably expect to enjoy the same level of amenity as in their home; or - people wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the

Source Odour Potential	Pathway Effectiveness	Receptor Sensitivity
“Moderately offensive”; or (where known) odours having neutral (0) to unpleasant (-2) hedonic score. Mitigation/ control – some mitigation measures in place, but significant residual odour remains.		normal pattern of use of the land. Examples may include places of work, commercial/ retail premises and playing/ recreation fields.
Small Source Odour Potential - Magnitude – falls below Part B threshold; materials usage hundreds of tonnes/m³ per year; area sources of tens m². - The compounds involved are only mildly odorous, having relatively high ODTs where known. - Unpleasantness – processes classed as “Less offensive” in Table 1; or (where known) compounds/ odours having neutral (0) to very pleasant (+4) hedonic score. - Mitigation/control – effective, tangible mitigation measures in place (e.g. BAT, BPM) leading to little or no residual odour.	Ineffective Pathway for Odour Flux to Receptor - Distance – receptor is remote from the source; distance exceeds any official set-back distances. - Direction – low frequency (%) of winds from source to receptor (or, qualitatively, receptors upwind of source with respect to prevailing wind). - Where mitigation relies on dispersion/ dilution – releases are from high level (e.g. stacks, or roof vents >3 m above ridge height) and are not compromised by surrounding buildings.	Low sensitivity receptor Surrounding land where: - the enjoyment of amenity would not reasonably be expected; or - there is transient exposure, where the people would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land. Examples may include industrial, farms, footpaths and roads
Notes: Minimum ‘setback’ distances may be defined for some odorous activities: for example, standard setback distances for livestock housing units are a popular tool for odour regulation in Australia and New Zealand, Europe and the United States. In the UK, there is no universally agreed-upon set of minimum setback distances for odorous activities. However as stated in The Town and Country Planning (General Permitted Development) (England) Order 2015 Schedule 2 Part 6 Class A, updated 2024, a development is not guaranteed consent if “the development is for the storage of slurry or sewage sludge where the building, structure or excavation is, or would be, within 400 metres of the curtilage of a protected building”. A protected building means “any permanent building which is normally occupied by people or would be so occupied, if it were in use for purposes for which it is designed; but does not include— (a) a building within the agricultural unit; or (b) a dwelling or other building on another agricultural unit which is used for or in connection with agriculture” Therefore, 400 m has been used as a recommended setback distance for the assessment.		

The next step in the assessment combines the estimates of source odour potential and pathway effectiveness to predict the risk of odour exposure (impact) at the receptor location, as illustrated in the IAQM matrix in **Table 4**.

Table 4: Risk Of Odour Exposure (Impact) at the Specific Receptor Location Matrix

Pathway Effectiveness	Source Odour Potential		
	Small	Medium	Large
Highly effective pathway	Low risk	Medium risk	High risk
Moderately effective pathway	Negligible risk	Low risk	Medium risk
Ineffective pathway	Negligible risk	Negligible risk	Low risk

The last stage involves assessing the impact of the odour on the exposed receptor, considering its sensitivity, as depicted in the IAQM matrix provided in **Table 5**. The potential odour effects range from negligible and slight adverse to moderate adverse and substantial adverse.

Table 5: Likely Magnitude of Odour Effect at the Specific Receptor Location Matrix

Receptor Odour Exposure (impact)	Receptor Sensitivity		
	Low	Medium	High
High risk of odour exposure	Slight adverse effect	Moderate adverse effect	Substantial adverse effect
Medium risk of odour exposure	Negligible effect	Slight adverse effect	Moderate adverse effect
Low risk of odour exposure	Negligible effect	Negligible effect	Slight adverse effect
Negligible risk of odour exposure	Negligible effect	Negligible effect	Negligible effect

To assess the significance of the effect, the evaluation has incorporated the following recommendation from IAQM:

“an assessment reaches a conclusion on the likely significance of the effects. Where the overall effect is greater than “slight adverse”, the effect is likely to be considered significant. This is a binary judgement: either it is “significant” or “not significant””.

4 Baseline

To provide an assessment of the significance of any new development proposal (in terms of odour), it is necessary to identify and understand the baseline conditions in and around the study area. This provides a reference state against which any potential future changes in odour can be assessed.

Ambient levels of odour are typically very low and are not routinely monitored in the UK. Based upon a desktop survey there are few potentially significant sources of odour in the immediate vicinity of the Site. Activities associated with Sheep Hay Farm do not give rise to significant odours. The campsite to the northeast and residential properties to the east are not expected to give rise to significant odours. The closest potential sources of odour to the Site are the Essity paperworks mill, approximately 410 m west of the Site and the treatment works, approximately 210 m southwest of the Site.

5 Odour Emissions Assessment

The initial step in the assessment involves estimating the potential for odour generation from site activities, referred to as 'Source Odour Potential'. This estimation of Source Odour Potential' is assessed in **Table 6**

Table 6: Assessment of Source Odour Potential

Factor Affecting Source Odour Potential	Discussion	Source Odour Potential
The scale (magnitude) of the release from the odour source	Slurry lagoon is proposed to have an area of 600 m ² and have a volume of approximately 1,200 m ³	Medium
The inherent odour intensity of the emission.	The exact contents of the slurry lagoon are unknown at this time and as the lagoon is not yet in place an assessment of the odour intensity (e.g. sniff testing) cannot be undertaken.	N/A
The relative pleasantness/unpleasantness of the odour.	The contents of the slurry lagoon would be classified as the most offensive odour category in the H4 odour criteria in Table 1 .	Large

The overall Source Odour Potential of the Site is therefore assessed as **Large**.

Taking into account the example risk factors in **Table 3**, the effectiveness of the source pathway and sensitivity of nearby receptors has been assessed in **Table 7**. The proposed plastic floating cover will reduce ammonia and odour emissions from the lagoon. With impermeable floating covers in place, ammonia emission reductions of approximately 95 % or more have previously been reported (European Union, 2017). With this type of odour reduction in place the odour pathway effectiveness from the lagoon is considered to be ineffective at all receptors.

Table 7: Assessment of Source Pathway and Receptor Sensitivity

Receptor Details and Location	Discussion	Pathway Effectiveness	Receptor Sensitivity
The Paddock Campsite, Leaches Road	Receptor is approximately 250 m northeast from the Site. Receptor is located downwind of the prevailing wind direction and is approximately 10 m uphill from the Site (OS Maps, 2025). The lagoon is a closed, covered process. Although the release is low-level, it is considered to be an ineffective odour pathway due to the cover.	Ineffective pathway	High
Whalley Road [A], Ramsbottom	Receptor is approximately 535 m northeast from the Site. Receptor is located downwind of the prevailing wind direction and is approximately 40 m uphill from the Site.	Ineffective pathway	High
Whalley Road [B], Ramsbottom	Receptor is approximately 490 m east from the Site. Receptor is not located upwind of the prevailing wind direction and is approximately 30 m uphill from the Site.	Ineffective pathway	High
Holcombe View, Shuttleworth	Receptor is approximately 500 m southeast from the Site. Receptor is located upwind of the prevailing wind direction and is approximately 35 m uphill from the Site.	Ineffective pathway	High

Receptor Details and Location	Discussion	Pathway Effectiveness	Receptor Sensitivity
Ashwood Avenue, Ramsbottom	Receptor is approximately 470 m south from the Site. Receptor is located upwind of the prevailing wind direction and is approximately 15 m uphill from the Site.	Ineffective pathway	High
Great Eaves Road, Ramsbottom	Receptor is approximately 330 m southwest from the Site. Receptor is located upwind of the prevailing wind direction and is approximately 10 m downhill from the Site.	Ineffective pathway	High

The risk of odour exposure (impact) at each receptor location was determined using the matrix in **Table 4** and is presented in **Table 8**.

Table 8: Risk of Odour Exposure at the Specific Receptor Location

Receptor Details and Location	Pathway Effectiveness	Source Odour Potential	Risk of Odour Exposure
The Paddock Campsite, Leaches Road	Ineffective pathway	Large	Low risk
Whalley Road [A], Ramsbottom	Ineffective pathway	Large	Low risk
Whalley Road [B], Ramsbottom	Ineffective pathway	Large	Low risk
Holcombe View, Shuttleworth	Ineffective pathway	Large	Low risk
Ashwood Avenue, Ramsbottom	Ineffective pathway	Large	Low risk
Great Eaves Road, Ramsbottom	Ineffective pathway	Large	Low risk

The magnitude of odour effect at the specific receptor location was determined using the matrix in **Table 5** and is presented in **Table 9**.

Table 9: Magnitude of Odour Effect at the Specific Receptor location

Receptor Details and Location	Risk of Odour Exposure	Receptor Sensitivity	Magnitude of Odour Effect at Receptor Location
The Paddock Campsite, Leaches Road	Low risk	High	Slight adverse effect
Whalley Road [A], Ramsbottom	Low risk	High	Slight adverse effect
Whalley Road [B], Ramsbottom	Low risk	High	Slight adverse effect
Holcombe View, Shuttleworth	Low risk	High	Slight adverse effect
Ashwood Avenue, Ramsbottom	Low risk	High	Slight adverse effect

Receptor Details and Location	Risk of Odour Exposure	Receptor Sensitivity	Magnitude of Odour Effect at Receptor Location
Great Eaves Road, Ramsbottom	Low risk	High	Slight adverse effect

Given the “low risk” of odour exposure and the “high” receptor sensitivity, the likely magnitude of odour effect at all receptors assessed is categorised as **Slight Adverse**, therefore according to the IAQM (2018) guidance, the effects at these receptors are considered to be **not significant**.

6 Summary and recommendations

A summary of the likely odour effects at existing sensitive receptors is presented in **Table 10**

Table 10: Summary of the Likely Odour Effects at Existing Sensitive Receptors

Receptor Details and Location	Source Odour Potential	Pathway Effectiveness	Risk of Odour Exposure	Receptor Sensitivity	Magnitude of Odour Effect at Receptor Location
The Paddock Campsite, Leaches Road	Large	Ineffective pathway	Low risk	High	Slight adverse effect
Whalley Road [A], Ramsbottom	Large	Ineffective pathway	Low risk	High	Slight adverse effect
Whalley Road [B], Ramsbottom	Large	Ineffective pathway	Low risk	High	Slight adverse effect
Holcombe View, Shuttleworth	Large	Ineffective pathway	Low risk	High	Slight adverse effect
Ashwood Avenue, Ramsbottom	Large	Ineffective pathway	Low risk	High	Slight adverse effect
Great Eaves Road, Ramsbottom	Large	Ineffective pathway	Low risk	High	Slight adverse effect

With the proposed mitigation of an impermeable UV-stabilised plastic floating cover implemented, the potential for effects at all nearby receptors is predicted to be not significant. It is recommended that the cover will be as per recommendations from Defra's guidance on the Code of Good Agricultural Practice (COGAP) for Reducing Ammonia Emissions (Defra, 2024) and The Industrial Emissions Directive 2010/75/EU Integrated Pollution Prevention and Control on the Best Available Techniques (BAT) Reference Document for the Intensive Rearing of Poultry or Pigs (European Union, 2017).

7 References

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