



BHM Two LLP

Proposed residential development of flats above restaurant at Hanover House Cheltenham

Odour Risk Assessment

Project No: 444240-01



APRIL 2021

RSK



RSK GENERAL NOTES

Report No.: 444240-01(00)
Title: Odour risk assessment for Hanover House, Cheltenham
Client: BHM Two LLP
Date: 09th April 2021
Office: Hemel Hempstead
Status: Draft for client comment

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Date:	22 nd March 2021	Date:	09 th April 2021

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This work has been undertaken in accordance with the quality management system of RSK Group plc.

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1 INTRODUCTION

RSK Environment Limited was Commissioned by BHM Two LLP to undertake an odour risk assessment to support the planning application for the change of use of the upper parts of Hanover House Montpellier, Cheltenham to residential use. The report will assess the potential odour impacts on the proposed residential properties from the commercial properties in the area, namely the ASK Italia Restaurant directly below the proposed residences.

The assessment will be undertaken with reference to the Institute of Air Quality Management (IAQM) '*Guidance on the Assessment of Odour for Planning*' and Ricardo's 2018 document '*Control on Odour and Noise from Commercial Kitchen Exhaust Systems*' which was prepared as an update to the withdrawn 2004 Defra document '*Guidance on the Control of Odour and Noise from Commercial Kitchen Exhaust Systems*'.

The odour assessment presented in this report included the following tasks:

- Consultation with the Environmental Protection team at Cheltenham Borough Council CBC.

- Identification of relevant odour sources;

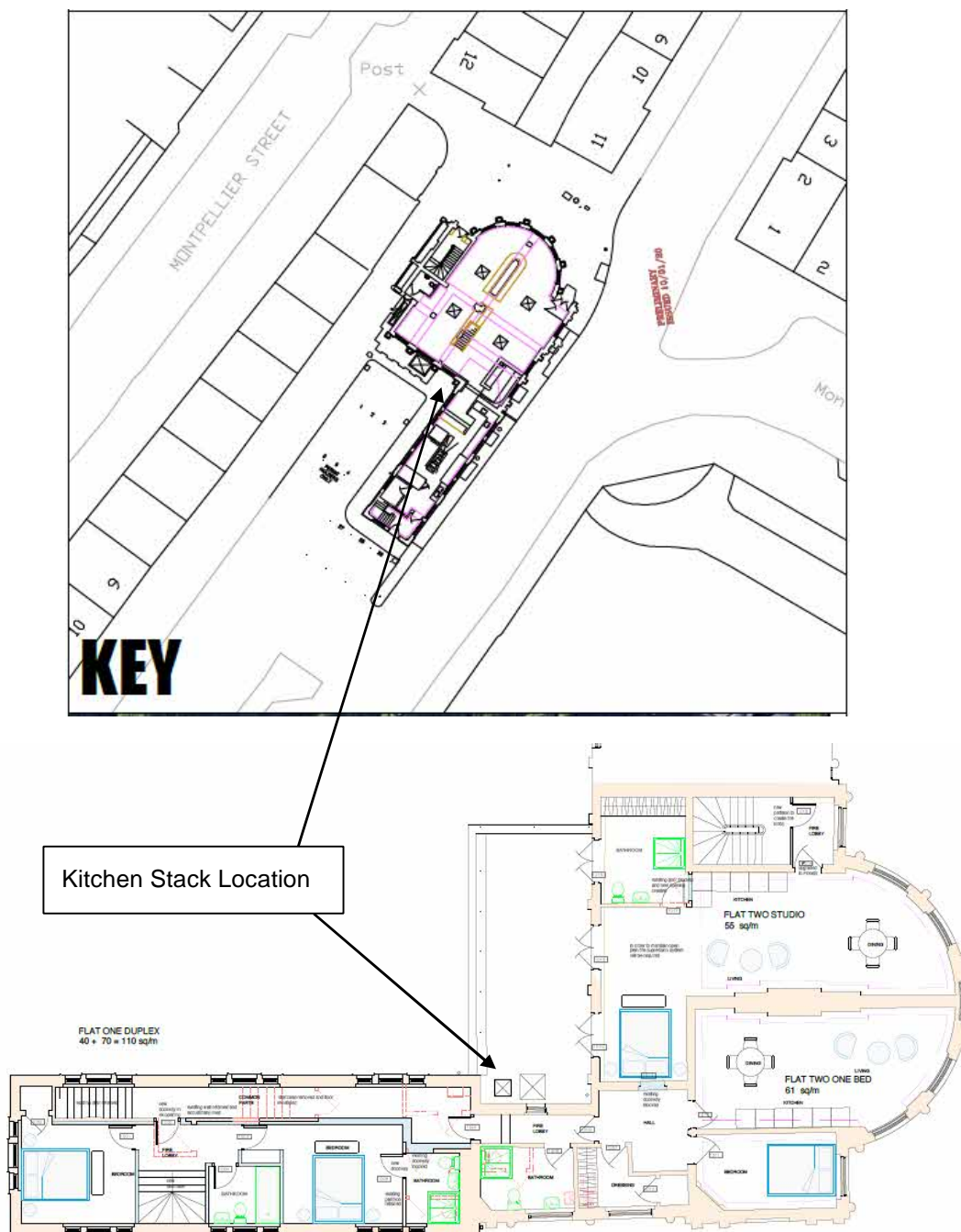
- Risk assessment of kitchen extract odour to potential new receptors with reference to Ricardo's '*Control of Odour and Noise from Commercial Kitchen Exhaust Systems*', and the Institute of Air Quality Management (IAQM) '*Guidance on the assessment of odour for planning*'; and

- Recommendation of mitigation measures, as appropriate.

2 SITE LOCATION

The site is the upper floors of Hanover House, above an Italian restaurant. Hanover House is located off the A4015 across from Montpellier Spa Road. There is a pedestrian path through to Montpellier Street in front of the building and the rear of the building is joined to other buildings on Montpellier Street. The surrounding area is made up of predominantly shops/ retail outlets with assumed residential properties above and a few bars/ cafes with assumed residential above.

Figure 1.1 Proposed Development Site Layout



3 LEGISLATION AND POLICY CONTEXT

3.1 Ricardo – Control of Odour and Noise from Commercial Kitchen Exhaust Systems

The Ricardo 2018 document provides an update to the withdrawn 2004 Defra guidance on the control of odour and noise with kitchen exhaust systems. The status of the guidance is as follows:

'...This guidance document is a revised and updated version of the original document, originally prepared by Netcen an operating division of AEA Technology, for Defra, and through it the Development Administration of the Scottish Executive, the National Assembly for Wales, and the Department of the Environment in Northern Ireland to provide clear guidance to the regulation process.'

This report will use the methodology from the guidance to consider the odour control requirements for the site.

3.2 IAQM Guidance on the Assessment of Odour for Planning

The IAQM's 2014 guidance provides a framework and describes approaches for assessing odour impacts for planning purposes. It is not to replace the existing guidance produced for environmental permitting (EP) purposes, but provides a comprehensive discussion of odour, assessment methods and criteria and odour benchmarks.

The IAQM Odour Guidance suggests that an approach to odour assessment is to carry out a 'screening assessment' before deciding whether a more detailed assessment is necessary, based on whether there is likely to be a significant risk of an odour impact.

This report will present an odour 'screening assessment' using the IAQM guidance.

4 KITCHEN EXHAUST SYSTEMS RISK ASSESSMENT FOR ODOUR

4.1 Introduction

Odour from commercial kitchen exhausts has the potential to affect local amenity, especially when located in urban areas where residences may be adjacent to the catering premises.

It is a requirement that odour control is designed to prevent disamenity and nuisance, and the Ricardo document suggests a methodology based on a scoring system, as a suggested means of determining the requirements for odour control for commercial kitchens.

In this case the restaurant is already present therefore the guidance has been adapted to assess the likely impacts on the proposed future receptors and to check appropriate odour mitigation measures are in place or advise improvements were applicable.

4.2 Assessment of Potential Odour Impact Risk

The proposed residential receptors are in an urban 'town centre' setting, on the floors above an existing ground floor Italian restaurant.

The ground floors of the neighbouring buildings are commercial, and it is assumed that the upper floors of some neighbouring buildings are residential.

The proposed residential properties are located on the first and second floor of the same building as the ground floor restaurant. The kitchen is served by an air extraction system, which will extract hot and potentially odorous kitchen air. The kitchen extract discharges above the eaves of the proposed development building located to the rear of the restaurant above a court yard, meaning proposed receptors would be located to the north, east and south of the discharge point.

The environmental health officer at CBC has confirmed that there are no complaints relating to odour in regards to Hanover House, however they did note that they do have recorded complaints from elsewhere in the Montpellier area relating to odours from kitchen extractor units affecting neighbouring residential dwellings, including flats directly above commercial premises.

With reference to the Ricardo guidance criteria outlined in Appendix A, the 'risk scores' for the kitchen extract discharge dispersion characteristics, proximity of receptors, and kitchen are summarised in Table 4.1.

Table 4.1: Summary of Odour Risk Factor Scores

Criteria	Assessment	Score	Details
Dispersion	Moderate	10	Discharging 1m above the eaves at assumed 10-15m/s
Proximity of Receptors	Close	10	Proposed sensitive receptors less than 20m from kitchen discharge
Size of Kitchen	Medium	3	Between 30 and 100 covers
Cooking Type (odour and grease loading)	Medium	4	Italian
Total Score:		27	'High Impact Risk'

Based on the sum of contributions from dispersion, proximity of receptors, size of kitchen and cooking type the Italian restaurant has a significance score of 27, therefore has a 'high' impact risk and should have in place a 'high level' of odour control.

The total score and consequent impact risk and odour control requirement are reproduced from the Ricardo guidance document in Table 4.2, below.

Table 4.2 Summary of Odour Impact risk and odour control requirement

Impact Risk	Odour Control Requirement	Total Score
Low to Medium	Low level odour control	Less than 20
High	High level odour control	20 to 35
Very High	Very high-level odour control	More than 35

4.3 Odour Control Measures

The impact risk was assessed as 'high' therefore a 'high level' of odour control will be required if not already present. High level odour control will typically include:

Filtration:

1. Fine filtration or ESP followed by carbon filtration (carbon filters with a 0.2-0.4 second resistance time); or
2. Fine filtration or ESP followed by UV ozone system to achieve the same level of control as 1.

Extraction location and exit velocity:

The Ricardo guidance document recommends that odour control system shall include an adequate level of:

1. Particulate and odour control; and
2. stack dispersion.

The overall performance of the odour abatement system will represent a balance of 1 and 2.

To achieve adequate control, the discharge stack should:

1. Discharge the extracted air not less than 1 m above the roof ridge of any building within 15m of the vent serving the commercial kitchen. Additional odour control measures may still be required depending on the cooking type and frequency;
2. If 1 cannot be complied with for planning reasons, then the extracted air shall be discharged not less than 1 m above the roof eaves or dormer window of the building housing the commercial kitchen. *A higher level of odour control measures than those required in part 1 may be required.*
3. If 1 or 2 cannot be complied with for planning reasons, then higher level of odour control measures than those required in part 1 or 2 may be required.

Use of 'hats' or other cowls which impede the upward air flow is not recommended (except accelerator cowls which promote upward velocity and increase the effective stack height).

Any changes need to the kitchen extract system should be designed and fitted by competent persons.

Submission of an appropriate scheme/ design including odour control may be secured by an appropriate condition attached to the planning consent of the proposed residential buildings.

4.4 Recommendations for Maintenance:

Odour abatement systems will only remain effective if appropriate maintenance and management procedures are in place, and these should therefore be included in an odour control scheme.

Maintenance should normally be in accordance with the manufacturers' instructions, but for a basic system without high-level abatement, should include:

- Regular inspection and replacement as necessary of all filters;
- Cleaning of washable grease filters;
- Inspection & servicing of fans;

If high level of odour abatement is required, additional maintenance is likely to be required, again following manufacturers' recommendations but typically:

1. System employing fine filtration and carbon filtration.

Change fine filters every two weeks.

Change carbon filters every 4 to 6 months.

2. System employing ESP and other in-line abatement, typically

ESP systems cleaned, and sump emptied on a four-weekly basis,

Carbon filters with ESP pre-treatment change carbon filters every 6 to 12 months.

5 ODOUR IMPACT RISK ASSESSMENT

5.1 Introduction

This IAQM Odour Guidance suggests the following approach to assess the potential for odours to affect receptors at and around the site:

1. Estimate the source odour potential from each source;
2. Estimate the effectiveness of the pathways connecting potential sources of odour to existing receptors;
3. Estimate the sensitivity of receptors;
4. Use the source odour potential and pathway effectiveness to estimate the risk of odour exposure (impact) at each receptor or group of receptors;
5. Compare the odour exposure category assigned in step 4 with the receptor sensitivity to estimate the odour effect at each receptor location; and,
6. Judge the potential significance of odour effects by reviewing the assessed risk of odour exposure at various receptor locations and taking into account baseline odour conditions (as summarised in Section 3).

Each of these steps is described in greater detail in Appendix B.

Table 5.1: Receptors considered within this assessment

Receptor ID	Receptor Sensitivity
1. Proposed future residences of Hanover House	High Sensitivity

5.2 Source Odour Potential

The IAQM guidance states that '*Odour impacts of commercial kitchens, restaurants and food premises - non-statutory guidance is provided by Defra for estimating the odour risk taking into account the stack/ exhaust height, the size of the kitchen*'.

The source odour potential has been classified as medium by using the kitchen size and food type classification in section 4 of this report, in the absence of mitigation.

5.3 Effectiveness of Pathway

Table 5.2 below summarises the pathway effectiveness assigned to each group of receptors assessed.

Table 5.2: Pathway effectiveness at receptors considered

Receptor ID	Pathway effectiveness
1. Proposed future residences of Hanover House	Highly effective pathway: The residences are located directly above the restaurant.

5.4 Risk of Odour Exposure, Receptor Sensitivity and Risk of Impacts

Table 5.3 summarises the overall odour impact for receptors, using the method outlined in Appendix B, the pathway effectiveness summarised in Table 5.2 and the source odour potential described in Section 5.2. A moderate adverse effect was determined at the potential residential receptors.

Table 5.3: Risk of odour exposure at receptors

Receptor ID	Source odour potential	Receptor Sensitivity	Overall predicted impact
1. Proposed future residences of Hanover House	Medium risk	High	moderate adverse

5.5 Conclusion and mitigation

Based on the results of the qualitative odour assessment, the restaurant has the potential to have a moderate adverse effect on the potential future residence of Hanover House.

However, with appropriate mitigation measures in place as outline in section 4.3 and 4.4 it is considered that the odour impact risk would be decreased to negligible or slight adverse.

With appropriate mitigation it is unlikely the restaurant will have a significant adverse effects on amenity of future receptors.

6 SUMMARY AND CONCLUSIONS

RSK Environment Limited was Commissioned to undertake an odour risk assessment of an Italian ground floor restaurant to support the planning application of the upper floors of the same building for a change of use to residential at Hanover House, Montpellier, Cheltenham.

With reference to the widely accepted guidance document '*Control of Odour and Noise from Commercial Kitchen Exhaust Systems*' the odour impact risk based on likely dispersion characteristics of discharge, proximity of receptors, size of kitchen and cooking type was estimated as 'high' therefore the restaurant requires 'high level odour control measures'.

Typical high level odour control measures suggested by Ricardo and Environmental health are as follows:

- Fine filtration or ESP followed by either carbon filtration or a UV ozone system.

- Maintenance of odour control measures in line with Ricardo guidance document.

The kitchen extraction appears to discharge is 1m above the eaves of the building, housing the proposed apartments, which is likely to aid good odour dispersion. The velocity is not known but assumed to be 10-15m/s for good practice.

CBC has confirmed that Hanover House does not have any recorded complaints relating to odour suggesting odour is currently well controlled.

It is unclear what odour control measures are currently in place and this should be confirmed and the detailed design and fitting of any required modification should be carried out by competent persons. It is recommended that the discharge height should be 1m above the ridge and the velocity be 15m/s or above if practicable.

Submission of an appropriate scheme/ design including odour control could be secured by a condition attached to the planning consent of the new residences.

7 APPENDIX A

Tables A1 and A2: Examples of risk factors and odour control requirement for odour dispersion, proximity to receptors, size of kitchen and cooking type.

Impact Risk	Odour Control Requirement	Significance Score*
Low to Medium	Low level odour control	Less than 20
High	High level odour control	20 to 35
Very High	Very high level odour control	More than 35

*Based on the sum of contributions from dispersion, proximity to receptors, size of kitchen and cooking type:

Criteria	Score	Score	Details
Dispersion	Very Poor	20	Low level discharge, discharge into courtyard or restriction on stack.
	Poor	15	Not low level but below eaves, or discharge below 10 m/s.
	Moderate	10	Discharging 1m above the eaves at 10-15 m/s.
	Good	5	Discharging 1m above ridge at 15 m/s.
Proximity of Receptors	Close	10	Closest sensitive receptor less than 20m from kitchen discharge.
	Medium	5	Closest sensitive receptor between 20 and 100m from kitchen discharge.
	Far	1	Closest sensitive receptor more than 100m from kitchen discharge.
Size of Kitchen	Large	5	More than 100 covers or large sized take away.
	Medium	3	Between 30 and 100 covers or medium sized take away
	Small	1	Less than 30 covers or small take away
Cooking Type (odour and grease loading)	Very high	10	Pub (high level of fried food), fried chicken, burgers or fish and chips.
	High	7	Kebab, Vietnamese, Thai or Indian
	Medium	4	Cantonese, Japanese or Chinese
	Low	1	Most pubs, Italian, French, Pizza or steakhouse

APPENDIX B QUALITATIVE ODOUR ASSESSMENT METHODOLOGY

Source Odour Potential

The indicative criteria which have been used to assess the source odour potential are reproduced from the IAQM guidance in Table F1 below.

Table B1: Source Odour Potential

Source Odour Potential	Suggested characteristics
Large	<p>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.</p> <p>The compounds involved are very odorous (e.g. mercaptans), having very low Odour Detection Thresholds (ODTs) where known.</p> <p>Unpleasantness – processes classed as “Most offensive” in H4; or (where known) compounds/odours having unpleasant (-2) to very unpleasant (-4) hedonic score.</p> <p>Mitigation/control – open air operation with no containment, reliance solely on good management techniques and best practice.</p>
Medium	<p>Magnitude – smaller Permitted processes or small STWs; materials usage thousands of tonnes/m³ per year; area sources of hundreds of m².</p> <p>The compounds involved are moderately odorous.</p> <p>Unpleasantness – processes classed in H4 as “Moderately offensive”; or (where known) odours having neutral (0) to unpleasant (-2) hedonic score.</p> <p>Mitigation/control – some mitigation measures in place, but significant residual odour remains.</p>
Small	<p>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.</p> <p>Unpleasantness – processes classed as “Less offensive” in H4; or (where known) compounds/odours having neutral (0) to very pleasant (+4) hedonic score.</p> <p>Mitigation/control – effective, tangible mitigation measures in place (e.g. BAT, BPM) leading to little or no residual odour.</p>

Pathway Effectiveness

The assessment of the effectiveness of the transport of odours (or the pathway) takes into account five main factors:

- distance from source to receptor;
- frequency of winds blowing from the source towards the receptor;

the effectiveness of any mitigation or controls;
the effectiveness of dispersion and dilution (a tall stack for example); and
topography and terrain in the local area.

Suggested definitions of pathway effectiveness are provided by the guidance and summarised in the IAQM odour guidance as set out in Table F2.

Table B2: Pathway Effectiveness

Pathway Effectiveness	Suggested Definition
Highly Effective	<p>Distance – receptor is adjacent to the source/site; distance well below any official set-back distances.</p> <p>Direction – high frequency (%) of winds from source to receptor (or, qualitatively, receptors downwind of source with respect to prevailing wind).</p> <p>Effectiveness of dispersion/dilution - open processes with low-level releases, e.g. lagoons, uncovered effluent treatment plant, landfilling of putrescible wastes.</p>
Moderately Effective	<p>Distance – receptor is local to the source.</p> <p>Where mitigation relies on dispersion/dilution – releases are elevated but compromised by building effects.</p>
Ineffective	<p>Distance – receptor is remote from the source; distance exceeds any official set-back distances.</p> <p>Direction – low frequency (%) of winds from source to receptor (or, qualitatively, receptors upwind of source with respect to prevailing wind).</p> <p>Where mitigation relies on dispersion/dilution – releases are from high level (e.g. stacks, or roof vents > 3m above ridge height) and are not compromised by surrounding buildings.</p>

In order to determine the relative likelihood that receptors would be downwind sources, 2017 meteorological data from the Heathrow meteorological monitoring station have been reviewed for this assessment. This site is approximately 23.1km south of the proposed development site, and it is considered likely to be reasonably representative of conditions at the development site.

The weather data illustrates the relative frequency of wind directions and wind speeds over in 2017 which was used in the assessment. The wind rose for the meteorological conditions recorded at this location is shown in Figure 3.3. This shows the direction from which winds blows and illustrates the relative frequency of wind directions and wind speeds used in the modelling study.

The IAQM 2018 guidance does not suggest definitions of what may constitute a low or high frequency of winds between the source and receptor, or what may constitute a ‘close’ or ‘distant’ receptor, therefore reference was made to ‘Guidance on the Assessment of Mineral Dust Impacts for Planning’ (Institute of Air Quality Management, 2016) (‘the IAQM 2016 guidance’). The ‘distance’ criteria have been adapted to better suit the potential effects of odours. Likewise, the ‘infrequent’ and ‘moderately frequent’ criteria have been adapted to account for the Midema et al. 98th percentile of hourly average odour concentrations.¹ The descriptors used within this assessment, modified from those within the IAQM 2016 guidance, are presented in Table F3 below.

Table B3: RSK examples of risk factors for pathway ‘effectiveness’

Descriptor	Definition of descriptor
Descriptors for ‘wind frequency’	
Infrequent	Frequency of winds from the direction of the odour source occur less than 2% of the total time period under consideration
Moderately frequent	Frequency of winds from the direction of the odour source occur between 2% and 12% of the total time period under consideration
Frequent	Frequency of winds from the direction of the odour source occur between 12% and 20% of the total time period under consideration
Very frequent	Frequency of winds from the direction of the odour source occur for more than 20% of the total time period under consideration
Descriptors for ‘distance of receptor from source’	
Distant	Receptor is over 500m from the odour source (along the shortest transect between the source and receptor, potentially differing from the wind directions reviewed above) ²
Intermediate	Receptor is between 100m and 500m from the odour source (along the shortest transect between the source and receptor, potentially differing from the wind directions reviewed above)
Close	Receptor is less than 100m from the odour source (along the shortest transect between the source and receptor, potentially differing from the wind directions reviewed above)

The effects of topography on pathway connectivity have not explicitly been assessed as the land appears relatively flat and as the effects of topography are accounted for in the meteorological data.

¹ This has been adapted from the threshold of 5% set within the IAQM 2016 guidance. This is because it is commonly accepted that the 2% of hours per annum in which odour concentrations can be expected to be highest are typically deducted from the hourly average odour concentrations, when undertaking dispersion modelling. This is due to them being sufficiently infrequent that further analysis was not justified. Midema et al., Exposure-annoyance relationships for odour from industrial sources. Atmos. Environ., 34, 2927-2936. Study cited within the IAQM 2018 guidance.

² This assessment has only considered ‘distant’ receptors where they are high sensitivity and located within 1km of the site. Less sensitive receptors, or high-sensitivity receptors located more than 1km from the source in question, have not been considered explicitly.

Table F4 shows how the pathway effectiveness was determined, based on the receptor distance and wind classifications assigned, for each receptor or group of receptors considered.

Table B4: Categorisation of Pathway Effectiveness

Pathway Effectiveness	Frequency of Potentially Odour-Bearing Winds			
Distance category	Infrequent	Moderately frequent	Frequent	Very frequent
Close	Ineffective	Moderately effective	Highly effective	Highly effective
Intermediate			Moderately effective	
Distant		Ineffective	Moderately effective	Moderately effective

Receptor Sensitivity

The IAQM odour guidance suggests that the definitions shown in Table F5 are used to determine receptor sensitivity. Some receptors of the same (maximum) sensitivity have been grouped together.

The receptors were selected based on their proximity to the site and to represent a sample of those in various wind directions.

Table B5: Exemplar definitions of high, medium and low sensitivity cited in the IAQM 2018 guidance

Receptor Sensitivity Criterion	Receptor Sensitivity Description
High	<p>Surrounding land where:</p> <p>Users can reasonably expect enjoyment of a high level of amenity; and People would reasonably be expected to be present here continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land.</p> <p>Examples may include residential dwellings, hospitals, schools/education and tourist/cultural.</p>
Medium	<p>Surrounding land where:</p> <p>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 normal pattern of use of the land.</p> <p>Examples may include places of work, commercial/retail premises and playing/recreation fields.</p>
Low	<p>Surrounding land where:</p> <p>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.</p>

Receptor Sensitivity Criterion	Receptor Sensitivity Description
	Examples may include industrial use, farms, footpaths and roads.

Risk of Odour Exposure at Individual Receptors

The source odour potential and pathway effectiveness are brought together to predict the risk of odour exposure at the receptor being considered. The IAQM 2018 guidance suggests a matrix approach for this, reproduced in Table F6.

Table B6: Risk of Odour Exposure

Pathway Effectiveness	Source Odour Potential		
	Small	Medium	Large
Highly Effective	Low Risk	Medium Risk	High Risk
Moderately Effective	Negligible Risk	Low Risk	Medium Risk
Ineffective	Negligible Risk	Negligible Risk	Low risk

Odour Impact Risk

The exposure risk and sensitivity of each receptor is used to assess the likely impact on the receptor. The impact assessment matrix is reproduced from the IAQM 2018 guidance at Table. The significance of odour effects can then be determined using professional judgement, based on the individual odour impacts identified.

Table B7: Likely Magnitude of Odour Effect At Individual Receptors

Risk of Odour Exposure	Receptor Sensitivity		
	Low	Medium	High
High	Slight Adverse Effect	Moderate Adverse Effect	Substantial Adverse Effect
Medium	Negligible Effect	Slight Adverse Effect	Moderate Adverse Effect
Low	Negligible Effect	Negligible Effect	Slight Adverse Effect
Negligible	Negligible Effect	Negligible Effect	Negligible Effect