ACP

Balancing Growth with Green

Odour Impact Assessment

Zubair Qureshi
168C Whitley Wood Rd, Reading, RG2 8LQ

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Table of Content

1 Introduction 3
1.1 Overview 3
1.2 Site Location 4
1.3 Key Pollutants- Odour 4
2 Commercial Kitchen Ventilation Systems Design and Operational Requirements 5
2.1 Minimum Ventilation Rates 5
2.2 Minimum Requirements for Canopy 5
2.3 Minimum Requirements for Ductwork 5
2.4 Minimum Requirements for Fans 6
3 Methodology 7
3.1 Overview 7
3.2 IAQM Guidance 7
3.3 Risk Assessment for Determining Odour Control Requirements 8
4 Odour Impact Assessment 9
4.1 Overview 9
4.2 Receptor Sensitivity 9
4.3 Source Odour Potential 9
4.4 Pathway Effectiveness 9
4.5 Odour Exposure 9
4.6 Likely Magnitude Odour Effect 9
4.7 Risk Assessment to Determine Odour Control Measures 10
5 Proposed Mitigation Measures 11
6 Conclusion 12
Appendices 13
Appendix A: Relevant Extract from IAQM Guidance 14

1 Introduction

1.1 Overview

Zubair Qureshi ('the client') is seeking consent for the proposed development at 168C Whitley Wood Rd, Reading RG2 8LQ (thereafter referred to as the 'proposed development site'), which is within the Reading City Council.

ACP Consultants Ltd. was instructed by the client to produce an Odour Impact Assessment to support the planning application. This site currently operates as a café with an ancillary takeaway function, and the proposal seeks to extend operational hours from 7:00 am – 3:00 pm to 7:00 am – 9:00 pm while incorporating a hot food takeaway service.

The report will investigate the odour impacts from the proposed development on nearby sensitive receptors. The main purpose of this report is to assess if the odour impact from the commercial kitchen is likely to have a detrimental impact on the nearby receptors and, if needed, to also propose required mitigation measures with odour control specifications regarding the proposed equipment and extract system.

The assessment was carried out by the Institute of Air Quality Management's (IAQM) "Guidance on the Assessment of Odour for Planning" (2018) and the updated guidance of Control of Odour and Noise from Commercial Kitchen Exhaust Systems (2018). This guidance is an update of the Defra Guidance on the Control of Odour and Noise from Commercial Kitchen Exhaust Systems (2004).

1.2 Site Location

Figure 1.1 shows the proposed site location. The surrounding area is predominantly residential, although the site is located within a block of mixed-use properties, with commercial usage on the ground floor and some residential dwellings on the first floor. The nearest receptors have been identified as residential receptors directly above the proposed development site.

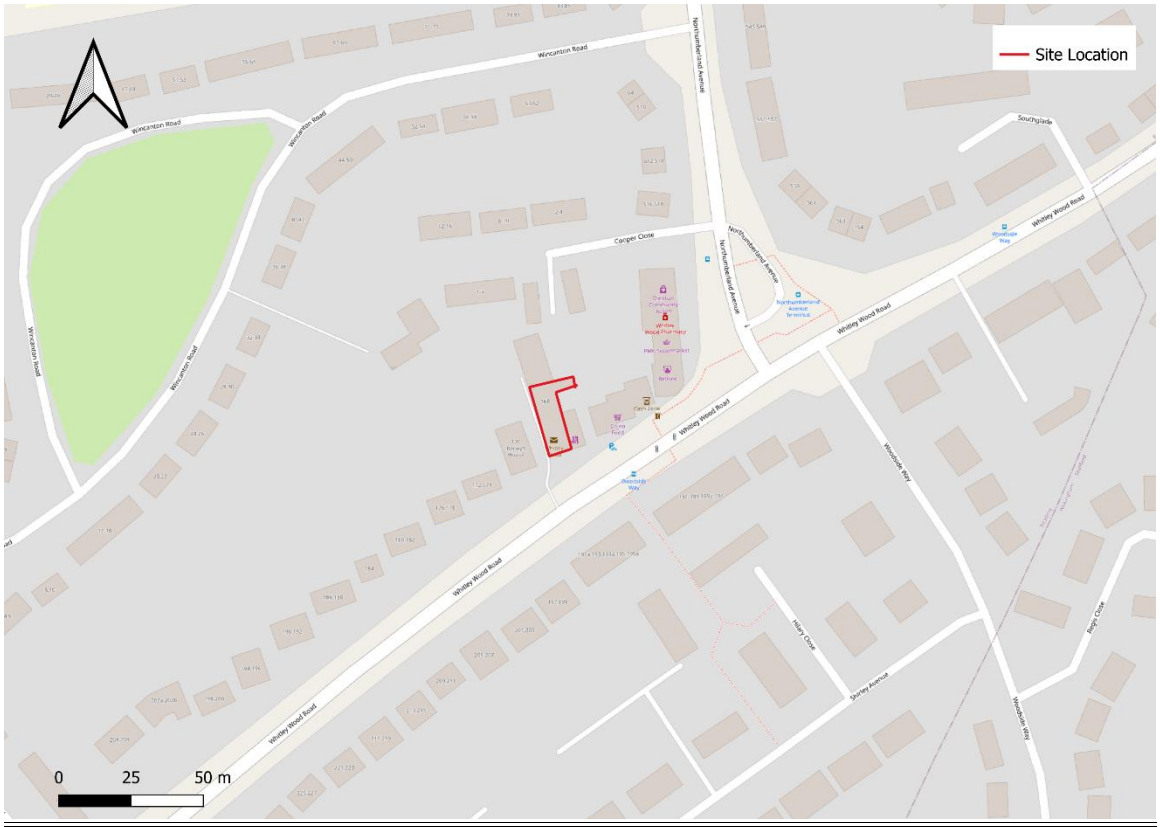

Figure 1.1 Proposed site location.

1.3 Key Pollutants- Odour

IAQM guidance defines odour as a mixture of many chemicals which interact to produce a ‘smell’. While odour-free air refers to air containing no odorous chemicals, fresh air is usually perceived as air containing no chemicals or contaminants that could be ‘unpleasant’.

While odour is not strictly speaking an air pollutant, certain combinations of chemicals can affect the human olfactory response (perception followed by psychological appraisal) and cause a loss of amenity. Perception of an odour can be subjective to the individual whether it is found as acceptable, objectionable or offensive. Odour can be produced by several industries including food outlets, production, recycling, waste handling, vehicle respraying, power plants, traffic emissions, agriculture etc.

Factors that influence the control of odour from commercial kitchens include:

- Size of the cooking facility- This influences the intensity of the odour and volume of ventilation air to be handled;
- Type of food prepared – This affects the chemical constituents within the ventilation air; and
- Types of cooking appliances used: This dictates the level of fat, water droplets and temperature within the ventilation air.

2 Commercial Kitchen Ventilation Systems Design and Operational Requirements

Based on the updated guidance of Control of Odour and Noise from Commercial Kitchen Exhaust Systems (2018) the minimum standards for commercial kitchen ventilation systems performance are:

2.1 Minimum Ventilation Rates

- An internal ambient air temperature of 28-degree Celsius maximum.
- Maximum humidity levels of 70%.
- Internal noise level should be between NR40-NR50.
- Dedicated makeup air system to be approximately 85% of the extract flow rate, and
- Extract flow rates for a commercial kitchen should be calculated using the thermal convection method only, as this overcomes heat and odour variation between different types of cooking appliances. Other less reliable methods remain available.

2.2 Minimum Requirements for Canopy

Velocity requirements:

- Light loading – 0.25 m/s (applies to steaming ovens, boiling pans, bain maries and stock pot stoves.
- Medium loading – 0.35 m/s (applies to deep fat fryers, Bratt pans solid and open-top ranges and griddles); and
- Heavy loading – 0.5 m/s (applies to chargrills, mesquite and specialist broiler units).

Sizing:

- Ideally, the plan dimensions of the canopy shall always exceed the plan dimensions of the catering equipment by a minimum of 250 mm on each free side.
- This should be increased to 600 mm in front of combination steaming ovens to cope with the steam or fumes released when the doors of the appliance are opened. Solid Fuel appliances must have an overhang of 300 mm from the door open position.

Materials:

- A material that would comply with the food hygiene requirement is stainless steel.
- Grease Separation
- The grease extracted by the separators shall be collected and removed so that it will not accumulate in either the canopy plenum or the ductwork system or fall back onto the cooking surface.
- The separator shall be constructed so that there are no sharp edges or projections and shall be easily removable for regular cleaning, and
- Primary filters that retain grease within the filtration matrix until cleaned shall not be used (not to be confused with those designed with purpose-made integral collection reservoirs).

2.3 Minimum Requirements for Ductwork

All ductwork should be Low-Pressure Class ‘A’ and constructed by BESA Specification DW/144 with a minimum thickness of 0.8 mm.

Duct velocities should be as follows:

Table 2.1: Duct Velocity

	Supply	Extract (m/s)
Main runs	6-8	6-9
Branch runs	4-6	5-7
Spigots	3-5	5-7

All internal surfaces of the ductwork should be accessible for cleaning and inspection. Access panels should be installed at 2.0 m centres and should be grease-tight using a heatproof gasket or sealant.

Ductwork should not pass through fire barriers and where it is not possible to immediately discharge the captured air, fire-rated ductwork may be required.

2.4 Minimum Requirements for Fans

Fans should be selected to handle the design resistance with an additional 10% airflow and 20% pressure margin allowed to suit possible extensions to the original kitchen plan.

Backwards curved centrifugal, mixed flow or axial flow impellers are preferred as they are less prone to unbalance and are more easily maintained and cleaned due to their open construction. Fixed or adjustable metal impellers with robust and open construction shall be used.

Care shall always be taken with the location of the supply and extract fans to ensure that there is enough space for regular cleaning and maintenance. Limited space shall not restrict the selection of the correct fan.

For fans serving canopies above solid fuel-burning appliances, the motor must be out of the airstream and impellers must have metal blades.

3 Methodology

3.1 Overview

The local authority requested that an odour assessment be carried out for the proposed development. Hence an odour assessment has been carried out using the latest guidance produced by the IAQM.

3.2 IAQM Guidance

IAQM guidance is limited to assessing the effect of odour on amenity and not on human health. For exposure to odour to occur, there must be an emission source to the atmosphere, a pathway for the odour to travel and a receptor that could experience adverse effects. Therefore, the IAQM guidance is based upon Defra's Green Leaves 111 guidance, which presents the Source-Pathway-Receptor (S-P-R) concept. The S-P-R concept presents the hypothetical relationship between the source (S) of the odour, the pathway (P) by which exposure might occur, and the receptor (R) that could be adversely affected.

An example framework for conducting odour assessments is laid out in Appendix A of IAQM guidance and has been followed for this assessment.

It is recognised that to assess the magnitude of odour effects from a site it is necessary to estimate the odour-generating potential of the site activity. The source odour potential takes into account the scale of the odour release (magnitude), how inherently odorous the emission is and the relative pleasantness/unpleasantness of the odour (its hedonic tone). Using Table A1 (Appendix A), the source of odour potential can be categorised as small, medium, or large.

Secondly, the effectiveness of the pollutant pathway for odour through the air versus the dilution/dispersion of the odorous emissions in the atmosphere needs to be estimated. Factors which may increase dilution and/or dispersion of the odour through the pathway will reduce the odour concentration at the receptor, thereby reducing exposure. Factors which need to be considered in this step are presented in Table A1 (Appendix A). The pollutant pathway can be categorised as ineffective, moderately effective or highly effective using Table A1 (Appendix A).

From this, IAQM guidance suggests that the risk of odour exposure (impact) for each receptor may be evaluated by combining the source odour potential and the pathway effectiveness using Table A2 (Appendix A).

IAQM guidance recommends classifying each receptor in terms of its sensitivity. Indicative examples of low, medium and high sensitivity receptors are given in Table A1 (Appendix A) and should be used in combination with professional judgment to assess the sensitivity of receptors to odour.

Justification needs to be given for the selected categorisation of the source odour potential, pathway effectiveness, and receptor sensitivity. This typically involves some degree of quantitative assessment supplemented by the professional judgement of the air quality practitioner.

The likely magnitude of the odour effect at specific receptor locations may be determined by combining the risk of odour exposure with the specific receptor sensitivity, as in Table A3 (Appendix A). The likely magnitude of odour effects may be classed as 'negligible', 'slight adverse', 'moderate adverse' or 'substantial adverse'.

The final step for most assessments is to estimate the overall odour effect on the surrounding area as a result of the site, development or process. This assessment must take into account the different magnitude of effects at different receptors and the total number of receptors that experience these different effects. IAQM guidance recommends the suggested descriptors for the total magnitude of odour effects, as reproduced in Table A3 (Appendix A). IAQM guidance suggests that "where the overall effect is greater than 'slight adverse', the effect is likely to be considered significant."

3.3 Risk Assessment for Determining Odour Control Requirements

Odour control must be designed to prevent odour nuisance in a given situation. The following score methodology is suggested as a means of determining odour control requirements using a simple risk assessment approach. The below methodology has been taken from EMAQ+ Guidance: Control of Odour and Noise from Commercial Kitchen Exhaust System. The odour control requirements considered here are consistent with the performance requirements listed in this report. The level of odour control required is proposed based on the following scores:

Table 2.1: Risk Score for Level of Odour Control Required

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

Table 2.2: Score of Criteria such as Dispersion, Proximity of 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 at below 10 m/s.
	Moderate	10	Discharging 1m above eaves at 10 -15 m/s.
	Good	5	Discharging 1m above ridge at 15 m/s.
Proximity of receptors	Close	10	The closest sensitive receptor is less than 20m from kitchen discharge.
	Medium	5	The closest sensitive receptor is between 20 and 100m from kitchen discharge.
	Far	1	The closest sensitive receptor is more than 100m from kitchen discharge.
Size of kitchen	Large	5	More than 100 covers or large-sized takeaways.
	Medium	3	Between 30 and 100 covers or medium-sized take away.
	Small	1	Less than 30 covers or small takeaway.
Cooking type (odour and grease loading)	Very high	10	Pub (high level of fried food), fried chicken, burgers or fish & chips. Turkish, Middle Eastern or any premises cooking with solid fuel.
	High	7	Vietnamese, Thai, Indian, Japanese, Chinese, steakhouse.
	Medium	4	Cantonese, Italian, French, Pizza (gas-fired),
	Low	1	Most pubs (no fried food, mainly reheating and sandwiches etc), Tea rooms.

4 Odour Impact Assessment

4.1 Overview

As discussed above, the odour impact assessment has been carried out following the IAQM guidance. Key information from the guidance is presented in Appendix A. The assessment has been divided into sub-sections to explain the outcome of each part of the assessment and how it was determined.

4.2 Receptor Sensitivity

The existing extract system is located within proximity to residential receptors and users of the neighbouring commercial properties. According to the sensitivity criteria outlined in Table A1 of Appendix A, residential receptors are classified as having ‘High’ sensitivity due to their prolonged time spent within the property. Hence, for the purpose of this assessment, residential receptors located within the flat on the first floor of the building have been considered in order to assess a worst-case scenario.

4.3 Source Odour Potential

The odour resulting from the cooking may not be perceived as neutral, potentially affecting nearby amenities based on individual perceptions. According to the criteria outlined in Table A1 of Appendix A, it is assumed that the extraction system processes are likely to present a 'Small' source odour potential.

4.4 Pathway Effectiveness

The residential receptors, as highlighted above, are located under 20m from the proposed extraction system. The extraction system is vertically discharging above any openable windows and above the eaves. The effectiveness of the odour pathway towards residential receptors is considered 'Moderately Effective' as per Table A1 in Appendix A.

4.5 Odour Exposure

The risk of odour exposure has been calculated using the IAQM criteria summarised in Appendix A: Table A2. As stated above, the source of odour potential was considered ‘Small’, and the pathway effectiveness was considered ‘Moderately Effective’ for the residents living above the proposed development. Based on IAQM guidance, the overall risk of odour exposure for the residential receptors is considered ‘Negligible Risk’.

4.6 Likely Magnitude Odour Effect

Table 3.1: Summary of likely odour effects at existing sensitive receptors

Receptor Details	Receptor Sensitivity	Source Odour Potential	Pathway Effectiveness	Odour Exposure	Likely Odour Effect
Residential receptors	High	Small	Moderately Effective	Negligible Risk	Negligible Effect

According to the results above and the criteria in Table A2, the odour exposure is considered to be of ‘Negligible Risk’ for the residential receptors. Based on the IAQM guidance, overall, the likely magnitude of the odour effect from the proposed development is considered to be a ‘Negligible Effect’, which is not considered significant.

4.7 Risk Assessment to Determine Odour Control Measures

In relevance to the information in Section 3 of this report, a risk assessment has been carried out to determine the level of odour control measures required and has been tabulated below. The extraction system discharges vertically, above all openable windows and above the eaves of the building. In contrast to the previously granted application, the kitchen will be utilised to prepare and cook curries in the evening.

Table 3.2: Risk Assessment for Odour Control System Requirement

Source	Dispersion	Proximity of receptors	Size of Kitchen	Cooking Type	Total Score
Kitchen Extract	10	10	1	7	28

The resulting score from Table 3.2 is classified as having a “High Risk” and, therefore, requires a high level of odour control.

5 Proposed Mitigation Measures

Based on the findings presented in Section 4 of this report, it is concluded that the anticipated odour impact from the proposed development will have a 'Negligible Effect'. As outlined in the IAQM guidance, this is not considered significant. However, as a precautionary measure based on the risk assessment undertaken in line with the EMAQ+ Guidance, it is recommended that a high level of odour control is implemented.

A high level of odour control may include:

1. Fine filtration or ESP followed by carbon filtration (carbon filters rated with a 0.4-0.8 second residence time).
2. Fine filtration or ESP followed by UV ozone system to achieve the same level of control as 1.

The existing extraction system was installed by the previous owners of the property, and therefore, the exact specification is not known.

Therefore, it is recommended that the proposed mitigation measures be checked by a kitchen extract installation engineer/expert to ensure they meet the criteria. If they do not, the appropriate filtration system should be provided to meet the minimum odour control criteria.

6 Conclusion

This report provides an assessment of the potential odour impact for the proposed development at 168C Whitley Wood Rd, Reading RG2 8LQ.

A qualitative assessment of the odour effects has been undertaken for the approved scheme. Based on the requirements in Section 2, following the methodology in Section 3 and as per the results presented in Section 4 of this report, relevant mitigation measures have been recommended (Section 5).

Therefore, it can be concluded that once the recommended mitigation measures are implemented, the proposed development will comply with national, regional, or local planning policy regarding the impact of operational phase odour on existing receptors.

Appendices

Appendix A: Relevant Extract from the IAQM Guidance

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Table A1: Examples of risk factors for odour source, pathway and receptor sensitivity based on IAQM (2018)

Source Odour Potential	Pathway Effectiveness	Receptor
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 the source concerning 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 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:

Table A1: Examples of risk factors for odour source, pathway and receptor sensitivity based on IAQM (2018)

Source Odour Potential	Pathway Effectiveness	Receptor
Large Source Odour Potential Magnitude – Larger Permitted processes of odorous nature or large STWs; materials usage hundreds of thousands of tonnes/m^3 per year; area sources of thousands of m^2. 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 5; 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 practices.	**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 concerning prevailing wind). Effectiveness of dispersion/dilution – open processes with low-level releases, e.g. lagoons, uncovered effluent treatment plant, landfilling of putrescible wastes.	**High Sensitive Receptor – Surrounding land where:** Users can reasonably expect enjoyment of a high level of amenities; and The 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.Examples may include residential dwellings, hospitals, schools/education and tourist/cultural.
Medium Source Odour Potential Magnitude – smaller Permitted processes or small Sewage Treatment Works (STWs); materials usage of thousands of tonnes/m3 per year; area sources of hundreds of m^2. The compounds involved are moderately odorous. Unpleasantness – processes classed in H4 as "Moderately offensive"; or (where known) odours having neutral (0) to unpleasant (-2) hedonic score. Mitigation/control – some mitigation measures are in place, but significant residual odour remains.	**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 normal pattern of use of the land. Examples may include places of work, commercial/retail premises and

Small Source Odour Potential	Ineffective Pathway for Odour Flux to Receptor	Low Sensitivity Receptor– surrounding land where:
Magnitude – falls below Part B threshold; materials usage hundreds of tonnes/m^3 per year; area sources of tens m2. The compounds involved are only mildly odorous, having relatively high ODT where known. Unpleasantness – processes classed as "Less offensive" in H4; 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.	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 concerning prevailing wind). Where mitigation relies on dispersion/ dilution – releases are from high levels (e.g. stacks, or roof vents >3m above ridge height) and are not compromised by surrounding buildings.	The enjoyment of amenities would not reasonably be expected; or There is transient exposure, where the people would reasonably be expected to be present only for limited periods as part of the normal pattern of use of the land. Examples may include industrial, farms, footpaths and roads.

Table A2: Risk of odour exposure (impact) at the specific receptor location based on IAQM (2018)

		Source Odour Potential		
		Small	Medium	Large
Pathway Effectiveness	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

Table A3: Likely magnitude of odour effect at the specific receptor location based on IAQM (2018)

Risk of Odour Exposure	**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