

Kitchen Odour Assessment

Kneller Hall

For Radnor House School Limited

Quality Management

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1 Introduction

- 1.1 This report details the odour assessment undertaken for the Kneller Hall Day School development at Kneller Road. This odour assessment has been carried out in response to a request from the London Borough of Richmond upon Thames for an “*Odour Assessment Report & Scheme, in line with EMAQ “Control of Noise and Odour from Commercial Kitchen Exhaust Systems: 2018”*”.
- 1.2 This assessment has been undertaken in accordance with guidance published by EMAQ on behalf of the Department of the Environment, Food and Rural Affairs (Defra) and the Institute of Air Quality Management (IAQM). The report begins by setting out the legislative and policy context for odour impacts before describing the development site and its environs. The methods employed in this odour assessment are described. Results of the odour risk assessment are presented and the appropriate requirements for odour control are identified.

2 Regulatory and Policy Framework for Odour

- 2.1 There are three main aspects to the regulatory framework affecting odour: the planning process determines whether and where a potentially odorous development can be located; building regulations control the design and construction of developments; and once built, the Environmental Permitting Regulations or nuisance provisions control pollution. The main framework of pollution regulation, planning policy and relevant guidance is summarised below.

Ambient Air Quality Legislation and National Policy

Air Quality Standards Regulations

- 2.2 The Air Quality Standards Regulations 2010 [1], amended by The Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020 [2], sets limit values for ambient air concentrations for the main air pollutants: particulate matter (PM₁₀ and PM_{2.5}), nitrogen dioxide (NO₂), sulphur dioxide (SO₂), ozone (O₃), carbon monoxide (CO), lead (Pb) and benzene, certain toxic heavy metals (arsenic, cadmium and nickel) and polycyclic aromatic hydrocarbons (PAHs). These limit values are legally binding on the Secretary of State. The Government and devolved administrations operate various national ambient air quality monitoring networks to measure compliance and develop plans to meet the limit values.
- 2.3 No limit values are set for odour concentrations in ambient air.

UK Air Quality Strategy

- 2.4 The Environment Act 1995 established the requirement for the Government and the devolved administrations to produce a National Air Quality Strategy (AQS) for improving ambient air quality, the first being published in 1997 and having been revised several times since, with the latest published in 2007 [3]. The Strategy sets UK air quality standards* and objectives# for the pollutants in the Air Quality Standards Regulations plus 1,3-butadiene and recognises that action at national, regional and local level may be needed, depending on the scale and nature of the air quality problem. There is no legal requirement to meet objectives set within the UK AQS except where equivalent limit values are set within the Air Quality Standards Regulations.

* Standards are concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. Standards, as the benchmarks for setting objectives, are set purely with regard to scientific evidence and medical evidence on the effects of the particular pollutant on health, or on the wider environment, as minimum or zero risk levels.

Objectives are policy targets expressed as a concentration that should be achieved, all the time or for a percentage of time, by a certain date.

- 2.5 The 1995 Environment Act also established the UK system of Local Air Quality Management (LAQM), that requires local authorities to go through a process of review and assessment of air quality in their areas, identifying places where objectives are not likely to be met, then declaring Air Quality Management Areas (AQMAs) and putting in place Air Quality Action Plans to improve air quality.
- 2.6 No AQS objective values are set for odour concentrations in ambient air.

Nuisance Provisions

- 2.7 Part III of the Environmental Protection Act 1990 defines several statutory nuisances and includes: *“any dust, steam, smell or other effluvia arising on industrial, trade or business premises and being prejudicial to health or a nuisance”*. The Act places a duty on local authorities to investigate the likely occurrence of statutory nuisance and to take reasonable steps to investigate local complaints. Where a local authority is satisfied of the existence or recurrence of statutory nuisance it must generally serve an abatement notice requiring the execution of such works and other steps necessary to rectify the nuisance. If ignored, this can result in proceedings in the Magistrates Court and imposition of an order to prevent the nuisance and a fine. The Act provides a defence for the operator to demonstrate that the Best Practicable Means (BPM) have been used to control potential nuisance. For a nuisance action to succeed the offence also has to be a cause of material harm or to be persistent or likely to recur.
- 2.8 The above statutory nuisance controls apply mainly to odour from premises not regulated under other specific environmental regulations: a local authority requires the consent of the Secretary of State to institute statutory nuisance proceedings arising from operation of a “regulated facility” (including a waste operation, a Part A(1), Part A(2) or Part B installation, mobile plant or mining operation); or an “exempt waste operation”. This is designed to avoid the operators of such regulated facilities or exempt waste operations being exposed to action by both the Environment Agency and the local authority for the same incident (i.e. to avoid “double jeopardy”) [4].
- 2.9 It is important to note that there is no numerical odour concentration limit that can indicate unequivocally whether a statutory (or other) nuisance is being caused and it is ultimately only the Court that can decide at what point it becomes “prejudicial to health or a nuisance” and whether a statutory nuisance is occurring.

Building Regulations

- 2.10 The main purpose of the Building Regulations 2010 (in response to the Building Act 1984) is to protect the Health and Safety of people in and around buildings. It is necessary to gain approval under the Building Regulations for any new building, or any change to an existing building that

involves changes to the building structure. The Regulations are split into ten parts and six schedules; Part F of Schedule 1 relates to the ventilation of buildings relevant to this assessment.

Control of Odour and Noise from Commercial Kitchen Exhaust Systems

2.11 The EMAQ ‘Control of Odour and Noise from Commercial Kitchen Exhaust Systems’ [5] document published on behalf of Defra and the IAQM is designed to provide non-statutory guidance for regulators. It provides information on best-practice techniques for the minimisation of odour and noise nuisance from kitchen exhaust systems.

National Planning Policy Framework

2.12 The National Planning Policy Framework (NPPF) [6] is a material consideration for local planning authorities and decision-takers in determining applications. At the heart of the NPPF, is a presumption in favour of sustainable development, subject to caveats where a plan or project affects a habitats site. For determining planning applications, this means approving development proposals if they accord with an up-to-date local development plan, unless material considerations indicate otherwise. If the development plan does not contain relevant policies, or the policies are out of date, then planning permission should be granted unless the application of policies in the NPPF that protect areas or assets of particular importance provides a clear reason for refusing the development, or any adverse impacts would significantly outweigh the benefits.

2.13 The NPPF sets out three overarching objectives to achieve sustainable development. The relevant objective in the context of this air quality assessment is:

“an environmental objective – to protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution and mitigating and adapting to climate change, including moving to a low carbon economy” (Paragraph 8c)

2.14 Under the heading ‘Conserving and enhancing the natural environment’, the NPPF states:

“Planning policies and decisions should contribute to and enhance the natural and local environment by:

...

Preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability...” (Paragraph 174)

2.15 Under the heading ‘Ground Conditions and Pollution’, the NPPF states:

“The focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities.” (Paragraph 188)

National Planning Practice Guidance

- 2.16 The National Planning Practice Guidance (NPPG) was issued on-line on 6 March 2014 and is updated periodically by government as a live document. The last major update was on 1 November 2019. The Air Quality section of the NPPG describes the circumstances when air quality, odour and dust can be a planning concern, requiring assessment.
- 2.17 Relevant to this assessment it states that *“Odour and dust can also be a planning concern, for example, because of the effect on local amenity.”* The NPPG advises that *“Assessments should be proportionate to the nature and scale of development proposed and the level of concern about air quality, and because of this are likely to be locationally specific.”*

Local Planning Policy

- 2.18 The London Borough of Richmond Upon Thames’ Local Plan was adopted in July 2018 setting out policies up to 2033. The key policies related to this assessment are

Policy LP 8 which states;

“All development will be required to protect the amenity and living conditions for occupants of new, existing, adjoining and neighbouring properties. The Council will:

1. ...
2. ...
3. ...
4. *Ensure there is no harm to the reasonable enjoyment of the use of buildings, gardens and other spaces due to increases in traffic, servicing, parking, noise, light, disturbance, air pollution, odour or vibration or local micro-climatic effects.”*

And Policy LP 10, which states:

“A. The Council will seek to ensure that local environmental impacts of all development proposals do not lead to detrimental effects on the health, safety and the amenity of existing and new users or occupiers of the development site, or the surrounding land. These potential impacts can include, but are not limited to, air pollution, noise and vibration, light pollution, odours and fumes, solar glare and solar dazzle as well as land contamination.

Odours and Fume Control

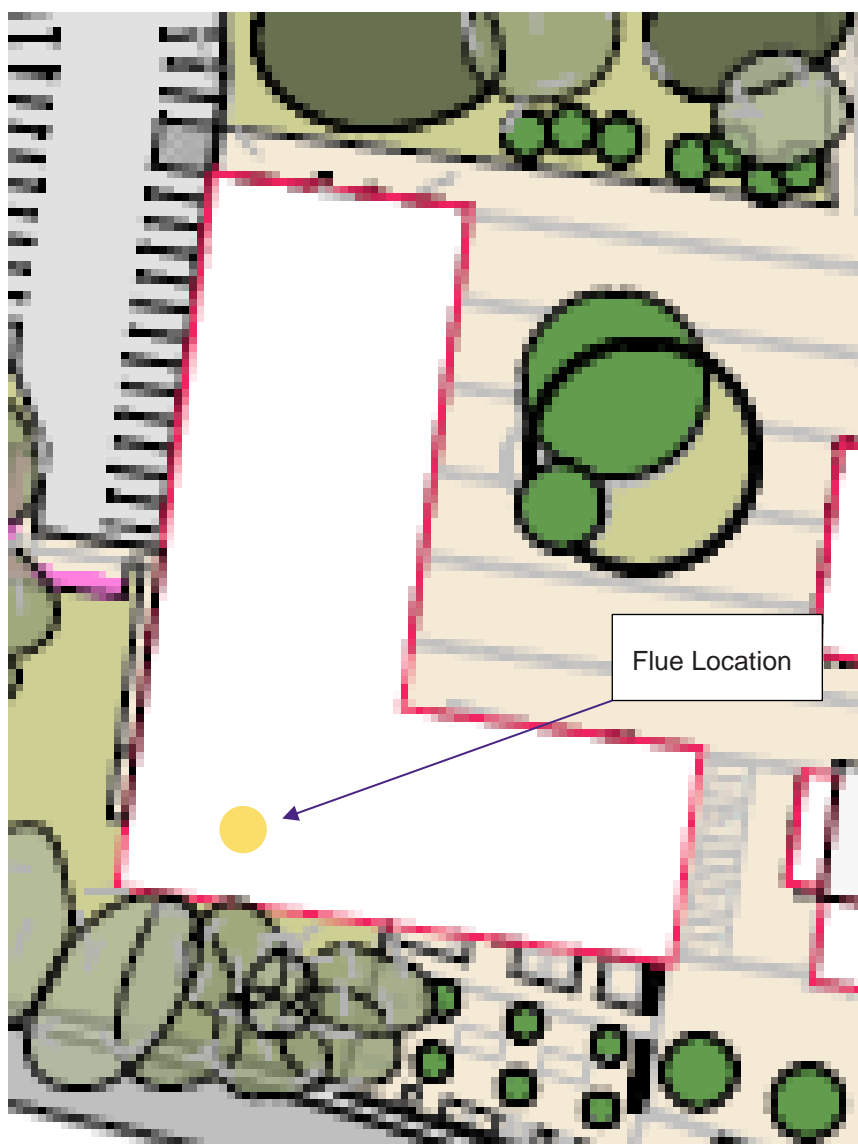
E. The Council will seek to ensure that any potential impacts relating to odour and fumes from commercial activities are adequately mitigated by requiring the following:

- 1. an impact assessment where necessary;*
- 2. the type and nature of the filtration to be used;*
- 3. the height and position of any chimney or outlet;*
- 4. promotion and use of new abatement technologies;”*

3 The Development Site and the Surrounding Area

- 3.1 The Kneller Hall Day School site will have capacity for up to 1,000 pupils and will include a kitchen to provide meals to the pupils. The upper levels of the development will have classrooms. There is one kitchen exhaust flue which will terminate on the roof of a three-story building. The location of the flue is shown in Figure 3.1

Figure 3.1 Locations of Flue



- 3.2 The site is positioned on the corner of Kneller Road and Whitton Dene. The building is currently surrounded by residential properties to the west and south and another school building to the east.
- 3.3 Figure 3.2 shows the site location with the future context.

Figure 3.2 Site Location with Future Context



- 3.4 The nearest land users to flue will be the residential properties located approximately 35 m west from the flue.
- 3.5 There are no other buildings within 20 m of the flue.

4 Assessment Methodology

Background

- 4.1 Neither the NPPF nor the NPPG is prescriptive on the methodology for assessing air quality effects or describing significance; practitioners continue to use guidance provided by Defra and non-governmental organisations, including Environmental Protection UK and the Institute of Air Quality Management (IAQM). However, the NPPG does advise that *“Assessments should be proportionate to the nature and scale of development proposed and the level of concern about air quality, and because of this are likely to be locationally specific.”*
- 4.2 Air quality guidance advises that the organisation engaged in assessing the overall risks should hold relevant qualifications and/or extensive experience in undertaking air quality assessments. The RPS air quality team members involved at various stages of this assessment have professional affiliations that include Fellow and Member of the Institute of Air Quality Management and Chartered Environmentalist and have the required academic qualifications for these professional bodies. In addition, the Director responsible for authorising all deliverables has over 18 years’ experience.

Characteristics of Odour

- 4.3 Most odours are mixtures of many chemicals that interact to produce what we detect as a smell. Odour-free air contains no odorous chemicals, whilst fresh air is usually perceived as being air that contains no chemicals or contaminants that are unpleasant (i.e. air that smells ‘clean’). Fresh air may contain odorous chemicals, but these odours will usually be pleasant in character, such as freshly-mown grass or sea spray. Perceptions of an odour - whether we find it acceptable, objectionable or offensive - are partly innate and hard-wired, and partly determined through life experiences and hence can be subjective to the individual.
- 4.4 Before disamenity, annoyance or nuisance can occur, there must be odour exposure. For odour exposure to occur all three links in the source-pathway-receptor chain must be present.
- a. an emission **source** - a means for the odour to get into the atmosphere.
 - b. a **pathway** - for the odour to travel through the air to locations off site, noting that:
 - anything that increases dilution and dispersion of an odorous pollutant plume as it travels from source to receptor will reduce the concentration at the receptor, and hence reduce exposure.
 - dilution and dispersion increase as the length of the pathway increases.

- increasing the length of the pathway (e.g. by releasing the emissions from a high stack) will – all other things being equal – increase the dilution and dispersion.
 - c. the presence of **receptors** (people) that could experience an adverse effect, noting that different people vary in their sensitivities to odour.
- 4.5 By convention, we restrict the term odour impact to the negative appraisal by a human receptor of the odour exposure. This appraisal, occurring over a matter of seconds or minutes, involves many complex psychological and socio-economic factors. Once exposure to odour has occurred, the process can lead to disamenity, annoyance, nuisance and possibly complaints.
- 4.6 Both, or either, annoyance and nuisance can lead to complaint action. However, a lack of complaints does not necessarily prove there is no disamenity, annoyance or nuisance. On the other hand, there needs to be an underlying level of annoyance before complaints are generated. The responses of disamenity, annoyance and nuisance can change over time.

EMAQ Kitchen Odour Risk Assessment

- 4.7 The EMAQ '*Control of Odour and Noise from Commercial Kitchen Exhaust Systems*' document [5] enables the odour risk to be assessed taking into account the stack/exhaust height, the size of the food establishment (e.g. number of covers), the type of kitchen/food and proximity to sensitive receptors, as detailed below. The guidance can be used in the following ways:
- to calculate the effective height for an exhaust vent to give adequate dispersal of odorous emissions, providing the necessary project-specific information for the above calculation is available from the developer;
 - if the necessary project-specific information is not available at this stage of the scheme design, then as a fall-back it is possible to estimate the ventilation stack height based on the minimum recommended requirements and specified limits; or
 - if design constraints limit the ventilation stack height, then the level of odour mitigation/control and other general design features can be identified that is appropriate for the design ventilation release height and the characteristics of the food establishment.

Odour risk factors

- 4.8 The EMAQ guidance on the control of odour from kitchen exhausts enables the odour risk to be assessed from a consideration of the following variables:
- **Dispersion:** the discharge stack height relative to the roof ridge affects the degree of dilution and dispersion that will occur;

- **Proximity of receptors:** dilution and dispersion increase with distance, reducing the exposure of the receptor to odour;
- **Size of the kitchen:** this influences the intensity of the odour and volume of ventilation air to be handled; and
- **Cooking type:** this affects the chemical constituents within the ventilation air.

4.9 The above factors were scored in accordance with the EMAQ guidance, as shown in Table 4.1.

Table 4.1 Scoring of Odour Risk Factors

Criteria	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 at 1 m above eaves at 10 – 15 m/s
	Good = 5	Discharging 1 m above ridge at 15 m/s
Proximity of receptors	Close = 10	Closest sensitive receptors less than 20 m from kitchen discharge
	Medium = 5	Closest sensitive receptors between 20 and 100 m from kitchen discharge
	Far = 1	Closest sensitive receptors more than 100 m 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 & 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 re-heating and sandwiches etc), Tea rooms

*A planner may take a pragmatic view when assessing whether certain low risk kitchens require any odour abatement to be fitted. In reaching this decision, the planner may consider the nature of the food being cooked and/or the size of the kitchen and/or its location.

Assessment of odour risk level

4.10 The risk scores were summed to establish the overall odour impact risk rating, as summarised in Table 4.2.

Table 4.2 Overall Odour Risk Rating

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

Requirements for odour control

4.11 Once the level of odour risk had been determined, the appropriate level of odour control to minimise odour disamenity effects was identified from the EMAQ guidance (summarised in Table 4.3 below).

Table 4.3 Defra Minimum Requirements for Odour Control

<p>Objectives</p> <ul style="list-style-type: none"> - for new premises or premises covered by planning conditions restricting the impact of odour the system shall be designed to prevent harm to the amenity. - for existing premises not covered by planning conditions restricting the impact of odour, the system shall be designed to avoid statutory nuisance and shall comply with the principles of Best Practical Means. <p>To achieve these objectives the odour control system shall include an adequate level of:</p> <ol style="list-style-type: none"> 1. odour control; and 2. stack dispersion. <p>The overall performance of the odour abatement system will represent a balance of 1 and 2.</p> <p>Discharge stack</p> <p>The discharge stack shall:</p> <ol style="list-style-type: none"> 1. Discharge the extracted air not less than 1 m above the roof ridge of any building within 15 m 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. <p>Odour arrestment plant performance</p> <p><u>Low to medium level control may include:</u></p> <ol style="list-style-type: none"> 1. Fine filtration or ESP (electrostatic precipitator) followed by carbon filtration (carbon filters rated with a 0.1 second residence time). 2. Fine filtration followed by counteractant/neutralising system to achieve the same level of control as 1. <p><u>High level odour control may include:</u></p> <ol style="list-style-type: none"> 1. Fine filtration or ESP followed by carbon filtration (carbon filters rated with a 0.2 - 0.4 second residence time). 2. Fine filtration or ESP followed by UV ozone system to achieve the same level of control as 1. <p><u>Very high level odour control may include:</u></p> <ol style="list-style-type: none"> 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 carbon filtration and by counteractant/neutralising system to achieve the same level of control as 1. 3. Fine filtration or ESP followed by UV ozone system to achieve the same level of control as 1. <p>In some instances where very high levels of control are required combinations or sacrificial levels of filtration may be employed.</p> <p>Maintenance must be carried out to ensure these performance levels are always achieved.</p>
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5 Assessment of Effects

EMAQ Kitchen Odour Risk Assessment

Odour Risk Factors

5.1 The risk factors for the kitchen exhaust have been informed by the following details.

Proximity of sensitive receptors to potential odour sources

5.2 Figure 3.1 and Figure 3.2 showed the location of the flue and the surrounding area.

5.3 The nearest receptors are approximately 35 m from the flue. This falls into the EMAQ “Medium” proximity category (“Closest sensitive receptors between 20 and 100 m from kitchen discharge”) and scores 5.

Description of ventilation exhaust system and release point

5.4 The flue terminates 1.5 m above the roof and the velocity of emissions is between 10 and 15 m/s. This falls into the EMAQ “Moderate” dispersion category and scores 10.

Description of food, cooking type and quantities/size of kitchen

5.5 The EMAQ guidance quantifies the magnitude of the kitchen by the number of covers it serves. The kitchen will have more than 100 covers. This falls into the EMAQ “Large” size of kitchen category and scores 5.

5.6 The kitchens would look to prepare a varied menu offer. The cooking type has conservatively been characterised into the EMAQ category of “Very High” odour and grease loading and scores 10.

Assessment of Odour Risk

5.7 The level of odour risk for the extract exhausts has been estimated based on the factors in Table 4.1 and Table 4.2, and is summarised in Table 5.1.

Table 5.1 Predicted Odour Risk

Criteria	Odour Risk Score
Dispersion	10
Proximity of Receptors	5
Size of Kitchen	5
Cooking type	10
TOTAL	30

5.8 The total score is 30 and falls into the “High” odour impact risk. The EMAQ guidance recommends a ‘High Level’ of odour control, which is described in more detail below.

Recommended Odour Controls

5.9 The minimum requirements for the different risk levels, as given in the EMAQ guidance, were summarised earlier in Table 4.3.

5.10 The level of control that would be expected as best practice for a ‘High’ level of odour control may include:

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

5.11 Providing filters meet the above standard, the odour impact at the sensitive receptors should be adequately controlled.

Recommended Maintenance of Exhaust Ventilation System

5.12 Carbon filters have a high efficiency of up to 95% for mitigating odour, but their efficiency decreases with use. They will, therefore, require regular changes (every 4 to 6 months), and constant and detailed maintenance as they are sensitive to high moisture, above 75% Relative Humidity (RH) and temperature above 40°C.

5.13 Regular maintenance of the kitchen equipment should be carried out to ensure the system remains as efficient as possible and also to ensure that the ventilation/ extract system remains in good condition. Table 5.2 provides the EMAQ recommended minimum performance requirements of a kitchen ventilation system.

Table 5.2 EMAQ Minimum Performance Requirements of General Maintenance of a Kitchen Ventilation System

The ideal criteria for the debris accumulation within a ventilation system are as follows:		
	Surface Contaminant Limits	Test Method
Extract	6 g/m ² 180 µm	Dust Vacuum Test (VT) Deposit thickness test (DTT)
Recirculation	1 g/m ² 60 µm	Dust Vacuum Test (VT) Deposit thickness test (DTT)

Supply	1 g/m ² 60 µm	Dust Vacuum Test (VT) Deposit thickness test (DTT)
The maximum allowable debris accumulation within a ventilation system are as follows:		
Wet Film Thickness Test Measurement		Recommended Action
200 µm as a mean across the system		Complete cleaning required
Any single measurement above 500 µm		Urgent local cleaning required

5.14 To achieve these limits, EMAQ recommends that:

- a visual inspection of the ventilation system be carried out at least once a week. All metal surfaces should be checked to ensure that there is no accumulation of grease or dirt and that there is no surface damage;
- cooker hoods and grease filters should be cleaned on a daily basis;
- baffle type self-draining filters and collection drawers should be cleaned weekly as a minimum. The cleaning period for mesh filters should be at least twice a week;
- cleaning period for extract ductwork are used as follows:

Grease Loading	Daily Usage	Cleaning Interval
Heavy Use – Heavy/continuous grease production	6 - 12 hours per day	3 – 6 months
	12 - 16 hours per day	2 -3 months
Moderate Use – moderate grease production	6 - 12 hours per day	6 -12 months
	12 - 16 hours per day	3 – 4 months
Light Use – no significant grease production	6 - 12 hours per day	12 months
	12 - 16 hours per day	6 months

- periodic 'deep hygiene cleaning' be undertaken by a specialist contractor. All accessible main ductwork runs and branches, including fitted equipment should be inspected and cleaned. [Note: periodic will be defined by the use of equipment];
- all fans are maintained on a regular basis as recommended by the fan manufacturer; and
- ventilation grilles, where fitted have easily removable cores to facilitate cleaning.

6 Summary

- 6.1 This report details the odour assessment undertaken for the Kneller Hall Day School development at Kneller Road. This odour assessment has been carried out in response to a request from the Council.
- 6.2 The Odour Risk Assessment of the odour extract exhaust was carried out in accordance with the EMAQ *Control of Odour and Noise from Commercial Kitchen Exhaust Systems* document.
- 6.3 The extract exhaust falls into the “High” odour impact risk. This report sets out the EMAQ recommended levels of odour control, commensurate with the risk.

References

- 1 Defra, 2010, The Air Quality Standards Regulations.
- 2 The Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020
- 3 Defra, 2007, The Air Quality Strategy for England, Scotland, Wales and Northern Ireland. Volume 2.
- 4 Defra (2011) Environmental Permitting Guidance – Statutory Nuisance s79(10) Environmental Protection Act 1990 – for the Environmental Permitting (England and Wales) Regulations 2010.
- 5 EMAQ (2018) Control of Odour and Noise from Commercial Kitchen Exhaust Systems.
- 6 Communities and Local Government, July 2021, National Planning Policy Framework