



Cascades Leisure Centre

Air Quality Assessment

On behalf of

Gravesham Borough Council



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1 Introduction

1.1 Proposed Development

- 1.1.1 This air quality assessment has been prepared by Stantec UK Limited to accompany a full planning application for the redevelopment of the Cascades Leisure Centre site in Gravesend. The application is submitted on behalf of Gravesham Borough Council (GBC) (the 'Applicant').
- 1.1.2 The proposals include the demolition of the existing Cascades Leisure Centre and public house and redevelopment of the site to provide a new leisure centre with community pool, training pool, leisure water, café, soft play, 'clip n climb' facility, a six court sports hall, fitness suite, spin studio, 2 no. fitness studios and 2 no squash courts. The Site is located at land off Thong Lane, Gravesend, Kent (postcode DA12 4LG) in GBC's administrative area.

1.2 Scope of Assessment

- 1.2.1 This report describes existing air quality within the study area, considers the suitability of the site for a leisure centre development and assesses the impact of the construction and operation of the Proposed Development on air quality in the surrounding area.
- 1.2.2 The main air pollutants of concern related to construction are dust and fine particulate matter (PM₁₀) associated with on-site construction activities and off-site trackout.
- 1.2.3 The main air pollutants of concern during the operational period are nitrogen dioxide (NO₂), PM₁₀ and PM_{2.5} emissions associated with road traffic.
- 1.2.4 The energy strategy for the Proposed Development is proposed to be all electric, utilising electrically driven heat pumps and roof mounted photovoltaic panels, both of which are zero-emission technologies. The building will also be provided with a natural gas supply; however, this is for back up use only in the event of failure of the heat pumps. As no combustion sources are proposed for the primary energy supply, no local air quality impacts are anticipated and the impacts of emissions from the energy plant are considered to be not significant. A detailed assessment of combustion emissions has therefore been scoped out of this assessment.
- 1.2.5 The assessment has been prepared taking into account relevant local and national guidance, policy and legislation.

1.3 Consultation

- 1.3.1 Consultation has been carried out with GBC via email correspondence with the Environmental Protection Department in October 2022, to discuss the scope and methodology of the assessment. At the time of writing, a response has not been received.

2 Legislation, Policy and Guidance

2.1 Air Quality Regulations

- 2.1.1 The Air Quality (England) Regulations 2000 (AQR) defined National Air Quality Objectives (NAQOs, a combination of concentration-based thresholds, averaging periods and compliance dates) for a limited range of pollutants. Subsequent amendments were made to the AQR in 2001 and 2002 to incorporate 'limit values' and 'target values' for a wider range of pollutants as defined in European Union (EU) Directives.
- 2.1.2 These amendments were consolidated by the Air Quality Standards Regulations 2010 (AQSR) (with subsequent amendments most notably in 2016 and for the devolved administrations), which transposed the EU's Directive on ambient air quality and cleaner air for Europe (2008/50/EC).
- 2.1.3 Following the Transition Period after the UK's departure from the EU in January 2020, the Air Quality (Amendment of Domestic Regulations) (EU Exit) Regulations 2019 (and subsequent amendments for the devolved administrations) have amended the AQ Standards Regulations 2010 to reflect the fact that the UK has left the EU. The Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020 amended the PM_{2.5} limit value in the AQSR to 20 µg/m³.
- 2.1.4 The relevant NAQOs for this assessment are shown in **Table 2-1**.

Table 2-1 Relevant Air Quality Objectives / Limit Values

Pollutant	Time Period	NAQOs	Source
NO ₂	1-hour mean	200 µg/m ³ not to be exceeded more than 18 times a year	NAQO and AQSR limit value
	Annual mean	40 µg/m ³	NAQO and AQSR limit value
PM ₁₀	24-hour mean	50 µg/m ³ not to be exceeded more than 35 times a year	NAQO and AQSR limit value
	Annual mean	40 µg/m ³	NAQO and AQSR limit value
PM _{2.5}	Annual mean	20 µg/m ³	AQSR limit value

- 2.1.5 The NAQO's for NO₂ and PM₁₀ were to have been achieved by 2005 and 2004 respectively, but also continue to apply in all future years thereafter.
- 2.1.6 The 2019 Clean Air Strategy includes a commitment to set a "new, ambitious, long-term target to reduce people's exposure to PM_{2.5}" which the Environment Act 2021 commits the Secretary of State to setting (Statutory Instrument, 2021).

National Air Pollution Plan for NO₂ in the UK

- 2.1.7 The national Air Quality Plan for NO₂ (Department for Environment, Food and Rural Affairs (DEFRA), 2018) sets out how the Government plans to deliver reductions in NO₂ throughout the UK, with a focus on reducing concentrations to below the EU Limit Values throughout the UK within the 'shortest possible time'.

- 2.1.8 The Plan requires all Local Authorities (LAs) in England which DEFRA identified as having exceedances of the Limit Values in their areas past 2020 to develop local plans to improve air quality and identify measures to deliver reduced emissions, with the aim of meeting the Limit Values within their area within "*the shortest possible time*". Potential measures include changing road layouts, encouraging public and private ultra-low emission vehicle (ULEV) uptake, the use of retrofitting technologies and new fuels and encouraging public transport. In cases where these measures are not sufficient to bring about the required change within 'the shortest possible time' then LAs may consider implementing access restrictions on more polluting vehicles (e.g. Clean Air Zones (CAZs)). A CAZ is defined within the plan as being "*an area where targeted action is taken to improve air quality and resources are prioritised and coordinated in a way that delivers improved health benefits and supports economic growth*" and may be charging or non-charging.

2.2 Air Quality Management

The Air Quality Strategy

- 2.2.1 Part IV of the Environment Act 1995 (His Majesty's Stationery Office (HMSO), 1995) required the Secretary of State to prepare and publish a 'strategy' regarding air quality.
- 2.2.2 The Air Quality Strategy (2007) establishes the policy framework for ambient air quality management and assessment in the UK (DEFRA, 2007). The primary objective of the Air Quality Strategy is to ensure that everyone can enjoy a level of ambient air quality which poses no significant risk to health or quality of life. The Air Quality Strategy sets out the NAQOs and Government policy on achieving these.
- 2.2.3 The Clean Air Strategy (2019) aims to lower national emissions of pollutants, thereby reducing background pollution and minimising human exposure to harmful concentrations of pollution. The Strategy aims to create a stronger and more coherent framework for action to tackle air pollution (DEFRA, 2019a).

Local Air Quality Management

- 2.2.4 Part IV of the Environment Act 1995 (HMSO, 1995) introduced a system of Local Air Quality Management (LAQM) which requires local authorities to regularly and systematically review and assess air quality within their boundary and appraise development and transport plans against these assessments.
- 2.2.5 Where a NAQO is unlikely to be met, the local authority must designate an Air Quality Management Area (AQMA) and draw up an Air Quality Action Plan (AQAP) setting out the measures it intends to introduce in pursuit of the NAQOs within its AQMA.
- 2.2.6 The Local Air Quality Management Technical Guidance 2022 (LAQM.TG(22); DEFRA, 2022), issued by DEFRA for LAs provides advice as to where the NAQOs apply. These include outdoor locations where members of the public are likely to be regularly present for the averaging period of the objective (which vary from 15 minutes to a year) as summarised in **Table 2-2**.

Table 2-2 Relevant Public Exposure

Averaging Period	NAQOs should apply at:	NAQOs don't apply at:
Annual mean	All locations where members of the public might be regularly exposed For example:	Façades of offices or other places of work where members of the public do not have regular access Hotels, unless people live there as their permanent residence

	Building façades of residential properties, schools, hospitals, care homes etc	Gardens of residences Kerbside sites Any other location where public exposure is expected to be short term
24-hour mean and 8-hour mean	All locations where the annual mean NAQO would apply, together with hotels and gardens of residences	Kerbside sites Any other location where public exposure is expected to be short term
1-hour mean	All locations where the annual mean and 24 and 8-hour mean NAQOs apply as well as: Kerbside sites Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more. Any outdoor locations where members of the public might reasonably be expected to spend one hour or longer.	Kerbside locations where the public would not be expected to have regular access
15-minute mean	All locations where members of the public might reasonably be regularly exposed for a period of 15 minutes or longer.	

2.3 Planning Policy

National Planning Policy

2.3.1 The National Planning Policy Framework (NPPF) sets out the Government's planning policies for England and how they are expected to be applied (Ministry of Housing, Communities & Local Government (MHCLG), 2021). The following paragraphs are considered relevant from an air quality perspective.

2.3.2 Paragraph 104 on promoting sustainable transport states:

"Transport issues should be considered from the earliest stages of plan-making and development proposals, so that: ...

d) the environmental impacts of traffic and transport infrastructure can be identified, assessed and taken into account – including appropriate opportunities for avoiding and mitigating any adverse effects, and for net environmental gains; ..."

2.3.3 Paragraph 105 goes on to state:

"Significant development should be focused on locations which are or can be made sustainable, through limiting the need to travel and offering a genuine choice of transport modes. This can help to reduce congestion and emissions, and improve air quality and public health."

2.3.4 Paragraph 174 on conserving and enhancing the natural environment states:

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

e) 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 stability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans, and..."

2.3.5 Paragraph 180 within habitats and biodiversity states:

"When determining planning applications, local planning authorities should apply the following principles:

a) if significant harm to biodiversity resulting from a development cannot be avoided (through locating on an alternative site with less harmful impacts), adequately mitigated, or, as a last resort, compensated for, then planning permission should be refused;

b) development on land within or outside a Site of Special Scientific Interest, and which is likely to have an adverse effect on it (either individually or in combination with other developments), should not normally be permitted. The only exception is where the benefits of the development in the location proposed clearly outweigh both its likely impact on the features of the site that make it of special scientific interest, and any broader impacts on the national network of Sites of Special Scientific Interest;

c) development resulting in the loss or deterioration of irreplaceable habitats (such as ancient woodland and ancient or veteran trees) should be refused, unless there are wholly exceptional reasons and a suitable compensation strategy exists; and

d) development whose primary objective is to conserve or enhance biodiversity should be supported; while opportunities to improve biodiversity in and around developments should be integrated as part of their design, especially where this can secure measurable net gains for biodiversity or enhance public access to nature where this is appropriate"

2.3.6 Paragraph 185 within ground conditions and pollution states:

"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development."

2.3.7 Paragraph 186 states that:

"Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan."

2.3.8 Paragraph 187 states that:

"Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a

significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed".

National Planning Practice Guidance

- 2.3.9 Paragraph 005, Reference 32-005-20191101 (revision date 01.11.2019), of the Planning Practice Guidance (PPG) (MHCLG, 2019) provides guidance on how considerations regarding air quality can be relevant to the development management process as follows:

"Whether air quality is relevant to a planning decision will depend on the proposed development and its location. Concerns could arise if the development is likely to have an adverse effect on air quality in areas where it is already known to be poor, particularly if it could affect the implementation of air quality strategies and action plans and/or breach legal obligations (including those relating to the conservation of habitats and species). Air quality may also be a material consideration if the proposed development would be particularly sensitive to poor air quality in its vicinity.

- *Where air quality is a relevant consideration the local planning authority may need to establish:*
- *The 'baseline' local air quality, including what would happen to air quality in the absence of the development;*
- *Whether the proposed development could significantly change air quality during the construction and operational phases (and the consequences of this for public health and biodiversity); and*
- *Whether occupiers or users of the development could experience poor living conditions or health due to poor air quality."*

- 2.3.10 Paragraph 006, Reference 32-006-20191101 (revision date 01.11.2019), of the PPG identifies what specific air quality issues need to be considered in determining a planning application:

"Considerations that may be relevant to determining a planning application include whether the development would:

- *Lead to changes (including any potential reductions) in vehicle-related emissions in the immediate vicinity of the proposed development or further afield. This could be through the provision of electric vehicle charging infrastructure; altering the level of traffic congestion; significantly changing traffic volumes, vehicle speeds or both; and significantly altering the traffic composition on local roads. Other matters to consider include whether the proposal involves the development of a bus station, coach or lorry park; could add to turnover in a large car park; or involve construction sites that would generate large Heavy Goods Vehicle flows over a period of a year or more;*
- *Introduce new point sources of air pollution. This could include furnaces which require prior notification to local authorities; biomass boilers or biomass-fuelled Combined Heat and Power plant; centralised boilers or plant burning other fuels within or close to an air quality management area or introduce relevant combustion within a Smoke Control Area; or extraction systems (including chimneys) which require approval or permits under pollution control legislation;*
- *Expose people to harmful concentrations of air pollutants, including dust. This could be by building new homes, schools, workplaces or other development in places with poor air quality;*

- Give rise to potentially unacceptable impacts (such as dust) during construction for nearby sensitive locations; and
- Have a potential adverse effect on biodiversity, especially where it would affect sites designated for their biodiversity value."

2.3.11 Paragraph 007, Reference 32-007-20191101 (revision date 01.11.2019), of the PPG provides guidance on how detailed an assessment needs to be:

"Assessments need to be proportionate to the nature and scale of development proposed and the potential impacts (taking into account existing air quality conditions), and because of this are likely to be locationally specific".

and

"The following could form part of assessments:

A description of baseline conditions and any air quality concerns affecting the area, and how these could change both with and without the proposed development;

- Sensitive habitats (including designated sites of importance for biodiversity);
- The assessment methods to be adopted and any requirements for the verification of modelling air quality;
- The basis for assessing impacts and determining the significance of an impact;
- Where relevant, the cumulative or in-combination effects arising from several developments;
- Construction phase impacts;
- Acceptable mitigation measures to reduce or remove adverse effects; and
- Measures that could deliver improved air quality even when legally binding limits for concentrations of major air pollutants are not being breached."

2.3.12 Paragraph 008, Reference 32-008-20140306 (revision date 01.11.2019), of the PPG provides guidance on how an impact on air quality can be mitigated:

"Mitigation options will need to be locationally specific, will depend on the proposed development and need to be proportionate to the likely impact. It is important that local planning authorities work with applicants to consider appropriate mitigation so as to ensure new development is appropriate for its location and unacceptable risks are prevented. Planning conditions and obligations can be used to secure mitigation where the relevant tests are met.

Examples of mitigation include:

- Maintaining adequate separation distances between sources of air pollution and receptors;
- Using green infrastructure, trees, where this can create a barrier or maintain separation between sources of pollution and receptors;
- Appropriate means of filtration and ventilation;
- Including infrastructure to promote modes of transport with a low impact on air quality (such as electric vehicle charging points);

- *Controlling dust and emissions from construction, operation and demolition; and*
- *Contributing funding to measures, including those identified in air quality action plans and low emission strategies, designed to offset the impact on air quality arising from new development."*

Local Policy

Gravesham Local Plan

2.3.13 The Gravesham Core Strategy (GBC, 2014), adopted in 2014 and covering the period up to 2028, outlines the strategic objectives to achieve the Council's long term spatial vision for the Borough. The following policies are relevant to air quality:

2.3.14 Policy CS18: Climate Change

"New development must minimise the impact of drainage on wastewater systems. The Council requires that surface water run-off from new development must not have greater adverse impact than the existing use. SuDS are required on all development where technically and financially feasible.

All non-residential developments of 1,000 sqm or more must meet the BREEAM "excellent" standards of water efficiency and include provision for the collection of rainwater.

The Council will support proposals which lead to a reduction in carbon footprint."

2.3.15 Policy CS19: Development and Design Principles

"[...]

New development will be located, designed and constructed to:

[...]

- *Avoid averse environmental impacts from pollution, including noise, air, odour and light pollution, and land contamination"*

2.3.16 GBC are also in the process of undertaking a Local Plan review and conducted a Regulation 18 (Stage 2) Consultation in late 2020. As part of this consultation, GBC published an emerging Development Management Policies document (GBC, 2020) which contains the following draft policy relevant to air quality:

2.3.17 Policy AM1: Air Quality

"Development proposals which may individually or cumulatively increase levels of air pollution in the Borough and/or are located in areas of poor air quality will be required to submit an air quality assessment. Such an assessment will be required to consider, as appropriate:

- *impacts upon areas with existing poor air quality;*
- *impacts upon the amenity and health and wellbeing of existing and future occupiers;*
- *adverse impacts upon the implementation of local and/or national air quality strategies and action plans;*
- *impacts on designated nature conservation sites, biodiversity and wildlife, along with appropriate avoidance and mitigation measures where impacts are likely to occur; and*

- breaches of EU and/or national legislation including that applicable to biodiversity and wildlife.

All major developments likely to result in unacceptable air quality impacts will require an emissions mitigation assessment. These assessments should be carried out by a suitably qualified air quality consultant in accordance with the latest guidance. Where development has the potential to worsen air quality either alone or in combination with other proposals, it will only be permitted if appropriate mitigation measures can be implemented to ensure that there is no unacceptable deterioration in air quality, having regard to the sensitivity of affected receptors and it will not prevent air quality objectives being met in a timely manner.

Where unacceptable adverse impacts are identified and where such impacts cannot be adequately mitigated development proposals will not be permitted."

Kent and Medway Energy and Low Emissions Strategy

- 2.3.18 The Kent and Medway Energy and Low Emissions Strategy (Kent County Council (KCC) and Medway Council (MC), 2020) sets out how Medway Council and the Kent district councils will respond to the UK climate emergency and drive clean, resilient economic recovery across the county. The strategy contains ten priorities to achieve the overarching vision of reducing emissions to net-zero by 2050. The following actions are relevant to air quality:

- Tackle poor air quality hotspots through the implementation of Air Quality Management Plans
- Increased involvement in regulation of public transport and taxis to tackle poor air quality and lower greenhouse gas emissions
- Ensure climate change, energy, air quality and environmental considerations are integrated into Local Plans, policies, and developments.

Gravesham Air Quality Action Plans

- 2.3.19 GBC have adopted two AQAPs with their administrative area: one covering the A2 Trunk Road and Northfleet Industrial Area AQMAs (GBC, 2004), and one covering the Urban Area AQMAs (GBC, 2006a). The AQAPs include the following measures to improve air quality within the AQMAs and the Borough as a whole:

- Speed regulation and traffic rerouting
- Realignment and widening of the A2 and Rathmore Link Road
- Relocation and measures to minimise releases at Northfleet Cement Works
- Improvement in emission standards for Council Fleet and Public Service Vehicles
- Additional street cleaning measures

- 2.3.20 In addition, GBC have prepared an Air Quality Strategy (GBC, 2006b) to address wider air pollution issues and prevent air quality deteriorating in Gravesham. The Strategy draws upon existing policies which are expected to have an impact on air quality and proposes a number of additional policies to deliver cleaner air and encourage partnership with neighbouring local authorities.

2.4 Assessment Guidance

- 2.4.1 The primary guidance documents used in undertaking this assessment are detailed below.

Defra 'Local Air Quality Management Technical Guidance (LAQM.TG(22))'

- 2.4.2 DEFRA's LAQM.TG(22) was published for use by local authorities in their LAQM review and assessment work (DEFRA, 2022). The document provides key guidance on aspects of air quality assessment, including screening, use of monitoring data, and use of background data that are applicable to all air quality assessments.

EPUK-IAQM 'Land-Use Planning & Development Control: Planning for Air Quality'

- 2.4.3 Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) have together published guidance to help ensure that air quality is properly accounted for in the development control process (EPUK / IAQM 2017). It clarifies when an air quality assessment should be undertaken, what it should contain, and how impacts should be described and assessed including guidelines for assessing the significance of impacts.

IAQM 'Guidance on the Assessment of Dust from Demolition and Construction'

- 2.4.4 Guidance on the assessment of dust from demolition and construction has been published by the IAQM (IAQM, 2014). The guidance provides a series of matrices to determine the risk magnitude of potential dust sources associated with construction activities in order to identify appropriate mitigation measures that are defined within further IAQM guidance.
- 2.4.5 Within the IAQM guidance, an 'impact' is described as a change in pollutant concentrations or dust deposition and an 'effect' is described as the consequence of an impact.

Kent and Medway Air Quality Planning Guidance

- 2.4.6 The Kent and Medway Air Quality Planning Guidance (Kent & Medway Air Quality Partnership (KMAQP), 2015) is a supplementary planning document developed to improve air quality across the region and encourage emission reductions from development. The guidance also provides consistency in the approach to assessing air quality as part of the planning regime.
- 2.4.7 The document provides a screening process to identify when a detailed air quality assessment is required and an approach to assessing potential impacts in monetary terms through a damage cost calculation and the process by which developments should implement mitigation measures to reduce emissions.

DEFRA's Air Quality Damage Cost Guidance and Appraisal Toolkit

- 2.4.8 Damage costs are a set of values used to quantify air quality impacts by tonne of emission and provide an estimation of the societal costs associated with small changes in pollutant concentrations. The Air Quality Damage Cost Guidance developed by DEFRA (DEFRA, 2020a) details the methodology for calculating damage costs and provides the cost per tonne for each pollutant assessed.
- 2.4.9 The Air Quality Damage Cost Appraisal Toolkit (DEFRA, 2019b) has also been developed by DEFRA to assist with the calculation of damage costs. The Toolkit calculates the damage cost using the methodology outlined in the Damage Cost guidance (DEFRA, 2020a) and requires the following user-defined inputs: appraisal period start year and end year, price base year, pollutants, and the transport-related pollutant emissions resulting from the development.

3 Methodology

3.1 Introduction

- 3.1.1 The assessment methodology detailed in the following sections has been applied to ascertain the potential impacts of emissions to air in order to identify their significance and compliance with policy and regulatory requirements (outlined in **Section 2** of this report), and whether or not additional mitigation is required.
- 3.1.2 This assessment first outlines the existing air quality within the study area, then considers the potential impacts of emissions to air in the locale of the Site. It also assesses the impact of construction and operational activities on air quality and sensitive receptors in the study area.

3.2 Baseline Air Quality

- 3.2.1 Any exceedances of the Limit Values along roads within the study area have been identified using the 2020 NO₂ Projections Data published by DEFRA (DEFRA, 2020b). Information on baseline air quality in the study area has been obtained by collating the results of monitoring carried out by GBC and their LAQM reports to identify potential AQMAs. Background concentrations for the study area have been defined using the national pollution maps published by DEFRA which cover the whole country on a 1x1 km grid (DEFRA, 2020c).

3.3 Construction Dust Impacts

- 3.3.1 During demolition and construction, dust from on-site activities and off-site trackout by construction vehicles has the potential to impact on sensitive human receptors within the study area.
- 3.3.2 The suspension of particles in the air is dependent on surface characteristics, weather conditions and on-site activities. Impacts have the potential to occur when dust generating activities coincide with dry, windy conditions, and where sensitive receptors are located downwind of the dust source(s).
- 3.3.3 Separation distance is also an important factor. Large dust particles (greater than 30 µm), can be potentially responsible for most dust annoyance, will largely deposit within 100 m of sources. Intermediate particles (10-30 µm) can travel 200-500 m. Consequently, significant dust annoyance is usually limited to within a few hundred metres of its source. Smaller particles (less than 10 µm), which are the predominant fraction that can be potentially responsible for human health impacts largely remain airborne. However, the impact on the short-term concentrations of PM₁₀ occurs over a shorter distance due to the rapid decrease in concentrations with distance from the source due to dispersion.
- 3.3.4 The assessment of the risk of potential construction dust impacts has been undertaken with reference to relevant guidance (IAQM, 2014). The assessment methodology considers three separate potential dust impacts:
- loss of amenity due to dust soiling;
 - human health effects due to increases in concentrations of PM₁₀; and
 - harm to ecological receptors due to increased dust deposition.
- 3.3.5 The first stage of the assessment involves a screening to determine if there are sensitive receptors within threshold distances of the activities associated with the construction phase of the scheme; defined as the study area. No further assessment is required if there are no receptors within the study area.

3.3.6 The assessment of potential risk is determined by considering the risk of dust impacts arising from four activities in the absence of mitigation:

- demolition;
- earthworks;
- construction; and
- trackout.

3.3.7 The dust emission class (or magnitude) for each activity, receptor sensitivity and the overall sensitivity of the area are determined using the criteria outlined in Table B-1, to B-4 in **Appendix B** (based on the IAQM guidance), indicative thresholds and professional judgement. The risk of dust impacts arising is a product of the relationship between the dust emission magnitude and the area sensitivity and is based on the criteria outlined in **Table B-5** (based on the IAQM guidance). The risk of impact is then used to determine the mitigation requirements.

3.3.8 The IAQM guidance recommends that no assessment of the significance of effects is made without mitigation in place, as mitigation is assumed to be secured by planning conditions, legal requirements or required by regulations.

3.3.9 With appropriate mitigation in place, the IAQM guidance indicates that the residual effect of dust emissions associated with the demolition and construction can be classified as being 'not significant'.

3.4 Road Traffic Emission Impacts

3.4.1 The potential for significant impacts on existing sensitive receptors within the study area as a result of emissions from traffic generated by the Proposed Development is determined based on the screening criteria outlined in the EPUK / IAQM Guidance (EPUK / IAQM, 2017) (see **Appendix C** which includes consideration of the volume and composition of traffic generated by the Proposed Development and existing local air quality conditions (i.e. the presence of any declared AQMAs). It should be noted that if traffic from a development exceeds these levels, then it does not necessarily mean that a modelling assessment is necessary, only that the air quality impacts of traffic require more detailed consideration.

3.4.2 Information on the Proposed Development's trip generation has been provided by the Project's transport consultants, Stantec UK Limited.

3.5 Site Suitability

3.5.1 A qualitative assessment to determine whether there is a potential for exceedances of the relevant NAQOs at sensitive locations within the Proposed Development has been undertaken qualitatively, taking into account local monitoring, estimated background concentrations, the layout of the Proposed Development and the proximity of worst-case sensitive locations within the Proposed Development to nearby sources of emissions (i.e. the local road network).

3.6 Emissions Mitigation Calculation

3.6.1 As recommended in the Kent and Medway guidance (KMAQP, 2015), the damage cost calculation has been carried out in accordance with the principles of DEFRA's Air Quality Damage Cost Guidance (DEFRA, 2020a) and uses emissions obtained from the latest DEFRA Emission Factor Toolkit (EFT) v.11.0 (DEFRA, 2020d). The damage cost has been calculated in DEFRA's Air Quality Damage Cost Appraisal Toolkit (DEFRA, 2019b).

- 3.6.2 To calculate the amount of transport-related pollutant emissions the development is likely to produce, the additional number of trips generated by the development, over and above those trips already generated by the existing site use, has been inputted into the EFT. The EFT has been run for the key pollutants, nitrogen oxides (NO_x) and particulates (PM_{2.5}). In accordance with the Kent and Medway Guidance (KMAQP, 2015), a vehicle speed of 50 kph (average speed) and a link length of 10 km (NTS UK average) have been used and the road type has been determined to be Urban (not London). 2024 has been used as the emissions factor year throughout this assessment as it represents the earliest year the development could be occupied.
- 3.6.3 Emissions calculated in the EFT (DEFRA, 2020d) have been inputted into DEFRA's Damage Cost Appraisal Toolkit (DEFRA, 2019b). The source sector in the Toolkit was defined as 'road transport urban medium', and a 5-year appraisal period for 2024-2028 has been used in the calculation. The central damage cost value for NO_x and PM_{2.5} has then been obtained from the Toolkit.
- 3.6.4 Following calculation of the appropriate damage cost, the indicative cost of the mitigation measures proposed as part of the development have been identified and compared against the calculated damage cost.

4 Baseline Environment

4.1 Site Context

- 4.1.1 The Site lies to the east of Thong Lane in Gravesend. Within the immediate context is the Gravesend Model Marine and Engineering Society and Gravesend Golf Centre to the north, the Southern Valley Golf Club to the south, and sports pitches to the east. The local area is predominately residential to the west and rural to the east. The site is currently occupied by the existing Cascades Leisure Centre and its associated car park.

4.2 Study Area

- 4.2.1 The study area adopted for this assessment is as follows:
- for the construction phase assessment, the study area (based on IAQM, 2014 guidance) is defined as up to 350 m from the site or 50 m from the route of construction vehicles (up to 500 m from the Site Entrance).
 - for the operational phase assessment, the study area (based on EPUK / IAQM, 2017 guidance) is defined as all roads within 250 m of the site and any other roads which could potentially exceed the screening criteria outlined in **Appendix C**.

4.3 Ambient Air Quality

EU Limit Values

- 4.3.1 The study area does not contain any predicted or measured exceedances of an EU Limit Values.

LAQM

- 4.3.2 GBC have investigated air quality within their administrative area as part of their responsibilities under the LAQM regime. GBC currently have four AQMA's declared due to exceedances of the annual mean NO₂ and PM₁₀ and 24-hour mean PM₁₀ NAQOs across the Borough.
- 4.3.3 The closest AQMA to the Site is the A2 Trunk Road AQMA, located approximately 1.3 km to the south and declared for exceedances of the annual mean NO₂ and 24-hour mean PM₁₀ NAQOs.

Local Monitoring Data

NO₂

- 4.3.4 GBC undertakes automatic monitoring of NO₂ concentrations at two locations in the Borough, the closest of which to the Site is the Gravesham A2 Roadside monitoring station (ID: ZG2). GBC also undertakes monitoring using NO₂ diffusion tubes at a number of locations. The closest diffusion tube monitoring location to the Site, GR69, is located approximately 140 m to the northeast at Gravesend Golf Centre. The nearest automatic monitoring station and passive diffusion tube monitoring sites located within approximately 2 km of the Site are described in **Table 4-1** and **Table 4-2** and their locations are shown in **Figure 1** below.

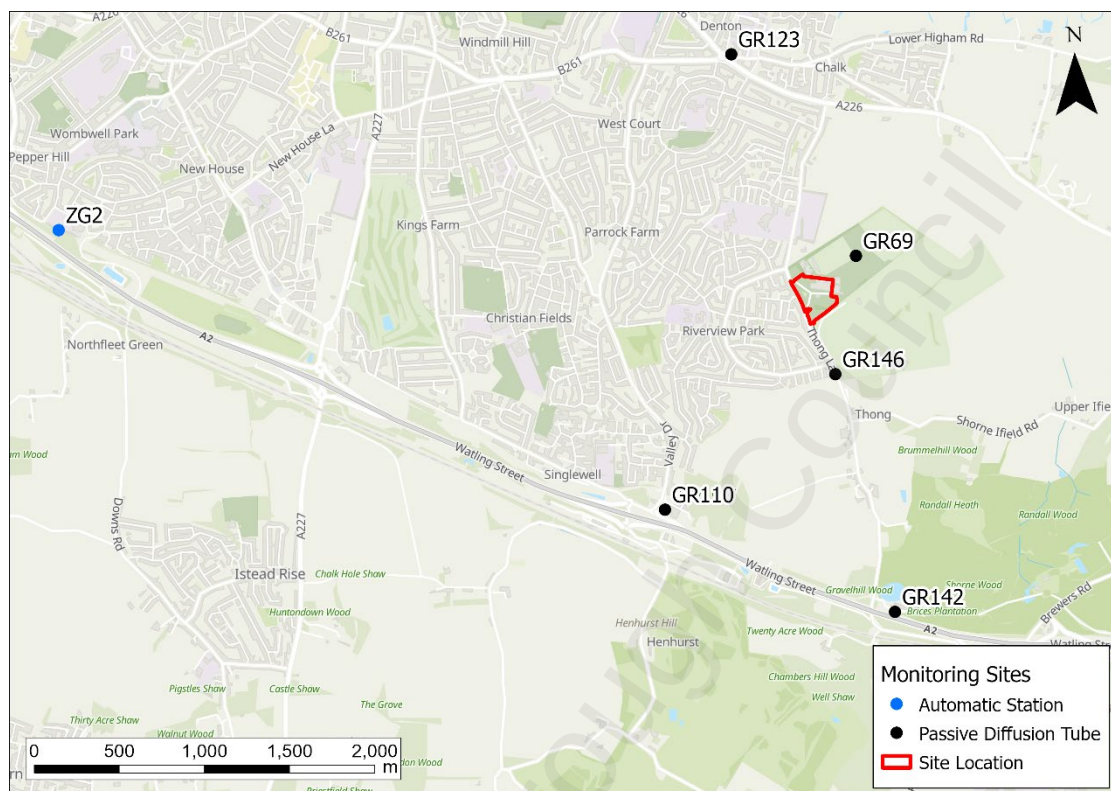


Figure 1: Monitoring Sites in the Vicinity of the Site. Contains OS Data © Crown Copyright and Database right 2022. Contains data from OS Zoomstack.

4.3.5 Whilst 2020 and 2021 monitoring results have been included in **Table 4-1** and **Table 4-2**, it should be noted that these are not considered to be representative of longer terms trends due to COVID-19 restrictions in place over this period.

Table 4-1 Measured Annual Mean NO₂ Concentrations 2016 – 2021

Site ID	Site Type	Within AQMA	Approx. Distance from Site (m)	Annual Mean (µg/m³)					
				2016	2017	2018	2019	2020	2021
Automatic Stations									
ZG2 – Gravesham A2 Roadside	Roadside	Yes	4,300	29.6	31.6	29.9	29.1	23.7	22.8
Passive Diffusion Tubes									
GR69 – Golf Driving Range (Fencing), Thong Lane	Urban Background	No	140	20.3	21.3	19.1	20.7	16.3	15.8
GR146 – Lampost adjacent to 354 Thong Lane	Roadside	No	320	-	-	22.8	18.5	14.9	14.3

Site ID	Site Type	Within AQMA	Approx. Distance from Site (m)	Annual Mean ($\mu\text{g}/\text{m}^3$)					
				2016	2017	2018	2019	2020	2021
GR110 – Nells Café, Valley Drive	Roadside	Yes	1,370	34.5	40.4	35.3	38.7	32.1	29.7
GR123 – City Praise Centre Lower Higham Road	Roadside	No	1,380	25.1	26.1	24.0	26.3	21.5	21.2
GR142 – Inn on the Lake, Watling Street, Shorne	Roadside	Yes	1,750	-	65.6	55.0	59.8	46.1	41.1
NAQO				40					

Exceedances of the annual mean NAQO are highlighted bold. Annual mean concentrations in excess of $60 \mu\text{g}/\text{m}^3$, indicating a potential exceedance of the NO_2 hourly mean NAQO have been underlined.
2016 – 2021 data taken from the GBC 2021 and 2022 Air Quality Annual Status Reports (GBC, 2022a and GBC, 2022b)

- 4.3.6 The annual mean NO_2 objective has been exceeded at two roadside passive diffusion tube locations in the vicinity of the Site within the last six available monitored years, both of which are located within the A2 Trunk Road AQMA to the south. However, the annual mean NAQO has been consistently achieved at all monitoring sites located within 1.5 km of the Site since 2018, including the closest passive diffusion tube location to the Site, GR69, over the six-year period.

Table 4-2 Measured Exceedances of the Hourly Mean NO_2 NAQO 2016 – 2021

Site ID	Number of Hours $>200\mu\text{g}/\text{m}^3$					
	2016	2017	2018	2019	2020	2021
ZG2 – Gravesham A2 Roadside	0	0	0	0	0	0
NAQO	18 (hours $>200\mu\text{g}/\text{m}^3$)					

2016 – 2021 data taken from the GBC 2021 and 2022 Air Quality Annual Status Reports (GBC, 2022a and GBC, 2022b)

- 4.3.7 **Table 4-2** shows that there have been no exceedances of the hourly mean NO_2 NAQO between 2016 – 2021.

PM₁₀

- 4.3.8 The results of the PM₁₀ monitoring at the Gravesham A2 Roadside automatic monitoring station (ID: ZG2) are shown in **Table 4-3** and **Table 4-4**.

Table 4-3 Measured Annual Mean PM₁₀ Concentrations 2014 – 2019.

Site ID	Annual Mean PM ₁₀ ($\mu\text{g}/\text{m}^3$)					
	2016	2017	2018	2019	2020	2021
ZG2 – Gravesham A2 Roadside	19.0	16.7	15.4	15.3	16.3	16.0
NAQO	40					

2016 – 2021 data taken from the GBC 2021 and 2022 Air Quality Annual Status Reports (GBC, 2022a and GBC, 2022b)

Table 4-4 Measured Exceedances of the 24-hour Mean PM₁₀ NAQO 2014 – 2019.

Site ID	PM ₁₀ Number of Days >50µg/m ³					
	2016	2017	2018	2019	2020	2021
ZG2 – Gravesham A2 Roadside	1	5	1	1	1	0
NAQO	35 (days >50 µg/m³)					

2016 – 2021 data taken from the GBC 2021 and 2022 Air Quality Annual Status Reports (GBC, 2022a and GBC, 2022b)

- 4.3.9 Measured PM₁₀ concentrations have been below the relevant NAQOs for the duration of the 2016 – 2021 monitoring period.

PM_{2.5}

- 4.3.10 GBC do not currently undertake PM_{2.5} monitoring within the Borough.

Predicted Background Concentrations

- 4.3.11 Estimated background concentrations for the Site have been obtained from the latest 2018-based national maps provided by DEFRA (DEFRA, 2020c). The Site falls into two grid squares: X 566500 Y 171500 and X 567500 Y 171500.
- 4.3.12 The DEFRA background concentrations at the Site are provided in **Table 4-5** for 2019, the baseline year, 2023, the year construction is due to commence, and 2024, the anticipated opening year of the Proposed Development.
- 4.3.13 The background concentrations are all well below the relevant NAQOs and limit value in both the 'existing' and future years.

Table 4-5 Estimated Annual Mean Background Concentrations at the Site

Year	Location	Annual Mean (µg/m ³)		
		NO ₂	PM ₁₀	PM _{2.5}
2019	566_171	16.5	16.9	11.7
	567_171	14.4	16.3	10.5
2023	566_171	14.5	16.0	11.0
	567_171	12.7	15.5	9.8
2024	566_171	13.9	15.8	10.9
	567_171	12.2	15.3	9.7
NAQOs		40	40	20

Note: Projections in the 2018 reference year background maps and associated tools are based on assumptions which were current before the Covid-19 outbreak in the UK. In consequence these tools do not reflect short- or longer-term impacts on emissions in 2020 and beyond resulting from behavioural change during the national or local lockdowns.

Railway Emissions

- 4.3.14 The Site is located adjacent to The Gravesend Model Marine and Engineering Society (GMMES) miniature steam railway. As stated in LAQM.TG(22) (DEFRA, 2022), coal fired locomotives can give rise to high short-term NO₂ and SO₂ concentrations near railway stations and railway tracks, albeit emissions from miniature railways are expected to be lower than large-scale locomotives.
- 4.3.15 As stated on the GMMES website (GMMES, 2022), the steam railway is generally in operation for approximately three hours per week during early spring to late autumn. Based on this

infrequent use, the distance of the tracks from the Site and the size of the locomotive engines in use, railway emissions from GMMES are unlikely to influence local air quality at the Site.

Gravesham Borough Council

5 Predicted Impacts

5.1 Construction Dust Impacts

- 5.1.1 The main potential effects during construction are annoyance and loss of amenity caused by dust soiling, human health impacts caused by PM₁₀ and damage to ecological sites due to dust deposition.

Dust Emission Magnitude

- 5.1.2 The dust emissions magnitude of demolition, earthworks and construction activities and as a result of trackout have been determined in **Table 5-1** below based the criteria shown in **Table B-1, Appendix B**.

Table 5-1 Dust Emissions Magnitudes

Activity	Magnitude	Justification
Demolition	Large	The Site currently includes the existing Cascades Leisure Centre and its associated car park. Demolition activities are not expected to occur more than 10 m above ground; however, the demolition of the existing leisure centre, existing pub, and car park has the potential to exceed 50,000 m ³ of material and may utilise on-site crushing. Therefore, the dust emission magnitude of demolition activities is judged to be 'large' as a precautionary measure.
Earthworks	Large	Proposed earthworks activities comprise clearance of vegetation, soil preparation and landscaping across an area greater than 10,000 m ² . The soil at the Site is largely classified as freely draining loamy soils (British Geological Survey, 2022) which are considered to be moderately dusty, particularly during periods of dry weather. Based on this, the dust emission magnitude of earthworks activities is judged to be 'large'.
Construction	Medium	The total building volume to be constructed is expected to be between 25,000 m ³ and 100,000 m ³ . Construction materials will comprise a mixture of masonry material including those with a high potential for dust release, such as concrete, as well as those with a lower dust potential such as metals and timber. Based on this, the dust emission magnitude of construction activities is judged to be 'medium'.
Trackout	Large	The number of HDVs that will exit the Site will vary depending upon the processes occurring at any one time. There are unlikely to be more than 50 outward HDV movements in any one day. Due to the nature of the Site, there could be an unpaved road length greater than 100 m in length comprising moderately dusty surface material. Based on this, the dust emission magnitude of trackout is judged to be 'large'.

Area Sensitivity

- 5.1.3 The area sensitivity to dust soiling and human health impacts has been determined based on the criteria shown in **Appendix B**. The IAQM demolition and construction band criteria used to determine the sensitivity of the local area is shown in **Figure 1** below.

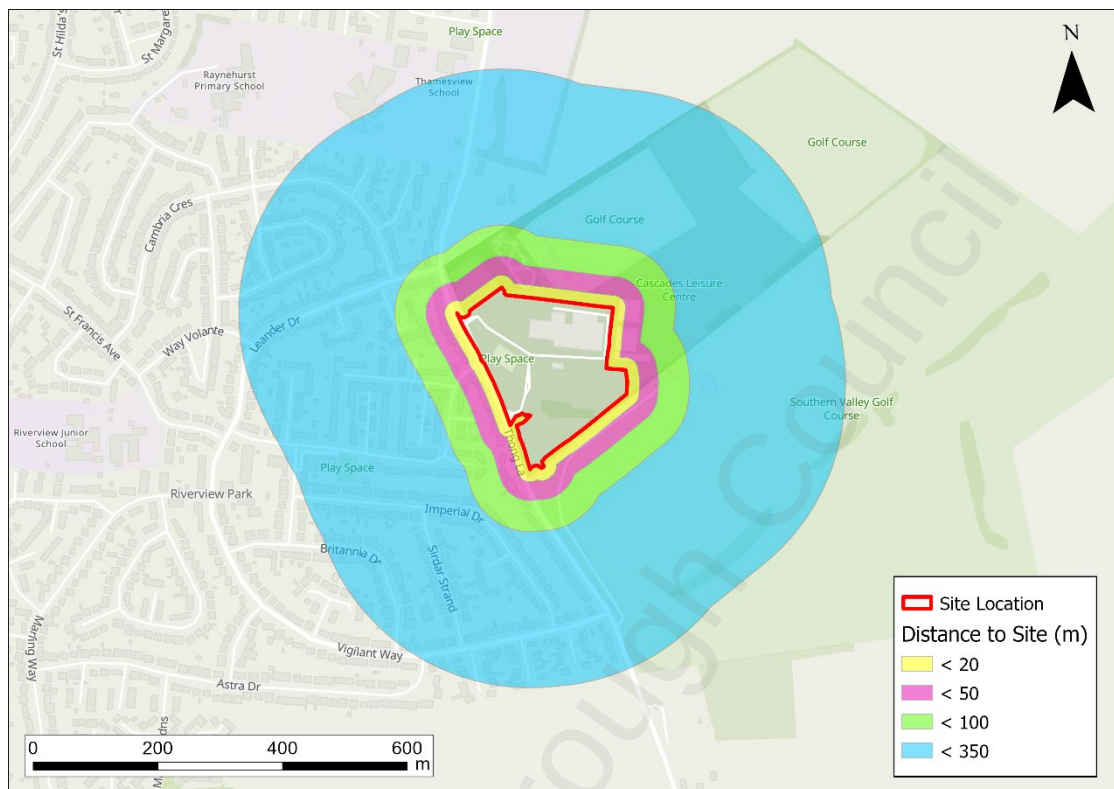


Figure 2: IAQM Demolition and Construction Dust Band Criteria from the Site boundary. Contains OS Data © Crown Copyright and database right 2022. Contains data from OS Zoomstack.

- 5.1.4 Residential properties are classed as 'high sensitivity' receptors to human health impacts as well as dust soiling, based on the IAQM guidance (IAQM, 2014) (**Appendix B**). There are more than 10 residential properties located within 20 m of the Site boundary; as such, the sensitivity of the area surrounding the Site to human health impacts and dust soiling is judged to be **'high'**.
- 5.1.5 The IAQM guidance states that trackout may occur at distances up to 500 m from large sites. The demolition and construction traffic routing is currently unknown, however it has been assumed the vehicles would travel south down Thong Lane and Darnley Lodge Lane to join the A2. Nonetheless, for the purposes of this assessment, a worst-case scenario has been considered assuming construction vehicles will also travel north of the Site along Thong Lane to join the A226. There are more than 10 residential properties located within 20 m of roads extending up to 500 m of the Site; as such, the sensitivity to dust soiling of the area surrounding roads along which material may be tracked is judged to be **'high'**.
- 5.1.6 The IAQM also defines residential properties as being 'high sensitivity' receptors to human health impacts (see **Appendix B**). PM₁₀ concentrations at existing residential properties within the study area are anticipated to be similar to those predicted by DEFRA at the Site (see **Table 4-4**) in 2023, the year construction is proposed to commence (i.e. 15.5 – 16.0 µg/m³). Based on the maximum predicted 2023 PM₁₀ concentration in the vicinity of the Site, and the number of sensitive receptors situated within 20 m of the site boundary and roads used for trackout, the sensitivity to human health impacts of the areas surrounding the Site and the area surrounding roads along which material may be tracked are judged to be **'medium'**. Pupils at Thamesview School, located within 350 m of the Site, have also been considered as high sensitivity receptors in this assessment.
- 5.1.7 There are no sensitive ecological receptors within 50 m of the Site or roads along which material may be tracked, therefore, the study area is not considered to be sensitive to potential impacts on sensitive ecological receptors.

Risk of Impacts

- 5.1.8 The risk of construction dust impacts, without mitigation, have been defined based on the criterion shown in **Table B-5, Appendix B** and are presented in **Table 5-1**.

Table 5-2 Risk of Construction Dust Impacts without Mitigation

Potential Impact	Risk			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	High Risk	High Risk	Medium Risk	High Risk
Human Health	High Risk	Medium Risk	Medium Risk	Medium Risk

5.2 Road Traffic Emission Impacts

- 5.2.1 As part of the proposals, car parking provision at the Site is proposed to increase from 158 to 257 car parking spaces. The projected traffic generation as a result of the proposals has been provided by the Project's Transport Consultants, Stantec UK Limited.
- 5.2.2 The Proposed Development is predicted to generate approximately 283 additional Annual Average Daily Traffic (AADT) trips during the operational phase when compared to the Site's existing use, 8 of which are predicted to be HDVs. As the Site is located outside of an AQMA, the traffic generated by the Proposed Development falls below the EPUK / IAQM screening criteria (see **Appendix C**) and, therefore, the impacts of operational traffic generated by the Proposed Development on existing sensitive receptors within the study area can be screened and considered to be 'not significant' and therefore no additional mitigation is required.

5.3 Site Suitability

- 5.3.1 As the Proposed Development is for leisure use, only the 1-hour mean NO₂ NAQO applies. Analysis of long-term monitoring data suggests that if the annual mean NO₂ concentration is less than 60 µg/m³, then the 1-hour mean NO₂ NAQO is unlikely to be exceeded where road transport is the main source of pollution.
- 5.3.2 Annual mean NO₂ concentrations recorded at passive diffusion tube monitoring locations within 1.5 km of the Site have not exceeded 60 µg/m³ in the last six available years. The closest passive diffusion tube to the Site, GR69, recorded an annual mean NO₂ concentration of 20.7 µg/m³ in 2019, the latest representative year due to Covid-19 lockdowns.
- 5.3.3 DEFRA predicted background concentrations of NO₂ are also well below 60 µg/m³ at the Site, with a maximum predicted concentration of 13.9 µg/m³ in 2024, the anticipated opening year of the Proposed Development.
- 5.3.4 As such, it is considered unlikely the 1-hour mean NO₂ objective will be exceeded within the Proposed Development. The Site is therefore considered suitable for the proposed leisure centre use without the need for site-specific mitigation associated with air quality.

5.4 Emissions Mitigation Calculation

- 5.4.1 The Proposed Development is predicted to generate an additional 283 vehicle trips per day (AADT) compared to the existing leisure centre at the Site.
- 5.4.2 The estimated central present value of damage costs using the emission factors (EFT v11.0, DEFRA, 2020d) is £9,909 for 203.1 kg/year of NO_x and £8,385 for 19.6 kg/year PM_{2.5}; a combined damage cost of **£18,294**.

6 Mitigation

6.1 Construction

- 6.1.1 The following standard mitigation measures from the IAQM guidance (IAQM, 2014) are recommended to be implemented via a Construction Environmental Management Plan (CEMP) which will be prepared for the Proposed Development, and have been determined while taking into account the outcomes of the construction dust risk assessment (presented in **Table 5-1**).

Table 6-1 Construction Phase Mitigation Measures

Category	Mitigation Measure
Communications	Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.
	Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary.
	Display the head or regional office contact information.
Management	Develop and implement a Dust Management Plan (DMP).
	Record all dust and air quality complaints, identify causes and take measures to reduce emissions in a timely manner, and record the measures taken.
	Make the complaints log available to the local authority when asked.
	Record any exceptional incidents that cause dust and/or air emissions, either on- of off-site, and the action taken to resolve the situation in the log book.
	Hold regular liaison meetings with other high risk construction sites within 500 m of the site boundary to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/deliveries which might be using the same strategic road network routes.
Monitoring	Undertake daily on-site and off-site inspections, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked.
	Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked.
	Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.
	Agree dust deposition, dust flux, or real-time PM ₁₀ continuous monitoring locations with the local authority. Where possible, commence baseline monitoring at least three months before work on a phase commences.
Preparing and maintaining the site	Plan site layout so that machinery and dust causing activities are located away from receptors, as far as possible.
	Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
	Fully enclose site or specific operations where there is a high potential for dust productions and the site is active for an extensive period.
	Avoid site runoff of water or mud.
	Keep site fencing, barriers and scaffolding clean using wet methods.

Category	Mitigation Measure
Operating vehicle/machinery and sustainable travel	Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site.
	Cover, seed or fence stockpiles to prevent wind whipping/
	Ensure all vehicles switch off engines when stationary – no idling vehicles.
	Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.
	Impose and signpost a maximum speed limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas.
Operations	Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.
	Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking and car sharing).
	Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
	Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
	Use enclosed chutes and conveyors and covered skips.
Waste management	Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
	Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.
	Avoid bonfires and burning of waste materials.
	Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).
	Ensure effective water suppression is used during demolition operations.
Demolition	Avoid explosive blasting, using appropriate manual or mechanical alternatives.
	Bag and remove any biological debris or damp down such material before demolition.
	Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.
	Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.
	Only remove the cover in small areas during work and not all at once.
Earthworks	Avoid scabbling (roughening of concrete surfaces) if possible.
	Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
	Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.
	For smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust.

Category	Mitigation Measure
Trackout	Use water assisted dust sweepers on the site access and local roads.
	Avoid dry sweeping of large areas.
	Ensure vehicles entering and leaving the site are covered to prevent escape of materials.
	Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.
	Record all inspections of haul routes and any subsequent action in a site log book.
	Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowzers and regularly cleaned.
	Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).
	Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.
	Access gates to be located at least 10 m from receptors where possible.

6.2 Operation

- 6.2.1 To mitigate for potential effects on local air quality during the operational phase, a mitigation package is proposed by the developer. As the exact specification of mitigation measures proposed are yet to be determined, designs and costings are not available at this stage.
- 6.2.2 Nonetheless, a Travel Plan will be prepared for the Proposed Development which will go some way to reduce any operational air quality impacts, although the effect of this plan cannot be quantified at this stage.
- 6.2.3 Furthermore, in line with the Kent and Medway Air Quality Planning Guidance (KMAQP, 2015), all commercial developments must provide electric vehicle charging points for 10% of any proposed car parking spaces. As such, the Proposed Development will provide a minimum of 25 electric vehicle charge points at the Site.
- 6.2.4 Although costings are not available at this stage, it is expected that the package of mitigation measures proposed will exceed the total damage cost and no further mitigation measures will be required. This will be confirmed at the detailed design stage.

7 Summary and Conclusions

- 7.1.1 The air quality impacts associated with the Proposed Development on land off Thong Lane have been assessed. The Site is located within the administrative boundary of Gravesham Borough Council (GBC).
- 7.1.2 GBC has declared four Air Quality Management Areas (AQMA) due to exceedances of the annual mean NO₂ and PM₁₀ and 24-hour mean PM₁₀ air quality objectives. However, the Site is not located within an AQMA and pollutant concentrations recorded at nearby monitoring locations have been in compliance with the relevant objectives in recent years.
- 7.1.3 The construction activities have the potential to create dust. It is recommended that a package of mitigation measures in accordance with the IAQM guidance is put in place to minimise the risk of elevated PM₁₀ concentrations and dust soiling in the surrounding area. With mitigation in place the construction impacts are judged as being 'not significant'.
- 7.1.4 The predicted increase in road traffic associated with the Proposed Development is below the EPUK / IAQM screening criteria. As such, the air quality impacts of the Proposed Development with regards to road traffic are considered to be 'not significant' and additional mitigation is not required. Nonetheless, a package of mitigation measures to reduce vehicle trips (and therefore associated pollutant emissions) will be implemented through a Framework Travel Plan for the Site.
- 7.1.5 An air quality damage cost analysis has been undertaken for the Proposed Development. In accordance with the Kent and Medway Air Quality Planning Guidance, a package of mitigation measures for the operational impact of the Proposed Development on air quality is proposed. The cost of their implementation is expected to exceed the calculated air quality damage cost; however, this will be confirmed at the detailed design stage.
- 7.1.6 The Proposed Development is therefore considered to be in accordance with the requirements of the NPPF, and relevant local and national guidance regarding air quality.

References

British Geological Survey (2022). 'UK Soil Observatory (UKSO)' Available at: <http://mapapps2.bgs.ac.uk/ukso/home.html>. (Accessed: 25/10/2022)

Department for Environment, Food and Rural Affairs (DEFRA) (2018). 'UK Plan for tackling Roadside Nitrogen Dioxide Concentrations: Detailed Plan'. Available at: <https://www.gov.uk/government/publications/air-quality-plan-for-nitrogen-dioxide-no2-in-uk-2017>. (Accessed: 21/10/2022).

Department for Environment, Food and Rural Affairs (DEFRA) in partnership with the Scottish Executive, The National Assembly for Wales and the Department of the Environment for Northern Ireland (2007). 'The Air Quality Strategy for England, Scotland, Wales, Northern Ireland'. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69336/pb12654-air-quality-strategy-vol1-070712.pdf. (Accessed: 21/10/2022).

Department for Environment, Food and Rural Affairs (DEFRA) (2019a). 'Clean Air Strategy 2019'. Available at: <https://www.gov.uk/government/publications/clean-air-strategy-2019>. (Accessed: 21/10/2022).

Department for Environment, Food and Rural Affairs (DEFRA) (2019b). 'Damage Cost Appraisal Toolkit'. Available at: <https://www.gov.uk/government/publications/assess-the-impact-of-air-quality/air-quality-appraisal-damage-cost-guidance>. (Accessed: 21/10/2022).

Department for Environment, Food and Rural Affairs (DEFRA) (2020a). 'Air Quality Appraisal: Damage Cost Guidance'.

Department for Environment, Food and Rural Affairs (DEFRA) (2020b) '2020 NO₂ and PM Projections Data (2018 Reference Year)'. Available at: <https://uk-air.defra.gov.uk/library/no2ten/2020-no2-pm-projections-from-2018-data>. (Accessed: 21/10/2022).

Department for Environment, Food and Rural Affairs (DEFRA) (2020c). '2018 Based Background Maps'. Available at: <https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018>. (Accessed: 21/10/2022).

Department for Environment, Food and Rural Affairs (DEFRA) (2020d). 'Emissions Factor Toolkit (Version 11)', Available at: <https://laqm.defra.gov.uk/air-quality/air-quality-assessment/emissions-factors-toolkit/>. (Accessed: 21/10/2022).

Department for Environment, Food and Rural Affairs (DEFRA) (2022). 'Local Air Quality Management Technical Guidance (TG22)'. August 2022. Available at: <https://laqm.defra.gov.uk/wp-content/uploads/2022/08/LAQM-TG22-August-22-v1.0.pdf>. (Accessed: 20/10/2022).

Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe

Environmental Protection UK and the Institute of Air Quality Management (EPUK / IAQM) (2017). 'Land-use Planning & Development Control: Planning for Air Quality'. V1.2. Available at: <https://www.iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf>. (Accessed: 21/10/2022)

Gravesham Borough Council (2004). 'Local Air Quality Management – Final Action Plan'. Available at: <https://kentair.org.uk/report/gravesham-borough-council-action-plan-2004>. (Accessed: 21/10/2022).

Gravesham Borough Council (2006a). 'Local Air Quality Management – Action Plan'. Available at: <https://kentair.org.uk/report/gravesham-borough-council-action-plan-2006>. (Accessed: 21/10/2022).

Gravesham Borough Council (2006b). 'Local Air Quality Management – Air Quality Strategy'. Available at: <https://kentair.org.uk/report/gravesham-borough-council-air-quality-strategy-2006>. (Accessed: 21/10/2022).

Gravesham Borough Council (2014). 'Gravesham Local Plan Core Strategy'. Available at: <https://www.gravesham.gov.uk/local-plan-policy/local-plan>. (Accessed: 21/10/2022).

Gravesham Borough Council (2020). 'Gravesham Local Plan Regulation 18 Stage 2 Consultation, Part 2: Draft Development Management Policies Document'. Available at: <https://localplan.gravesham.gov.uk/REG18S2/consultationHome>. (Accessed: 25/11/2022).

Gravesham Borough Council (2022a). 'Annual Status Report 2021'. Available at: <https://kentair.org.uk/report/gravesham-borough-council-annual-status-report-2021>. (Accessed: 21/10/2022).

Gravesham Borough Council (2022b). 'Annual Status Report 2022'. Available at: <https://kentair.org.uk/report/gravesham-borough-council-annual-status-report-2022>. (Accessed: 21/10/2022).

His Majesty's Stationery Office (1995), UK Public General Acts 1995, Environment Act 1995, London. Available at: <https://www.legislation.gov.uk/ukpga/1995/25/contents>. (Accessed: 21/10/2022)

Institute of Air Quality Management (2014). 'Assessment of Dust from Demolition and Construction', Available at: <https://iaqm.co.uk/text/guidance/construction-dust-2014.pdf>. (Accessed: 21/10/2022).

Kent & Medway Air Quality Partnership (2015). 'Kent & Medway Air Quality Partnership Air Quality Planning Guidance'. Available at: <https://kentair.org.uk/air-quality-planning-guidance>. (Accessed: 21/10/2022).

Kent County Council and Medway Council (2020). 'Kent and Medway Energy and Low Emissions Strategy'. Available at: <https://www.kent.gov.uk/about-the-council/strategies-and-policies/environment-waste-and-planning-policies/environmental-policies/kent-and-medway-energy-and-low-emissions-strategy>. (Accessed: 21/10/2022).

Ministry of Housing, Communities & Local Government (2019). Planning Practice Guidance. Air Quality. Available at: <https://www.gov.uk/government/collections/planning-practice-guidance>. (Accessed: 21/10/2022).

Ministry of Housing, Communities & Local Government (2021). 'National Planning Policy Framework'. Available at: <https://www.gov.uk/government/publications/national-planning-policy-framework--2#history>. (Accessed: 21/10/2022).

Statutory Instrument 2000, No 921, 'The Air Quality (England) Regulations 2000' HMSO, London.

Statutory Instrument 2002, No 3034, 'The Air Quality (England) (Amendment) Regulations 2002' HMSO, London.

Statutory Instrument 2010, No. 1001, 'The Air Quality Standards Regulations 2010' HMSO, London.

Statutory Instrument 2016, No. 1184, 'The Air Quality Standards (Amendment) Regulations 2016' HMSO, London.

Statutory Instruments 2019, No. 74, 'The Air Quality (Amendment of Domestic Regulations) (EU Exit) Regulations 2019' HMSO, London

Statutory Instruments 2020, No. 131, 'The Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020' HMSO, London

Statutory Instruments 2021, c. 30, 'Environment Act 2021' HMSO, London

The Gravesend Model Marine and Engineering Society (2022). The Gravesend Model Marine and Engineering Society Website. Available at: <http://www.gmmes.co.uk/>. (Accessed: 20/10/2022).

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Appendix A Glossary

Abbreviations	Meaning
AADT	Annual Average Daily Traffic
AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
CAZ	Clean Air Zone
CEMP	Construction Environmental Management Plan
Defra	Department for Environment, Food and Rural Affairs
Diffusion Tube	A passive sampler used for collecting NO ₂ in the air
EFT	Emission Factor Toolkit
EPUK	Environmental Protection UK
GBC	Gravesham Borough Council
GMMES	The Gravesend Model Marine and Engineering Society
HDV	Heavy Duty Vehicle; a vehicle with a gross vehicle weight greater than 3.5 tonnes. Includes Heavy Goods Vehicles and buses
HMSO	His Majesty's Stationery Office
IAQM	Institute of Air Quality Management
KCC	Kent County Council
LA	Local Authority
LAQM	Local Air Quality Management
MC	Medway Council
MHCLG	Ministry of Housing, Communities and Local Government
NAQO	National Air Quality Objective as set out in the Air Quality Strategy and the Air Quality Regulations
NO ₂	Nitrogen Dioxide
NO _x	Oxides of nitrogen generally considered to be nitric oxide and NO ₂ . Its main source is from combustion of fossil fuels, including petrol and diesel used in road vehicles
NPPF	National Planning Policy Framework
PM ₁₀ /PM _{2.5}	Small airborne particles less than 10/2.5 µm in diameter
PPG	Planning Practice Guidance
Receptor	A location where the effects of pollution may occur
ULEV	Ultra Low Emission Vehicle

Appendix B IAQM Dust Guidance (2014) Approach

Table B-1 Dust Emission Magnitude Classification

Activity	Dust Emission Magnitude		
	Large	Medium	Small
Demolition	Total building volume of >50,000 m ³ , potentially dusty construction material, on-site crushing and screening, demolition activities >20 m above ground	Total building volume of 20,000 – 50,000 m ³ , potentially dusty construction material, demolition activities 10 – 20 m above ground level	Total building volume of <20,000 m ³ , construction material with low potential for dust release, demolition activities <10 m above ground, demolition during wetter months
Earthworks	Total site area of >10,000 m ² , potentially dusty soil type, >10 heavy earth moving vehicles active at any one time, formation of bunds >8 m in height, total material moved >100,000 tonnes	Total site area of 2,500 - 10,000 m ² , moderately dusty soil type, 5 - 10 heavy earth moving vehicles active at any one time, formation of bunds 4 - 8 m in height, total material moved 20,000 - 100,000 tonnes	Total site area of <2,500 m ² , soil type with large grain size, <5 heavy earth moving vehicles active at any one time, formation of bunds <4 m in height, total material moved <20,000 tonnes. Earthworks during wetter months
Construction	Total building volume >100,000 m ² , on-site concrete batching, sandblasting	Total building volume 25,000 - 100,000 m ² , potentially dusty construction material, on-site concrete batching	Total building volume <25,000 m ² , construction material with low potential for dust release
Trackout	>50 HDV outwards movements in any one day, potentially dusty surface material, unpaved road length >100 m	10 - 50 HDV outwards movements in any one day, moderately dusty surface material, unpaved road length 50 - 100 m	<10 HDV outwards movements in any one day, surface material with low potential for dust release, unpaved road length <50 m

Table B-2 Receptor Sensitivity

Receptor Sensitivity	Impact		
	High	Medium	Low
High	An area where: - Users can reasonably expect enjoyment of a high level of amenity; - The appearance, aesthetics of value of their property would be diminished by soiling; - The people or property would reasonably be expected to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land. Examples include dwellings, museums and other culturally important collections, medium and long-term car showrooms.	Locations where members of the public are exposed over a time period relevant to the air quality objective for PM₁₀ (in the case of the 24-hour objective, a relevant location would be one where individuals may be exposed for eight hours or more per day. Examples include residential properties. Hospitals, schools and residential care homes should also be considered as having equal sensitivity to residential areas for the purposes of this assessment.	Locations with an international or national designation <i>and</i> the designated features may be affected by dust soiling; OR Locations where there is a community of particularly dust sensitive species such as vascular species included in the Red Data List for Great Britain. Indicative examples include a SAC designated for acid heathlands or a local site designated for lichens adjacent to the demolition of a large site containing concrete (alkali) buildings.
Medium	An area where: - Users would expect to enjoy of a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; - The appearance, aesthetics of value of their property could be diminished by soiling; - The people or property 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 include parks and places of work.	Locations where people exposed are workers, and exposure is over a time period relevant to the air quality objective for PM₁₀ (in the case of the 24-hour objective, a relevant location would be one where individuals may be exposed for eight hours or more per day. Examples include office and shop workers, but will generally not include workers occupationally exposed to for PM₁₀, as protection is covered by Health and Safety at Work legislation.	Locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown; OR Locations with a national designation where the features may be affected by dust deposition. Indicative example is a SSSI with dust sensitive features.

Low	An area where: - The enjoyment of amenity would not reasonably be expected; - Property would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling; - There is transient exposure, where the people or property 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 include playing fields, farmland (unless commercially sensitive horticultural), footpaths, short-term car parks and roads.	Locations where human exposure is transient. Examples include public footpaths, playing fields, parks and shopping streets.	Locations with a local designation where the features may be affected by dust deposition. Indicative example is a LNR with dust sensitive features.
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Table B-3 Sensitivity of an Area to Dust Soiling Effects

Receptor Sensitivity	Number of Receptors	Distance from Source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10 – 100	High	Medium	Low	Low
	1 – 10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Table B-4 Sensitivity of an Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM ₁₀ Concentration	Number of Receptors	Distance from the Source (m)				
			<20	<50	<100	<200	<350
High	>32 µg/m ³	>100	High	High	High	Medium	Low
		10 – 100	High	High	Medium	Low	Low
		1 - 10	High	Medium	Low	Low	Low
	28 - 32 µg/m ³	>100	High	High	Medium	Low	Low
		10 – 100	High	Medium	Low	Low	Low
		1 - 10	High	Medium	Low	Low	Low
	24 - 28 µg/m ³	>100	High	Medium	Low	Low	Low
		10 – 100	High	Medium	Low	Low	Low
		1 - 10	Medium	Low	Low	Low	Low
	<24 µg/m ³	>100	Medium	Low	Low	Low	Low
		10 – 100	Low	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
Medium	>32 µg/m ³	>10	High	Medium	Low	Low	Low
		1 - 10	Medium	Low	Low	Low	Low
	28 - 32 µg/m ³	>10	Medium	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
	24 - 28 µg/m ³	>10	Low	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
	<24 µg/m ³	>10	Low	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
Low	-	≥1	Low	Low	Low	Low	Low

Table B-5 Sensitivity of an Area to Ecological Impacts

Receptor Sensitivity	Distance from Source (m)	
	<20	<50
High	High Risk	Medium Risk
Medium	Medium Risk	Low Risk
Low	Low Risk	Low Risk

Table B-6 Risk of Dust Impacts Calculation Matrix

Sensitivity of Area		Dust Emission Magnitude		
		Large	Medium	Small
Demolition	High	High Risk	Medium Risk	Medium Risk
	Medium	High Risk	Medium Risk	Low Risk
	Low	Medium Risk	Low Risk	Negligible Risk
Earthworks	High	High Risk	Medium Risk	Low Risk
	Medium	Medium Risk	Medium Risk	Low Risk
	Low	Low Risk	Low Risk	Negligible Risk
Construction	High	High Risk	Medium Risk	Low Risk
	Medium	Medium Risk	Medium Risk	Low Risk
	Low	Low Risk	Low Risk	Negligible Risk
Trackout	High	High Risk	Medium Risk	Low Risk
	Medium	Medium Risk	Low Risk	Negligible Risk
	Low	Low Risk	Low Risk	Negligible Risk

Appendix C EPUK IAQM Guidance (2017) Screening Criteria

The Development Will:	Indicative Criteria to Proceed to an Air Quality Assessment
Cause a significant change in LDV traffic flows on local roads with relevant receptors.	A change of LDV flow of: >100 AADT within or adjacent to an AQMA; and >500 AADT elsewhere.
Cause a significant change in HDV flows on local roads with relevant receptors.	A change of HDV flow of: >25 AADT within or adjacent to an AQMA; and >100 AADT elsewhere.
Realign roads i.e. changing the proximity of receptors to traffic lanes.	Where the change is 5 m or more and the road is within an AQMA.
Introduce a new junction or remove an existing junction near to relevant receptors.	Applies to junctions that cause traffic to significantly change vehicle acceleration / deceleration, e.g. traffic lights, or roundabouts.
Introduce or change a bus station.	A change of bus flows of: >25 AADT within or adjacent to an AQMA; and >100 AADT elsewhere.
Have an underground car park with extraction system.	The ventilation extract for the car park will be located within 20 m of a relevant receptor; and The car park will have >100 movements per day (total in and out).

The screening criteria presented is amended from Table 6.2 of the EPUK / IAQM guidance (EPUK / IAQM, 2017). Only the screening criteria relevant to changes in transport (including both traffic and the transport network) are outlined.