Red & Yellow
Specialist Extra Care
Melliss Avenue - Kew

Air Quality Assessment
October 2018

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Red & Yellow

Quality information

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Revision History

Revision	Revision date	Details	Authorized	Name	Position
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1. Introduction

1.1 This Air Quality Assessment Report has been prepared by AECOM on behalf of Melliss Ave Devco Limited to support a planning application for the Red & Yellow Specialist Extra Care facility on Melliss Avenue, Kew TW9 4BD ('the Proposed Development'), located within the administrative boundary of London Borough of Richmond upon Thames (LBR).

1.2 As described in the planning application material, the development comprises: *Demolition of existing buildings and structures and redevelopment of the site to provide a specialist extra care facility (C2 Use Class) for the elderly with existing health conditions. Comprising, 89 units, with extensive private and communal healthcare, therapy, leisure and social facilities set within a building of ground plus 3 to 5 storeys including set backs. Provision of car and cycle parking, associated landscaping and publicly accessible amenity spaces including a children's play* area. The building is a Specialist Extra Care facility, Planning Use Class C2. The site will offer 27 Car parking Spaces including one drop off/short-term space. 12 of these parking spaces will be for blue badge disables use only.

1.3 The Application Site was formerly the Thames Water Biothane treatment plant associated with Stag Brewery, which is located to the east of Melliss Avenue and bordered on its eastern side by the River Thames. It is currently vacant.

1.4 The development has the potential to affect local air quality during its construction and operation.

1.5 During the construction phase dust and emissions generated by construction activities and the operation of construction plant have the potential to impact upon dust-sensitive receptors and human health. An assessment of potential construction dust impacts has been carried out in accordance with the Mayor of London's Sustainable Design and Construction Supplementary Planning Guidance (SPG)[1]. Mitigation measures have been identified to minimise any potential impacts.

1.6 Operational phase impacts on air quality may arise due to additional vehicle emissions generated by road traffic associated with the Proposed Development. It should be noted that the current lawful site use would itself generate traffic, however, the number of movements associated with this lawful use are not know so this assessment has only focused on the change in existing traffic movement on the local roads as a result of the Proposed Development use which represents a worst-case. These impacts have been assessed quantitatively, using a detailed dispersion model to predict pollutant concentrations at sensitive receptor locations. This also includes the assessment of the introduction of new exposure into an area of potentially poor air quality.

1.7 An 'Air Quality Neutral' assessment has been carried out of the proposed development in fulfilment of The London Plan[2] and Mayor of London's SPG

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requirement that proposed developments in London are at least ‘air quality neutral’ and do not lead to any further deterioration of existing poor air quality. The impacts from the buildings and transport associated with the Proposed Development have been calculated in this assessment.

1.8 The proposed Development will include a Life Safety generator which will provide a secondary means of supply in accordance with BS 9999 Fire safety in the design management and use of buildings. The generator will serve Life Safety Supplies within the development, including but not limited to those serving the following will be provided:

- Sprinklers system
- Evacuation lifts
- Smoke extract fans

1.9 The generator will only run in the event of an emergency and testing, which is likely to be undertaken for less than an hour per month, and as such the assessment of emission from the generator has been excluded from further consideration as its operation will have a negligible effect on air quality.

2. Legislative Framework and Planning

National and European Air Quality Legislation and Policy

Local Air Quality Management

2.1 The provisions of Part IV of the Environment Act 1995 establish a national framework for air quality management, which requires all local authorities in England, Scotland and Wales to conduct local air quality reviews. Section 82(1) of the Act requires these reviews to include an assessment of the current air quality in the area and the predicted air quality in future years. Should the reviews indicate that the objectives prescribed in the UK Air Quality Strategy[3] and the Air Quality (England) Regulations[4,5] will not be met, the local authority is required to designate an Air Quality Management Area (AQMA). Action must then be taken at a local level to ensure that air quality in the area improves. This process is known as 'local air quality management' or LAQM.

UK Air Quality Strategy

2.2 The UK Air Quality Strategy (AQS) identifies nine ambient air pollutants that have the potential to cause harm to human health and two for the protection of vegetation and ecosystems. The Strategy defines objectives for these pollutants that aim to reduce the impacts of these pollutants to negligible levels. The objectives are not mandatory but rather targets that local authorities should try to achieve.

European Air Quality Directives

2.3 The Air Quality Framework Directive (96/62/EC) on ambient air quality assessment and management defines the policy framework for 12 air pollutants known to have a harmful effect on human health and the environment. The limit values for the specific pollutants are set through a series of Daughter Directives. The limit values have been transposed into The Air Quality Standards Regulations 2010 (SI 2010 No. 1001) and are a legal requirement that the UK Government is required to meet.

Air Quality Criteria

2.4 The pollutants of concern for this assessment are NO_2 and particulate matter (PM_{10} and $PM_{2.5}$). The Government's Air Quality Strategy objectives and EU limit values for NO_2 are:

- an annual mean concentration of 40 µg/m^3; and
- a one-hour mean concentration of 200 µg/m^3, not to be exceeded more than eighteen times per year

2.5 The Government's Air Quality Strategy objectives and the EU limit value for PM_{10} are:

[3] Defra (2007). The Air Quality Strategy for England, Scotland, Wales and Northern Ireland
[4] Defra (2000). The Air Quality (England) Regulations, 2000 (SI 2000/928).
[5] Defra (2002). The Air Quality (England) (Amendment) Regulations, 2002 (SI 2002/3043).

- an annual mean concentration of 40 µg/m^3 (gravimetric); and
- a 24-hour mean concentration of 50 µg/m^3 (gravimetric) to be exceeded no more than 35 times per year.

2.6 The Government's Air Quality Strategy objective and the EU limit value for $PM_{2.5}$ is:

- an annual mean concentration of 25 µg/m^3 for the EU limit value; and
- an objective to reduce emissions / concentrations of $PM_{2.5}$

Planning Policy

National Planning Policy

National Planning Policy Framework (2018)

2.7 The revised National Planning Policy Framework (NPPF) was published in July 2018[6] and concisely sets out national policies and principles on land use planning. Paragraph 103 of the NPPF states that:

"The planning system should actively manage patterns of growth in support of these objectives. 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."

2.8 Air quality is considered as an important element of the natural environment. On conserving and enhancing the natural environment, Paragraph 170 states that:

"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 instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality …"

2.9 Air quality in the UK has been managed through the Local Air Quality Management regime using national objectives. The effect of a proposed development on the achievement of such policies and plans are matters that may be a material consideration by planning authorities, when making decisions for individual planning applications. Paragraph 181 of the NPPF 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

[6] Ministry of Housing, Communities & Local Government, 2018

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."

2.10 The different roles of a planning authority and a pollution control authority are addressed by the NPPF in paragraph 183:

"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."

National Planning Practice Guidance (2016, updated 24 July 2018)

2.11 The Planning Practice Guidance (PPG) was updated on 24 July 2018[7], with specific reference to air quality, which was published on 6 March 2014. The PPG states that the planning system should consider the potential effect of new developments on air quality where relevant limits have been exceeded or are near the limit. Concerns also arise where the development is likely to adversely affect the implementation of air quality strategies and action plans and/or, in particular, lead to a breach of EU legislation (including that applicable to wildlife). In addition dust can also be a planning concern, for example, because of the effect on local amenity.

2.12 When deciding whether air quality is relevant to a planning application the PPG states that a number of factors should be taken into consideration including if the development will:

"Significantly affect traffic in the immediate vicinity of the proposed development site or further afield. This could be by generating or increasing traffic congestion; significantly changing traffic volumes, vehicle speed or both; or 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; adds to turnover in a large car park; or result in 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; or extraction systems (including chimneys) which require approval under pollution control legislation or biomass boilers or biomass-fuelled CHP plant; centralised boilers or CHP plant burning other fuels within or close to an air quality management area or introduce relevant combustion within a Smoke Control Area;

Expose people to existing sources of air pollutants. This could be by building new homes, workplaces or other development in places with poor air quality.

Give rise to potentially unacceptable impact (such as dust) during construction for nearby sensitive locations.

[7] Ministry of Housing, Communities & Local Government, 2018

Affect biodiversity. In particular, is it likely to result in deposition or concentration of pollutants that significantly affect a European-designated wildlife site, and is not directly connected with or necessary to the management of the site, or does it otherwise affect biodiversity, particularly designated wildlife sites."

2.13 On how detailed an air quality assessment needs to be, the PPG states:

"Assessments should be proportionate to the nature and scale of the development proposed and the level of concern about air quality... Mitigation options where necessary will be locationally specific, will depend on the proposed development and should be proportionate to the likely impact. It is important therefore that local planning authorities work with applicants to consider appropriate mitigation so as to ensure the new development is appropriate for its location and unacceptable risks are prevented."

Regional Planning Policy

The London Plan

2.14 The London Plan[8] is the overall strategic plan for London, and it sets out a fully integrated economic, environmental, transport and social framework for the development of the capital to 2031. It forms part of the development plan for Greater London. Local plans of London Boroughs need to be in general conformity with the London Plan, and its policies guide decisions on planning applications by councils and the Mayor.

2.15 Improvement of air quality is one of the key policy objectives of the London Plan (Policy 7.14). Under para 7.51 improving air quality, it states:

2.16 "Increased exposure to existing poor air quality should be minimised by avoiding introduction of potentially new sensitive receptors in locations where they will be affected by existing sources of air pollution (such as road traffic and industrial processes). Particular attention should be paid to development proposals such as housing, homes for elderly people, schools and nurseries.

2.17 Where additional negative air quality impacts from a new development are identified, mitigation measures will be required to ameliorate these impacts. This approach is consistent with paragraphs 120 and 124 of the NPPF. These could include on-site measures such as design solutions, buffer zones and smarter travel measures that support and encourage sustainable travel behaviours.

2.18 Where it can be clearly shown that on-site mitigation measure are impractical or inappropriate, and where measures having clearly demonstrated equivalent air quality benefits could be taken elsewhere, local planning authorities should use their planning powers to ensure this.

2.19 The Mayor will produce guidance to assist boroughs in developing supplementary planning documents on air quality for boroughs to assist them in determining planning applications and identifying appropriate offsetting and mitigation measures. Developer contributions and mitigation measures should be secured through planning conditions, Section 106 agreements or the Community Infrastructure Levy, where appropriate."

Mayor of London's Air Quality Strategy

[8] Mayor of London (2016), The London Plan, GLA.

2.20 The Mayor of London's Air Quality Strategy was published in December 2010[9]. The London Air Quality Strategy (Policy 7) states that 'the Mayor will ensure that new developments in London shall as a minimum be 'air quality neutral' through the adoption of best practice in the management and mitigation of emissions.' It should be demonstrated therefore that any development has no significant impact on local air quality in order to obtain approval.

2.21 In addition, Policy 6 of the Mayor's Air Quality Strategy 'Reducing emissions from construction and demolition sites' states the Mayor will work to encourage implementation of Best Practice Guidance for construction and demolition sites across London, through supplementary planning guidance, so as not to pose health risks to people working or living nearby.

Supplementary Planning Guidance (SPG) on Sustainable Design and Construction

2.22 The SPG on sustainable design and construction[10] provides guidance on when air quality assessment requirements are required, explains the air quality neutral policy for buildings and transport and sets emissions standards for combustion plant. The key priorities are:

- Developers are to design their schemes so that they are at least 'air quality neutral'.
- Developments should be designed to minimise the generation of air pollution.
- Developments should be designed to minimise and mitigate against increased exposure to poor air quality.
- Developers should select plant that meets the standards for emissions from gas boilers and combined heat and power and biomass plants as set out in the SPG.
- Developers and contractors should follow the guidance set out in the emerging 'Minimising dust and emissions from construction and demolition' SPG when constructing their development.

SPG on the Control of Dust and Emissions During Construction and Demolition

2.23 This SPG on the control of dust and emissions[11] sets out the requirements for an Air Quality Statement, a dust risk assessment, emission control measures, air quality monitoring and cleaner construction machinery for developments in London. The key requirements are summarised below.

2.24 An Air Quality Statement is required to be submitted to the Local Planning Authority during the application stage, prior to works commencing on site. This Statement shall include:

- Summary of work to be carried out;
- Description of site layout and access;
- Inventory and timetable of all dust and NO_x generating activities;
- Air quality (Dust) risk assessment;

[9] Mayor of London (2010), Clearing the Air, The Mayor of London's Air Quality Strategy, GLA.
[10] Mayor of London (2014), Sustainable Design and Construction Supplementary Planning Guidance, GLA
[11] Mayor of London (2014), The Control of Dust and Emissions during Construction and Demolition Supplementary Planning Guidance, GLA.

- List of all dust and emission control methods to be employed;
- Details of any fuel stored on-site;
- Identification of an authorised responsible person on-site for air quality. This person needs to have knowledge of pollution monitoring and control methods and vehicle emissions;
- Summary of monitoring protocols and agreed procedure of notification to the local authority nominated person(s); and
- A site log book to record details and action taken in response to exceptional incidents or dust-causing episodes and the mitigation measures.

2.25 Non-Road Mobile Machinery (NRMM) to be used on any construction sites need to comply with the latest European emission standards. This is as set out below:

- From 1st September 2015 onwards, all NRMM of net power between 37 kW and 560 kW within Greater London will be required to meet the Stage IIIA of the EU Directive 97/68/EC and its subsequent amendments as a minimum. Compliance of Stage IIIB of the Directive will be required as a minimum of Central Activity Zone or Canary Wharf.
- From 1st September 2020 onwards, all NRMM of net power between 37 kW and 560 kW within Greater London will be required to meet the Stage IIIB of the EU Directive 97/68/EC and its subsequent amendments as a minimum. Compliance of Stage IV of the Directive will be required as a minimum of Central Activity Zone or Canary Wharf.

2.26 This policy is enforced through the planning process and compliance with the NRMM standards should be secured by the local authorities as a planning condition or s106 agreement.

2.27 If emissions of NRMM are unknown, developers will be required to provide a written statement of their commitment and ability to meet these standards as part of the Air Quality Statement.

2.28 An inventory of all NRMM should be kept on-site stating the emission limits for all equipment and made available to local authority officers if required.

Local Planning Policy

London Borough of Richmond upon Thames

2.29 The Local Plan[12] (previously known as Local Development Framework) sets out the priorities for the development of the Borough and is used for making decisions on planning applications. It consists of a number of planning documents and guidance. The new Local Plan was adopted by LBR in July 2018 which replaces the previous policies within the Core Strategy and Development Management Plan. The Plan sets out policies and guidance for the development of the borough over the next 15 years.

2.30 The Local Plan states under Section 2.3 Strategic Objectives of the council are to:

[12] London Borough of Richmond Upon Thames Local Plan as Adopted by the Council 3 July 2018.

"Reduce or mitigate environmental impacts and pollution levels (such as air, noise, light, odour, fumes water and soil) and encourage improvements in air quality, particularly along major roads and areas that already exceed acceptable air quality standards."

2.31 Policy LP2 Building Heights states that:

"Tall or taller buildings can have a greater impact on their environment than other building types, posing problems of overshadowing, overlooking, creation of harmful micro-climates, worsening air quality and harmful effects on residents and amenity spaces. The siting and massing of new buildings will be controlled to avoid harmful intrusions into the skyline and on significant local views."

2.32 Policy LP 10 Local Environmental Impacts, Pollution and Land Contamination states that for air quality:

"The Council promotes good air quality design and new technologies. Developers should secure at least 'Emissions Neutral' development. To consider the impact of introducing new developments in areas already subject to poor air quality, the following will be required:

1. an air quality impact assessment, including where necessary, modelled data;

2. mitigation measures to reduce the development's impact upon air quality, including the type of equipment installed, thermal insulation and ducting abatement technology;

3. measures to protect the occupiers of new developments from existing sources;

4. strict mitigation for developments to be used by sensitive receptors such as schools, hospitals and care homes in areas of existing poor air quality; this also applies to proposals close to developments used by sensitive receptors.

Good air quality is vital to the health and wellbeing of the borough. There are a number of areas in the borough that do not comply with the air quality targets and action must be taken to control, minimise and reduce the contributing factors of poor air quality.

The whole of the borough has been declared as an Air Quality Management Area (AQMA) and as such any new development and its impact upon air quality must be considered very carefully. Strict mitigation will be required for any developments proposed within or adjacent to 'Air Quality Focus Areas'. An 'Air Quality Focus Area' is a location that has been identified as having high levels of pollution (i.e. exceeding the EU annual mean limit value for nitrogen dioxide) and human exposure. Air Quality Focus Areas are designated by the Greater London Authority. The Council will consider the impact of introducing new developments to areas already subject to poor air quality, and the impact on the new occupiers of that development, especially in sensitive uses such as schools.

The Council will seek financial contributions through the use of Planning Obligations towards air quality measures where a proposed development is not air quality neutral or mitigation measures do not reduce the impact upon poor air quality."

2.33 This policy also states for states that for Construction and demolition

"There is a need to ensure that occupiers are protected from environmental disturbances during the construction and demolition phase of major developments, and in particular during excavating and construction of subterranean developments such as basements.

The Council requires the submission of Construction Management Statements (CMS) for the types of developments as set out in the policy. In addition, the Council's Good Practice Guide on Basement Developments sets out guidance to ensure that problems relating to excavation and constructions of basements, such as highway/parking impacts, noise, dust, vibration and disturbance to neighbours, are avoided. Developers of basements are also expected to sign up to a Considerate Construction Scheme. To manage the environmental impacts and ensure that the Construction Management Statements are adhered to, the Council will seek a charge to the applicant/developer to cover the cost of monitoring the CMS. Where an applicant/developer uses the Council's Building Control services, a discount may be applied to this charge.

The Council may also consider requiring a Construction Logistics Plan (CLP) in areas that are subject to high traffic congestion to ensure that vehicles entering the site do not adversely impact on local traffic.

The Council may also require a management plan that sets out how developers monitor dust, noise and vibration, and where necessary take the appropriate action if issues arise.

It will also be necessary to control the hours of operation for noisy site works and the processes that would need to be followed in order to work outside these hours when and if required.

As part of the Council's commitment to better air quality, the Council will also request, through planning conditions, that the GLA Regulation relating to Non Road Mobile Machinery (NRMM) is imposed where necessary."

Other Relevant Policy, Standards and Guidance

2.34 The Mayor of London has issued London specific LAQM Technical Guidance (LLAQM.TG(16))[13] on how London local authorities should assess air quality for Local Air Quality Management (LAQM) purposes. This includes guidance on estimating emissions, screening tools and monitoring. Additional information is available in the LAQM Technical Guidance (LAQM.TG(16)) on dispersion modelling (Ref. 5-17) which has also been used in this assessment. The Mayor has also issued Policy Guidance (LLAQM.PG(16))[14] to accompany the London Technical Guidance. This provides guidance on AQMAs, action plans, $PM_{2.5}$ and public health, and planning and the building control system.

2.35 Institute of Air Quality Management (IAQM) and Environmental Protection United Kingdom (EPUK) on Land Use Planning and Development Control[15].

[13] Defra (2016), Local Air Quality Management, Technical Guidance 2016 (LAQM.TG(16)), Defra.
[14] Mayor of London (2016), London Local Air Quality Management, Policy Guidance (LLAQM.PG(16)), GLA.
[15] IAQM/EPUK (2017) Land use planning and development control: planning for air quality, January 2017 (v1.2), IAQM.

3. Methodology

3.1 This section presents the methodology used to assess the potential effects on air quality during the construction phase and the operational phase of the Proposed Development.

Study Area

3.2 The geographic scope of the air quality assessment with regards to construction phase impacts, in accordance with IAQM guidance for the assessment of dust during demolition and construction, is defined as up to 350m from the Site boundary and 50m from the site traffic route(s) up to 500m of the Site entrance, within which there could be the potential for dust soiling and PM_{10} effects on human receptors. For sensitive ecological receptors, the corresponding distances are 50m in both cases. This study area is illustrated in Appendix A Figure 1.

3.3 The study area for operational phase impacts is defined on the basis of changes in road traffic flows associated with the Proposed Development, as determined by the Transport Assessment, and where there is the potential for members of the public or sensitive habitats to be affected. The study area is shown in Appendix A Figure 2.

3.4 Receptors potentially sensitive to air quality have been identified from a review of Ordnance Survey (OS) mapping and aerial photography of the area surrounding the Proposed Development.

Identifying Likely Effects

3.5 The Proposed Development has the potential to result in air quality effects during construction and operational phases. The potential impacts of the following emission sources have been assessed, as these are considered to have the potential to give rise to the greatest effects:

- Fugitive construction dust and PM_{10} emissions; and
- Road traffic generated by the operational Proposed Development using the local road network.

3.6 Construction phase impacts have been assessed across the construction phase period, taking account of periods of peak construction activity.

3.7 Descriptions of the methodologies used to assess the likely construction phase and operational effects of the Proposed Development are outlined in the following sections.

Construction

3.8 Construction phase activities associated with the Proposed Development have the potential to generate dust emissions that could result in dust soiling and/or air quality impacts at nearby sensitive receptors. The main impacts that may occur due to construction phase activities are:

- Dust deposition, resulting in the soiling of surfaces;

- Visible dust plumes, which are evidence of dust emissions; and
- Elevated PM_{10} concentrations as a result of dust-generating activities on site.

3.9 The potential risks of dust impacts have been identified and assessed in accordance with IAQM dust guidance. The potential risk of dust impacts is assessed for each of the four activity categories that are likely to generate dust and emissions on construction sites, taking account of the scale and nature of the works, and the sensitivity of the surrounding area:

- Demolition – any activities associated with the removal of existing structures on site;
- Earthworks – including the processes of soil-stripping, ground-levelling, excavation and landscaping;
- Construction – any activities relating to the provision of new structures on site; and
- Track-out – the transport of dust and dirt from the construction site onto the public road network where it may be deposited and resuspended by traffic using the network.

3.10 The IAQM Dust Guidance assigns sensitivities to receptors with respect to dust soiling, human health, and ecological effects. These are set out in Table 1 to Table 3.

Table 1: Receptor Sensitivity Descriptors with respect to Dust Soiling

Value (Sensitivity)	Descriptor
High	Locations where users can reasonably expect enjoyment of a high level of amenity; or Appearance, aesthetics or value of property would be diminished by soiling; and People / 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. e.g. residential dwellings, museums, medium/long-term car parks, car showrooms.
Medium	Locations where users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; or Appearance, aesthetics or value of property could be diminished by soiling; or 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. e.g. parks and places of work
Low	Enjoyment of amenity would not reasonably be expected; or Property would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling; or 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. e.g. playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks and roads

Table 2: Receptor Sensitivity Descriptors with respect to Human Health Effects

Value (Sensitivity)	Descriptor
High	Locations where members of the public are exposed over a time period relevant to the 24-hour objective for PM_{10} (a relevant location would be where individuals may be exposed for 8 hours or more in a day). e.g. residential dwellings, hospitals, schools, residential care homes.
Medium	Locations where the people exposed are workers, and exposure is over a time period relevant to the 24-hour objective for PM_{10} (a relevant location would be where individuals may be exposed for 8 hours or more in a day). e.g. office and shop workers, generally excludes workers occupationally exposed to PM_{10}, as protection is covered by Health and Safety at Work legislation.
Low	Locations where human exposure is transient. e.g. public footpaths, playing fields, parks and shopping streets.

Table 3: Receptor Sensitivity with respect to Ecological Effects

Value (Sensitivity)	Descriptor
High	Locations with an international/national designation and 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. e.g. Special Area of Conservation (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	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. e.g. a Site of Special Scientific Interest (SSSI) with dust sensitive features.
Low	Locations with a local designation where the features may be affected by dust deposition. e.g. a local Nature Reserve with dust sensitive features.

3.11 Risks are described in terms of there being a low, medium or high risk of dust impacts for each of the four activity categories. Where there is uncertainty regarding the level of risk associated with the activity a precautionary approach should be taken with the higher risk category being applied. The level of risk determines the site-specific mitigation measures required to ensure that there will be no significant effect.

Operational Development

3.12 This section describes how the likely operational effects of the Proposed Development have been assessed.

3.13 The following scenarios have been assessed:

- Model verification (2016) using 2016 emission rates for comparison against published 2016 monitoring data from LBR;
- 'Without' the Development – opening year of the Proposed Development 2020 excluding development traffic emissions.; and
- 'With' the Development - opening year of the Proposed Development 2020 including development traffic emissions.

3.14 Operational phase air quality impacts for the Proposed Development have been assessed quantitatively using the ADMS-Roads (Version 4.1.1) detailed dispersion model to assess road contributions. Dispersion modelling has been undertaken in accordance with Defra's Local Air Quality Management Technical Guidance (LLAQM.TG(16)) and Defra's Emission Factor Toolkit (EFT) version 8.0[16] which provides road vehicle emission factors and fleet composition data.

3.15 The effects of the Proposed Development on air quality will be influenced by a number of factors. These include background pollution levels and the level of traffic emissions, which is dictated by traffic flow rates, vehicle flow composition and speed.

3.16 Concentrations of NO_2, PM_{10} and $PM_{2.5}$ have been predicted at 19 sensitive receptor locations in the study area including 15 off-site receptors (residential and non-residential - i.e. local school) and 4 receptors representative of the façade of Proposed Development, outside dining area and children's play area. Details of the modelled sensitive receptors are presented in Table 4. Maps of the modelled receptors are provided in Figure 2.

Table 4: Modelled Receptor Locations

Receptor Number	Receptor Status	Description	X co-ordinate	Y co-ordinate	Modelled Height (m)
1	Existing	68 Melliss Ave, Richmond	519736	176863	1.5
2	Existing	48 Melliss Ave, Richmond	519718	176909	1.5
3	Existing	35 Melliss Ave, Richmond	519705	176851	1.5
4	Existing	Saffron House, 7 Woodman Mews, Richmond	519739	176840	1.5
5	Existing	Lime House, 33 Melliss Ave, Richmond	519715	176801	1.5
6	Existing	123 Mortlake Rd, Richmond	519444	176786	1.5
7	Existing	Kew Meadows Path, Richmond	519874	176452	1.5
8	Existing	Kew Riverside Primary School	519774	176546	1.5
9	Existing	Kew Riverside Primary School	519838	176402	1.5
10	Existing	Kew Riverside Primary School	519787	176379	1.5
11	Existing	Kew Meadows Path, Richmond	519816	176455	1.5
12	Existing	217 Mortlake Rd, Richmond	519698	176433	1.5
13	Existing	3 Taylor Ave, Richmond	519599	176464	1.5
14	Existing	165 Mortlake Rd, Richmond	519489	176574	1.5
15	Existing	242 Mortlake Rd, Richmond	519803	176157	1.5
16	Proposed	Front Façade of Proposed Development	519732	176926	1.5
17	Proposed	Front Façade of Proposed Development	519775	176933	1.5
18	Proposed	Rear Façade/outside dining area of Proposed Development	519526	176732	1.5
19	Proposed	Rear Façade/children's play area of Proposed Development	519808	176895	1.5

3.17 The main inputs required to undertake the air quality dispersion modelling are:

- Traffic data;

[16] Defra (2017), Emission Factor Toolkit v8.0, http://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html

- Vehicle emission factors;
- Roads model verification;
- Meteorological data;
- NO_x to NO_2 conversion; and
- Background pollutant concentrations.

3.18 These inputs are described in the following sections.

Traffic Data

3.19 The traffic data used in the study is described in more detail in the Traffic Assessment which has been prepared in support of the planning application and the traffic data used for the air quality assessment is summarised in Appendix B Table 25. For each road link and each assessment scenario, the following data were input into the model:

- Annual average daily traffic (AADT) flows;
- Proportion of Heavy-Duty Vehicles (HDV), which consists of Heavy Goods Vehicles (HGVs), buses and coaches; and
- Traffic speeds (kph).

Emission Factors

3.20 Vehicle emission factors for NO_x, PM_{10} and $PM_{2.5}$ were taken from Defra's EFT version 8.0, using the "London (outer)" vehicle fleet composition and the "Basic Split" traffic format.

3.21 Vehicle emission rates are expected to decrease in the future due to increasingly stringent Euro emission standards but there is uncertainty as to the rate of improvement for NO_x emissions from diesel vehicles in light of recent measurements of exhaust emissions and ambient air quality.

Roads Model verification

3.22 The performance of the dispersion model was assessed by comparing the modelled concentrations with measured concentrations. Meteorological data from 2016, monitored concentrations from 2016 and Defra EFT version 8.0 vehicle emission rate data for 2016 was used for the model verification. Table 5 presents a summary of the model performance prior to bias adjustment.

Table 5: Model Performance Pre Bias Adjustment

Monitoring site	Measured NO_2 ($\mu g/m^3$)	Modelled NO_2 ($\mu g/m^3$)	% difference (modelled – measured / measured)
DT20	47.0	37.3	-20.6
DT54	49.0	37.7	-23.0
DT55	50.0	34.8	-30.4

3.23 These comparisons show that the model had a tendency to under predict annual mean concentrations of NO_2. Model verification was, therefore, carried out and an adjustment factor calculated and applied in all scenarios, in accordance with the methodology prescribed in LLAQM.TG(16). A regression analysis was undertaken of modelled and measured road NO_x concentrations at these locations. The derived adjustment factor, 2.17, was then applied to the modelled road NO_x concentrations to adjust for model bias. The comparison of

modelled with measured values was then repeated following this adjustment and the results are shown in Table 6.

Table 6: Model Performance Post Bias Adjustment

Monitoring site	Measured NO_2 ($\mu g/m^3$)	Modelled NO_2 ($\mu g/m^3$)	% difference (modelled – measured / measured)
DT20	47.0	49.6	5.4
DT54	49.0	50.3	2.7
DT55	50.0	44.9	-10.3

3.24 The accuracy of the adjusted model was also considered via the calculation of the Root Mean Square Error (RMSE) and fractional bias. For the unadjusted model results the RMSE was 37.1 $\mu g/m^3$ and this reduced to 3.4 $\mu g/m^3$ post verification. As the post adjustment RMSE is below the 4.0 $\mu g/m^3$ maximum recommended, the adjusted model is considered robust when compared to actual monitored data. The fractional bias was 1.2 with the unadjusted model, and was reduced to 0.0 following adjustment and demonstrates that the model neither over nor under predicts concentrations significantly post verification.

3.25 The adjustment factors described above were applied at all receptors within the study area. In the absence of suitably located sampled PM_{10} or $PM_{2.5}$ data, the same factor has been applied to the modelled road PM_{10} and $PM_{2.5}$ contributions, as recommended in LLAQM.TG(16).

Meteorological Data

3.26 Meteorological data from Heathrow Airport, located approximately 10km to the west of the Site for 2016 has been used in the modelling, as this is considered to be the nearest data source representative of meteorological conditions in the study area. Meteorological data for 2016 has been used in the roads modelling to maintain consistency with the verification year.

NO_x to NO_2 Conversion

3.27 The proportion of NO_2 in NO_x varies greatly with location and time according to a number of factors including the amount of ozone available and the distance from the emission source.

3.28 Defra produces a NO_x to NO_2 Calculator spreadsheet tool[17] which provides a methodology for converting road NO_x concentrations to NO_2 concentrations for any given year up to 2030. This conversion methodology has been used for the purpose of this assessment. The current NO_x to NO_2 Calculator is version 6.1 and is designed to be used in combination with the 2015-reference year background maps and version 8.0 of the EFT. The traffic mix option used was the 'All London Traffic' option.

NO_2 Hourly Mean Objective

3.29 The assessment evaluates the likelihood of exceeding the hourly mean NO_2 objective by comparing predicted annual mean NO_2 concentrations at all receptors to an annual mean equivalent threshold of 60$\mu g/m^3$ NO_2. Defra's LAQM.TG(16) states that the hourly mean NO_2 objective is unlikely to be exceeded if annual mean concentrations are less than 60$\mu g/m^3$.

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3.30 Where predicted concentrations are below this value, it can be concluded that the hourly mean NO_2 objective (200µg/m^3 NO_2 not more than 18 times per year) will be achieved.

Predicting the Number of Days in which the PM_{10} 24-hr Mean Objective is Exceeded

3.31 In order to assess model results against the Air Quality Strategy 24-hour mean objective for PM_{10}, Defra's LAQM.TG(16) sets out a method by which the number of days in which the PM_{10} 24-hr objective is exceeded can be obtained based on a relationship with the predicted PM_{10} annual mean concentration. The Defra calculation is:

3.32 Number of exceedances = -18.5 + 0.00145 x annual mean^3 + (206/annual mean)

Background Pollutant Concentrations

3.33 A large number of small sources of air pollutants exist, which individually may not be significant, but collectively, over a large area, need to be considered in the modelling process. Emissions from these background sources were applied to the model as background concentrations. The background air quality has been investigated as part of the study and this is presented in Section 4.

Air Quality Neutral

3.34 As discussed above, the London Plan requires that all new development should be at least 'air quality neutral'. Therefore, the Proposed Development has been assessed to determine whether it meets the 'air quality neutral' criteria in-line with the guidance. This requires that building and transport related emissions of NO_x and PM_{10} associated with the operational phase of the Proposed Development are calculated and then compared to the relevant benchmarks.

3.35 The Proposed Development comprises up to 11,977m^2 of 'Residential Institutions Excluding hospitals' (Class C2). Transport Emission Benchmarks have been provided in the guidance for retail (A1), office (B1) and residential (C3) land uses but not for other land use categories. A Transport Emission Benchmark (TEB) is not currently available for Land Use Class C2. The Air Quality Neutral Planning Support guidance note states that "where a specific TEB has not been calculated, it will be possible to show that a development would meet the benchmark if the scheme-generated trip rate for a particular land-use class does not exceed the benchmark trip rate derived from TRAVL".

3.36 TRAVL, or 'Trip Rate Assessment Valid for London', is a multi-modal trip generation database to estimate the effect of proposed changes in land use on transport patterns and, in particular, on the amount of road traffic in an area. For a Class C2 development located in Outer London, the TRAVL benchmark for the average number of trips generated is 19.5 trips/m2/annum.

Impact Descriptors

Construction Phase

3.37 For effects on amenity (including those associated with dust), the aim is to bring forward a construction phase that includes appropriate mitigation measures that avoids the potential for complaints to be generated.

3.38 Experience in the UK shows that good site practice is capable of mitigating the impact of fugitive emissions of particulate matter effectively, so that in all but the most exceptional circumstances, effects at sensitive receptors can be controlled to ensure that effects are negligible or slight adverse (i.e. 'not significant') (see Table 7).

Table 7: Descriptors Applied to the Predicted Effects of Fugitive Emissions of Particulate Matter

Impact Descriptors of Effect at Single Receptor	Description
Substantial	A significant effect that is likely to be a material consideration in its own right.
Moderate	A significant effect that may be a material consideration in combination with other significant effects, but is unlikely to be a material consideration in its own right.
Slight	An effect that is not significant but that may be of local concern.
Negligible	An effect that is not significant change.

3.39 Construction dust effects generally occur when high risk dust generating activities coincide with adverse meteorological conditions. Therefore, even without mitigation, any impact would be limited to events that are infrequent and short-term in nature. Mitigation measures must be defined in a form suitable for implementation by way of planning conditions (e.g. through a CEMP) or legal obligations within a section 106 agreement.

Operational Phase

3.40 Receptors selected to represent locations where people are likely to be present are based on potential impacts on human health. The air quality objectives and limit values have been set at concentrations that provide protection to all members of society, including more vulnerable groups such as the very young, elderly or unwell. The air quality objectives apply at locations where members of the public could be present over the averaging period stated in the criteria. The objectives and limit values do not apply in workplaces as the workforce is considered to be less vulnerable to air pollution than the general public.

3.41 According to the EPUK & IAQM Air Quality Guidance determining whether a development has a significant effect on local air quality requires:

- a qualitative or quantitative description of the impacts on local air quality arising from the development; and
- professional judgement on the overall significance of the effects.

3.42 The first of these stages is addressed using Table 8 to Table 10. The air quality impacts associated with a development at sensitive receptor locations are assigned descriptors based on the percentage change in pollutant concentration relative to the Air Quality Assessment Level ('AQAL') and the total predicted pollutant concentration expressed as a percentage of the AQAL. The AQAL in this case is the AQS objective / limit value. The impact descriptors may be adverse or beneficial depending upon whether pollutant concentrations are predicted to increase or decrease, respectively, as a result of a development.

Table 8: Effects Descriptors at Individual Receptors – Annual Mean NO_2 and PM_{10}

Annual Mean Pollutant Concentration at Receptor in Assessment Year	Annual Mean Pollutant Concentration at Receptor in Assessment Year as a % of the AQAL	Change in Annual Mean Concentration of NO_2/PM_{10} ($\mu g/m^3$)[a] and Percentage (%) as a proportion of the AQAL[b]				
		<0.2 $\mu g/m^3$ (0%)	0.2-<0.6 $\mu g/m^3$ (1-2%)	0.6-<2.2 $\mu g/m^3$ (2-5%)	2.2 -<4 $\mu g/m^3$ (6% - 10%	>4 $\mu g/m^3$ (>10%
≤30.2	≤ 75%	Negligible	Negligible	Negligible	Slight	Moderate
30.2 – 37.8	76 – 94%	Negligible	Negligible	Slight	Moderate	Moderate
37.8 – 41.0	95 – 102%	Negligible	Slight	Moderate	Moderate	Substantial
41.0 – 43.8	103 – 109%	Negligible	Moderate	Moderate	Substantial	Substantial
≥43.8	≥ 110%	Negligible	Moderate	Substantial	Substantial	Substantial

Notes: AQAL = Air Quality Assessment Level. The AQAL will be equal to the annual mean air quality objective/ EU limit value for the pollutant being assessed. The nature of the effects may be adverse, negligible or beneficial, depending upon whether concentrations increase, remain the same, or decrease as a result of the scheme.

[a] Absolute concentrations quoted to which the percentages correspond have been provided by IAQM (personal communication, 2015) and are based on annual mean NO_2 / PM_{10} concentrations.

[b] The percentage change in pollutant concentration is calculated and rounded to the nearest whole number to make it clearer which column the impacts fall within. Changes of less than 0.5% are rounded down to zero and described as negligible.

Table 9: Effects Descriptors at Individual Receptors – Annual Mean $PM_{2.5}$

Annual Mean Pollutant Concentration at Receptor in Assessment Year	Change in Annual Mean Concentration of $PM_{2.5}$ ($\mu g/m^3$) and Percentage (%) as a proportion of the EU Limit Value				
	<0.1 $\mu g/m^3$ (0%)	0.1-<0.4 $\mu g/m^3$ (1- 2%)	0.4-<1.4 $\mu g/m^3$ (2-5%)	1.4 -<2.5 $\mu g/m^3$ (6% - 10%	>2.5 $\mu g/m^3$ (>10%
≤18.9	Negligible	Negligible	Negligible	Slight	Moderate
18.9 - 23.6	Negligible	Negligible	Slight	Moderate	Moderate
23.6 - 25.6	Negligible	Slight	Moderate	Moderate	Substantial
25.6 - 27.4	Negligible	Moderate	Moderate	Substantial	Substantial
≥27.4	Negligible	Moderate	Substantial	Substantial	Substantial

Adapted from the EPUK & IAQM Air Quality Guidance.

3.43 For determining the air quality impacts of a development on short-term PM_{10} concentrations (i.e. the number of days of PM_{10} greater than 50$\mu g/m^3$), the Guidance suggests using an adapted version of Table 8 and a derived value for the AQAL equivalent to 35 days per year of PM_{10} concentrations greater than 50$\mu g/m^3$. An annual mean PM_{10} concentration of 32$\mu g/m^3$ is broadly equivalent to 35 days of exceedance; and as such this value has been used as the AQAL and has been used to calculate the changes in concentration thresholds for assessing the air quality impacts on short-term (daily) PM_{10} concentrations, as set out in Table 10.

Table 10: Local Air Quality Impact Descriptors for Daily PM_{10} Concentrations at Individual Receptors

Mean Pollutant Concentration at Receptor	Mean Pollutant Concentration at Receptor as a % of the AQAL	Change in Annual Mean Concentration of PM_{10} ($\mu g/m^3$)[a] and Percentage (%) as a proportion of the AQAL[b]				
		<0.2 $\mu g/m^3$ (0%)	0.2-<0.5 $\mu g/m^3$ (1-2%)	0.5-<1.8 $\mu g/m^3$ (2-5%)	1.8 -<3.2 $\mu g/m^3$ (6% - 10%	>3.2 $\mu g/m^3$ (>10%

Mean Pollutant Concentration at Receptor	Mean Pollutant Concentration at Receptor as a % of the AQAL	Change in Annual Mean Concentration of PM_{10} ($\mu g/m^3$)[a] and Percentage (%) as a proportion of the AQAL[b]				
		<0.2 $\mu g/m^3$ (0%)	0.2-<0.5 $\mu g/m^3$ (1-2%)	0.5-<1.8 $\mu g/m^3$ (2-5%)	1.8 -<3.2 $\mu g/m^3$ (6% - 10%	>3.2 $\mu g/m^3$ (>10%
<24.2	≤ 75%	Negligible	Negligible	Negligible	Slight	Moderate
24.2 – <30.2	76 – 94%	Negligible	Negligible	Slight	Moderate	Moderate
30.2 – <32.8	95 – 102%	Negligible	Slight	Moderate	Moderate	Substantial
32.8 – <35.0	103 – 109%	Negligible	Moderate	Moderate	Substantial	Substantial
>=35.0	≥ 110%	Negligible	Moderate	Substantial	Substantial	Substantial

Notes: Adapted from the EPUK & IAQM Air Quality Guidance. AQAL = Air Quality Assessment Level. For the assessment of short-term PM_{10} impacts, the AQAL is calculated as 32 $\mu g/m^3$, which is equivalent to 35 days per year.
[a] Absolute concentrations quoted to which the percentages correspond have been provided by IAQM (personal communication, 2015) and are based on annual mean NO_2 / PM_{10} concentrations.
[b] The percentage change in pollutant concentration is calculated and rounded to the nearest whole number to make it clearer which column the impacts fall within. Changes of less than 0.5% are rounded down to zero and described as negligible.

3.44 The EPUK/IAQM guidance notes that overall significance is determined using professional judgement and should consider:

- The existing and future air quality in the absence of development;
- The extent of current and future population exposure to any air quality impacts associated with the development;
- The influence and validity of any assumptions made in the assessment approach;
- The cumulative effects arising from other committed developments in the study area; and
- The introduction of new occupants into the proposed development and the levels of air pollution to which they are likely to be exposed.

3.45 The significance of the reported effects is then considered for the proposed development in overall terms but the principal focus is in determining the significance of any change to the likelihood of future achievement of the air quality objectives and limit values set out in Table 1.

Limitations and Assumptions

3.46 The assessment of the operational phase of the Proposed Development has adopted the following limitations and conservative assumptions:

3.47 The local air quality impacts have been assessed based on the results from atmospheric dispersion modelling. A series of assumptions have been made in relation to the dispersion modelling used to predict the air quality effects of the Proposed Development. These have been outlined in the assessment methodology.

3.48 By carrying out model verification and adjusting the results in line with measured concentrations, the uncertainty in the predictions for the current baseline is reduced.

3.49 A greater level of uncertainty is associated with predictions for future years than for the base year, with greater uncertainty the further into the future the predictions are made. The assumptions made in relation to traffic flows, vehicle emission rates and vehicle fleet composition are expected to be the most uncertain.

3.50 Road traffic emissions modelling has used traffic data provided by the project traffic consultants;

3.51 Road traffic emissions related impact predictions have been checked against baseline monitoring data to capture and adjust variations in model performance; and

3.52 Worst case receptors have been assumed, which represents the location of maximum exposure of air pollutants within an area.

4. Baseline

Summary of Local Air Quality Management

4.1 In 2000 LBR concluded that the Borough-wide levels of NO_2 and PM_{10} would not meet their relevant AQS objectives by the time they became applicable. As such, LBR declared the entire Borough an AQMA attributed to localised vehicle emissions. LBR 2015 Updating and Screening Assessment stated that, "*NO_2 continued to exceed one or more of the Government's air quality objectives within the Borough, therefore it is necessary to continue to maintain the AQMA*". The 2016 and 2017 LBR Air Quality Annual Status Reports show annual mean NO_2 concentrations have remained similar to previous results and findings, and the AQMA should remain, though monitored annual concentrations of PM_{10}, and $PM_{2.5}$, were well below the AQS objective as were the number of exceedences of the daily PM_{10} objective.

Local Authority Air Quality Monitoring

4.2 LBR currently has continuous monitoring at two permanent sites, with a third site operated by Defra as part of the Automatic Urban Rural Network (AURN) located at the National Physical Laboratory (NPL). LBR also operates a Mobile Air Quality Unit which is predominantly used to monitor roadside locations, however due to the frequency that this monitor is relocated it has not been considered further in this assessment. The measured concentrations at the three static locations within the Borough are shown in Table 11 and the locations of these monitors illustrated in Figure 3. All of the measured concentrations were within the objectives / limit vales.

Table 11: Annual Mean Results of Automatic NO_2 Monitoring Sites

Site ID	Site name	X,Y	Approx. distance to site (km)	Site type	Annual mean NO_2 concentration (µg/m³) with Number of hours NO_2 1-hour means >200 µg/m³ in parentheses				
					2012	2013	2014	2015	2016
RI1	Castelnau Library, Barnes	522500, 177165	2.7	Roadside	37 (0)	39 (2)	37 (0)	34 (0)	36 (0)
RI2	Wetlands Centre, Barnes	522991, 176495	3.2	Suburban	25 (0)	24 (0)	25 (0)	21 (0)	25 (0)
TD0	NPL - Teddington AURN	515542, 170420	7.8	Suburban	36 (0)	21 (0)	27 (0)	19 (0)	22 (0)

Notes: Exceedances of the NO_2 annual mean objective / limit value of 40µg/m^3 are shown in bold. Exceedances of the NO_2 1-hour mean objective / limit value (200µg/m^3 not to be exceeded more than 18 times/year) are shown in bold and underlined.
Results obtained from LBR 2017 Air Quality Annual Status Report

Table 12: Annual Mean Results of Automatic PM_{10} Monitoring Sites

Site ID	Site name	X,Y	Approx. distance to site (km)	Site type	Annual mean PM_{10} concentration (µg/m³) with Number of days >50 µg/m³ in parentheses				
					2012	2013	2014	2015	2016
RI1	Castelnau Library, Barnes	522500,	2.7	Roadside	21 (14)	22 (10)	20 (4)	22 (5)	20 (7)

		177165							
RI2	Wetlands Centre, Barnes	522991, 176495	3.2	Suburban	18 (13)	20 (6)	18 (3)	17 (1)	16 (3)

Notes: Exceedances of the PM_{10} annual mean objective / limit value of 40µg/m^3 are shown in bold. Exceedances of the daily objective / limit value (50µg/m^3 not to be exceeded more than 35 times/year) are shown in bold and underlined.
Results obtained from LBR 2017 Air Quality Annual Status Report

Table 13: Annual Mean Results of Automatic $PM_{2.5}$ Monitoring Sites

Site ID	Site name	X,Y	Approx. distance to site (km)	Site type	Annual mean $PM_{2.5}$ concentration (µg/m³)				
					2012	2013	2014	2015	2016
TD0	NPL - Teddington AURN	515542, 170420	7.8	Suburban	11.5	16.7	N/A	N/A	N/A

Notes: The NPL site ended $PM_{2.5}$ monitoring in mid-2013. Exceedances of the $PM_{2.5}$ annual mean objective / limit value of 25µg/m^3 are shown in bold. Results obtained from LBR 2017 Air Quality Annual Status Report

4.3 LBR also operates a network of NO_2 diffusion tubes, covering 70 locations within the city. Details of each location within 3.5km of the Site are presented in Table 15 and illustrated in Figure 3. The majority of the kerbside sites measured concentrations above the annual mean objective / limit value.

Table 14: Annual Mean Results of NO_2 Diffusion Tube Sites within 3 km of the Site

Site ID	X,Y	Approx. distance to site (km)	Site type	Annual mean NO_2 concentration (µg/m³)				
				2012	2013	2014	2015	2016
54	519585,176492	0.5	kerbside	**55**	**54**	**56**	**51**	**49**
20	519205,177221	0.6	kerbside	**53**	**51**	**55**	**48**	**47**
55	519793,176142	0.8	kerbside	**48**	**52**	**55**	**50**	**50**
66	519060,177428	0.9	kerbside	-	-	-	-	**49**
21	520053,175826	1.1	roadside	**43**	**44**	**41**	37	39
52	519776,175746	1.2	kerbside	**59**	**59**	**62**	**55**	**57**
Rut 03	520348,175849	1.2	background	-	-	**42**	-	-
51	520497,175790	1.3	kerbside	36	34	34	28	32
19	518637,176161	1.4	kerbside	**56**	**53**	**55**	**48**	**49**
50	519962,175321	1.6	kerbside	**63**	**61**	**60**	**57**	**55**
18	518822,175590	1.6	kerbside	**68**	**71**	**66**	**67**	**56**
36	520510,175393	1.7	kerbside	**54**	**56**	**56**	**49**	**50**
49	520505,175390	1.7	kerbside	**47**	**45**	**45**	39	**44**
62	521651,176430	1.9	kerbside	-	**54**	**52**	**46**	**51**
24	521750,177056	2.0	kerbside	**40**	**40**	**40**	35	37
25	521130,175450	2.0	roadside	**47**	**51**	**51**	**45**	**46**
26	519031,175021	2.0	roadside	**42**	**43**	**42**	**40**	**40**
44	518458,175042	2.3	kerbside	**46**	**45**	**45**	39	**42**
42	518080,175259	2.4	roadside	**56**	**58**	**54**	**47**	**82**
41	518102,174854	2.7	kerbside	**45**	**42**	**41**	38	39
Rut 02	517917,174928	2.7	kerbside	**95**	**94**	**88**	**88**	**96**
23	522502,177166	2.7	roadside	38	39	38	35	35

17	517822,174755	2.9	kerbside	**70**	**68**	**68**	**63**	**69**
27	518663,174208	2.9	roadside	**41**	**40**	38	37	**43**
28	519467,173993	3.0	background	22	21	18	17	21
43	517771,174701	3.0	kerbside	**78**	**87**	**80**	**80**	**85**
37	522989,176727	3.2	background	25	25	22	21	25
22	522845,177904	3.2	kerbside	**51**	**57**	**59**	**53**	**65**
39	517592,174404	3.3	roadside	**62**	**56**	**56**	**52**	**55**
16	517558,174369	3.4	roadside	**45**	**44**	**43**	**41**	**42**

Notes: Exceedances of the NO_2 annual mean objective / limit value of 40µg/m^3 are shown in bold.
NO_2 annual means exceeding 60 µg/m^3, indicating a potential exceedance of the NO_2 1-hour mean objective / limit value are shown in bold and underlined.
Results obtained from LBR 2017 Air Quality Annual Status Report.

Defra Mapped Background Pollutant Concentrations

4.4 A large number of small sources of air pollutants exist, which individually may not be significant, but collectively, over a large area, need to be considered in the modelling process. Pollutants emissions from these sources contribute to background air quality, which when added to modelled emissions allow estimates of total ambient pollutant concentrations to be made.

4.5 Defra has produced maps of background pollutant concentrations[18] covering the whole of the UK for use by local authorities and consultants in the completion of LAQM reports and Air Quality Assessments where local background monitoring is unavailable or inappropriate for use. Defra maps provide background pollutant concentrations for each 1-km grid square within the UK for all years between 2015 and 2030.

4.6 Table 15 presents a comparison of the monitored urban background NO_2 monitoring undertaken by LBR (automatic monitors RI2 and TD0 and diffusion tube locations 28 and 37) in comparison to the Defra mapped background concentrations. The difference between measured and mapped NO_2 annual mean is up to -15.9%.

Table 15: Mapped Annual Mean Background NO_2 Concentrations (µg/m^3) Compared to Monitored Urban Background Diffusion Concentrations

Background Diffusion Tube		Background Map				
ID	Annual mean NO_2 Concentration (µg/m^3)	x	y	Annual Mean NO_2 Concentration (µg/m^3)	Difference (µg/m^3)	Relative difference
RI2	25	519500	173500	24.1	-0.9	-3.5%
TD0	22	522500	176500	18.7	-3.3	-14.9%
DT28	21	522500	176500	17.7	-3.3	-15.9%
DT37	25	515500	170500	24.1	-0.9	-3.5%

4.7 Table 15 demonstrates that the Defra mapped background concentrations under estimate background NO_2 concentrations within the Borough. Background air quality will therefore be established based on monitored background concentrations to represent a worst-case scenario. For the purposes of this study automatic monitoring location RI2 has been used to establish background air quality. This monitor is located a similar distance from

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the River Thames to the Application and is over 200 m from any local roads. In comparison the LBR diffusion tube 28 is located to the south of the Application Site away from the River Thames. LBR diffusion tube is co-located with the RI2 automatic monitor and the TD0 AURN site is over 7km from the application site.

4.8 Table 17 presents a comparison of the monitored urban background PM_{10} monitoring undertaken by LBR (automatic monitors RI2) in comparison to the Defra mapped background concentrations. The difference between the measured and mapped PM_{10} annual mean concentration is 1.4%. As such, the Defra mapped PM_{10} concertation in the vicinity of the application site will be used in the assessment.

Table 16: Mapped Annual Mean Background PM_{10} Concentrations (µg/m^3) Compared to Monitored Urban Background Diffusion Concentrations

Background Diffusion Tube		Background Map				
ID	Annual mean PM_{10} Concentration (µg/m^3)	x	y	Annual Mean PM_{10} Concentration (µg/m^3)	Difference (µg/m^3)	Relative difference
RI2	16	519500	173500	16.2	0.2	1.4%

4.9 In the absence of local $PM_{2.5}$ monitoring, the Defra mapped background concentrations predicted for the study area will be used. Background PM_{10} and $PM_{2.5}$ concentrations will be adjusted to take account of future improvements in line with Defra estimates, however, background concentration of NO_2 will not be adjusted, i.e. the monitored concentration of 25 µg/m^3 will be used for the Without and With assessment scenarios in the opening year. The background concentrations to be used in the assessment are presented in Table 17.

Table 17: Modelled Background Pollutant Concentrations (µg/m^3)

Pollutant	Annual Mean Concentration (µg/m^3)	
	2016	2020
NO_2	25.0	25.0
PM_{10}	16.1	15.5
$PM_{2.5}$	10.4	9.9

4.10 NO_2, PM_{10} and $PM_{2.5}$ concentrations presented in Table 17 are well within the air quality objectives and limit values.

5. Assessment of Effects

Demolition and Construction Effects

5.1 The Site currently has a number of structures on it associated with its former use including concrete hardstanding and a number of metal and or concrete tanks which will require removal to make way for the Proposed Development. The area of the application site is approximately 6,700 m^2 and the volume of material to be removed from site is 1,980 m^3 however, existing structures and bases are to be crushed and reused on site, and as such, in accordance with the GLA Construction Dust SPG the dust emissions magnitude for demolition works is, therefore, considered to be Medium.

5.2 There is likely to be a need for extensive earthworks on the site including topsoil stripping, excavation and levelling for infrastructure and building foundations, and the removal/re-establishment of vegetation. Given that the total area of the application site is approximately 6,700m^2, with approximately 2,200 m^3 of material to be imported onto the site, it is anticipated that the area covered by earthwork activities will fall into the 2,500 to 10,000m^2 range set out in the GLA Construction Dust SPG. As such, the dust emissions magnitude for earthworks is therefore considered to be Medium.

5.3 The magnitude of dust emissions during construction depend upon the size of the proposed building, the method of construction, construction materials and the duration of the build. The Proposed Development will range from four to six storeys (max circa 20m above ground level (AGL)) with 89 apartments consisting of a mix of one and two bedroom apartments. Construction is likely to involve the use of dusty materials, including concrete. It is expected that the total building volume will be approximately 50,000m^3, so fall within the 25,000 to 100,000m^3 range set out in the GLA Construction Dust SPG, and as such construction dust emissions are considered to be Medium.

5.4 The peak number of vehicle movements associated with the construction phase of the Proposed Development is expected to be 10 and 50 HDVs which would place it in the Medium emissions category as set out in the GLA Construction Dust SPG.

5.5 The potential Dust Emission Magnitudes for each construction activity are summarised in Table 18.

Table 18: Summary of Dust Emission Magnitudes

Activity	Dust Emission Magnitude
Demolition	Medium
Earthworks	Medium
Construction	Medium
Track-out	Medium

Sensitivity of the Local Area

5.6 The sensitivity of the area is determined by the specific sensitivities of receptors in the area, the proximity and number of those receptors, the local background

PM_{10} concentration and site-specific factors such as the presence of natural shelters (e.g. trees and hedges) and vegetation cover that would reduce the potential for wind-blown dust.

5.7 There are between 10 and 100 residential properties within 20m of the Site boundary. This makes the area of High sensitivity with respect to dust soiling effects on people and property from demolition and construction activities.

5.8 From Defra's air pollution background concentration maps, the annual mean background PM_{10} concentration across the Site is predicted to be 16.1 µg/m^3 in 2016 and 15.5µg/m^3 in 2020; the area is therefore defined as Low sensitivity with respect to human health impacts from earthworks and construction.

5.9 Due to the large-scale nature of the Site, impacts due to track-out are expected within 50m of construction traffic routes and up to 500m from Site access points. There are likely to be ten or more high-sensitivity receptors within 20m of construction traffic routes and so the area is defined as High sensitivity with respect to dust soiling effects on people and property, and as Low sensitivity with respect to human health impacts from track-out. Table 19 provides summaries of the classification of the sensitivity of the area.

5.10 There are no nationally or internationally designated ecological sites within 50m of the Site boundary or within 50m of construction traffic routes as such impacts at ecological receptors has been scoped out of this assessment.

Table 19: Sensitivity of the Area

Activity	Sensitivity of Surrounding Area
Dust Soiling	High
Human Health	Low

Risk of Dust Impacts

5.11 The risk of dust impacts associated with each construction activity is defined on the basis of the Dust Emissions Magnitude (Table 18) and Sensitivity of the Local Area (Table 19). The Dust Impact Risk categories are used to define the appropriate site-specific mitigation measures that would ensure any effects due to dust and emissions are not significant. Table 20 summarises the Dust Impact Risk for each activity.

Table 20: Summary of Dust Impact Risk Categories

Potential Impact	Dust Soiling	Human Health
Demolition	Medium	Low
Earthworks	Medium	Low
Construction	Medium	Low
Track-out	Medium	Low

Significance of Dust Effects

5.12 The GLA Construction Dust SPG aims to ensure that the correct level of mitigation is applied to construction sites to ensure that for almost all construction activity significant effects on receptors are prevented. Experience

shows that this is normally possible and that the residual effect will normally be 'not significant' ".

5.13 Following qualitative consideration, the results of the construction dust assessment indicate that due to the size of the site and the proximity of nearby sensitive receptors, the overall risk of dust impacts is Medium, and mitigation measures consistent with a Medium Risk site should be employed accordingly.

Mitigation Measures and Residual Effects

5.14 Recommended mitigation measures appropriate for a Medium Risk site are included in Appendix C. Appropriate measures for the site should be enforced through the planning conditions for the proposed development. The mitigation measures cover:

- Communications;
- Site management;
- Preparing and maintaining the site;
- Operating vehicle / machinery and sustainable travel;
- Operations;
- Waste management;
- Earthworks;
- Construction; and
- Trackout

Residual Effects

5.15 Provided effective mitigation measures to reduce dust and emissions from construction phase activities are enforced and implemented within a CEMP, then the construction-phase air quality impacts are expected to be slight and not significant.

5.16 It should be noted that even with a comprehensive CEMP in place and enforced it is not possible to guarantee that mitigation measures will be 100% effective all of the time. For example, during dry and/or windy weather conditions or in the event of an interruption to water supplies for dust suppression, short-term dust annoyance may arise. It is important that such conditions are recognised promptly and, if necessary, potentially dusty operations should be suspended until conditions are more favourable.

Operational Effects

Modelled NO_2 Concentrations

5.17 The predicted results in Table 21 show the annual mean NO_2 concentrations predicted at sensitive receptors for each modelled scenario.

Table 21 Predicted Annual Mean NO_2 concentrations ($\mu g/m^3$)

Receptor	WO 2020	W 2020	Change WO-W 2020	Change as a % of the AQS objective	Impact Descriptor

Receptor	WO 2020	W 2020	Change WO-W 2020	Change as a % of the AQS objective	Impact Descriptor
1	26.2	26.4	0.3	0.6	Negligible
2	26.1	26.3	0.2	0.5	Negligible
3	26.4	26.6	0.2	0.4	Negligible
4	26.2	26.5	0.3	0.7	Negligible
5	26.4	26.5	0.2	0.4	Negligible
6	32.5	32.6	0.1	0.2	Negligible
7	27.5	27.6	0.1	0.3	Negligible
8	27.2	27.3	0.2	0.4	Negligible
9	30.3	30.4	0.1	0.3	Negligible
10	34.4	34.5	0.1	0.3	Negligible
11	27.5	27.6	0.1	0.2	Negligible
12	32.7	32.8	0.1	0.2	Negligible
13	33.3	33.4	0.1	0.2	Negligible
14	32.8	32.9	0.1	0.2	Negligible
15	34.0	34.0	0.1	0.2	Negligible
16	N/A	26.2	N/A	N/A	N/A
17	N/A	26.2	N/A	N/A	N/A
18	N/A	25.7	N/A	N/A	N/A
19	N/A	25.6	N/A	N/A	N/A

Note: Values in bold indicate an exceedences of the annual mean ASQ objective of 40 µg/m^3.

5.18 Predicted NO_2 concentrations are well within the annual mean NO_2 objective (40 µg/m^3) at all sensitive receptors in both the without and with scenarios, with the highest concentration predicted at Receptor 15, with annual mean NO_2 concentrations predicted to be 34 µg/m^3 in both the without and with scenario.

5.19 The largest change as a result of the development in the opening year of 2020 is predicted to be 0.3 µg/m^3, which represents 0.7% of the AQS objective. This change is considered to be of negligible significance in accordance with the IAQM/EPUK assessment criteria adopted for this assessment.

5.20 As the annual mean is below 60 µg/m^3 at all modelled locations in accordance with Defra LLAQM.TG(16) the hourly AQS objective is also anticipated to be achieved at all receptors.

5.21 Concentrations at Receptors 16 to 19, which are representative of the proposed development, are also predicted to be well below the annual AQS objective of 40 µg/m^3 and, as such, no additional mitigations is, therefore, required as part of the design with the site is considered appropriate for its proposed use from an air quality standpoint.

Modelled PM_{10} concentrations

5.22 The predicted results in Table 22 show the annual mean PM_{10} concentrations predicted at sensitive receptors for each modelled scenario.

Table 22 Predicted Annual Mean PM_{10} concentrations ($\mu g/m^3$)

Receptor	WO 2020	W 2020	Change WO-W 2020	Change as a % of the AQS objective	Impact Descriptor
1	15.7	15.8	<0.1	0.1	Negligible
2	15.7	15.8	<0.1	0.1	Negligible
3	15.8	15.8	<0.1	0.1	Negligible
4	15.7	15.8	<0.1	0.1	Negligible
5	15.8	15.8	<0.1	0.1	Negligible
6	17.1	17.1	<0.1	0.0	Negligible
7	16.0	16.0	<0.1	0.0	Negligible
8	15.9	15.9	<0.1	0.1	Negligible
9	16.5	16.5	<0.1	0.1	Negligible
10	17.5	17.5	<0.1	0.1	Negligible
11	16.0	16.0	<0.1	0.0	Negligible
12	17.1	17.1	<0.1	0.0	Negligible
13	17.2	17.3	<0.1	0.0	Negligible
14	17.1	17.1	<0.1	0.0	Negligible
15	17.4	17.4	<0.1	0.0	Negligible
16	N/A	15.7	N/A	N/A	N/A
17	N/A	15.7	N/A	N/A	N/A
18	N/A	15.7	N/A	N/A	N/A
19	N/A	15.6	N/A	N/A	N/A

Note: Values in bold indicate an exceedences of the annual mean AQS objective of 40 $\mu g/m^3$.

5.23 Predicted PM_{10} concentrations are also well within the annual mean PM_{10} objective (40 $\mu g/m^3$) in all assessment years, with very little change at each receptor location between the without and with scenarios. Impacts at all existing receptors are less than 0.1 $\mu g/m^3$ and are, therefore, considered negligible.

5.24 Concentrations at Receptors 16 to 19 which are representative of the proposed development are all well below the annual AQS objective of 40 $\mu g/m^3$ and, as such, the site is considered appropriate for residential use from an air quality standpoint with no additional mitigation proposed.

5.25 Defra LLAQM.TG(16) provides an equation to calculate the number of daily mean PM_{10} concentrations may be above 50 $\mu g/m^3$. The resulting estimated number of days above the threshold is shown in Table 23.

Table 23: Predicted Number of Exceedances of Daily PM_{10} Concentrations and Impacts at Existing Receptors

Receptor	WO 2020	W 2020	Change WO-W 2020	Impact Descriptor
1	0.2	0.2	<1	Negligible
2	0.2	0.2	<1	Negligible
3	0.3	0.3	<1	Negligible
4	0.2	0.3	<1	Negligible
5	0.2	0.3	<1	Negligible
6	0.8	0.8	<1	Negligible
7	0.3	0.3	<1	Negligible

Receptor	WO 2020	W 2020	Change WO-W 2020	Impact Descriptor
8	0.3	0.3	<1	Negligible
9	0.5	0.5	<1	Negligible
10	1.0	1.0	<1	Negligible
11	0.3	0.3	<1	Negligible
12	0.8	0.8	<1	Negligible
13	0.9	0.9	<1	Negligible
14	0.8	0.8	<1	Negligible
15	1.0	1.0	<1	Negligible
16	N/A	0.2	N/A	N/A
17	N/A	0.2	N/A	N/A
18	N/A	0.2	N/A	N/A
19	N/A	0.2	N/A	N/A

Note: Values in bold indicate an exceedences of the daily mean AQS objective of 50 µg/m^3 not to be exceeded more than 35 times in a calendar year.

5.26 The number of days with concentrations exceeding 50 µg/m^3 are predicted to be well below the 35 days allowed in accordance with the AQS objective / limit value with only Receptor 10 and 15 predicted to exceed for a day in total. The Proposed Development is not predicted to lead to an increase in the number of days in which the AQS objective is exceeded, as such the impact is considered to be negligible.

5.27 The number of daily exceedences of the PM_{10} AQS objective are predicted to be less than 35 days at all modelled receptors representative of the proposed Development, as such the site is considered appropriate for residential use from an air quality standpoint with no additional mitigation proposed.

Modelled $PM_{2.5}$ Concentrations

5.28 The predicted results in Table 24 show the annual mean $PM_{2.5}$ concentrations predicted at sensitive receptors for each modelled scenario.

Table 24 Predicted Annual Mean $PM_{2.5}$ concentrations (µg/m^3)

Receptor	WO 2020	W 2020	Change WO-W 2020	Change as a % of the AQS objective	Impact Descriptor
1	10.0	10.0	<0.1	0.1	Negligible
2	10.0	10.0	<0.1	0.1	Negligible
3	10.0	10.0	<0.1	0.1	Negligible
4	10.0	10.0	<0.1	0.1	Negligible
5	10.0	10.0	<0.1	<0.1	Negligible
6	10.7	10.7	<0.1	<0.1	Negligible
7	10.1	10.1	<0.1	<0.1	Negligible
8	10.1	10.1	<0.1	0.1	Negligible
9	10.4	10.4	<0.1	<0.1	Negligible
10	11.0	11.0	<0.1	<0.1	Negligible
11	10.1	10.1	<0.1	<0.1	Negligible
12	10.8	10.8	<0.1	<0.1	Negligible
13	10.8	10.8	<0.1	<0.1	Negligible

Receptor	WO 2020	W 2020	Change WO-W 2020	Change as a % of the AQS objective	Impact Descriptor
14	10.8	10.8	<0.1	<0.1	Negligible
15	10.9	10.9	<0.1	<0.1	Negligible
16	N/A	10.0	N/A	N/A	N/A
17	N/A	10.0	N/A	N/A	N/A
18	N/A	9.9	N/A	N/A	N/A
19	N/A	9.9	N/A	N/A	N/A

Note: Values in bold indicate an exceedences of the annual mean ASQ objective of 25 µg/m^3.

5.29 Predicted $PM_{2.5}$ concentrations are all well within the annual mean $PM_{2.5}$ limit value (25 µg/m^3) in both the Without and With scenarios. Impacts at all existing receptors are less than 0.1 µg/m^3 and are, therefore, considered negligible.

5.30 Concentrations at Receptors 16 to 19 which are representative of the proposed development are all well below the annual AQS objective of 25 µg/m^3 and, as such, the site is considered appropriate for residential use from an air quality standpoint with no additional mitigation proposed.

Air Quality Neutral

Building emissions

5.31 Heating to the scheme is proposed to be provided using electric heat pumps; no centralised gas boilers, CHP unit or the like are proposed, as there is unlikely to be a gas supply to the site. The Proposed Development can, therefore, be considered air quality neutral in terms of building emissions.

Transport emissions

5.32 The Proposed Development is predicted to result in an additional 164 two-way AADT trips once fully occupied. The proposed Development falls under the C2 land use classification for 'Residential Institutions Excluding hospitals'. A Transport Emission Benchmark (TEB) is not currently available for Land Use Class C2. The Air Quality Neutral Planning Support guidance note states that "*where a specific TEB has not been calculated, it will be possible to show that a development would meet the benchmark if the scheme-generated trip rate for a particular land-use class does not exceed the benchmark trip rate derived from TRAVL*".

5.33 TRAVL, or 'Trip Rate Assessment Valid for London', is a multi-modal trip generation database to estimate the effect of proposed changes in land use on transport patterns and, in particular, on the amount of road traffic in an area. For a Class C2 development located in Outer London, the TRAVL benchmark for the average number of trips generated is 19.5 trips/m^2/annum. For the proposed development, the total number of trips generated is estimated to be 164 vehicle movements per day (AADT) or 59,860 trips per annum. The proposed Development has a gross internal area (GIA) of circa 11,977 m^2, which equates to approximately 5.0 trips/m^2/annum (i.e. 59,860 trips / 11,977 m^2).

5.34 As the number of trips generated by the proposed development is lower than the trip rates obtained from TRAVL the proposed development can be assumed to be 'air quality neutral' with respect to transport emissions. As such, no further mitigation is required in accordance with the SPG.

6. Conclusions and Recommendations

6.1 This Air Quality Assessment Report has been prepared by AECOM on behalf of Melliss Ave Devco Limited to support a planning application for the Specialist Extra Care facility ('the Proposed Development'), (Class C2 'Residential Institutions Excluding hospitals') consisting of 89 one and two bed apartments, located within the administrative boundary of London Borough of Richmond upon Thames (LBR).

6.2 The Application Site was formerly the Thames Water Biothane Plant located to the east of Melliss Avenue and bordered on its eastern side by the River Thames. The development has the potential to affect local air quality during its construction and operation.

6.3 Following qualitative consideration, the results of the construction dust assessment indicate that due to the large size of the site and the proximity of sensitive receptors to the site boundary, the risk of dust impacts is Medium, and mitigation should be employed accordingly. By following the best practice mitigation measures presented in Appendix C, as recommended by the GLA Construction Dust SPG, the impacts from construction dust and emissions will not be significant.

6.4 The Proposed Development is expected to lead to an increase in local road traffic of approximately 164 AADT daily movements close to the proposed site.

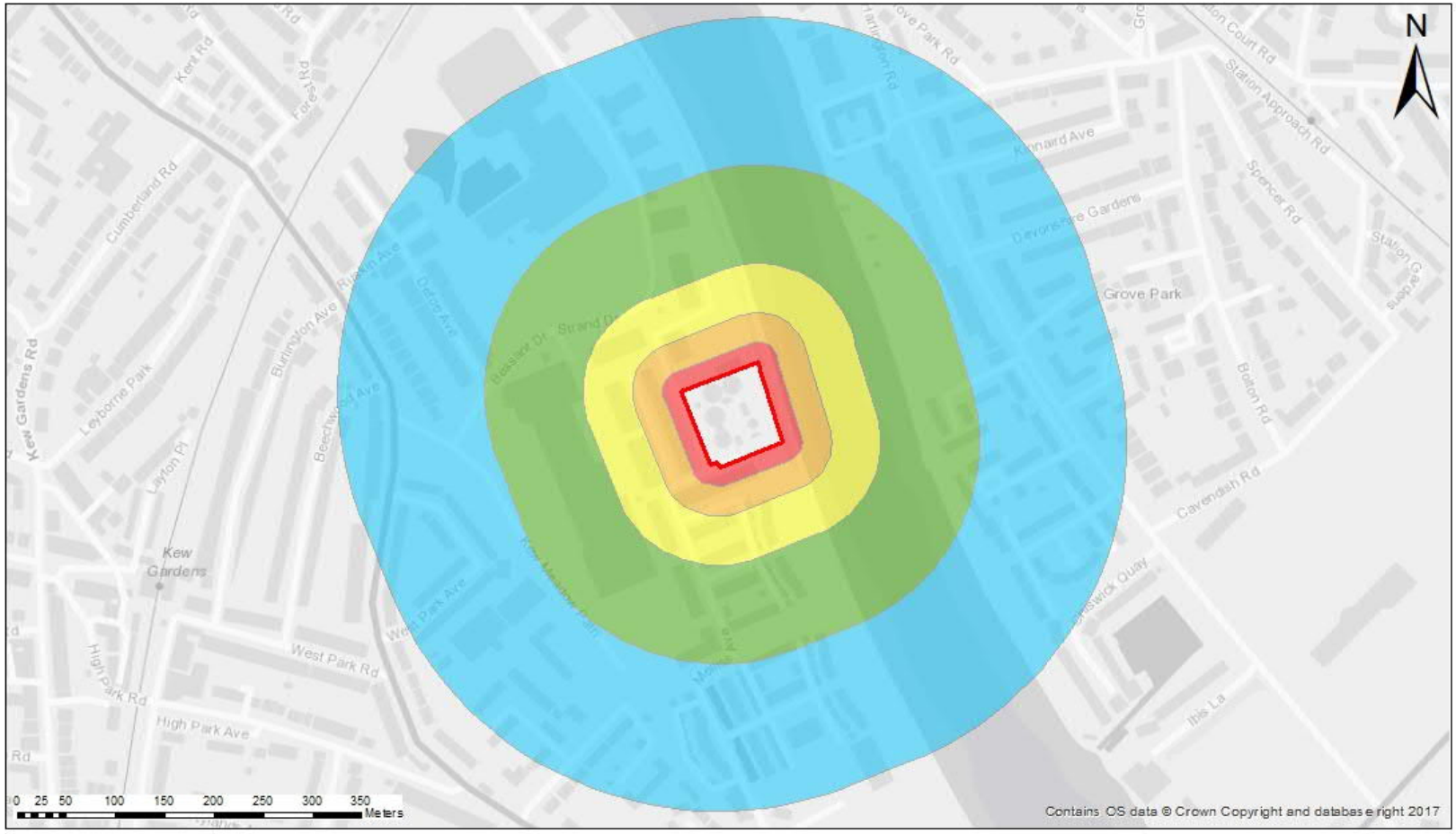
6.5 Detailed dispersion modelling of Melliss Avenue, Townmead Road and Mortlake Road was carried out the without and with scenarios in 2020. Predicted annual mean NO_2 concentrations at all sensitive existing and proposed receptors were within the AQS objective with a maximum annual mean NO_2 concentration, predicted in both the without and with scenarios, of 34.0 µg/m^3. The maximum change as a result of the proposed Development was 0.3 µg/m^3 which is considered negligible in accordance with the IAQM/EPUK assessment criteria. PM_{10} and $PM_{2.5}$ concentrations were also predicted to be well within the AQS objective / limit values, and impacts are also considered negligible.

6.6 It should be noted that there is the potential for the number of days with PM_{10} concentrations greater than 50 µg/m^3 may be exceeded more than the 35 times that is allowed within the AQS objective, however, this occurs at those receptors in both the without and with scenarios. The Proposed Development is predicted to lead to the number of exceedences increasing by a single day at one receptor (R15), however, this is due to decimal rounding and is, therefore, not considered to be significant as neither the dispersion model or the Defra LLAQM.TG(16) calculation methodology, used to derive daily PM_{10} exceedences, can predict to this level of accuracy.

6.7 Concentrations at receptors R16 to R19, which are representative of the Proposed Development, are all well below the relevant AQS objective/ limit values for each pollutant assessed and, as such, the site is considered appropriate for its proposed use from an air quality standpoint.

Appendix A Figures

Figure 1: Construction Dust Assessment Distances



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Scale: 1:5,135

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Dust Assessment Zones

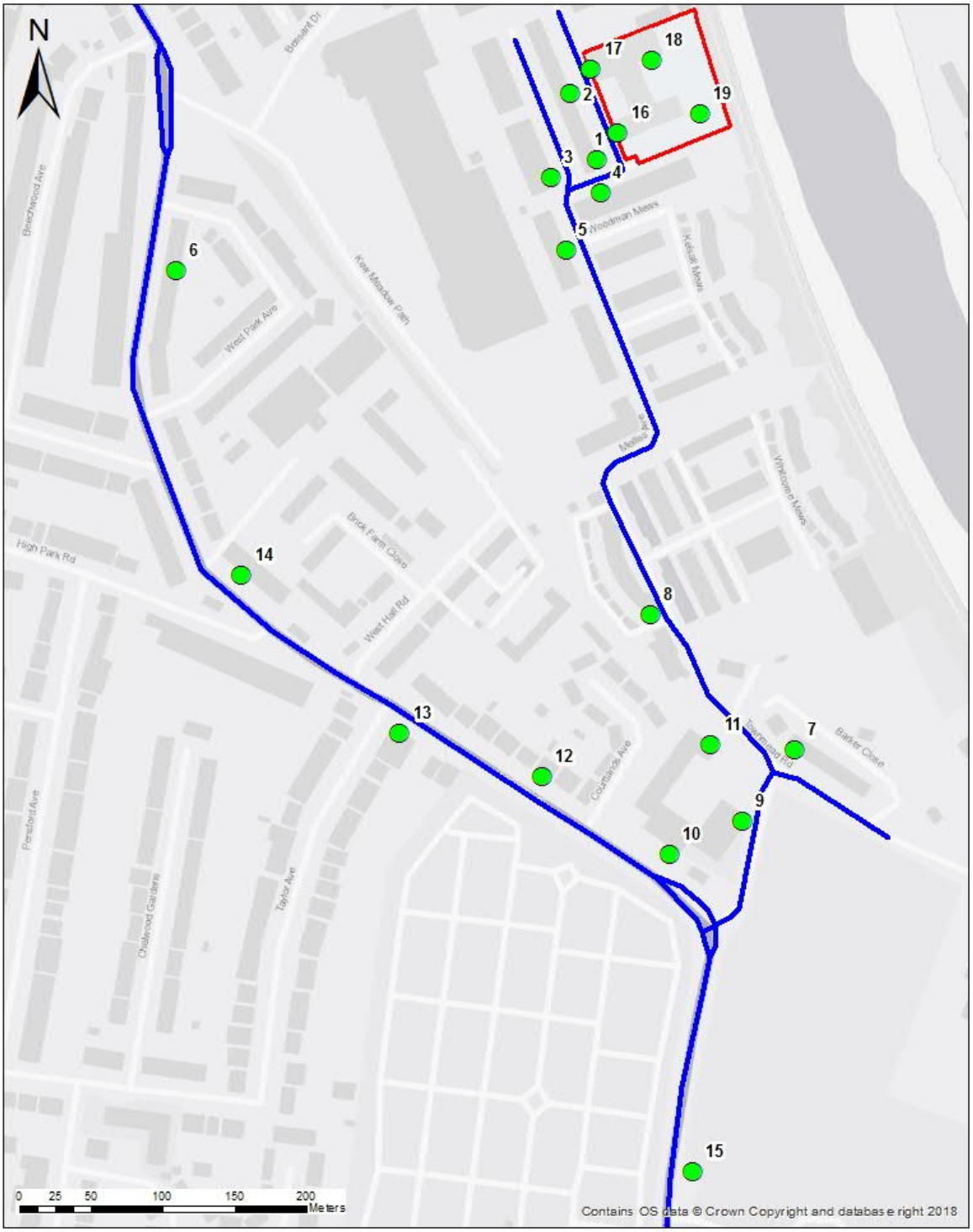
Legend

- 0-20m
- 20-50m
- 50-100m
- 100-200m
- 200-350m
- Application Site

Project:
Red & Yellow Kew

Client:
Red & Yellow

Figure 2: Modelled Roads and Receptors



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Scale: 1:3,354

Modelled Receptors and Road Links

Legend

- Receptors
- ADMS Road Source
- Application Site

Project:
Red & Yellow Kew

Client:
Red & Yellow

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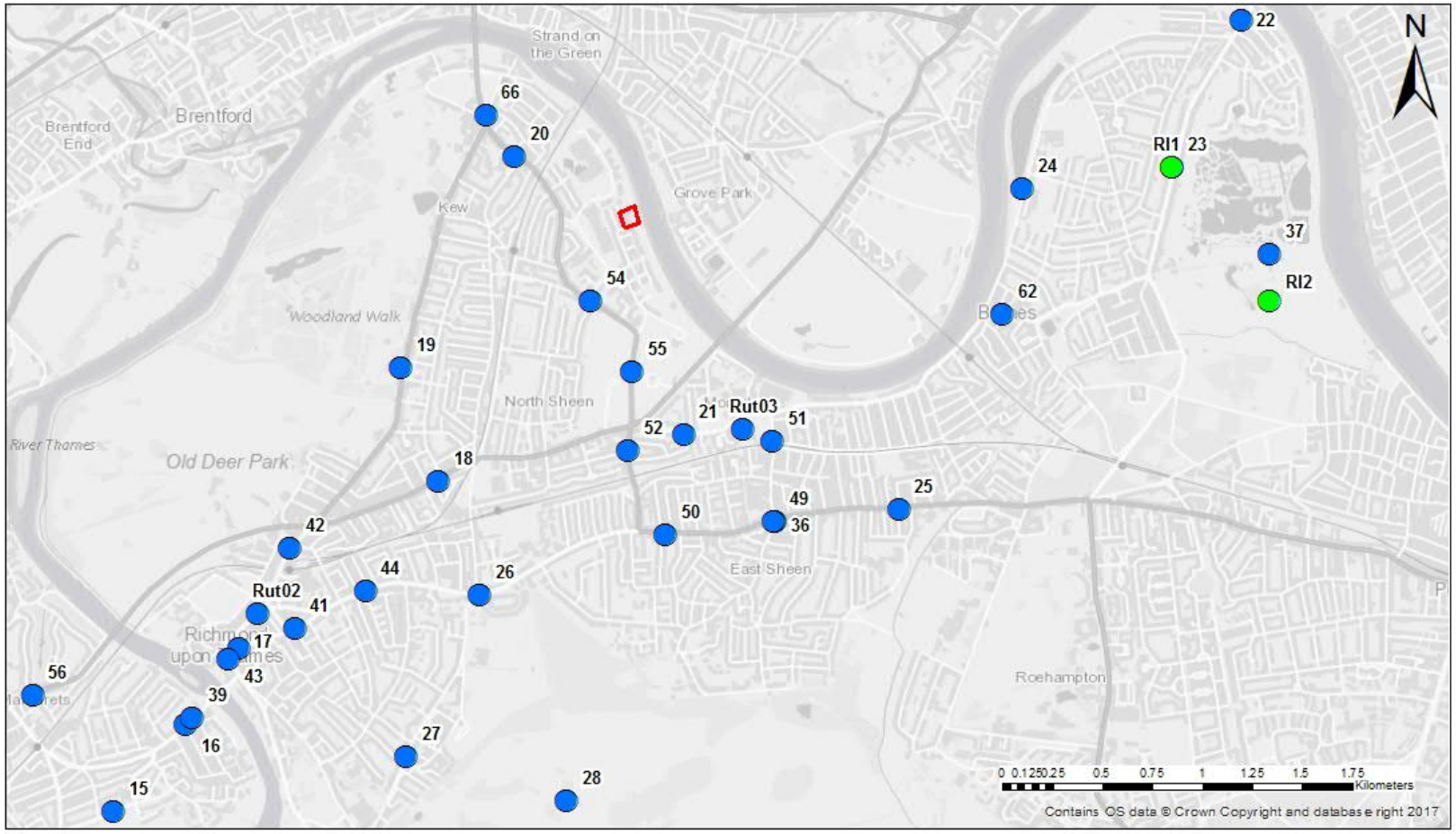
Figure 3: LBR Monitoring Locations



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Air Quality Monitoring Locations

Legend

- Automatic Monitor
- DiffusionTube
- Application Site

Project:
Red & Yellow Kew

Client:
Red & Yellow

Appendix B Traffic Data

Table 25: Traffic Data

Automatic Traffic Count Site	Direction	Base Flows		Development Flows		Speed (kph)
		AADT	HDV	AADT	HDV	
Site 1 - Mortlake Road, 50m north of Townmead Road	NB	9862	9862	81	8	43
	SB	9715	9715	83	8	41
	Total	**19577**	**19577**	**164**	**16**	**42**
Site 2 - Townmead Road, 40m north of Mortlake Road	NB	2361	2361	81	8	25
	SB	2428	2428	83	8	29
	Total	**4789**	**4789**	**164**	**16**	**27**
Site 3 - Melliss Avenue, 20m north of Townmead Road	NB	800	800	81	8	25
	SB	801	801	83	8	25
	Total	**1601**	**1601**	**164**	**16**	**25**
Site 4 - Melliss Avenue, 50m south of Kelsall Mews	NB	644	644	81	8	24
	SB	648	648	83	8	25
	Total	**1292**	**1292**	**164**	**16**	**24**
Site 5 - Melliss Avenue, 60m north of Melliss Avenue	NB	96	96	81	8	19
	SB	95	95	83	8	19
	Total	**191**	**191**	**164**	**16**	**19**

Note: NB = North Bound, SB = South Bound.

Appendix C Dust Mitigation

Table 26: Summary of Dust Mitigation Measures

Activity	Mitigation Measures	Recommendation
Site Management	Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.	Highly Recommended
	Develop a Dust Management Plan.	Highly Recommended
	Display the name and contact details of person(s) accountable for air quality pollutant emissions and dust issues on the site boundary.	Highly Recommended
	Display the head or regional office contact information.	Highly Recommended
	Record and respond to all dust and air quality pollutant emissions complaints.	Highly Recommended
	Make a complaints log available to the local authority when asked.	Highly Recommended
	Carry out regular site inspections to monitor compliance with air quality and dust control procedures, record inspection results, and make an inspection log available to the local authority when asked.	Highly Recommended
	Increase the frequency of site inspections by those accountable for dust and air quality pollutant emissions issues when activities with a high potential to produce dust and emissions and dust are being carried out, and during prolonged dry or windy conditions.	Highly Recommended
	Record any exceptional incidents that cause dust and air quality pollutant emissions, either on or off the site, and the action taken to resolve the situation is recorded in the log book.	Highly Recommended
Preparing and maintaining the site	Plan site layout: machinery and dust causing activities should be located away from receptors.	Highly Recommended
	Erect solid screens or barriers around dust activities or the site boundary that are, at least, as high as any stockpiles on site.	Highly Recommended
	Fully enclosure site or specific operations where there is a high potential for dust production and the site is active for an extensive period.	Highly Recommended
	Install green walls, screens or other green infrastructure to minimise the impact of dust and pollution.	Desirable
	Avoid site runoff of water or mud.	Highly Recommended
	Keep site fencing, barriers and scaffolding clean using wet methods.	Highly Recommended
	Remove materials from site as soon as possible.	Highly Recommended
	Cover, seed or fence stockpiles to prevent wind whipping.	Highly Recommended
	Carry out regular dust soiling checks of buildings within 100m of site boundary and cleaning to be provided if necessary.	Desirable

	Agree monitoring locations with the Local Authority.	Highly Recommended
	Where possible, commence baseline monitoring at least three months before phase begins.	Highly Recommended
	Put in place real-time dust and air quality pollutant monitors across the site and ensure they are checked regularly.	Highly Recommended
Operating vehicle/machinery and sustainable travel	Ensure all on-road vehicles comply with the requirements of the London Low Emission Zone.	Highly Recommended
	Ensure all non-road mobile machinery (NRMM) comply with the standards set within this guidance.	Highly Recommended
	Ensure all vehicles switch off engines when stationary – no idling vehicles.	Highly Recommended
	Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where possible.	Highly Recommended
	Impose and signpost a maximum-speed-limit of 10mph on surfaced haul routes and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).	Desirable
	Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.	Highly Recommended
	Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).	Highly Recommended
Operations	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.	Highly Recommended
	Ensure an adequate water supply on the site for effective dust/particulate matter mitigation (using recycled water where possible).	Highly Recommended
	Use enclosed chutes, conveyors and covered skips.	Highly Recommended
	Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.	Highly Recommended
	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.	Highly Recommended
Waste management	Reuse and recycle waste to reduce dust from waste materials.	Highly Recommended
	Avoid bonfires and burning of waste materials.	Highly Recommended
Measures Specific to Demolition	Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).	Desirable
	Ensure water suppression is used during demolition operations.	Highly Recommended
	Avoid explosive blasting, using appropriate manual or mechanical alternatives.	Highly Recommended
	Bag and remove any biological debris or damp down such material before demolition.	Highly Recommended

Measures Specific to Earthworks	Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces.	Desirable
	Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil.	Desirable
	Only remove secure covers in small areas during work and not all at once.	Desirable
Measures Specific to Construction	Avoid scabbling (roughening of concrete surfaces) if possible.	Desirable
	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.	Highly Recommended
	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.	Desirable
	For smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust.	Desirable
Measures Specific to Trackout	Regularly use a water-assisted dust sweeper on the access and local roads, as necessary, to remove any material tracked out of the site.	Highly Recommended
	Avoid dry sweeping of large areas.	Highly Recommended
	Ensure vehicles entering and leaving sites are securely covered to prevent escape of materials during transport.	Highly Recommended
	Record all inspections of haul routes and any subsequent action in a site log book.	Highly Recommended
	Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems and regularly cleaned.	Highly Recommended
	Inspect haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.	Highly Recommended
	Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).	Highly Recommended
	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.	Highly Recommended
	Access gates to be located at least 10m from receptors where possible.	Highly Recommended
	Apply dust suppressants to locations where a large volume of vehicles enter and exit the construction site.	Desirable

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