10. Air Quality

Introduction

10.1. Prepared by Waterman Infrastructure & Environment (Waterman), this Chapter presents an assessment of the likely significant effects of the Development on local air quality. In particular, consideration is given to the likely effects of potential emissions from the demolition, alteration, refurbishment and construction works (the Works), as well as emissions from operational road traffic associated with the completed and operational Development on existing sensitive receptors surrounding the Site, and at receptors within the Development itself.

10.2. This Chapter describes the methods used to assess these effects and the baseline conditions currently existing at the Site and in the surrounding area. The likely significant direct and indirect effects of the Development arising from the Works and from the Development once completed and operational are presented in this Chapter.

10.3. Mitigation measures are identified where appropriate to avoid, reduce or offset any likely adverse effects identified and / or enhance likely beneficial effects and the nature and significance of likely residual effects taking account of the mitigation measures are described.

10.4. This Chapter is supported by:

- **Appendix 10.1:** Air Quality Modelling Study;
- **Appendix 10.2:** Air Quality Neutral Assessment;
- **Appendix 10.3:** Air Quality Monitoring Study; and
- **Appendix 10.4:** Air Quality Positive Statement.

Assessment Methodology and Significance

Assessment Methodology

10.5. This air quality assessment has been undertaken using appropriate information sources, standard assessment procedures and where appropriate professional judgement, as follows:

- identification of potentially sensitive existing and future receptor locations which could be affected by changes in air quality resulting from the Works, as well as the operation of the completed Development;
- review of LBRuT's Air Quality Updating and Screening Assessment and Progress Reports published as part of the Local Air Quality Management (LAQM) regime in order to determine baseline conditions in the area of the Site;
- application of the ADMS-Roads[1] air quality dispersion model using data from the project Transport Consultant (Stantec) and the project Building Services Consultant (Hoare Lea), to assess the likely effects of emissions from traffic generated by the completed and operational Development and emissions from the Development Area 1 car park within the Development on local air quality. The latest NO_2 from NO_x Calculator available from the LAQM Support website[2] has been applied to derive the road-related NO_2 concentrations from the modelled

NO_x concentrations and the Environment Agency[3] conversion of NO_x to ground level NO_2 associated with the emissions from the Energy Centres;

- comparison of the predicted pollutant concentration with the Air Quality Strategy Objectives (UK AQS);
- comparison of the predicted air pollutant concentrations with LBRuT monitored concentrations for the year 2019, and adjustment of modelled results where necessary (model verification details are provided in **Appendix 10.1**);
- determination of the likely significant effects of the Works, and consideration of the environmental management controls likely to be employed during the Works;
- determination of the likely significant effects of the completed and operational Development on air quality, based on the application of the Environmental Protection UK Guidance and Institute of Air Quality Management[4] (EPUK/ IAQM) significance criteria to modelled results;
- identification of mitigation measures where appropriate. This includes inherent measures which would have a beneficial effect on local air quality; and
- establishment of the likely residual effects of the Development upon air quality taking into account mitigation measures.

10.6. The UK AQS identifies the pollutants of concern associated with road traffic emissions and local air quality as:

- nitrogen oxides (NO_x);
- particulate matter (as PM_{10} (particles with a diameter up to 10µm) and $PM_{2.5}$ (particles with a diameter up to 2.5µm));
- carbon monoxide (CO);
- 1, 3-butadiene (C_4H_6); and
- benzene (C_6H_6).

10.7. Emissions of total NO_x from motor vehicle exhausts comprise nitric oxide (NO) and nitrogen dioxide (NO_2). NO oxidises in the atmosphere to form NO_2.

10.8. The most significant pollutants associated with road traffic emissions, in relation to human health, are NO_2 and PM_{10}. LBRuT has declared an Air Quality Management Area (AQMA) for the entire Borough, for both annual mean NO_2 and annual mean and 24-hour mean PM_{10}, attributable to road traffic emissions (referred to later in this chapter). This assessment, therefore, focuses on NO_2 and particulate matter (PM_{10} and $PM_{2.5}$).

10.9. The Development includes two basement car parks with extraction systems – one located in Development Area 1 and one in Development Area 2. The technical specification of the ventilation strategy for Development Area 2 was indicative at the time of writing. As such the basement extraction system for Development Area 2 has not been considered in the air quality assessment. The final extraction system would be designed in accordance with best practice design and appropriate regulations and be secured by a suitably worded planning condition. As such, it is anticipated that the car park extraction system used for Development Area 1 would not give rise to significant environmental effects and has not been considered further at this stage. Refer to **Appendix 10.1** for further details on the assessment of the Development Area 1 car park.

10.10. The Development would be served by non-combustion plant, primarily air source heat pumps and, therefore, would not produce on-site emissions related to provision of heating and hot water. Heating plant has, therefore, not been considered within the air quality assessment.

10.11. As agreed via the EIA scoping process (refer to **Chapter 2: EIA Methodology**), no assessment was undertaken (or is, indeed necessary) in relation to odour. Any ventilation extracts associated with the café and restaurant uses within the Development would be designed in accordance with best practice design and appropriate regulations. This would be secured by a suitably worded planning condition. As such, it is not anticipated that odours generated by café and restaurant uses within the Development would give rise to significant environmental effects. An Odour Assessment Report is submitted as a standalone planning report which sets out the design principles to be considered at the detailed design stage with regards to the design of odour extraction related to the commercial elements of the Development.

The Works

10.12. The major influences on air quality throughout the Works would most likely be dust generating activities and vehicle emissions from plant and vehicles both on, and accessing / egressing, the Site.

Dust Emissions

10.13. The assessment of the effects of dust emissions from the Works has been based on the guidance published by the IAQM (2014)[5].

10.14. The approach to the assessment includes:

- consideration of planned construction activities and their phasing; and
- a review of the sensitive uses in the area immediately surrounding the Site in relation to their distance from the Site.

10.15. Following the IAQM Guidance, construction activities can be divided into the following four distinct activities:

- demolition – any activity involved in the removal of an existing building;
- earthworks – the excavation, haulage, tipping and stockpiling of material, but may also involve levelling a site and landscaping;
- construction – any activity involved with the provision of a new structure; and
- trackout – the movement of vehicles from unpaved ground on a site, where they can accumulate mud and dirt, onto the public road network where dust might be deposited.

10.16. The IAQM considers three separate dust effects, with the proximity of sensitive receptors being taken into consideration for:

- annoyance due to dust soiling;
- potential effects on human health due to significant increase in exposure to PM_{10}; and
- harm to ecological receptors.

10.17. A summary of the four-step process which has been undertaken to determine the effect of the Works as set out in the IAQM guidance is presented in **Table 10.1**.

Table 10.1: Summary of the IAQM Guidance for Undertaking a Construction Dust Assessment

Step		Description
1	Screen the Need for a Detailed Assessment	Simple distance based criteria are used to determine the requirement for a detailed dust assessment. An assessment will normally be required where there are 'human receptors' within 350 m of the boundary of the site and / or within 50 m of the route(s) used by construction vehicles on public highway, up to 500 m from the site entrance or 'ecological receptors' within 50 m of the boundary of the site and/or within 50 m of the route(s) used by construction vehicles on public highway, up to 500 m from the site entrance.
2	Assess the Risk of Dust Effects	The risk of dust arising in sufficient quantities to cause annoyance and/or health or ecological effects should be determined using four risk categories: negligible, low, medium and high based on the following factors • the scale and nature of the works, which determines the risk of dust arising (i.e. the magnitude of potential dust emissions) classed as small, medium or large; and • the sensitivity of the area to dust effects, considered separately for ecological and human receptors (i.e. the potential for effects) defined as low, medium or high.
3	Site Specific Mitigation	Determine the site-specific measures to be adopted at the site based on the risk categories determined in Step 2 for the four activities. For the cases where the risk is 'negligible' no mitigation measures beyond those required by legislation are required. Where a local authority has issued guidance on measures to be adopted these should be considered.
4	Determine Significant Effects	Following Steps 2 and 3, the significance of the potential dust effects should be determined, using professional judgement, considering the factors that define the sensitivity of the surrounding area and the overall pattern of potential risks.

Construction Vehicle Exhaust Emissions

10.18. The IAQM guidance on assessing construction impacts states that:

"Experience of assessing the exhaust emissions from on-site plant (also known as non-road mobile machinery or NRMM) and site traffic suggests that they are unlikely to make a significant effect on local air quality, and in the vast majority of cases they will not need to be quantitatively assessed. For site plant and on-site traffic, consideration should be given to the number of plant/vehicles and their operating hours and locations to assess whether a significant effect is likely to occur. For site traffic on the public highway, if it cannot be scoped out, then if should be assessed using the same methodology and significance criteria as operational traffic impacts".

10.19. The IAQM guidance states that a detailed air quality assessment should be undertaken where there is a change in Heavy Duty Vehicles (HDV) greater than an annual average daily trip of 25. The Works would result in 57 HDVs during the peak construction period and as such detailed dispersion modelling using ADMS-Roads of the peak construction phase has been undertaken (for the year 2028) to determine the impact of exhaust emissions from construction traffic.

Construction Plant Emissions

10.20. In accordance with the London Plan[6] all plant used during the Works would need to adhere to the emissions standards for NO_2 and PM_{10} set out for Non-Road Mobile Machinery (NRMM). As such it is considered that a quantitative assessment of plant exhaust emissions is not required.

Completed Development

ADMS Models

10.21. The likely effects on local air quality from traffic movements and heating plant emissions generated from the completed and operational Development have been assessed using the atmospheric dispersion model ADMS-Roads. **Appendix 10.1** presents the details of the dispersion modelling.

10.22. For the purposes of modelling, traffic data for the relevant local road network and car park trips, has been provided by Stantec. The baseline year of 2019 has been assessed (due to the COVID-19 pandemic the latest year for representative LBRuT air quality monitoring data) together with the 'without Development' and 'with Development' scenarios for the year 2029, the anticipated first year of operation of the Development.

10.23. The ADMS-Roads dispersion model predicts how emissions from roads combine with local background pollution levels, taking account of meteorological conditions, to affect local air quality. The model has been run for the completion year, using background data and vehicle emission rates for 2029 as inputs. For the verification assessment (referred to later in this Chapter), background data and vehicle emission rates for 2019 have been used, which would be higher than the 2029 data. Pollutant concentrations have been modelled at a number of locations representative of nearby sensitive receptors.

10.24. Full details of the dispersion modelling study, including the road traffic and car park data used in the assessment, are presented within **Appendix 10.1**.

Model Uncertainty

10.25. Analyses of historical monitoring data by Defra[7] identified a disparity between actual measured NO_X and NO_2 concentrations and the expected decline associated with emission forecasts, which form the basis of air quality modelling as described above. In February 2020, Air Quality Consultants published a report on Performance of Defra's Emission Factor Toolkit 2013-2019[8]. The report concluded that recent analysis of recent NO_X measurements provides evidence that vehicle controls are working, and as a result, the Emission Factor Toolkit (EFT) is now reflecting the rate of observed reductions. This air quality assessment has been undertaken using the latest emission factors published by Defra – EFT version 11.0.

Background Pollutant Concentrations

10.26. To estimate the total concentrations due to the contribution of any other nearby sources of pollution, background pollutant concentrations need to be added to the modelled concentrations. During consultation, the EHO at LBRuT requested that urban background concentrations from the Wetlands Centre, Barnes are used in this air quality assessment – however, the Defra

background concentrations are higher and have been used to ensure a suitably robust assessment. Full details of the background pollution data used within the air quality assessment are included in **Appendix 10.1**.

Model Verification

10.27. Model verification is the process of comparing monitored and modelled pollutant concentrations and, if necessary, adjusting the modelled results to reflect actual measured concentrations, to improve the accuracy of the modelling results.

10.28. The model has been verified by comparing the predicted annual mean NO_2 concentrations for the baseline 2019, with the project specific kerbside and roadside diffusion tube monitoring locations (as presented in **Table 10.13)** and monitored annual mean NO_2 concentrations from LBRuT's diffusion tubes located at:

- Site 74 (Previously 21) (Lower Richmond Road);
- Site 18 (Lower Mortlake Road)
- Site 55 (Mortlake Road)
- Site 70 (Stag Brewery)
- Site 51 (Sheen Lane); and
- Site 52 (Clifford Avenue).

10.29. These locations are the nearest LBRuT monitors to the Site and have been identified by the EHO at LBRuT for use in the model verification. It is noted that whilst diffusion tubes 36 (Upper Richmond Road West (URRW) Sheen Lane); 49: URRW War Memorial (Sheen Lane); and 50 (URRW, near Clifford Avenue) are located close to the Site, they have not been used as they are located outside of the road domain used in the ADMS-Roads dispersion model. The approach to the verification and adjustment process is described in detail in **Appendix 10.1**.

Chalkers Corner Junction

10.30. As discussed in **Chapter 5: The Proposed Development**, the Section 278 (S278) highways works at Chalkers Corner Junction involves a new left-hand lane westbound on Lower Richmond Road and forms part of the Development. As such the S278 highways works at Chalkers Corner have been considered within the 'with Development' scenario of this air quality assessment.

UK Air Quality Strategy Objectives and Limit Values

10.31. Air pollutants at high concentrations can give rise to adverse effects on the health of humans and ecosystems. European Union (EU) legislation on air quality forms the basis for UK legislation and policy on air quality. The EU Framework Directive[9] on ambient air quality assessment and management came into force in May 2008 and was implemented by Member States, including the UK, by June 2010. The Directive aims to protect human health and the environment by avoiding, reducing or preventing harmful concentrations of air pollutants.

10.32. The current UK AQS, which was published in July 2007[10], sets out objectives for local authorities in undertaking their Local Air Quality Management (LAQM) duties. The 2007 AQS introduced a national level policy framework for exposure reduction for fine particulate matter. Currently it is a

local authority's responsibility to determine the effect of a development against the UK AQS objectives, as such the UK AQS objectives of air pollutants relevant to this assessment are summarised in **Table 10.2**.

Table 10.2: Selected Receptor Locations

Pollutant	Objective		Date by Which Objective is to be Met
	Concentration	Measured as	
Nitrogen Dioxide (NO_2)	200µg/m^3	1-hour mean not to be exceeded more than 18 times per year.	31/12/2005.
	40µg/m^3	Annual Mean.	31/12/2005.
Particulate Matter (PM_{10}) (a)	50µg/m^3	24-hour mean not to be exceeded more than 35 times per year.	31/12/2004.
	40µg/m^3	Annual Mean.	31/12/2004.
Particulate Matter ($PM_{2.5}$) (b)	Target of 15% reduction in concentrations at urban background locations.	Annual Mean.	Between 2010 and 2020.
	25µg/m^3	Annual Mean.	01/01/2020.

Notes:
(a) Particulate Matter with a mean aerodynamic diameter of less than 10µm (micrometres or microns).
(b) Particulate Matter with a mean aerodynamic diameter of less than 2.5µm.

Potentially Sensitive Receptors

The Works

10.33. As mentioned above, the IAQM guidance indicates that receptors within 350m of the Site boundary, and within 50m of construction routes, would be sensitive to emissions and nuisance dust from construction activities.

Completed Development

10.34. The receptors selected for the Completed Development assessment were identified due to their proximity to the road network and considered to be the receptors most likely to be exposed to poor air quality. Air pollutant levels at dwellings set further back from the road network would be expected to be lower and have therefore not been assessed.

10.35. The approach adopted by the UK AQS is to focus on areas at locations at, and close to, ground level where members of the public (in a non-workplace area) are likely to be exposed over the averaging time of the objective in question (i.e. over 1-hour, 24-hour or annual periods). Objective exceedences principally relate to annual mean NO_2 and PM_{10}, and 24-hour mean PM_{10} concentrations, so that associated potentially sensitive locations relate mainly to residential properties and other sensitive locations (such as schools) where the public may be exposed for prolonged periods.

10.36. **Table 10.3** presents existing sensitive receptors selected due to their proximity to the road network likely to be affected by the Development. These existing receptors are located closest to road traffic impacts (i.e. at junctions) and / or the users are highly sensitive to air pollution (such as schools and residential users).

10.37. **Table 10.3** also presents future sensitive receptor locations which are representative of sensitive uses (such as residential uses and the school) within the Development itself. The future sensitive receptor locations in **Table 10.3** represent the areas of the Development that would likely be exposed to the worst-case air quality conditions, i.e. the lowest residential / school levels of the Development that would be closest to road traffic and car park louvres.

10.38. The location of the selected existing and future receptors assessed are presented in **Figure 10.1**.

Table 10.3: Selected Receptor Locations

ID (Refer to Figure 10.1)	Receptor Location	Receptor Type	OS Grid Reference		Height Above Ground (m)
1	1 Varsity Flow	Residential	520212	176221	0
2	6 Watney Cottages	Residential	520078	175845	0
3	1 Watney Cottages	Residential	520122	175846	0
4	1-3 Parliament Mews	Residential	520296	176185	0
5	Ship Lane	Residential	520390	176117	0
6	Lower Richmond Road	Residential	520365	175939	0
7	Lower Richmond Road	Residential	520359	175914	0
8	Lower Richmond Road	Residential	520238	175832	0
9	13 Sheen Lane	Residential	520503	175882	0
10	40 Mortlake High Street	Residential	520582	175939	0
11	Boat Race Court	Residential	520734	175984	0
12	Little Paradise Nursery	Child Care	520300	175870	0
13	Thomas House Primary School	School	520510	175816	0
14	Richmond Training and Development Centre	Child Care	520123	175809	0
15	St Mary Magdalen's Catholic Primary School	School	520831	175901	0
16	179 Lower Richmond Road	Residential	519744	175831	0
17	189 Lower Richmond Road	Residential	519725	175828	0
18	2 South Circular	Residential	519767	175812	0
19	67 Shalstone Road	Residential	519787	175794	0
20	2 Lower Richmond Road	Residential	519811	175852	0
21	36 Lower Richmond Road	Residential	520037	175819	0
22	1 Chertsey Court	Residential	519996	175859	0

ID (Refer to Figure 10.1)	Receptor Location	Receptor Type	OS Grid Reference		Height Above Ground (m)
23	23 Chertsey Court	Residential	520041	175853	0
24	139 Chertsey Court	Residential	519960	175962	0
25	77 Chertsey Court	Residential	520006	176011	0
26	Proposed Building 10 – Ground Floor Level	Residential / Commercial	520629	175977	0
27	Proposed Building 5 – Ground Floor Level	Residential / Commercial	520496	175938	0
28	Proposed Building 9 – Ground Floor Level	Residential / Commercial	520645	176981	0
29	Proposed School – Ground Floor Level	School	520272	175896	0

Note: Ground floor assumed to be 0m to represent worst-case assessment of exposure as it is the closest location of the receptor to the tailpipe vehicle emissions.

Significance Criteria

The Works

Dust Emissions

10.39. The significance of likely effects of the Works on air quality have been assessed based on professional judgement and with reference to the criteria set out in the IAQM guidance. Appropriate Site-specific mitigation measures that would need to be implemented to minimise any adverse effect have also been considered. Details of the assessor's experience and competence to undertake the dust assessment is provided in **Appendix 10.1**.

10.40. The assessment of the risk of dust effects arising from each of the construction activities as part of the Works, as identified by the IAQM guidance, is based on the magnitude of potential dust emission and the sensitivity of the area. Examples of the factors defining the sensitivity of the area as set out in the IAQM guidance are presented in **Table 10.4**.

Table 10.4: Examples of Factors Defining Sensitivity of the Area

Type of Effect	Sensitivity of Receptor	Examples
Sensitivities of People to Dust Soiling Effects	High	Users can reasonably expect[1] enjoyment of a high level of amenity; or The appearance, aesthetics or value of their property would be diminished by soiling; and the people or property would reasonably be expected[1] to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land. Indicative examples include dwellings, museums and other culturally important collections, medium and long term car parks[2] and car showrooms.

Type of Effect	Sensitivity of Receptor	Examples
	Medium	Users would expect[1] to enjoy a reasonable level of amenity, but would not reasonably expect[1] to enjoy the same level of amenity as in their home; or The appearance, aesthetics or value of their property could be diminished by soiling; or The people or property wouldn't reasonably be expected[1] to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land. Indicative examples include parks and places of work.
	Low	The enjoyment of amenity would not reasonably be expected[1]; or property would not reasonably be expected[1] 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. Indicative examples include playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks[2] and roads.
Sensitivities of People to Health Effects of PM_{10}	High	Locations where members of the public are exposed over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, relevant location would be one where individuals may be exposed for eight hours or more in a day).[3] Indicative examples include residential properties. Hospitals, schools and residential care homes should also be considered as having equal sensitivity to residential areas for the purposes of this assessment.
	Medium	Locations where the people exposed are workers[4], and exposure is over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day). Indicative examples include office and shop workers but will generally not include workers occupationally exposed to PM_{10}, as protection is covered by Health and Safety at Work legislation.
	Low	Locations where human exposure is transient.[5] Indicative examples include public footpaths, playing fields, parks and shopping streets.
Sensitivities of Receptors to Ecological Effects	High	Locations with an international or national designation and the designated features may be affected by dust soiling; or Locations where there is a community of a particularly dust sensitive species such as vascular species included in the Red Data List For Great Britain[6]

Type of Effect	Sensitivity of Receptor	Examples
		Indicative examples include a 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. Indicative example is 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. Indicative example is a local Nature Reserve with dust sensitive features.

1 People's expectations will vary depending on the existing dust deposition in the area.

2 Car parks can have a range of sensitivities depending on the duration and frequency that people would be expected to park their cars there, and the level of amenity they could reasonably expect whilst doing so. Car parks associated with work place or residential parking might have a high level of sensitivity compared to car parks used less frequently and for shorter durations, such as those associated with shopping. Cases should be examined on their own merits.

3 This follows Defra guidance as set out in LAQM.TG(09).

4 Notwithstanding the fact that the air quality objectives and limit values do not apply to people in the workplace, such people can be affected to exposure of PM_{10}. However, they are considered to be less sensitive than the general public as a whole because those most sensitive to the effects of air pollution, such as young children are not normally workers. For this reason workers have been included in the medium sensitivity category.

5 There are no standards that apply to short-term exposure, e.g. one or two hours, but there is still a risk of health impacts, albeit less certain.

6 Cheffing C. M. & Farrell L. (Editors) (2005), The Vascular Plant. Red Data List for Great Britain, Joint Nature Conservation Committee.

10.41. The sensitivity of the area and risk category matrix for each of the construction activity types are presented in **Table 10.5** to **Table 10.8**.

Table 10.5: Risk Category from Demolition Activities

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible

Table 10.6: Risk Category from Earthworks Activities

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table 10.7: Risk Category from Construction Activities

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table 10.8: Risk Category from Trackout Activities

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible

10.42. The risk category determined for each of the likely construction activity types was used to define the appropriate, Site-specific, mitigation measures that should be applied. The IAQM's construction dust guidance recommends that significance is only assigned to the impact after considering mitigation and assumes that all actions to avoid or reduce the impacts are inherent within the design of the Development. Construction mitigation (secured through planning conditions, legal requirements or required by regulations), would ensure that likely significant adverse residual effects will not occur. However, to maintain consistency with the structure of the Environmental Statement (ES), as outlined in **Chapter 2: EIA Approach and Methodology**, pre-mitigation significance criteria based on professional judgement was applied – **Table 10.9**.

Table 10.9: Pre-Mitigation Significance Criteria for Demolition and Construction Assessment

Significance Criteria	Definition
Adverse effect of major significance.	Receptor is less than 10 m from a major active construction or demolition site.
Adverse effect of moderate significance.	Receptor is 10 m to 100 m from a major active construction or demolition site, or up to 10 m from a minor active construction or demolition site.
Adverse effect of minor significance.	Receptor is between 100 m and 200 m from a major active construction or demolition site or 10 m to 100 m from a minor active construction site or demolition site.

Significance Criteria	Definition
Insignificant.	Receptor is over 100 m from any minor active construction or demolition site or over 200 m from any major active construction or demolition site.

10.43. The IAQM outlines that experience of implementing mitigation measures for construction activities demonstrates that total mitigation is normally possible such that likely residual impacts would not be 'significant'.

Construction Vehicle Exhaust Emissions

10.44. The methodology for determining the magnitude and significance of effects associated with vehicle emissions from the peak construction period is the same as the methodology detailed below for the Completed Development.

Construction Plant Emissions

10.45. Given all construction plant used during the Works would need to adhere to the emissions standards for NO_2 and PM_{10} set out for NRMM professional judgment has been used to determine the significance of effects.

Completed Development

10.46. The aforementioned EPUK / IAQM Guidance provides an approach to assigning the magnitude of change as a result of a development as a proportion of a relevant assessment level, followed by examining this change in the context of the new total concentration and its relationship with the assessment criterion to provide a description of the impact at selected receptor locations.

10.47. **Table 10.10** presents the IAQM framework for describing the impacts (the change in concentration of an air pollutant) at individual receptors. The term Air Quality Assessment Level (AQAL) is used to include air quality objectives or limit values, where these exist.

Table 10.10: Impact Descriptors for Individual Receptors

Long term average Concentration at receptor in assessment year	% Change in concentration relative to Air Quality Assessment Level (AQAL)			
	1	2-5	6-10	>10
75% or less of AQAL	Negligible	Negligible	Slight	Moderate
76-94% of AQAL	Negligible	Slight	Moderate	Moderate
95-102% of AQAL	Slight	Moderate	Moderate	Substantial
103-109% of AQAL	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Moderate	Substantial	Substantial	Substantial

Note: AQAL may be an air quality objective, EU limit value, or an Environment Agency 'Environmental Assessment Level (EAL)'.
The table is intended to be used by rounding the change in percentage pollutant concentration to whole numbers. Changes of 0% (i.e. less than 0.5%) are described as Negligible.
The table is only to be used with annual mean concentrations.

10.48. The approach set out in the EPUK / IAQM Guidance provides a method for describing the impact magnitude at individual receptors only. The Guidance outlines that this change may have an effect on the receptor, depending on the severity if the impact and other factors that may need to be taken into account. The assessment framework for describing impacts can be used as a starting point to make a judgement on significance of effect. However, whilst there may be 'slight', 'moderate' or 'substantial' impacts described at one or more receptors, the overall effect may not necessarily be judged as being significant in some circumstances.

10.49. Following the approach to assessing impacts outlined in the EPUK / IAQM Guidance, the significance of likely residual effects of the completed Development on air quality has been established through professional judgement and the consideration of the following factors:

- the geographical extent (local, district or regional) of effects;
- their duration (temporary or long term);
- their reversibility (reversible or permanent);
- the magnitude of changes in pollution concentrations;
- the exceedance of standards (for example AQS objectives); and
- changes in pollutant exposure.

Baseline Conditions

London Borough of Richmond upon Thames Review and Assessment Process

10.50. In accordance with the UK Air Quality Strategy[11] and Part IV of the 'Environment Act[12], LBRuT has and will continue to review the ambient air quality within its administrative boundary. In 2000 LBRuT concluded that the Borough-wide levels of nitrogen dioxide (NO_2) and fine particulate matter (PM_{10}) are not expected to meet the Air Quality Strategy Objectives. As such, LBRuT have declared the entire Borough an AQMA attributed to localised vehicle emissions.

10.51. The LBRuT 2015 Updating and Screening Assessment[13] states that the results for NO_2 continue 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 findings of the LBRuT Air Quality Annual Status Report for 2020 completed in 2021[14] indicate the AQMA should remain.

10.52. In addition to the above declaration of the Borough wide AQMA, the Greater London Authority has identified 187 Air Quality Focus Areas (AQFA) in London that exceed the EU annual mean limit value for NO_2 and have high levels of human exposure. The Site is located approximately 160m east of the Chalkers Corner / Clifford Avenue / A205 / Upper Richmond Rd / Millstone Green AQFA.

London Borough of Richmond upon Thames Air Quality Action Plan, 2019 – 2024

10.53. LBRuT has produced an updated Air Quality Action Plan[15] which sets out the actions that LBRuT will deliver for the period 2019-2024 to reduce concentrations of, and exposure to, ambient pollution. The measures relevant to the Development include:

- "*New buildings and development. We have embedded air quality in our Local Plan and will produce a Supplementary Planning Document that will help to deliver our aspirations for*

cleaner air in the borough. This document will cover all areas of planning and ensure developers focus on air quality throughout the build and for the life of the development";

- "*Continuing roll out of Electric Vehicle Charging in the borough*";
- "*Ensure that sites are regulated in accordance with the Mayor of London's Non Road Mobile Machinery where this is applicable. This project is currently being delivered throughout London by our joint regulatory service*";
- "*Anti-idling is a priority for the borough*"; and
- "*Prioritising cycling and walking in the borough*".

Local Monitoring

10.54. Due to the COVID-19 pandemic, 2020 and 2021 monitoring data was not considered representative of baseline air quality conditions at and surrounding the Site. 2020 and 2021 monitoring data has, therefore, not been considered further in this Chapter.

10.55. In 2019, LBRuT undertook monitoring of NO_2 and PM_{10} at three automatic monitoring locations and NO_2 at 62 locations using diffusion tubes within the Borough.

10.56. The only static roadside automatic monitor within the Borough is located at Castelnau Library, Barnes, approximately 2.4km to the northeast of the Site (OS Grid Reference 522845, 177904). Monitored concentrations at the Castelnau Library roadside monitor are presented in **Table 10.11**.

Table 10.11: Monitored Concentrations at the LBRuT Castelnau, Library Road Automatic Monitor

Pollutant	Averaging Period	AQS Objective	2015	2016	2017	2018	2019
NO_2	Annual Mean	40µg/m^3	34	36	31	31	27
	1-Hour Mean (No. of Hours)	200µg/m^3 not to be exceeded more than 18 times a year	0	0	0	0	0
PM_{10}	Annual Mean	40µg/m^3	22	20	18	19	15
	24-Hour Mean (No. of Days)	50µg/m^3 not to be exceeded more than 35 times a year	5	7	4	1	3

Notes: Data obtained from LBRuT Air Quality Annual Status Report for 2020, May 2021
Exceedances of the AQS Objectives shown in **bold** text.

10.57. The monitoring results in **Table 10.11** indicate the annual mean NO_2 and PM_{10} objectives were met in all years.

10.58. NO_2 was also measured at 62 locations using diffusion tubes. The results for the 10 NO_2 diffusion tube roadside and kerbside locations within 1 km of the centre of the Site are presented in **Table 10.12**.

Table 10.12: Measured Concentrations at the LBRuT Diffusion Tubes Within 1km of the Site

Site ID	Location	Distance to Site	Classification	Annual Mean NO_2 ($\mu g/m^3$)				
				2015	2016	2017	2018	2019
51	Sheen Lane (railway crossing), Sheen^	0.3 km	Kerbside	28	32	35	33	30
21 (74)	Lower Richmond Road, Mortlake (Nr. Kingsway)^	0.4 km	Roadside	37	39	36	**50**	**52**
55	Mortlake Rd (adj. to cemetery gates), Kew	0.6 km	Kerbside	**55**	**50**	**45**	**41**	**40**
58	London Road, Twickenham	0.6 km	Kerbside	**46**	**50**	**47**	**43**	**40**
36	Upper Richmond Road West (URRW), Sheen Lane	0.6 km	Kerbside	**49**	**50**	**60**	**63**	**61**
49	URRW War Memorial, Sheen Lane, Sheen	0.6 km	Kerbside	39	**44**	31	closed	
52	Clifford Avenue, Chalkers Corner	0.7 km	Kerbside	**55**	**57**	**50**	**59**	**55**
50	URRW (Nr. Clifford Avenue, Sheen)	0.8 km	Kerbside	**57**	**55**	**53**	**52**	**50**
54	Mortlake Rd (adj. to West Hill Rd) Kew	0.9 km	Kerbside	**51**	**51**	**48**	**40**	**40**
25	URRW (Nr. Sheen School)	0.9 km	Roadside	**45**	**46**	38	38	36

Notes: Data obtained from directly from LBRuT 2019 Air Quality Annual Status Report
^ site 21 and 51 were moved closer to Chalkers Corner junction in 2018
Exceedances of the AQS Objectives shown in **bold** text.

10.59. The monitoring results in **Table 10.12** indicate that nine of the 10 diffusion tube monitoring locations closest to the Site were at or exceeded the annual mean NO_2 objective of $40\mu g/m^3$ between 2015 and 2019. However, eight of the nine diffusion tubes, where data is available, recorded a reduction in the monitored annual mean NO_2 concentration from 2018 to 2019. The annual mean NO_2 concentration at the other diffusion tube on Mortlake Road remained the same.

Project Specific Air Quality Monitoring

10.60. A short-term air quality monitoring study for nitrogen dioxide (NO_2) was undertaken within the Site around Chalkers Corner and on Lower Richmond Road, for a 6-month period, from July 2018 to January 2019. The technical details of the monitoring are provided in **Appendix 10.3** and the location of the monitors are shown on **Figure A1** of **Appendix 10.3**.

10.61. The results from this monitoring are presented in **Table 10.13** below.

Table 10.13: Measured Concentrations at the LBRuT Diffusion Tubes Within 1km of the Site

ID	Site Description	Monitor Classification[(a)]	Relevant AQS Objective[(b)]	Annual Average 2019 Result
DT1	Lower Richmond Road	Kerbside	60µg/m^3	**40.0**
DT2	Chertsey Court metal railings	Roadside	60µg/m^3	34.3
DT3	Chertsey Court Lower Richmond Road	Façade	40µg/m^3	31.8
DT4	Chalkers Corner Junction	Kerbside	60µg/m^3	39.7
DT5	Chertsey Court	Carpark	60µg/m^3	37.5
DT6	Clifford Avenue	Kerbside	60µg/m^3	**45.7**
DT7	Clifford Avenue metal railings	Roadside	60µg/m^3	39.2
DT8	Chertsey Court Clifford Avenue	Façade	40µg/m^3	30.5
School 1	Stag Brewery Sports Club (future school façade)	Roadside	40µg/m^3	28.1
School 2	Stag Brewery Sports Club (future school façade)	Roadside	40µg/m^3	28.0

Note: (a) Kerbside = monitor 1m from kerb of a road;
Roadside = monitoring within 1-5m from kerb of a road;
Façade = monitor on residential property and at a location of relevant residential and school exposure;
Carpark = monitor located within an open-air car park
(b) As set out in Box 1.1 of LAQM.TG(16)
Results denoted in **bold** are above annual mean NO_2 AQS objective of 40µg/m^3

10.62. As shown in **Table 10.13**, the highest concentrations measured at all the diffusion tubes in the study are located on the kerbside (DT1, DT4 and DT6, monitored concentrations of 40.0µg/m^3, 39.7µg/m^3 and 45.7µg/m^3, respectively in 2019). The NO_2 results at these locations relate to these monitors being located directly above vehicle tailpipe emissions at Chalkers Corner. The annualised data shows a reduction in annual mean NO_2 concentrations from 2018 to 2019.

10.63. The results in **Table 10.13** show monitored concentrations at the façade of Chertsey Court (DT3 and DT8) are below the relevant annual mean NO_2 AQS objective of 40µg/m^3, as 31.8µg/m^3 and 30.5µg/m^3, and as such existing conditions at Chertsey Court are considered to be acceptable as the AQS objective is met.

10.64. **Table 10.13** shows existing NO_2 concentrations at the location of the proposed school are below the annual mean NO_2 AQS objective of 40µg/m^3, as 28.1µg/m^3 and 28.0µg/m^3, and as such existing conditions at the school site are considered to be good.

Likely Significant Effects

The Works

Nuisance Dust

10.65. Construction activities in relation to the Development have the potential to affect local air quality through Demolition, Earthworks, Construction and Trackout activities. A description of these activities is presented earlier in this Chapter.

10.66. The surrounding area is mixed-use, including residential and commercial uses. Additionally, the River Thames bounds the north-east of the Site and Mortlake Green is located on the other side of Lower Richmond Road to the south of the Site. The nearest residential properties to the Site are located on Mortlake High Street, located approximately 10 m to the east of the Site. In addition, St. Mary Magdalen's Catholic Primary School is located approximately 180 m to the south-east of the Site.

10.67. In addition to the above, the River Thames and Tidal Tributaries Site of Metropolitan Importance (SMI) is located adjacent to the north-east boundary of the Site and has the potential to be impacted by dust deposition.

10.68. Should the Development be granted permission, it is likely that there would be air quality sensitive uses associated with occupiers of the early phases whilst other later phases are constructed. As such there is likely to be future receptors in proximity to the Works.

10.69. As there are existing and proposed receptors within 350 m of the boundary of the Site, and within 50 m of the routes that would be used by construction vehicles on the public highway, it is considered that a detailed assessment is required to determine the likely dust impacts, as recommended by the IAQM guidance on construction dust. Results of this assessment are provided for each main activity (Demolition, Earthworks, Construction and Trackout) below.

10.70. In addition, given the distance to the River Thames and Tidal Tributaries SMI the detailed qualitative assessment considers potential ecological impacts.

Demolition

10.71. As described in **Chapter 6: Development Programme, Demolition, Alteration, Refurbishment and Construction**, Site-wide demolition would be undertaken apart from a small number of key buildings to be retained. Given the details in **Chapter 6: Development Programme, Demolition, Alteration, Refurbishment and Construction**, it was estimated that the total volume of buildings to be demolished could be over 100,000m^3. Based on this and considering the criteria in paragraph 4.27 of the SPG, the potential dust emissions during demolition would be of a **large** magnitude.

Earthworks

10.72. As previously noted, the area of the Site is approximately 9.25 hectares (ha), or 92,500m^2. Based on this, and considering the criteria in paragraph 4.29 of the SPG, the potential dust emissions during earthworks activities would be of **large** magnitude.

Construction

10.73. The total volume of buildings to be constructed is over 100,000m^3. Based on the criteria in paragraph 4.31 of the SPG, the potential dust emissions during construction activities would be of **large** magnitude.

Trackout

10.74. As detailed in **Chapter 6: Development Programme, Demolition, Alteration, Refurbishment and Construction**, the number of construction vehicles could peak at 276 daily trips to and from the Site during Q1 2028. Based on this and considering the criteria in paragraph 4.33 of the SPG, the potential for dust emissions due to trackout activities would be of **large** magnitude.

10.75. The dust risk categories, based on the potential magnitude of dust emissions and the sensitivity of the area to dust, are presented in **Table 10.14**.

Table 10.14: Summary of Risk from the Works

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

10.76. As outlined in **Table 10.14**, the Site is considered to be a **medium** to **high-risk** site with regard to the Works. In line with the assessment methodology described earlier in this Chapter, no significance criteria are prescribed to pre-mitigation effects. However, such effects would likely be **temporary**, **short to medium term**, **local** and of **moderate adverse significance**. Consequently, mitigation (as set out later in this Chapter) would be required to ensure that adverse effects be minimised, reduced and, where possible, eliminated.

Construction Vehicle Exhaust Emissions

10.77. Likely effects on local air quality associated with construction of the Development would result from changes to traffic flows on the local road network. To present a worst-case assessment of construction, vehicle emission rates and background concentrations for 2019 have been used. The results of the ADMS-Roads modelling of construction traffic at existing sensitive receptors are presented in **Table 10.15**.

Table 10.15: Results of the ADMS-Roads Construction Traffic Modelling at Sensitive Receptors

Receptor ID	NO_2 Annual Mean ($\mu g/m^3$)			PM_{10} Annual Mean ($\mu g/m^3$)			PM_{10} Number of Days >50$\mu g/m^3$			$PM_{2.5}$ Annual Mean ($\mu g/m^3$)		
	Without Construction	With Construction	Change	Without Construction	With Construction	Change	Without Construction	With Construction	Change	Without Construction	With Construction	Change
1	19.0	19.0	0.0	17.0	17.0	0.0	0	0	0	11.3	11.3	0.0
2	22.0	22.2	0.2	17.3	17.3	0.0	0	0	0	11.5	11.5	0.0
3	20.1	20.2	0.1	17.1	17.1	0.0	0	0	0	11.4	11.4	0.0
4	17.9	17.9	0.0	16.4	16.4	0.0	0	0	0	11.0	11.0	0.0
5	17.8	17.8	0.0	16.4	16.4	0.0	0	0	0	11.0	11.0	0.0
6	20.5	20.5	0.0	17.6	17.6	0.0	1	1	0	11.7	11.7	0.0
7	20.3	20.3	0.0	17.5	17.5	0.0	1	1	0	11.6	11.6	0.0
8	20.1	20.1	0.1	17.3	17.3	0.0	0	0	0	11.5	11.5	0.0
9	19.8	19.8	0.0	16.9	16.9	0.0	0	0	0	11.3	11.3	0.0
10	20.6	20.6	0.0	17.6	17.6	0.0	1	1	0	11.7	11.7	0.0
11	20.3	20.3	0.0	17.4	17.5	0.1	1	1	0	11.6	11.6	0.0
12	20.0	20.0	0.0	17.4	17.4	0.0	0	0	0	11.5	11.5	0.0
13	19.6	19.6	0.0	16.7	16.7	0.0	0	0	0	11.2	11.2	0.0
14	19.5	19.6	0.1	16.9	16.9	0.0	0	0	0	11.3	11.3	0.0
15	17.7	17.7	0.0	16.4	16.4	0.0	0	0	0	11.0	11.0	0.0
16	28.7	28.9	0.2	18.2	18.2	0.0	1	1	0	12.1	12.1	0.0
17	27.0	27.1	0.1	17.9	17.9	0.0	1	1	0	11.9	11.9	0.0
18	28.6	28.8	0.2	18.2	18.3	0.1	1	1	0	12.1	12.1	0.0
19	28.8	29.2	0.4	18.3	18.3	0.0	1	1	0	12.2	12.2	0.0
20	33.5	33.9	0.4	18.6	18.6	0.0	1	1	0	12.3	12.3	0.0
21	22.0	22.2	0.2	17.2	17.2	0.0	0	0	0	11.5	11.5	0.0
22	22.0	22.3	0.3	17.5	17.5	0.0	1	1	0	11.7	11.7	0.0
23	21.4	21.6	0.2	17.0	17.1	0.1	0	0	0	11.4	11.4	0.0
24	23.0	23.1	0.1	17.7	17.7	0.0	1	1	0	11.8	11.8	0.0
25	22.3	22.4	0.1	17.2	17.3	0.1	0	0	0	11.5	11.5	0.0

Note: For accuracy, the changes arising from the Development have been calculated using the exact output from the ADMS-Road and ADMS model rather than the rounded numbers. This explains where there may be a slight difference in the calculated change in concentrations from the 'without' and 'with' Development scenarios.

10.78. As shown in **Table 10.15**, for the peak construction period (in 2028) with the Development construction vehicles on the local road network, concentrations are predicted to meet the respective AQS objectives for all pollutants assessed.

10.79. Using the impact descriptors outlined in **Table 10.10**, the Development is predicted to result in a 'negligible' impact at all receptors. As discussed in **Appendix 10.1**, the 1-hour mean AQS objective for NO_2 is unlikely to be exceeded at a roadside location where the annual mean NO_2 concentration is less than 60µg/m^3. It is considered that with the Development construction vehicles on the local road network there would be a 'negligible' impact on hourly NO_2 concentrations.

10.80. Using the impact descriptors outlined in **Table 10.10** with the Development construction vehicles on the local road network for PM_{10} and $PM_{2.5}$ the predicted impact is 'negligible' at all existing receptors.

10.81. The predicted impacts above are worst-case, as the assessment has used the peak construction trips operating throughout an entire year (which would not occur in reality) and does not consider any improvements in NO_x and NO_2. Nonetheless, using professional judgement, based on the severity of the impact and the concentrations predicted at the sensitive receptors, it is considered that the effect of construction vehicles associated with the Development would be **insignificant** at all receptors and for all pollutants assessed.

10.82. The construction traffic modelling above was used to ascertain the impact of construction vehicles on existing receptors. The impact of construction vehicles on proposed receptors built out by 2028, such as the school, were not assessed. However, based on the impact of construction vehicles on existing receptors, the impact of construction vehicles on proposed receptors built out by 2028 would be **insignificant**.

Construction Plant Emissions

10.83. All construction plant would meet the Emissions Standard set out in the London Plan. As such it is considered the impact from construction plant emissions would be **insignificant**.

10.84. To ensure compliance, as per the guidance in the London Plan, all construction plant would be registered, and the emission ratings recorded.

Completed Development

Changes in Local Air Quality from Traffic

10.85. Likely impacts on local air quality when the Development is completed and operational in 2029 would result from changes to traffic flows on the local road network and emissions from the basement car parks associated with the Development. The results of the ADMS-Roads modelling of operational traffic (based on current guidance, that is with reduced emission rates and background concentration to the completion year of 2029) are presented in **Table 10.16**.

Table 10.16: Results of the Traffic Modelling at Select Sensitive Receptors

Receptor ID	NO_2 Annual Mean (µg/m³)				PM_{10} Annual Mean (µg/m³)				PM_{10} Number of Days >50µg/m³				$PM_{2.5}$ Annual Mean (µg/m³)			
	2019 Baseline	2029 Without Development	2029 With Development	2029 Change	2019 Baseline	2029 Without Development	2029 With Development	2029 Change	2019 Baseline	2029 Without Development	2029 With Development	2029 Change	2019 Baseline	2029 Without Development	2029 With Development	2029 Change
1	27.1	18.4	18.5	0.1	18.4	17.4	17.4	0.0	1	0	0	0	12.3	11.6	11.6	0.0
2	33.2	21.2	21.4	0.2	18.8	17.7	17.7	0.0	2	1	1	0	12.6	11.8	11.8	0.0
3	29.3	19.4	19.6	0.2	18.5	17.5	17.5	0.0	1	1	1	0	12.4	11.7	11.7	0.0
4	24.5	17.3	17.4	0.1	17.8	16.8	16.8	0.0	1	0	0	0	12.0	11.3	11.3	0.0
5	24.2	17.2	17.4	0.2	17.8	16.7	16.8	0.1	1	0	0	0	12.0	11.2	11.3	0.1
6	30.7	19.8	20.0	0.2	19.1	18.0	18.1	0.1	2	1	1	0	12.7	11.9	12.0	0.1
7	30.0	19.6	19.7	0.1	18.9	17.9	18.0	0.1	2	1	1	0	12.7	11.9	11.9	0.0
8	29.5	19.4	19.5	0.1	18.7	17.7	17.7	0.0	2	1	1	0	12.6	11.8	11.8	0.0
9	28.7	19.1	19.3	0.2	18.4	17.3	17.4	0.1	1	0	0	0	12.4	11.6	11.6	0.0
10	31.0	19.8	20.0	0.2	19.0	18.0	18.0	0.0	2	1	1	0	12.7	11.9	12.0	0.1
11	30.2	19.6	19.7	0.1	18.9	17.8	17.9	0.1	2	1	1	0	12.6	11.8	11.9	0.1
12	29.4	19.3	19.5	0.2	18.8	17.7	17.8	0.1	2	1	1	0	12.6	11.8	11.8	0.0
13	27.6	19.0	19.1	0.1	18.1	17.1	17.1	0.0	1	0	0	0	12.2	11.4	11.4	0.0
14	27.9	18.9	19.0	0.1	18.3	17.3	17.3	0.0	1	0	0	0	12.3	11.5	11.6	0.1
15	24.2	17.2	17.2	0.0	17.8	16.8	16.8	0.0	1	0	0	0	12.0	11.3	11.3	0.0

Receptor ID	NO_2 Annual Mean (µg/m³)				PM_{10} Annual Mean (µg/m³)				PM_{10} Number of Days >50µg/m³				$PM_{2.5}$ Annual Mean (µg/m³)			
	2019 Baseline	2029 Without Development	2029 With Development	2029 Change	2019 Baseline	2029 Without Development	2029 With Development	2029 Change	2019 Baseline	2029 Without Development	2029 With Development	2029 Change	2019 Baseline	2029 Without Development	2029 With Development	2029 Change
16	**42.1**	28.5	28.6	0.1	19.7	18.1	18.1	0.0	3	1	1	0	13.2	12.0	12.0	0.0
17	39.4	26.8	26.9	0.3	19.4	17.8	17.9	0.1	2	1	1	0	13.1	11.9	11.9	0.0
18	**42.0**	28.4	28.4	0.0	19.7	18.1	18.2	0.1	3	1	1	0	13.3	12.1	12.1	0.0
19	**42.5**	28.6	28.7	0.1	19.8	18.2	18.3	0.1	3	1	1	0	13.3	12.1	12.1	0.0
20	**48.4**	33.2	33.4	0.2	20.2	18.5	18.6	0.1	3	1	1	0	13.5	12.3	12.3	0.0
21	32.9	21.2	21.4	0.2	18.7	17.6	17.6	0.0	1	1	1	0	12.5	11.7	11.7	0.0
22	32.5	22.1	22.2	0.1	18.9	17.4	17.4	0.0	2	0	0	0	12.7	11.6	11.6	0.0
23	31.6	20.7	20.9	0.2	18.5	17.4	17.5	0.1	1	0	1	0	12.4	11.6	11.7	0.1
24	35.2	23.0	23.1	0.1	19.2	17.6	17.6	0.0	2	1	1	0	12.9	11.7	11.7	0.0
25	33.9	21.6	21.6	0.0	18.7	17.6	17.6	0.0	2	1	1	0	12.6	11.7	11.8	0.1
26	-	-	22.5	-	-	-	17.9	-	-	-	1	-	-	-	11.9	-
27	-	-	20.2	-	-	-	19.0	-	-	-	2	-	-	-	12.5	-
28	-	-	19.7	-	-	-	17.8	-	-	-	1	-	-	-	11.8	-
29	-	-	18.2	-	-	-	17.2	-	-	-	0	-	-	-	11.5	-

Note: For accuracy, the changes arising from the Development have been calculated using the exact output from the ADMS-Road and ADMS model rather than the rounded numbers within Table 10.15. This explains where there may a slight difference in the calculated change in concentrations from the 'without' and 'with' Development scenarios. Exceedences of the AQS objectives shown in **bold** text

Nitrogen Dioxide (NO_2)

10.86. The results in **Table 10.16** indicate that for 2019 the annual mean NO_2 objective is exceeded at four of the existing 25 sensitive receptors (Receptors 16, 18, 19 and 20) and met at the remaining 21 existing receptors. The highest concentration is predicted at Receptor 20 (48.4µg/m^3). As discussed in **Appendix 10.1**, the 1-hour mean AQS objective for NO_2 is unlikely to be exceeded at a roadside location where the annual mean NO_2 concentration is less than 60µg/m^3. As shown in **Table 10.16**, the predicted annual mean NO_2 concentrations in 2019 are below 60µg/m^3 at all receptor locations. Accordingly, the 1-hour mean objective is likely to be met at these locations.

10.87. In 2029, both 'without' and 'with' the Development, concentrations are predicted to meet the NO_2 annual mean objective value at all receptor locations assessed. Therefore, the 1-hour mean objective is also predicted to be met at all existing receptor locations.

10.88. Using the impact descriptors outlined in **Table 10.10**, the Development is predicted to result in an 'negligible' impact at all existing receptors assessed. It is also considered that the Development would have an 'negligible' impact on hourly NO_2 concentrations.

Particulate Matter (PM_{10} and $PM_{2.5}$)

10.89. As shown in **Table 10.16**, the annual mean concentrations of PM_{10} are predicted to be well below the objective of 40µg/m^3 in 2019 and in 2029 both 'without' and 'with' the Development at all the existing receptor locations considered. The 2019 predicted annual mean PM_{10} concentrations are consistent / in line with the existing LBRuT automatic monitor results. The maximum predicted annual mean PM_{10} concentration is 20.0µg/m^3 at Receptor 20 in 2019. Using the impact descriptors outlined in **Table 10.10**, the Development is predicted to result in an 'negligible' impact at all existing receptors assessed.

10.90. The results in **Table 10.16** indicate that in 2019 and in 2029 for both 'without' and 'with' the Development, all existing receptor locations are predicted to be below the 24-hour mean PM_{10} objective value of 35 days exceeding 50µg/m^3. The maximum predicted concentration in all scenarios tested is 3 days at Receptors 19 and 20.

10.91. The results in **Table 10.16** indicate that in 2019 and in 2029 for both 'without' and 'with' the Development, all existing receptor locations are predicted to be below the annual mean $PM_{2.5}$ objective value of 25µg/m^3.

10.92. Using the impact descriptors outlined in **Table 10.10** the Development is predicted to result in an 'negligible' impact at all existing receptors.

10.93. Using professional judgement, based on the severity of the impact discussed above and the concentrations predicted at all the sensitive receptors considered in the air quality assessment, it is considered that the effect of the Development on local NO_2, PM_{10} and $PM_{2.5}$ concentrations would be **insignificant**.

Conditions within the Development

10.94. As shown by the results in **Table 10.16**, the predicted NO_2, PM_{10} and $PM_{2.5}$ concentrations for locations within the Development with relevant exposure are below the relevant objectives in 2029

for all floor levels. As such, it is considered that the effect of introducing future residential and school uses to the Site is **insignificant**.

Overall Predicted Effects of the Development

10.95. Using professional judgement, based on the severity of the impact discussed above and the concentrations predicted at all the sensitive receptors considered in the air quality assessment - it is considered that the effect of the Development on local NO_2, PM_{10} and $PM_{2.5}$ concentrations would be **insignificant**.

Mitigation Measures and Likely Residual Effects

The Works

Nuisance Dust

10.96. The Site is considered to be a medium to high-risk site, and, therefore, a range of environmental management controls to be implemented through a Construction Environmental Mitigation Plan (CEMP) would be developed with reference to the IAQM guidance for High-Risk sites. The management controls would prevent the release of dust entering the atmosphere and / or being deposited on nearby receptors, including the River Thames and Tidal Tributaries SMI. The management controls would include:

- develop and implement a stakeholder communications plan, including community engagement before demolition and construction works commence on the Site;
- record all dust and air quality complaints, identify causes, take appropriate measures to reduce emissions in a timely manner, and record the measures taken, make the log available to the local authority;
- hold regular liaison meetings with other high-risk construction sites within 500 m of the Site boundary to ensure plans are coordinated and emissions minimised;
- plan the Site layout so that machinery and dust causing activities are located away from receptors, as far as possible;
- erect barriers around dusty activities that are at least as high as any stockpiles;
- fully enclose specific operations where there is a high potential for dust production and the area is active for an extensive period;
- avoid Site runoff of water or mud;
- keep hoarding, barriers and scaffolding clean using wet methods;
- remove materials that have a potential to produce dust from Site as soon as possible, unless being re-used on the Site;
- cover, seed or fence stockpiles to prevent wind whipping, where practicable;
- ensure all vehicles switch off engines when stationary – no idling vehicles;
- avoid the use of diesel or petrol-powered generators and use mains electricity or battery powered equipment, where practicable;

- impose and signpost a maximum speed limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas;
- produce a Construction Traffic Management Plan to manage the sustainable delivery of goods and materials and that supports and encourages sustainable travel;
- use cutting, grinding or sawing equipment fitted, or in conjunction, with suitable dust suppression techniques such as water sprays or local extraction;
- ensure adequate water supply on the Site for effective dust/particulate matter suppression / mitigation, using non-potable water, where possible and appropriate;
- used enclosed chutes and conveyors and covered skips;
- minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate;
- ensure equipment is readily available on the Site to clean any dry spillages. Clean up spillages as soon as reasonably practicable after the event using wet cleaning methods;
- use water -assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the Site;
- avoid dry sweeping of large areas;
- ensure vehicles entering and leaving the Site are covered to prevent escape of materials during transport;
- inspect on-Site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable;
- record all inspections of haul routes and any subsequent action in a Site log book;
- implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the Site where reasonably practicable);
- ensure there is an adequate area of hard surfaced road between the wheel wash facility and the Site exit, wherever possible; and
- access gates to be located at least 10 m from sensitive receptors, where possible.

10.97. Such measures are routinely and successfully applied to major construction projects throughout the UK and are proven to reduce significantly the potential for adverse nuisance dust effects associated with the various stages of demolition and construction work. Therefore, it is considered that the likely residual effects during the demolition and construction works due to fugitive emissions on all sensitive receptors (human and ecological) would be **insignificant**.

Construction Vehicle Exhaust Emissions

10.98. The effect of construction vehicles has been assessed using ADMS-Roads which found impacts predicted as being **insignificant** at receptors assessed. To reduce impacts, as part of the CEMP and as a matter of good practice, measures to control construction traffic are proposed. Such measures would include:

- establishment of the most suitable construction traffic routes;
- limiting the use of ‘sensitive’ roads (to include residential roads, congested roads etc.); and

- timing large-scale vehicle movements outside of peak hours.

10.99. Taking account of the above CEMP measures, the likely residual effect of construction traffic on local air quality would be **insignificant**.

Construction Plant Emissions

10.100. As described above, all construction plant would meet the Emissions Standard set out in the London Plan. On this basis, it is considered that the likely residual effect from construction plant emissions on local air quality would be **insignificant**.

Completed Development

10.101. As identified earlier in this Chapter - the effect of operational traffic emissions from the Development is predicted to have an **insignificant** effect on local air quality at relevant receptors surrounding the Site, and therefore the residual effect would remain **insignificant**.

10.102. **Table 10.17** presents measures inherent to the Development and additional mitigation measures to be included during the construction and operational phases of the Development which are likely to benefit local air quality. There is no standard or recognised methodology to enable the reduction in pollutant concentrations that these measures would result in to be quantified within an air quality assessment. However, these measures are consistent with those identified by LBRuT within their Air Quality Action Plan.

Table 10.17: Summary of Air Quality Mitigation Measures

	Mitigation Measures
1.Demolition and Construction Phase	• Environmental management controls developed and set out in the Framework Construction Management Plan and subsequent CEMPs, including dust suppression, hoarding, monitoring etc. • All construction plant would adhere to the emissions standards for NO_2 and PM_{10} set out for Non-Road Mobile Machinery (NRMM) in the London Plan. • Avoidance, or limited use, of traffic routes in proximity to sensitive routes. All construction traffic logistics would be agreed with LBRuT. • Avoidance, or limited use, of roads during peak hours, where practicable. • Provision of a Construction Worker Travel Plan and a Construction Transport Management Plan. • Dust monitoring and dust controls to be agreed with LBRuT.
2. Inherent – Measures included in the design of the Development	• School set back from Lower Richmond Road and interim dispersion modelling completed (using ADMS-Roads) and results to ensure this location is acceptable; • Provision of cycle spaces in accordance with London Plan requirements**.** • Low Parking Ratio (0.36 car parking spaces per residential unit). • 20% of all parking spaces are to be provided with active electric charging infrastructure (with the remainder passive) in accordance with London Plan standards. • Provision of new pedestrian and cycle paths aimed to promote walking, cycling and the use of public transport. • Extensive public and private realm and landscaping including: – public and private amenity space including playscape would be provided throughout the Development;

Mitigation Measures	
	– integration of a mix of trees, mass planting and lawn areas; – green or brown roofs to be incorporated as part of the Development; – provision of a public park and the Green Link between Mortlake Green via the Site to the riverside; and – pedestrianised High Street within the Site. • Preparation and implementation of a Delivery and Servicing Plan that will set out how all types of freight vehicle movements to and from the Development will be managed. • Framework, Site-wide, School and Residential Travel Plans setting out how all Site users can access the Development by sustainable forms of transport. • Provision of new car club spaces, as part of the Residential Travel Plan; • Introduction of stop idling / switch engine off' signs at the Williams Lane and Ship Lane junctions with Lower Richmond Road and introduction of a traffic congestion / air quality information board. • Reconfiguration to the Chalkers Corner junction to alleviate the transport and traffic implications associated with the operation of the Development (secured by S278 agreement).
3.Additional future measures that could be included / to be secured through s278 agreement.	• Other highways works, secured by s278: – Improvements to Ship Lane, which would continue as a public highway but would be enhanced as a pedestrian route through the provision of a wider footway on the west side and a new footway (3 m) on the east side; – A new pelican crossing at the southern end of the Green Link along Lower Richmond Road directly north of Mortlake Green. The existing signalised crossing point adjacent to Ship Lane would be relocated to align better with the Green Link; – A new signalised pedestrian crossing provided just to the west of the new access road to the school to improve access for pupils needing to cross Lower Richmond Road.; and – Provision of a new signalised pedestrian crossing to serve a desire line to the eastern portion of the Development. • Enhancement of existing bus services. Based on the current service pattern, an increased frequency for the 419 service would be the preferred solution together with provision of special buses to meet the peak demands associated with the school. • Safeguarding of land at the corner of Lower Richmond Road/Williams Lane to allow TfL to provide in the future bus stands, driver facilities and a bus turn facility. • Safeguarding of land close to the Green Link to allow the future provision of a cycle hire facility. • A new 20mph speed limit enforced between Williams Lane and Bulls Alley including Sheen Lane, between the Mortlake High Street / Lower Richmond Road junction and the Sheen Lane level crossing. A number of physical measures are proposed to help manage speeds including junction entry treatments, carriageway narrowing and provision of a textured tarmac resin to differentiate the area of speed restraint. Potentially, table tops to comply with TfL requirements for buses could be installed at pedestrian crossing points by the school and on the Green Link. • Potential funding for a new controlled parking zone and/or modifications to existing parking zones to help manage potential overspill parking associated with the proposed development onto surrounding roads.

Summary

10.103. **Table 10.18** summarises the likely significant effects, mitigation measures, and likely residual effects identified within this Chapter. Refer to **Table 10.17** above for a full list of air quality mitigation measures.

Table 10.18: Summary of Likely Significant Effects, Mitigation Measures and Likely Residual Effects

Description of Effect	Likely Significant Effect	Mitigation Measures	Likely Residual Effect
The Works			
Dust emissions on surrounding existing receptors and early occupiers of the Development.	**Temporary**, **short to medium term**, **local** and of **moderate adverse significance.**	Implementation of CEMP and Framework Construction Management Plan.	**Insignificant**.
Exhaust emissions from construction traffic on surrounding existing receptors and early occupiers of the Development.	**Insignificant**.	No mitigation required, although a Construction Traffic Management Plan would also be implemented.	**Insignificant**.
Emissions from construction plant on surrounding existing receptors and early occupiers of the Development.	**Insignificant**.	No mitigation required, as all construction plant would meet the Emissions Standard set out in the London Plan.	**Insignificant**.
Completed Development			
Traffic related exhaust emissions on existing sensitive locations surrounding the Site.	**Insignificant**.	No mitigation required, refer to **Table 10.16** and **Appendix 10.4**.	**Insignificant**.
Introduction of future residential and school uses to the Site.	**Insignificant**.	No mitigation required, refer to **Table 10.16** and **Appendix 10.4**.	**Insignificant**.

References

1 Cambridge Environmental Research Consultants Ltd (2020): 'ADMS-Roads', Version 5.0.01.

2 AEA (2020): 'NOx to NO2 Calculator', http://laqm1.defra.gov.uk/review/tools/monitoring/calculator.php Version 8.1, August 2020

3 Environment Agency. Air Quality Modelling and Assessment Unit. 'Conversion Ratios for NOx and NO2.

4 Environmental Protection UK & Institute of Air Quality Management (2017); 'Land-Use Planning & Development Control: Planning for Air Quality', January 2017. IAQM, London.

5 Institute of Air Quality Management (2014); 'Assessment of Dust from Demolition and Construction'.

6 Greater London Authority. 2021. The London Plan: The Spatial Development Strategy for Greater London, March 2021, GLA, London

7 http://laqm.defra.gov.uk/faqs/faqs.html.

8 Air Quality Consultants. 2020. Performance of Defra's Emission Factor Toolkit 2013 – 2019. February 2020

9 Council Directive 2008/50/EC of 21 May 2008 on ambient air quality and cleaner air for Europe.

10 Defra (2007); 'The Air Quality Strategy for England, Scotland, Wales & Northern Ireland'.

11 Department of the Environment, Food and Rural Affairs (DEFRA) (2007); 'The Air Quality Strategy for England, Scotland, Wales & Northern Ireland. DEFRA'.

12 Office of the Deputy Prime Minister (ODPM) (1995); 'The Environment Act' 1995. OPA.

13 London Borough of Richmond upon Thames (2016); '2015 Updating and Screening Assessment for The London Borough of Richmond upon Thames'.

14 London Borough of Richmond upon Thames.2021. London Borough of Richmond upon Thames Air Quality Annual Status Report for 2020. Date of publication: 28th May 2021. Available at : annual_status_report_2021.pdf (richmond.gov.uk)

15 London Borough of Richmond upon Thames (2019); 'Air Quality Action Plan 2019-2024'.