MEC
Development Technical Consultants

ACOUSTIC AIR

Officers' Meadow, Shenfield
Air Quality Assessment
September 2023

Report Ref: 27219-ENV-0401 Rev A

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REGISTRATION OF AMENDMENTS

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APPENDICES

1.0 INTRODUCTION

1.1 Mewies Engineering Consultants Ltd (M-EC), has been commissioned by Croudace Homes (Caterham) (hereafter referred to as 'the Client') to undertake an Air Quality Assessment to support a planning application for a proposed residential development at Officers' Meadow, Shenfield (hereafter referred to as 'the Site').

1.2 This Air Quality Assessment seeks to examine the impact of development traffic road emissions from the Site upon existing and future sensitive receptors. The key traffic related pollutants considered are nitrogen dioxide (NO_2) and particulate matter (PM_{10} and $PM_{2.5}$).

1.3 The assessment has been undertaken with reference to the advice provided within the Land-Use Planning and Development Control: Planning for Air Quality, and 'Guidance from Environmental Protection UK, the Institute of Air Quality Management for the consideration of air quality within the land-use planning and development control processes', May 2017 and the 'Guidance on the Assessment of the Impacts of Construction on Air Quality and the Determination of their Significance' 2014.

Disclaimer

1.4 M-EC has completed this report for the benefit of the individuals referred to in Paragraph 1.1 and any relevant statutory authority which may require reference in relation to approvals for the proposed development. Other third parties should not use or rely upon the contents of this report unless explicit written approval has been gained from M-EC.

1.5 M-EC accepts no responsibility or liability for:

a) The consequence of this documentation being used for any purpose or project other than that for which it was commissioned;
b) The issue of this document to any third party with whom approval for use has not been agreed.

2.0 SITE DESCRIPTION

Existing Site

2.1 The Site, comprised of arable land, is bound by the A1023 Chelmsford Road and existing residential to the northwest, with the A12 located beyond; arable land use to the northwest; the Great Eastern Main Line to the southeast; and existing residential and Shenfield High School to the southwest, with Alexander Lane located beyond.

2.2 The principal sources of emissions affecting the Site will be road traffic using the A1023 Chelmsford Road adjacent to the north western boundary, coupled with contributions from the A12 located beyond.

2.3 An approximate redline boundary is presented in Figure 2.1.

Figure 2.1: Approximate Redline Boundary

Development Proposals

2.4 Hybrid planning application for 344 units including 35% affordable housing, safeguarded land for a 2FE primary school and early years facility, public open space and associated landscaping, drainage and highways infrastructure.

2.5 The proposed site layout is provided in **Appendix A**.

3.0 LEGILSATION, POLICY AND GUIDANCE

General

3.1 This section of the report outlines the policy and legislative context of the proposed development with respect to local air quality.

3.2 Definitions of units and terms used to quantify air pollutant concentrations are provided in **Appendix B.**

National Policy

Environment Act 2021

3.3 Part IV of the Environment Act 2021 (the Act) requires UK government and devolved administrations to produce a national air quality strategy containing standards, objectives and measures for ameliorating ambient air quality and to continually review these policies.

3.4 The Act also provides a legislative framework for a system of Local Air Quality Management (LAQM). This system is an integral part of delivering the UK's air quality obligations.

3.5 Under the LAQM regime, responsible authorities are required to carry out a regular review and assessment (R&A) of air quality in their area against defined national objectives, which have been prescribed in regulations for the purposes of LAQM. Where it is found these objectives are unlikely to be met, responsible authorities must designate Air Quality Management Areas (AQMA) and implement Air Quality Action Plans (AQAPs) to tackle the problems.

3.6 Provisions in the Act are largely enabling and allow responsible authorities the power to take forward local policies to suit their own needs. Local circumstance will also determine the content of the local air quality policy, designation of AQMAs and the content of AQAPs.

The National Air Quality Strategy

3.7 Due to the transboundary nature of air pollution, it is appropriate to have an overarching strategy with common aims covering all parts of the UK. For this reason, the National Air Quality Strategy (NAQS) is presented as a joint UK Government and devolved administrations document.

3.8 The most recent NAQS was published in 2011 and established a framework for further air quality improvements across the UK. The NAQS sets out standards and objectives which have been established in order to measure the improvement of air quality.

3.9 The NAQS is a statement of policy intentions or policy targets and as such there is no legal requirement to meet these objectives except in so far as these mirror any equivalent legally binding 'limit values' in EU legislation.

3.10 With minimal exception, the objectives have been met across the UK for all pollutants except particulate matter (PM_{10}) and nitrogen dioxide (NO_2). These pollutants are directly related to road traffic pollution and many of the areas that breach the objectives (designated AQMAs) are located close to major road sources.

3.11 There are a wide range of terms and concepts used in international, national and local air quality policy and legislation and the NAQS discusses air quality in terms of Standards and Objectives. These terms are defined below:

- Standards are the concentrations of pollutants in the atmosphere which can be broadly taken to achieve a certain level of environmental quality. The standards are based on assessment of the effects of each pollutant on human health including the effects on sensitive sub groups and ecosystems.
- Objectives are policy targets often expressed as a maximum ambient concentration not to be exceeded either without exception or with a permitted number of exceedances within a given timescale.

National Planning Policy Framework

3.12 The latest National Planning Policy Framework (NPPF), issued by the Ministry of Housing, Communities and Local Government in 2021, sets out the Government's planning policies for England and how these are to be expected to be applied. The NPPF must be taken into account in the preparation of local and neighbourhood plans, and is to be a material consideration in planning decisions.

3.13 Paragraph 174 of the NPPF advises that, with respect to noise, planning policies and decisions should contribute to and enhance the natural and local environment by *"...preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans"*.

3.14 Further, paragraph 186 advises that *"Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan."*

National Planning Policy Guidance

3.15 The National Planning Practice Guidance (NPPG) provides guiding principles on how planning can take account of new development on air quality.

3.16 Whether or not air quality is relevant to a planning decision will depend on the proposed development and its location. Concerns may arise if the development is likely to generate an air quality impact in the area, or the development is likely to adversely impact upon the implementation of air quality strategies and action plans, and/or lead to a breach of EU legislation.

3.17 When deciding whether air quality is relevant to a planning application, considerations include whether the development would:

- Significantly affect traffic in the immediate vicinity of the proposed development or further afield.
- Introduce new point sources of air pollution.
- Expose people to existing sources of air pollutants, for example building new homes.
- Give rise to potentially unacceptable impact (such as dust) during construction.
- Affect biodiversity.

Legislation

3.18 The NAQS Objectives are transposed into UK legislation by a series of Regulations including, for England, the Air Quality (England) Regulations 2000, the Air Quality (England) Amendment Regulations 2002, and the Air Quality (England) Amendment Regulations 2004.

3.19 In addition, the UK has a legislative requirement to meet air quality limit values for key pollutants defined at a European level by European Council Directives.

- Directive 2008/50/EC on ambient air quality and cleaner air for Europe; and
- Directive 2004/107/EC relating to arsenic, cadmium, mercury, nickel and PAH.

3.20 These Directives are transposed into UK legislation by the Air Quality Standards Regulations 2010.

3.21 Table 3.1 summarises the national objectives and European 'limit value' obligations for PM_{10}, $PM_{2.5}$ and NO_2, the key transport-related pollutants of concern in the UK.

Table 3.1: Summary of Air Quality Objectives

Pollutant	Air Quality Objectives	
	Concentration (µg/m^3)	Averaging Period
Nitrogen Dioxide (NO_2)	200	1-hour mean; not to be exceeded more than 18 times a year
	40	Annual mean
Particulate Matter with an aerodynamic diameter of less than 10 microns (PM_{10})	50	24-hour mean; not to be exceeded more than 35 times a year
	40	Annual mean
Particulate Matter with an aerodynamic diameter of less than 2.5 microns ($PM_{2.5}$)	20	Annual mean

Local Air Quality Management

3.22 LAQM requires local authorities to undertake a regular Review and Assessment of air quality. Previous guidance (pre-2016) dictated three types of assessment a local authority could carry out.

3.23 The first was an Updating and Screening Assessment (USA), undertaken every three years. A USA considered the changes that had occurred in pollutant emissions and sources since the last round of Review and Assessment that may affect air quality. The USA was then followed by either a Detailed Assessment or a Progress Report.

3.24 A Detailed Assessment was required when the USA identifies a risk of exceeding an air quality objective at a location of relevant public exposure, and the objective is to determine whether it is necessary to declare an AQMA. If the USA does not identify any risk, then a Progress Report was prepared annually in the intervening years between USAs, to maintain continuity in the LAQM process.

3.25 The LAQM system changed in 2016, providing a more streamlined approach and a greater emphasis on action planning to bring forward improvements in air quality and to include local measures as part of EU reporting requirements. As part of the changes to LAQM, from 2016 Annual Status Reports (ASR) will replace all other reports, except Action Plans, to reduce the burden of the reporting cycle.

Construction Dust Nuisance

3.26 There is no specific guidance relating to the assessment of construction dust nuisance within Government documents such as the DMRB. Consequently, guidance from relevant national bodies provides the best advice for establishing the potential impacts from dust. Research carried out by the Buildings Research Establishment (BRE) indicates that the likelihood of complaints concerning dust nuisance is related to the distance of receptors from a construction site and the duration of dust raising activities. This relationship is shown in Table 3.2.

Table 3.2: Likelihood of Dust Complaints by Distance

Duration of Dust raising activity onsite	**Distance from site**			
	<20	20-50m	50-100m	100-150m
	Likelihood of complaint			
>12 months	Very Likely	Very Likely	Likely	Potential likelihood
6-12 months	Very Likely	Likely	Likely	Potential likelihood
<6 months	Very Likely	Likely	Potential Likelihood	Not Likely

Note: Beyond 150m dust nuisance is considered largely unlikely (Upton & Kukadia 2002, Measurements of PM_{10} from a Construction Site: A Case study, prepared by BRE Environment for National Society for Clean Air).

3.27 Further empirically derived measures of the maximum distance from a source of airborne dust within which significant adverse effects are likely to be observed, are presented in Table 3.3. These values reflect qualitative estimates derived from historical data presented within environmental assessment reports and expert evidence.

Table 3.3: Qualitative Construction Dust Assessment Criteria

		Zone for Potentially Significant Effects (Distance from Source)	
Source	**Duration**	**Soiling**	**PM_{10}***
Large construction sites	1 year or more	100 m	25-50 m
Moderate sized construction sites	Months	50 m	15-30 m
Minor construction sites	Weeks	25 m	10-20 m

*Based on 35 permitted exceedances of 50µg/m^3 in a year, as defined in the Air Quality (England) regulations. Source: Adapted from Thames Gateway Bridge- Environmental Statement (Laxen, 2004)

3.28 The Institute of Air Quality Management (IAQM) Guidance on the assessment of dust from demolition and construction, February 2014, provides a framework for the assessment of risk.

3.29 The guidance divides activities on construction sites into four types to reflect their different potential impacts. These are:

- Demolition;
- Earthworks;
- Construction; and
- Trackout.

3.30 The assessment methodology considers the following three separate dust effects, with account being taken of the distance of the receptors that may experience these effects.

- Annoyance due to dust soiling;
- Harm to ecological receptors; and
- The risk of health effects due to a significant increase in exposure to PM_{10}.

3.31 The assessment procedures and risk categories for each of the four phases of construction where the potential for dust is high, i.e., those listed above, are summarised in **Appendix C**.

3.32 Step 1 establishes that an assessment will normally be required where there are dwellings within 350m of the site boundary.

4.0 BRENTWOOD BOROUGH COUNCIL'S AIR QUALITY REVIEW AND ASSESSMENT

4.1 The main source of air pollution in the Brentwood Borough Council (BBC) area is road traffic emissions for major roads, notably, the M25, A12, A127, A128, A1023 and A129.

4.2 BBC currently has three Air Quality Management Areas (AQMAs), declared for exceedances to the annual mean nitrogen dioxide (NO_2) objectives, as follows:

- AQMA No. 2: Covering parts of Brook Street, Brentwood and the A12 – located approximately 5.4km southwest of the Site;
- AQMA No. 4: Covering parts of Warescot Road, Hurstwood Avenue and Ongar Road, Brentwood and the A12 – located approximately 3km southwest of the Site; and
- AQMA No. 7: Covering of Ongar Road, Ingrave Road, High Street and Shenfield Road, Brentwood in proximity to Wilsons Corner (the junction of the A128 and A1203) – located approximately 2.5km southwest of the Site.

4.3 BBC's most recently published 2022 Annual Status Report (ASR) states: *"#no air quality exceedances have been identified in 2021"*.

4.4 As the most recent yearly data sets will include impacts associated with COVID-19 and subsequent reduced traffic flows during local and national lockdowns, a more detailed review of BBC's 2020 ASR has been undertaken, which reports on 2019 measured concentrations, i.e., concentrations measured prior to the pandemic. The 2020 ASR states that: *"This report identifies that Brentwood Borough Council has not monitored any exceedances of the nitrogen dioxide Air Quality Objectives at relevant exposure."*.

4.5 The ASR indicates that due to continued compliance with the Air Quality Objectives, BBC were seeking the revocation of all AQMA.

4.6 BBC operates a comprehensive network of diffusion tube monitoring locations, and the most relevant diffusion tubes closest to the Site, and located within the neighbouring AMQA No. 4 and AQMA No. 7, are presented in Table 4.1.

Table 4.1: BBC Monitoring Data

Site ID	OS Co-ordinates	Annual Mean Concentrations (µg/m^3)			
		2018	2019	2020	2021
BRW 8	559691,193912	33.9	35.1	26.4	27.4
BRW 9	559643,193889	31.9	31.0	22.4	26.4
BRW 10	559699,193948	36.4	33.6	24.6	27.9
BRW 11	559604,194035	31.1	30.5	24.6	24.5
BRW 19	558769,194873	26.8	26.7	21.1	21.2
BRW 20	558818,194913	32.3	31.9	26.2	27.5
BRW 21	558681,194799	23.7	23.7	19.8	16.8
BRW 22	558683,194894	30.3	30.0	23.6	23.1
BRW 23	558742,194928	33.3	33.5	25.5	25.9

4.7 The information in Table 4.1 indicates that annual mean concentrations of NO_2 in the locality of the Site, and within the neighbouring AQMA, lies below the objective level of 40 µg/m^3, with the most relevant concentrations in 2019, i.e., prior to any impact associated with COVID-19, ranging from 30 – 35 µg/m^3.

4.8 Since 'relevant exposure' is already present adjacent to the Site, i.e., existing residential dwellings are present adjacent to the Site and local roads, and these have already been considered within BBC's reviews and assessments, the same conclusions will apply for new dwellings on the Site. Namely, all air quality objectives will be satisfied on the Site and at dwellings adjacent to the routes to the Site.

4.9 Nevertheless, it will be important that the air quality assessment for the proposed development looks at the potential effects of traffic generated by development upon existing dwellings adjacent to local roads to establish that there will be no adverse effects upon their existing standards of air quality. This matter is covered in the following section.

5.0 METHODOLOGY

General

5.1 The assessment has been undertaken using the atmospheric dispersion modelling package ADMS-Roads Air Quality Management System Version 5.1, developed by Cambridge Environmental Research Consultants Ltd (CERC), to establish air pollutant concentrations at the proposed development.

5.2 The assessment has been undertaken with reference to guidance set out within Defra's LAQM.TG(22), the IAQM and EPUK's 'Guidance on Land-Use Planning and Development Control: Planning for Air Quality 2017 (v1.2)'.

5.3 Specifically, ADMS-Roads has been used to disperse emissions of NO_x and PM_{10} from local road sources and derive resultant road contributions to the concentrations of these pollutants at specific existing receptor locations. When added to the background concentration, this provides an indication of the resulting air quality at each receptor location.

5.4 The ADMS-Roads model requires the input of background pollutant concentration data, hourly traffic flows, annual average vehicle speed, vehicle classification broken down into light and heavy duty vehicles (LDV/HDV), information on the type of road and meteorological data (model inputs are discussed in turn later).

5.5 Current guidance has led to some changes in the way in which NO_2 concentrations should be modelled. In accordance with LAQM.TG(22) the ADMS-Roads model has been used to derive road-based concentrations of NOx at specific receptor locations. To convert the modelled road-based NO_x to annual NO_2 the 'NO_x to NO_2' calculator (Version 8.1) (available from https://laqm.defra.gov.uk/air-quality/air-quality-assessment/nox-to-no2-calculator/) has been applied to all modelled results.

Assessment Scenarios

5.6 For the purpose of an Air Quality Assessment, sensitive receptors can be thought of as areas within 200m of the roadside where people may be subject to change in air quality. Beyond 200m from the roadside, atmospheric dispersion (and chemistry) effect render emissions from road traffic negligible

5.7 The assessment considers the potential impact of emissions from development-related traffic upon NO_2, PM_{10} and $PM_{2.5}$ concentrations at individual receptor locations as shown in **Appendix D**. The following scenarios (informed by available BBC NO_2 monitoring data and the Transport Assessment work) have been included in the assessment:

- 2019 Baseline (for verification);
- 2028 'Do Nothing' (i.e., Baseline + Committed);
- 2028 'Do Something' (i.e., Baseline + Committed + Proposed);
- 2033 'Do Nothing' (i.e., Baseline + Committed); and
- 2033 'Do Something' (i.e., Baseline + Committed + Proposed).

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5.8 The future year scenario has been modelled using future year traffic flow data, together with 2023 background and emissions data, to account for current uncertainty in future year projections. Background concentrations and vehicle emission factors are projected to decrease year on year due to fleet composition and technological changes. Using 2023 data therefore provides a conservative case for the future scenarios.

Local Road Network

5.9 Local road sources have been input into the model using the interface between ADMS-Roads and the ADMS-Roads mapper, which enables roads to be input according to their geographic location using OS base mapping of the local area. Road/carriageway widths have been informed from OS base and aerial mapping.

Traffic Data & Emissions

5.10 To inform emissions from each road source included within the model, traffic flows for the local road network have been provided by project's Transport Consultant; SLR Consulting. The available traffic flow data, % HGV and average speed assumptions for each assessment scenario are provided in **Appendix E** for information.

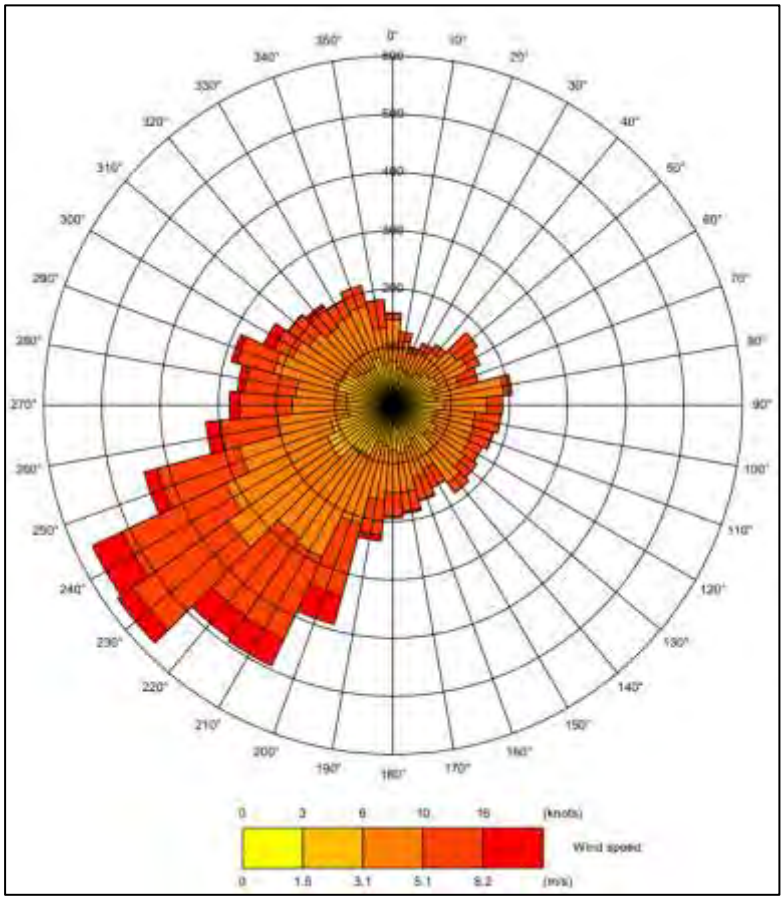
5.11 Emission rates for each road source have been derived from traffic flow data using the Emission Factor Toolkit (EFT), Version 11.0, published by Defra and the devolved administrations in November 2021. The EFT is incorporated within ADMS-Roads Extra, Emissions have been calculated and included within the software. The EFT allows users to calculate road vehicle pollutant emission rates for pollutants for a specified year, road type, and vehicle speed and vehicle fleet composition.

Meteorology

5.12 The closest meteorological station to the Site is located at Stanstead Airport. However, at an elevation 106m, and at a distance of 28km, the use of Numerical Weather Prediction (NWP) data is considered more appropriate. NWP data has been continuously improved driven by the demand for more accurate weather forecasts — which is the principal reason for the development of weather forecasting models that generate NWP data. Therefore, NWP data for the Site is considered to provide more representative data for the area in question, and has been utilised to approximate average weather conditions for all scenarios.

5.13 The NWP windrose for the Site is presented in Figure 5.1. The predominant wind direction, which is associated with the highest wind speeds, is predicted to be from the southwest.

Figure 5.1: NWP Windrose – Shenfield 2019



Background Concentrations

5.14 Background concentrations of NO_2, NO_x, PM_{10} and $PM_{2.5}$ have been obtained from the 2018-based maps available on the Defra website (https://uk-air.defra.gov.uk/data/laqm-background-homel) which provide estimated background pollutant concentrations for each 1kmx1km grid square in the UK. The projections in the 2018 LAQM background maps are based on assumptions which were current before the COVID-19 outbreak in the UK. In consequence, these maps do not reflect short or longer term impacts on emissions in 2020 and beyond resulting from behavioural change during the national or local lockdowns.

5.15 As the background maps provide data for individual pollutant sectors, those sectors relating to road traffic have been removed to avoid double counting of road emissions. As only total background concentrations are provided for NO_2, the NO_2 map has been adjusted using the online NO_2 Adjustment for NO_x Sector Removal Tool (Version 8.0), https://laqm.defra.gov.uk/air-quality/air-quality-assessment/no2-adjustment-for-nox-sector-removal-tool/.

Verification

5.16 To determine how well the model is performing and to correct any over or under estimation of pollutant concentrations, LAQM.TG(22) recommends a verification process that should be applied. Verification involves a comparison between predicted and measured 'road traffic contributions' at one or more local sites and adjustment of the modelled concentrations if necessary.

5.17 Modelled pollutant concentrations have been verified against BBC's 2019 NO_2 monitoring results, as shown in Table 5.1 below. 2019 monitored data has been used as these concentrations will not have been affected by the COVID-19 pandemic and subsequent travel restrictions.

Table 5.1: BBC Monitoring Data Used in Verification

Site ID	OS Co-ordinates	2019 Annual Mean Concentrations (µg/m^3)
BRW 8	559691,193912	35.1
BRW 9	559643,193889	31.0
BRW 10	559699,193948	33.6
BRW 11	559604,194035	30.5
BRW 19	558769,194873	26.7
BRW 20	558818,194913	31.9
BRW 21	558681,194799	23.7
BRW 22	558683,194894	30.0
BRW 23	558742,194928	33.5

5.18 A derived adjustment factor of 2.4 for the Site and AQMA 7, and 1.9 for AQMA 4, have been applied to all modelled road contribution NO_x and PM. Details of this verification process are included in **Appendix F**. In order to get to the verification factors shown above, a reduction of assumed road speeds along the existing roads has been applied.

5.19 In addition to this, a Root Mean Square Error (RMSE) has been calculated to determine the error within the calculations. The calculations for the RMSE are provided in **Appendix F**. The calculated RMSE are 4.7 µg/m^3 for the Site and AQMA 7, and 3 µg/m^3 for AQMA 4, which correlate to an error ratio of between 7 – 12%. The RMSE means that modelled results could be under or over predicting pollution concentrations between +/- 4.7 µg/m^3 at most.

5.20 It is considered that any attempts to reduce the verification factor further would lead to unrealistic speeds along the links in question, which would be unrepresentative of the average daily speed on the relevant road. Nevertheless, the calculated RMSE lies below 25% of the AQAL and is therefore, showing an acceptable correlation with the measured concentrations at the diffusion tube locations.

6.0 AIR QUALITY AND CONSTRUCTION DUST ASSESSMENT

General

6.1 This section of the report outlines the findings of the assessment discussed in Section 4.0. Having established the likely change in pollutant concentrations arising from the 'do something' assessment scenarios, the potential local air quality impact of the proposed development has been described using the approach set out in the IAQM and EPUK 'Guidance on Land-Use Planning and Development Control: Planning for Air Quality 2017'.

6.2 EPUK Guidance suggests a two-stage process to be followed in the assessment:

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

6.3 For air quality impacts on the surrounding area (i.e., existing receptors), a practical way of assigning a meaningful description to the degree of an impact is to express the magnitude of incremental change as a proportion of the relevant assessment level and then to examine this change in the context of the new total concentration and its relationship with the assessment criterion. The suggested IAQM/EPUK framework for describing the impacts on the basis set out above is shown in Table 6.1 below.

Table 6.1: 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

*AQAL = Air Quality Assessment Level 40µg/m^3

Results

6.4 The findings of the assessment of pollutant concentrations at each of the receptor locations for the modelled scenarios are discussed below.

6.5 These results should be compared with the objectives listed in Table 3.1, and summarised as follows:

- NO_2 average annual mean not to exceed 40 µgm^3;
- PM_{10} average annual concentrations not to exceed 40 µgm^3; and
- $PM_{2.5}$ average annual concentrations not to exceed 20 µgm^3.

Nitrogen Dioxide (NO_2)

6.6 The results in **Appendix G** indicate that for a baseline do-nothing scenario in both 2028 and 2033, receptors adjacent to all roads have values well below the current annual mean air quality objectives (40 µg/m^3) for NO_2, which is consistent with BBC's air quality and review data.

6.7 With traffic generated by development, i.e., the do-something scenario in 2028 and 2033, the absolute concentrations remain below the current air quality objectives and the incremental change due to traffic generated by development is small (0.7 µg/m^3 or less to annual mean concentrations of NO_2), which would not have a significant impact upon local air quality.

6.8 The impact significance in accordance with the EPUK/IAQM guidance is also presented in **Appendix G** for each receptor. For all receptors, the impact due to development is classed as 'Negligible' and none of the changes exceed 2% of the AQAL.

6.9 With regard to the 1-hour mean objective LAQM.TG(22) advises that *"A study carried out on behalf of Defra and the Devolved Administrations identified that exceedances of the NO_2 1-hour mean are unlikely to occur where the annual mean is below 60 µg/m^3"*. As the results in **Appendix G** indicate annual mean concentrations of NO_2 will remain below 60 µg/m^3, it is considered that the NO_2 1-hour objective will not be exceeded at any receptor.

6.10 It is noted that the future year scenarios have been modelled using future year traffic flow data, together with 2023 background and emissions data, to account for current uncertainty in future year projections. Background concentrations and vehicle emission factors are projected to decrease year on year, as new Euro standards and UK fleet turnover are assumed. Using 2023 data therefore provides a conservative case for the future year scenarios. In reality, pollutant concentrations may be lower.

Particulate Matter (PM_{10})

6.11 The modelled annual mean concentrations of PM_{10} are also presented in **Appendix G**. The results indicate that annual mean PM_{10} concentrations are predicted to remain below the objective for all receptor locations and for all scenarios. The incremental change due to traffic generated by development is small (less than 0.2 µg/m^3 to annual mean concentrations of PM_{10}), which would not have a significant impact upon local air quality.

6.12 The impact significance in accordance with the EPUK/IAQM guidance indicates that for all receptors, impact due to development is classed as 'Negligible', and none of the changes exceed 1% of the AQAL.

Particulate Matter ($PM_{2.5}$)

6.13 The modelled annual mean concentrations of $PM_{2.5}$ are also presented in **Appendix G**. The results indicate that annual mean $PM_{2.5}$ concentrations are predicted to remain below the objective for all receptor locations and for all scenarios. The incremental change due to traffic generated by development is small (0.1 µg/m^3 or less to annual mean concentrations of $PM_{2.5}$), which would not have a significant impact upon local air quality.

6.14 The impact significance in accordance with the EPUK/IAQM guidance indicates that for all receptors, impact due to development is classed as 'Negligible', and none of the changes exceed 1% of the AQAL.

6.15 Using the significance flowchart in **Appendix H**, air quality is not considered to be a significant consideration and the proposed development can proceed to a planning decision with conditions where appropriate.

6.16 Since the air quality assessment indicates that the annual mean air quality objective will be met at the most exposed receptor locations, and since the actual changes due to traffic generated by development are small and not significant, it can be concluded that the air quality at the Site is acceptable for residential development, and that development traffic will not lead to a significant adverse impact upon existing air quality.

Construction Dust Risk Assessment

6.17 Nuisance dust impacts are likely to be temporary and episodic (most noticeable during dry windy conditions) and would not persist beyond completion of construction.

6.18 Where dust raising activities are present for 12 months or more, dust complaints are considered to be very likely for those closest receptors to the site that lie between 10-30m from the site boundary. Therefore, appropriate dust mitigation measures will be required to minimize dust emissions from the Site.

6.19 In addition, the qualitative dust assessment criteria in Table 3.3 indicates that existing premises adjacent to the Site will lie within the zone for potentially significant effects for soiling and ambient concentrations of PM_{10}.

6.20 Applying IAQM risk assessment procedures as set out in **Appendix C** requires an assessment where there are sensitive receptors within 350m of the site boundary of the works and/or within 100m of the routes used by construction vehicles on the public highway up to 500m from the site entrance. Existing premises fall within 350m zone which triggers the initial screening criterion.

6.21 The stages considered by the dust risk assessment are presented in Table 6.2. The assessments and conclusions are based upon the classifications for a 'Large' construction site, as the total working area for the various activities lies above the respective thresholds. However, not all of the Site would require intensive earthworks, nor would it require large numbers of plant or significant amounts of spoil removal, nor are the types of construction work or soil conditions likely to lead to anything more than being 'moderately dusty'. There are no demolition requirements for the site, and no known ecological areas within 50m of the works.

Table 6.2: Dust Risk Assessment

Step	Consideration	Demolition	Earthworks	Construction	Track-out
2a	Scale/nature of works	-	Large	Large	Large
2b	Sensitivity of area:				
	To dust soiling	-	High	High	High
	To PM_{10} health effects	-	Low	Low	Low
	To ecological effects	-	Low	Low	Low
2c	Risk of Dust Impacts	-	High Risk	High Risk	High Risk

6.22 The assessments in Table 6.2 and the IAQM matrices have been used to define the Site-specific mitigation requirements for the construction phases and the overall risk assessment for dust from the construction works is summarised in Table 6.3.

Table 6.3: Summary of Dust Risk Table to Define Site-Specific Mitgation

Source	Dust Soiling Effects	PM_{10} Effects	Ecological Effects
Demolition	-	-	-
Earthworks	High Risk	Low Risk	-
Construction	High Risk	Low Risk	-
Trackout	High Risk	Low Risk	-

6.23 With regard to dust soiling, the risk assessment indicates that on the basis of no mitigation being present, the earthworks, construction and track-out phases would present a 'High Risk'.

6.24 With regard to PM_{10} effects, the risk assessment indicates that on the basis of no mitigation being present, the earthworks, construction and track-out phases would present a 'Low Risk' to health.

6.25 The IAQM guidance on the mitigation measures needed to deal with low, medium or high risk effects is set out in **Appendix I**.

7.0 MITIGATION

7.1 Assessment has shown that the annual mean air quality objectives will be met at the most exposed receptor locations, and the Site is acceptable for residential development. It is therefore considered that development-specific mitigation will not be required to reduce or offset road traffic emissions.

7.2 Nevertheless, in order to assist in offsetting incremental creep in pollutant emissions, a number of sustainable measures should be considered, these are follows:

- Electric vehicle charging – in accordance with Approved Document S 'Infrastructure for charging electric vehicles'.
- Low NO_x heating and boilers;
- Site-wide Travel Plan; and
- Measures to support cycling and walking infrastructure.

Construction Dust Mitigation

7.3 The relevant mitigation presented in **Appendix I** appropriate for 'High Risk' site would be routinely included in the Site's dust management plan for the relevant phase of construction. Key measures known to minimize dust emissions and represent good practice guidance are summarized in Table 7.1.

Table 7.1: Key Dust Mitigation Measures

Aspect	Mitigation Measures
Site Planning	No bonfires
	Plan site layout – machinery and dust causing activities should be located away from sensitive receptors
Construction Traffic	All vehicles should switch off engines when not in active use – no idling vehicles
	Wash or clean all vehicles effectively before leaving the site if close to sensitive receptors
	All loads entering and leaving site to be covered
	No site runoff of water or mud
	All non-road mobile machinery (NRMM) to use ultra low sulphur tax-exempt diesel (ULSD) where available
Site Activities	To employ best practicable means in the control of dust
	Minimise dust generation activities
	Use water as dust suppressant where possible
	Keep stockpiles for the shortest possible times
Site Management	Appointment of a site agent whose contact details are provided to the LPA's Environmental Health Department and local residents prior to construction works starting.
	Agent to provide immediate response to any complaints by logging details of complaint and investigating source of complaint to establish whether routine

Aspect	Mitigation Measures
	mitigation measures have been properly implemented. If necessary, appropriate steps to be taken to mitigate against any adverse effects, and details of actions to be logged.

8.0 SUMMARY AND CONCLUSIONS

8.1 Mewies Engineering Consultants Ltd (M-EC), has been commissioned by Croudace Homes (Caterham) to undertake an Air Quality Assessment to support a planning application for a proposed residential development at Officers' Meadow, Shenfield.

8.2 This Air Quality Assessment has sought to examine the impact of development traffic road emissions from the proposed development upon existing and future sensitive receptors. The key traffic related pollutants considered are nitrogen dioxide (NO_2) and particulate matter (PM_{10} and $PM_{2.5}$).

8.3 The assessment has been undertaken with reference to the advice provided within the Land-Use Planning and Development Control: Planning for Air Quality, and 'Guidance from Environmental Protection UK, the Institute of Air Quality Management for the consideration of air quality within the land-use planning and development control processes', May 2017 and the 'Guidance on the Assessment of the Impacts of Construction on Air Quality and the Determination of their Significance' 2016.

8.4 The following scenarios have been included in the assessment:

- 2019 Baseline (for verification);
- 2028 'Do Nothing' (i.e., Baseline + Committed);
- 2028 'Do Something' (i.e., Baseline + Committed + Proposed);
- 2033 'Do Nothing' (i.e., Baseline + Committed);
- 2033 'Do Something' (i.e., Baseline + Committed + Proposed);

8.5 The future year scenarios have been modelled using future year traffic flow data, together with 2023 background and emissions data, to account for current uncertainty in future year predictions.

8.6 The model has been verified using 2019 NO_2 monitoring data provided by BBC. A derived adjustment factor of 2.4 for the Site and AQMA 7, and 1.9 for AQMA 4, have been applied to all modelled road contribution NO_x and PM.

8.7 The assessment results indicate that annual mean NO_2 concentrations are predicted to remain below the annual mean objective at all assessed receptor locations.

8.8 With regard to impact, assessment shows that the development will not lead to the exceedance of the objective at any receptor location. Relative to the Air Quality Assessment Levels (AQAL) of the latest EPUK and IAQM guidance, the development's impact on local NO_2 concentrations is defined as 'Negligible' for all assessed receptors and none of the changes exceed 2% of the AQAL.

8.9 With regard to the 1-hour mean objective LAQM.TG(22) advises that *"A study carried out on behalf of Defra and the Devolved Administrations identified that exceedances of the NO_2 1-hour mean are unlikely to occur where the annual mean is below 60 µg/m^3"*. As the results indicate annual mean concentrations of NO_2 will

remain well below 60 µg/m^3, it is considered that the NO_2 1-hour objective will not be exceeded at any receptor.

8.10 Annual mean PM_{10} concentrations are also expected to remain below the annual mean objective at all assessed receptor locations, and the development's impact on local concentrations is defined as 'Negligible' for all assessed receptors, with none of the changes exceed 1% of the AQAL.

8.11 Similarly, annual mean $PM_{2.5}$ concentrations are expected to remain below the annual mean objective at all assessed receptor locations, and the development's impact on local concentrations is again defined as 'Negligible' for all assessed receptors, with none of the changes exceed 1% of the AQAL.

8.12 Therefore, since the air quality assessment indicates that the annual mean air quality objective will be met at the most exposed receptor locations, and since the actual changes due to traffic generated by development are small and not significant, it can be concluded that the air quality at the Site is acceptable for development, and that development traffic will not lead to significant adverse impact upon existing air quality.

8.13 Mitigation measures have been proposed to minimise the potential effects associated with increased air pollutant concentrations.

8.14 With regard to dust soiling, the risk assessment indicates that on the basis of no mitigation being present, the earthworks, construction and track-out phases would present a 'High Risk'.

8.15 With regard to PM_{10} effects, the risk assessment indicates that on the basis of no mitigation being present, the earthworks, construction and track-out phases a 'Low Risk' to health.

8.16 The relevant mitigation measures present in the IAQM guidance for a 'High Risk' site would be routinely included in the Site's dust management plan for the relevant phases.

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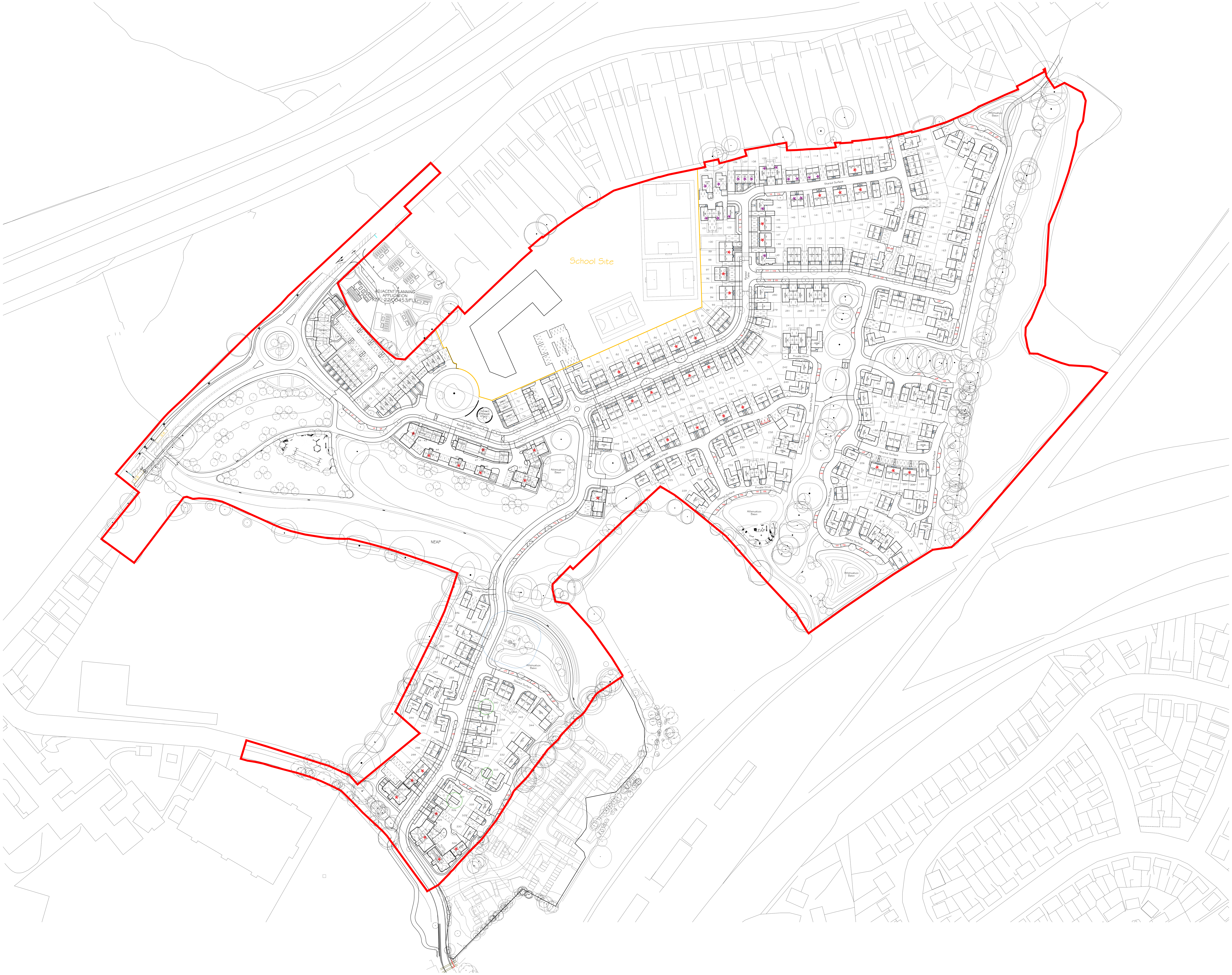
APPENDICES

APPENDIX A

OFFICERS' MEADOW, SHENFIELD
PROPOSED SITE LAYOUT

NORTH



Site Boundary
Proposed School Boundary
Affordable Housing
Custom Build Houses

0 10 20 30 40 50 100m
Scale 1:1000

Rev	Date	Amendment	Initials
P	04-09-2023	Landscape information added	YC
N	24-08-2023	Layout updated with balconies added to flats	YC
M	08-08-2023	Flat Block size updated.	AL
L	04-08-2023	Site layout update for the flats footprint	LB
K	01-08-2023	Flats footprint adjusted, FOG footprint adjusted	YC
J	17-07-2023	Flats footprint adjusted, site entrances amended	SF/YC
H	12-07-2023	Pre-app and EQRP comments addressed.	SF
G	22-05-2023	Mix updated to balance affordable plots	SF
F	14-05-2023	Layout amended to suit pre-app feedback.	SF
E	07-02-2023	Housing Mix amended.	SF
D	03-02-2023	Layout amended to suit design team comments	SF
C	17-01-2023	Layout amended asper Client's comments	YC/SF
A	29-11-2022	Layout revised to suit tree survey	SF

Project:
OFFICERS' MEADOW
SHENFIELD

Client:
CROUDACE HOMES

Drawing:
PROPOSED SITE LAYOUT
BLOCK PLAN

PLANNING

Drawing no: 1643.100 **Rev:** P

Scale@A0: 1/1000 **Date:** JUNE 2022 **Drawn:** SF **Checked:** _

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APPENDICES

APPENDIX B

DEFINITION OF AIR QUALITY TERMS AND UNITS

ppm parts per million - defines the units of pollution in every million (10^6) units of air.

ppb parts per billion - defines the units of pollution in every billion (10^9) units of air.

$\mu g/m^3$ micrognammes per cubic metre - one microgramme is one millionth of a gram.

ng/m³ nanogrammes per cubic metre – one nanogramme is one milliardth (i.e. one thousand millionth of a gram (10^{-9}))

Annual mean the average of the concentrations measured for one year.

1-hour mean the average of the concentrations measured for one hour.

24-hour mean the average of the concentrations measured for twenty four hours.

Running mean the mean or series of means calculated for overlapping time periods. For example, an 8-hour running mean is calculated every hour and averages the values for eight hours. The period of averaging is stepped forward by one hour for each subsequent value so that a degree of overlap exists between successive values. Non-running means are calculated for consecutive time periods so that there is no overlap.

Percentile a value that establishes a particular threshold in a collection of data. For example, the 90^{th} percentile of yearly values is the value that 90% of all the data in the year fall below or equal.

Exceedance a period of time when the concentration of a pollutant is greater than, or equal to, the relevant air quality standard.

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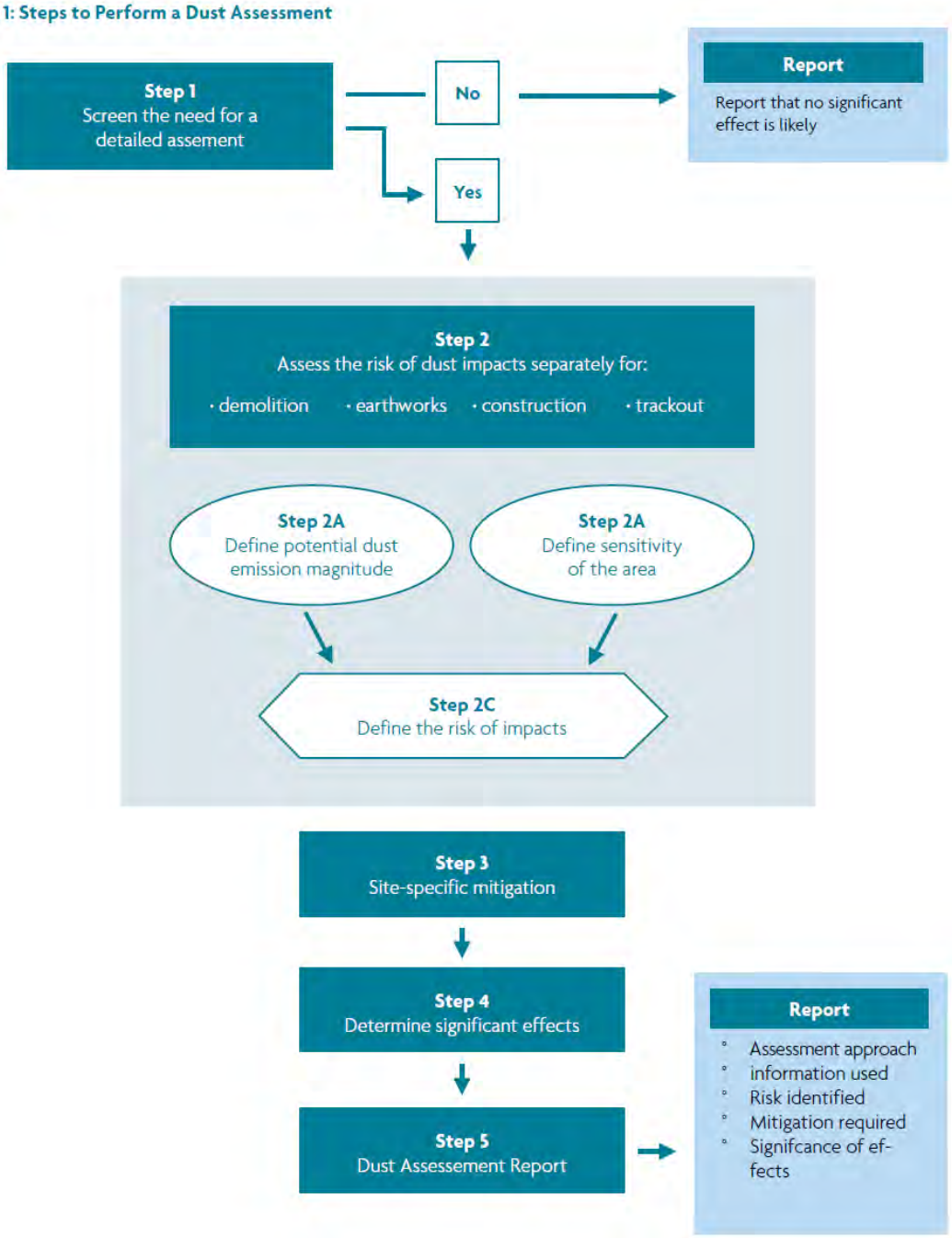
APPENDICES

APPENDIX C

Figure 1: Steps to Perform a Dust Assessment



Demolition

Examples:

- **Large**: Total building volume >50 000 m^3, potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities >20 m above ground level;
- **Medium**: Total building volume 20 000 m^3 – 50 000m^3, potentially dusty construction material, demolition activities 10-20 m above ground level; and
- **Small**: Total building volume <20 000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <10m above ground, demolition during wetter months.

Earthworks

Examples:

- **Large**: Total site area >10 000 m^2, potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds >8 m in height, total material moved >100 000 tonnes;
- **Medium**: Total site area 2 500 m^2 – 10 000 m^2, moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, formation of bunds 4 m - 8 m in height, total material moved 20 000 tonnes – 100 000 tonnes; and
- **Small**: Total site area <2 500 m^2, soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4 m in height, total material moved <10 000 tonnes, earthworks during wetter months.

Construction

Examples:

- **Large**: Total building volume >100 000 m^3, piling, on site concrete batching; sandblasting
- **Medium**: Total building volume 25 000 m^3 – 100 000 m^3, potentially dusty construction material (e.g. concrete), piling, on site concrete batching; and
- **Small**: Total building volume <25 000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber).

Trackout

Examples:

- **Large:** >50 HDV (>3.5t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100m;
- **Medium:** 10-50 HDV (>3.5t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road lengths 50m-100m;
- **Small:** <10 HDV (>3.5t) outward movements in any one day, surface material with low potential for dust release, unpaved road length <50m.

These numbers are for vehicles that leave the site after moving over unpaved ground, where they will accumulate mud and dirt that can be tracked out onto the public highway.

Table 2: Sensitivity of the Area to Dust Soiling Effects on People and Property [a b]

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)[c]			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

[a] The sensitivity of the area should be derived for each of the four activities: demolition, construction, earthworks and trackout. See **STEP 2B**, **Box 6** and **Box 9**.

[b] Estimate the total number of receptors within the stated distance. Only the *highest level* of area sensitivity from the table needs to be considered. For example, if there are 7 high sensitivity receptors < 20m of the source and 95 high sensitivity receptors between 20 and 50 m, then the total of number of receptors < 50 m is 102. The sensitivity of the area in this case would be high.

[c] For trackout, the distances should be measured from the side of the roads used by construction traffic. Without site-specific mitigation, trackout may occur from roads up to 500 m from large sites, 200 m from medium sites and 50 m from small sites, as measured from the site exit. The impact declines with distance from the site, and it is only necessary to consider trackout impacts up to 50m from the edge of the road.

Table 3: Sensitivity of the Area to Human Health Impacts [a b]

Receptor Sensitivity	Annual Mean PM_{10} concentration[c]	Number of Receptors[d]	Distance from the Source (m)[e]				
			‹20	‹50	‹100	‹200	‹350
High	›32 µg/m³ (›18 µg/m³ in Scotland)	**›100**	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32 µg/m³ (16-18 µg/m³ in Scotland)	**›100**	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28 µg/m³ (14-16 µg/m³ in Scotland)	**›100**	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	‹24 µg/m³ (‹14 µg/m³ in Scotland)	**›100**	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	-	**›10**	High	Medium	Low	Low	Low
	-	**1-10**	Medium	Low	Low	Low	Low
Low	-	**›1**	Low	Low	Low	Low	Low

[a] The sensitivity of the area should be derived for each of the four activities: demolition, construction, earthworks and trackout. See **STEP 2B**, **Box 7** and **Box 9**.
[b] Estimate the total within the stated distance (e.g. the total within 350m and not the number between 200 and 350m), noting that only the highest level of area sensitivity from the table needs to be considered. For example, if there are 7 high sensitivity receptors ‹ 20m of the source and 95 high sensitivity receptors between 20 and 50 m, then the total of number of receptors ‹ 50 m is 102. If the annual mean PM_{10} concentration is 29µg/m³, the sensitivity of the area would be high.
[c] Most straightforwardly taken from the national background maps, but should also take account of local sources. The values are based on 32µg/m³ being the annual mean concentration at which an exceedence of the 24-hour objective is likely in England, Walesand Northern Ireland. In Scotland there is an annual mean objective of 18µg/m³.
[d] In the case of high sensitivity receptors with high occupancy (such as schools or hospitals) approximate the number of people likely to be present. In the case of residential dwellings, just include the number of properties
[e] For trackout, the distances should be measured from the side of the roads used by construction traffic. Without site-specific mitigation, trackout may occur from roads up to 500 m from large sites, 200 m from medium sites and 50 m from small sites, as measured from the site exit. The impact declines with distance from the site, and it is only necessary to consider trackout impacts up to 50 m from the edge of the road.

Table 4: Sensitivity of the Area to Ecological Impacts [a b]

Receptor Sensitivity	Distance from the Source (m)[c]	
	‹20	‹50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

[a] The sensitivity of the area should be derived for each of the four activities: demolition, construction, earthworks and trackout and for each designated site. See **STEP 2B**, **Box 8** and **Box 9**.
[b] Only the highest level of area sensitivity from the table needs to be considered.
[c] For trackout, the distances should be measured from the side of the roads used by construction traffic. Without site-specific mitigation, trackout may occur from roads up to 500 m from large sites, 200 m from medium sites and 50 m from small sites, as measured from the site exit. The impact declines with distance from the site.

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APPENDICES

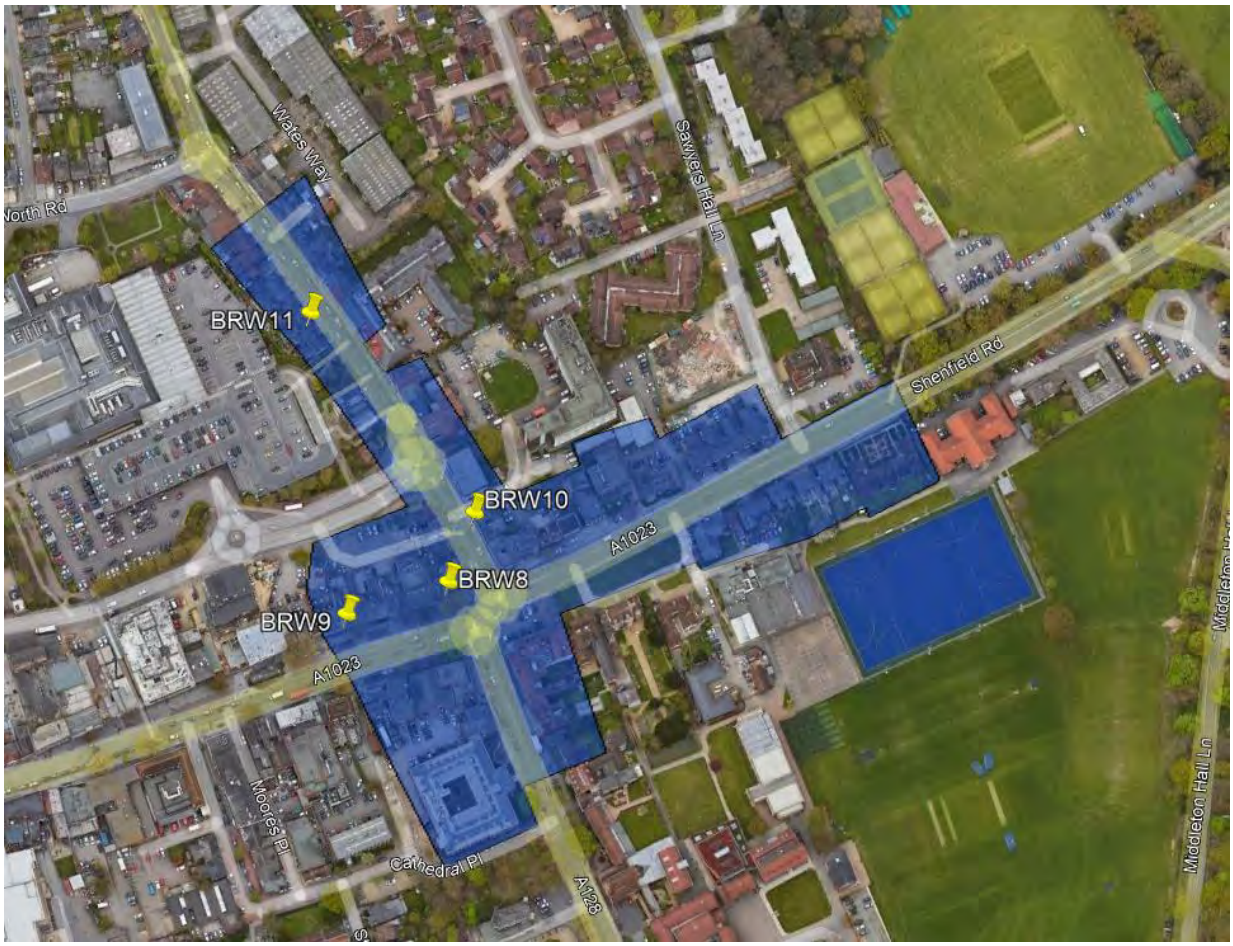
APPENDIX D

RECEPTOR LOCATION PLAN

Project: Officers Meadow, Shenfield

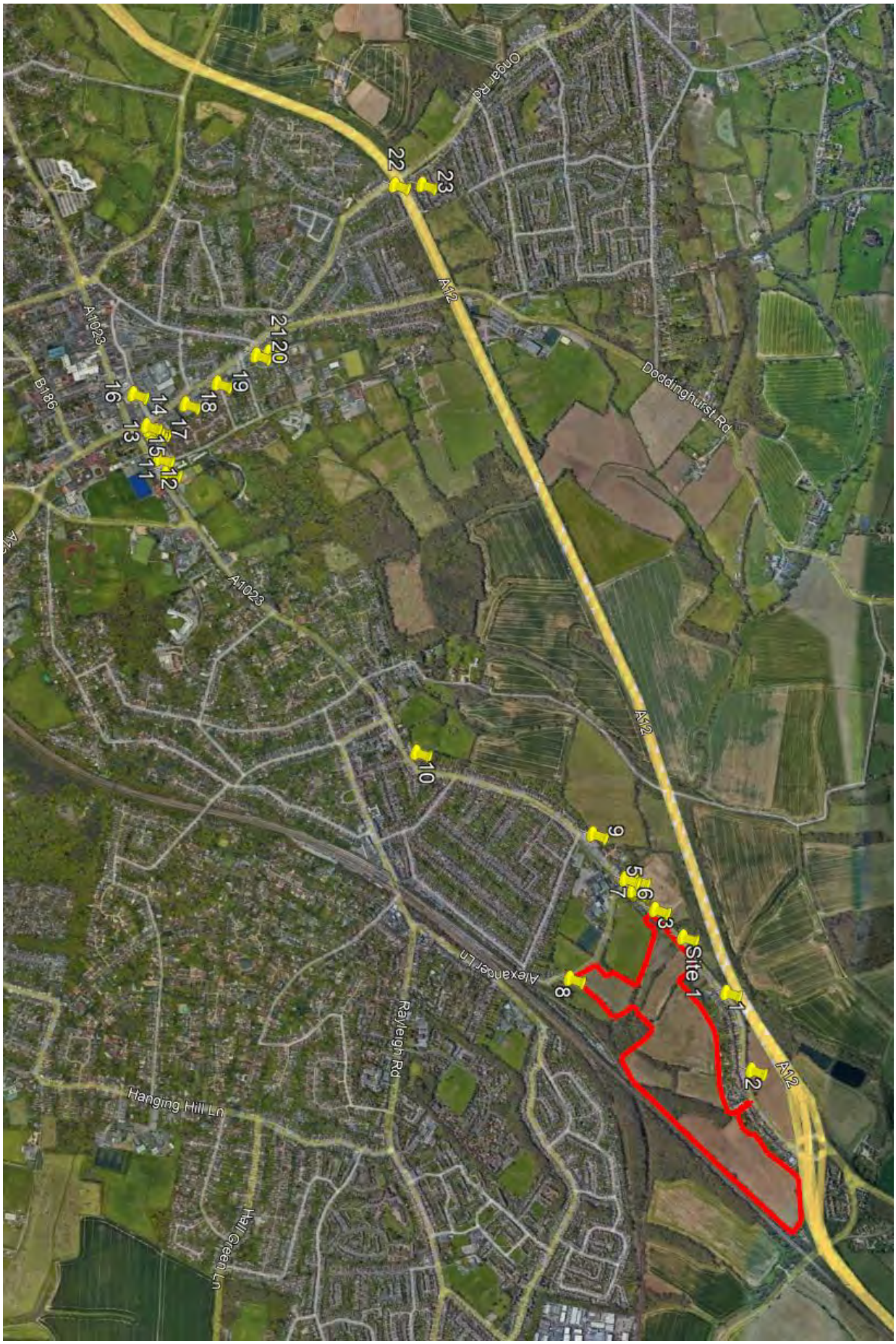
File Ref: 27219

Verification – AQMA 7



Verification – AQMA 4

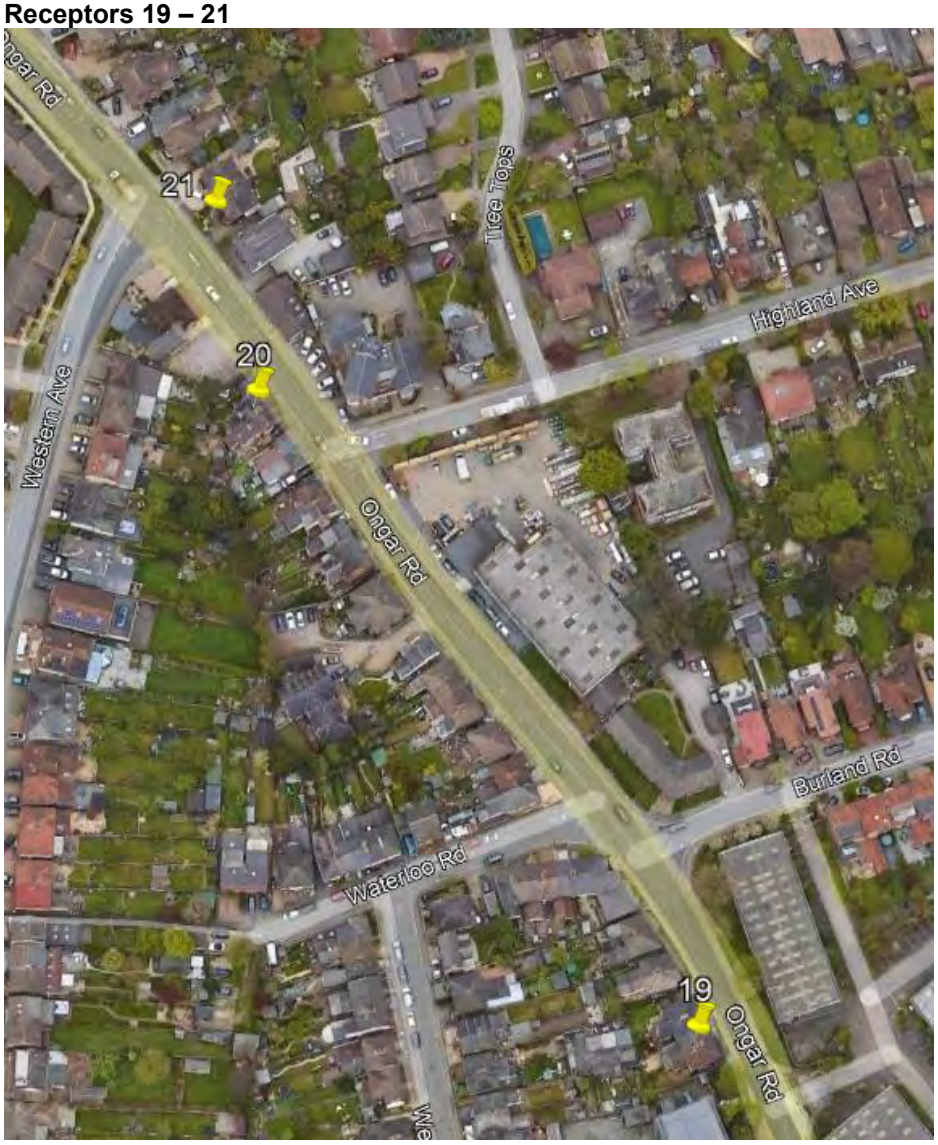
All Receptors



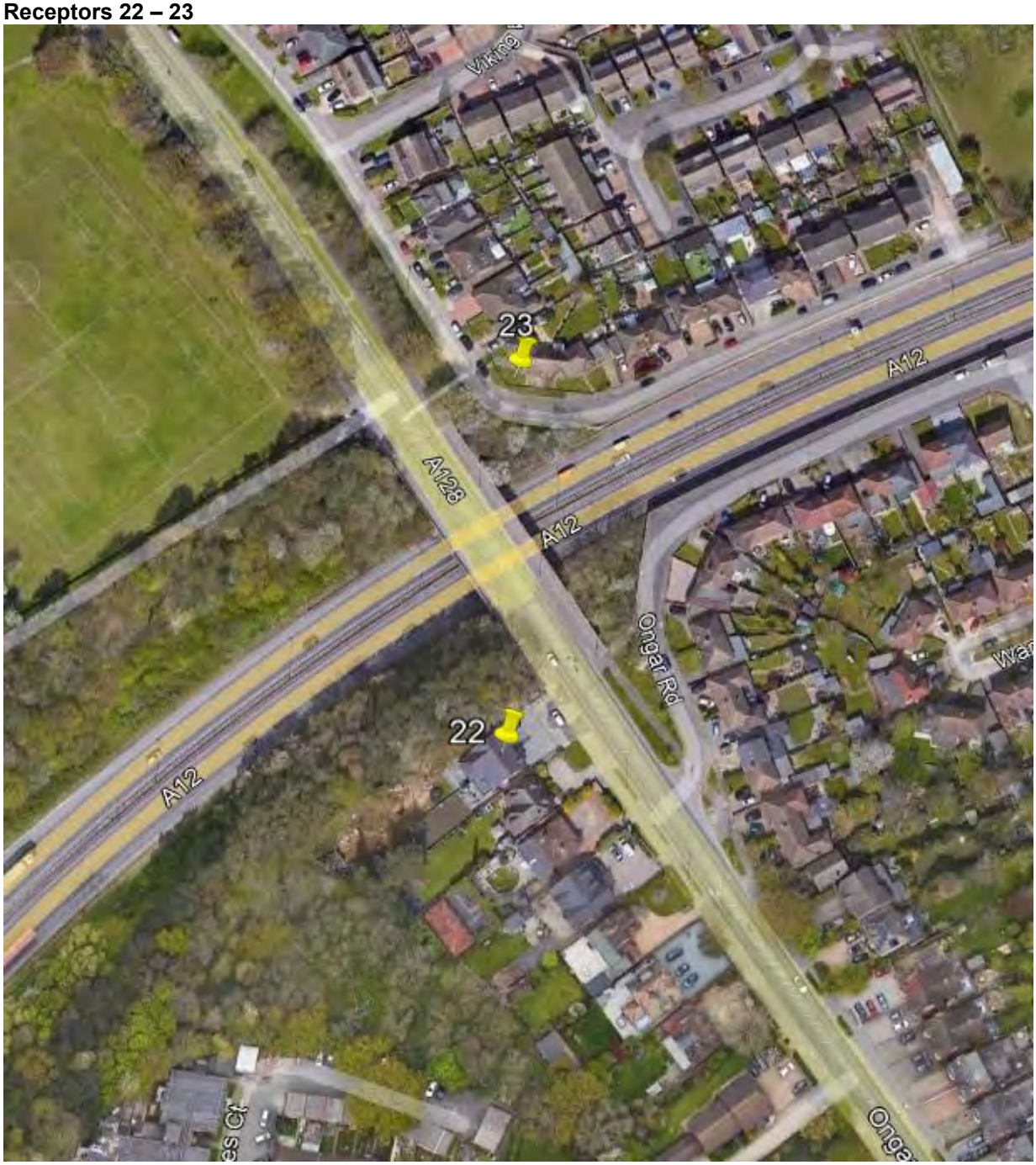
Receptor 1 – 10 and Site 1

Receptors 11 – 18

Receptors 19 – 21



Receptors 22 – 23



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APPENDICES

APPENDIX E

27219 Traffic Data

2019 Verification

Link ID	Link Name	AADT	LGV	Hourly	%HGV	HGV	Hourly	Speed (KPH)	Link Width (m)	Street Canyon Height (m)
1	A128 Ongar Road	15371	15240	635	1%	131	5	20-40	10	-
2	A128 Ongar Road (North of A1023)	19187	18853	786	2%	334	14	5-40	8-18	0-8
3	A1023 High Street (west of A128)	8335	8166	340	2%	169	7	5-35	16	0-8
4	A128 Ingrave Road (South of A1023)	16368	16010	667	2%	358	15	5-40	10-14	-
5	A1023 Shenfield Road (East of A128)	15084	14876	620	1%	208	9	5-40	8-14	-
6	A1023 Chelmsford Road	16717	16548	690	1%	169	7	20-40	8-10	-
7	Alexander Lane	3093	3047	127	1%	46	2	25-45	5	-
8	A12	72779	66973	2791	8%	5806	242	105	22	-

2028 Do Nothing (Base + Committed Developments)

Link ID	Link Name	AADT	LGV	Hourly	%HGV	HGV	Hourly	Speed (KPH)	Link Width (m)	Street Canyon Height (m)
1	A128 Ongar Road	15737	15603	650	1%	134	6	20-40	10	-
2	A128 Ongar Road (North of A1023)	19701	19359	807	2%	342	14	5-40	8-18	0-8
3	A1023 High Street (west of A128)	8899	8727	364	2%	172	7	5-35	16	0-8
4	A128 Ingrave Road (South of A1023)	16884	16519	688	2%	365	15	5-40	10-14	-
5	A1023 Shenfield Road (East of A128)	16050	15837	660	1%	213	9	5-40	8-14	-
6	A1023 Chelmsford Road	18581	18408	767	1%	173	7	20-40	8-10	-
7	Alexander Lane	3160	3113	130	1%	47	2	25-45	5	-
8	A12	76561	70453	2936	8%	6108	254	105	22	-

2028 Do Something (Base + Committed Developments + Proposed Development)

Link ID	Link Name	AADT	LGV	Hourly	%HGV	HGV	Hourly	Speed (KPH)	Link Width (m)	Street Canyon Height (m)
1	A128 Ongar Road	15779	15645	652	1%	134	6	20-40	10	-
2	A128 Ongar Road (North of A1023)	19826	19484	812	2%	342	14	5-40	8-18	0-8
3	A1023 High Street (west of A128)	9400	9228	385	2%	172	7	5-35	16	0-8
4	A128 Ingrave Road (South of A1023)	17093	16728	697	2%	365	15	5-40	10-14	-
5	A1023 Shenfield Road (East of A128)	16886	16673	695	1%	213	9	5-40	8-14	-
6	A1023 Chelmsford Road	20663	20490	854	1%	173	7	20-40	8-10	-
7	Alexander Lane	3745	3698	154	1%	47	2	25-45	5	-
8	A12	76561	70453	2936	8%	6108	254	105	22	-

2033 Do Nothing (Base + Committed Developments)

Link ID	Link Name	AADT	LGV	Hourly	%HGV	HGV	Hourly	Speed (KPH)	Link Width (m)	Street Canyon Height (m)
1	A128 Ongar Road	15808	15673	653	1%	135	6	20-40	10	-
2	A128 Ongar Road (North of A1023)	19789	19446	810	2%	343	14	5-40	8-18	0-8
3	A1023 High Street (west of A128)	8937	8764	365	2%	173	7	5-35	16	0-8
4	A128 Ingrave Road (South of A1023)	16959	16592	691	2%	367	15	5-40	10-14	-
5	A1023 Shenfield Road (East of A128)	16119	15905	663	1%	214	9	5-40	8-14	-
6	A1023 Chelmsford Road	18658	18485	770	1%	173	7	20-40	8-10	-
7	Alexander Lane	3174	3127	130	1%	47	2	25-45	5	-
8	A12	78784	72499	3021	8%	6285	262	105	22	-

2033 Do Something (Base + Committed Developments + Proposed Development)

Link ID	Link Name	AADT	LGV	Hourly	%HGV	HGV	Hourly	Speed (KPH)	Link Width (m)	Street Canyon Height (m)
1	A128 Ongar Road	15850	15715	655	1%	135	6	20-40	10	-
2	A128 Ongar Road (North of A1023)	19914	19571	815	2%	343	14	5-40	8-18	0-8
3	A1023 High Street (west of A128)	9439	9266	386	2%	173	7	5-35	16	0-8
4	A128 Ingrave Road (South of A1023)	17168	16801	700	2%	367	15	5-40	10-14	-
5	A1023 Shenfield Road (East of A128)	16955	16741	698	1%	214	9	5-40	8-14	-
6	A1023 Chelmsford Road	20740	20567	857	1%	173	7	20-40	8-10	-
7	Alexander Lane	3759	3712	155	1%	47	2	25-45	5	-
8	A12	78784	72499	3021	8%	6285	262	105	22	-

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APPENDICES

APPENDIX F

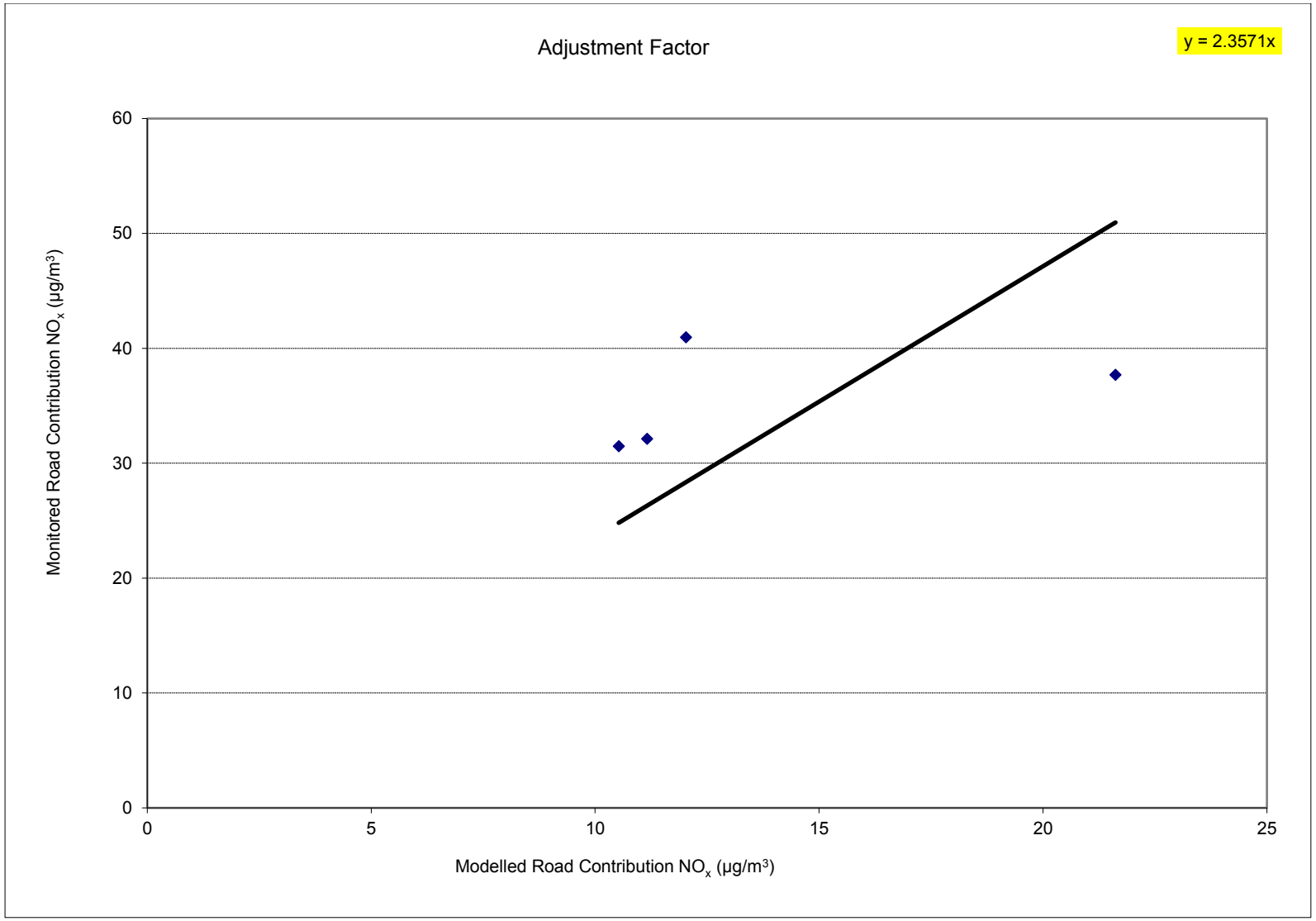
Verification (LAQM.TG 22)

AQMA 7 and Site

	559500, 193500	559500, 194500
Background NO_2	14.66	14.46
Background NO_x	20.16	19.78

Site ID	Location		Modelled Road Contribution NO_x (ex-background)	Monitored Total NO_2	Monitored Road Contribution Nox*	Monitored Total NO_x	Ratio of Monitored Road Contribution NO_x / Modelled Road Contribution NO_x
	X (m)	Y (m)					
BRW 8	559691	193912	12.0303	35.1	40.97	61.1	3.4
BRW 9	559643	193889	11.1611	31	32.13	52.3	2.9
BRW 10	559699	193948	21.6186	33.6	37.69	57.9	1.7
BRW 11	559604	194035	10.5265	30.5	31.47	51.3	3.0

Verification Factor	2.4


Adjustment Factor
y = 2.3571x
Monitored Road Contribution NOx (µg/m3)
Modelled Road Contribution NOx (µg/m3)
0
10
20
30
40
50
60
0
5
10
15
20
25

Root Mean Square Error (RMSE)

$$RMSE = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(Obs_i - Pred_i)^2}$$

Name	Observations	Predictions	Observations – Predictions	Squared
BRW 8	35.1	29.2	5.9	34.81
BRW 9	31	28.21	2.79	7.78
BRW 10	33.6	39.56	-5.96	35.52
BRW 11	30.5	27.29	3.21	10.30
			Total	88.42

88.42/4=22.1

√22.1=4.7

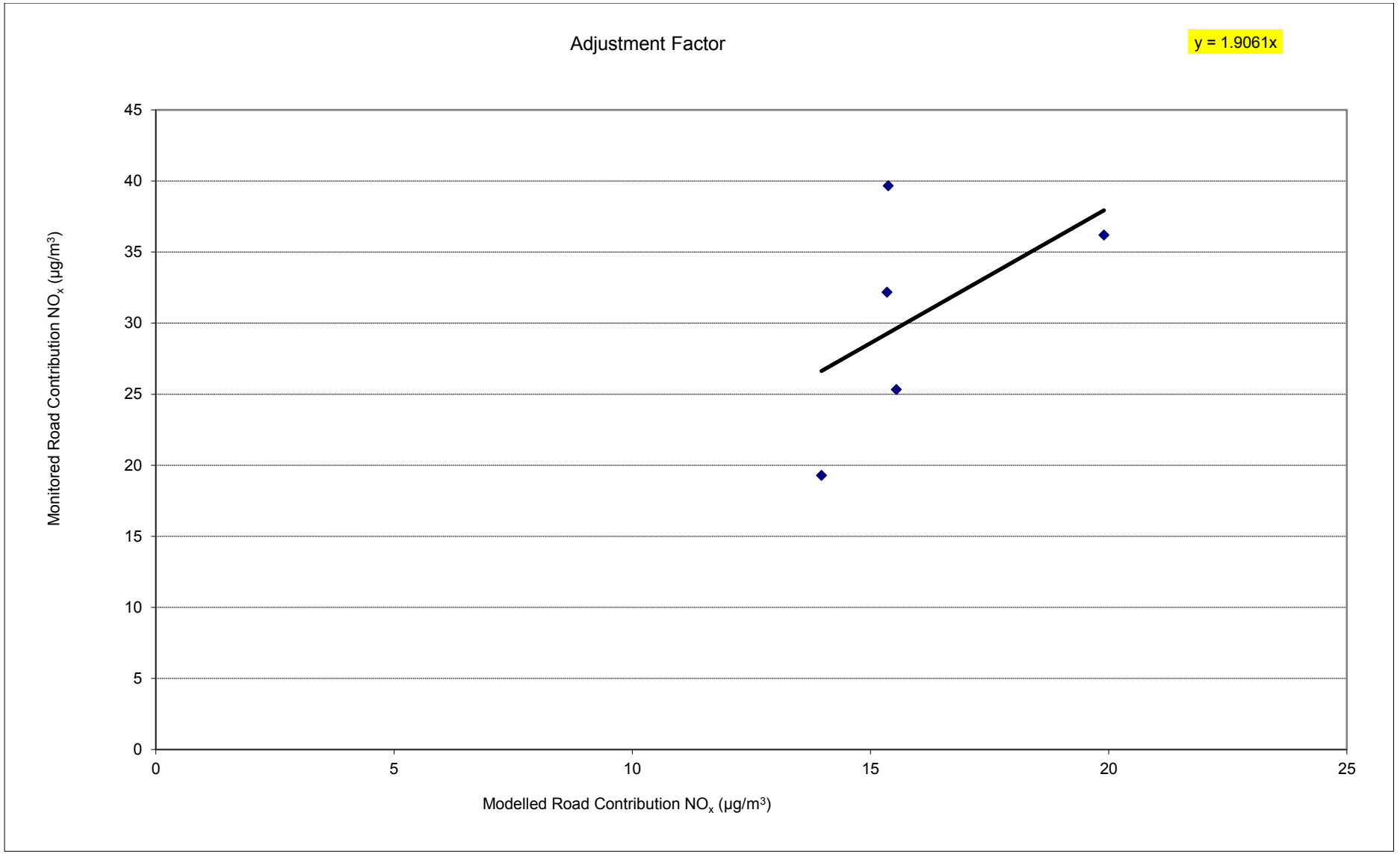
(4.7/40)x100=11.8%

AQMA 4

	559500, 193500
Background NO_2	13.57
Background NO_x	18.41

Site ID	Location		Modelled Road Contribution NO_x (ex-background)	Monitored Total NO_2	Monitored Road Contribution Nox*	Monitored Total NO_x	Ratio of Monitored Road Contribution NO_x / Modelled Road Contribution NO_x
	X (m)	Y (m)					
BRW 19	558769	194873	15.5429	26.7	25.33	43.7	1.6
BRW 20	558818	194913	19.9014	31.9	36.2	54.6	1.8
BRW 21	558681	194799	13.9724	23.7	19.29	37.7	1.4
BRW 22	558683	194894	15.3487	30	32.17	50.6	2.1
BRW 23	558742	194928	15.3742	33.5	39.66	58.1	2.6

Verification Factor	1.9


Adjustment Factor
y = 1.9061x
Monitored Road Contribution NOx (µg/m3)
Modelled Road Contribution NOx (µg/m3)
0
5
10
15
20
25
30
35
40
45

Root Mean Square Error (RMSE)

$$RMSE = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(Obs_i - Pred_i)^2}$$

Name	Observations	Predictions	Observations – Predictions	Squared
BRW 19	26.7	28.78	-2.08	4.33
BRW 20	31.9	32.7	-0.8	0.64
BRW 21	23.7	27.34	-3.64	13.25
BRW 22	30	28.61	1.39	1.93
BRW 23	33.5	28.63	4.87	23.72
			Total	43.87

43.87/5=8.8

√8.8=3.0

(3.0/40)x100=7%

MEC
Development Technical Consultants

APPENDICES

APPENDIX G

2028 NO_2										
Receptor Name	**X(m)**	**Y(m)**	**Z(m)**	**2028 DN**	**2028 DS**	**DS-DN**	**% Change**	**AQAL 2028 DN**	**AQAL 2028 DS**	**Impact Descriptor**
BRW8	559691	193912	2.5	23.47	23.62	0.15	0%	59%	59%	Negligible
BRW9	559643	193889	2.5	22.51	22.88	0.37	1%	56%	57%	Negligible
BRW10	559699	193948	2.5	31.30	31.46	0.16	0%	78%	79%	Negligible
BRW11	559604	194035	2.5	21.44	21.51	0.07	0%	54%	54%	Negligible
BRW19	558769	194873	2.5	22.21	22.21	0.00	0%	56%	56%	Negligible
BRW20	558818	194913	2.5	24.96	24.96	0.00	0%	62%	62%	Negligible
BRW21	558681	194799	2.5	21.25	21.26	0.01	0%	53%	53%	Negligible
BRW22	558683	194894	2.5	22.11	22.12	0.01	0%	55%	55%	Negligible
BRW23	558742	194928	2.5	22.09	22.10	0.01	0%	55%	55%	Negligible
1	561691.44	196309.83	1.5	19.89	20.30	0.41	1%	50%	51%	Negligible
2	561982.69	196430.8	1.5	17.38	17.77	0.39	1%	43%	44%	Negligible
3	561392.75	196010.39	1.5	19.31	20.02	0.71	2%	48%	50%	Negligible
4	561339	195931.23	1.5	18.64	19.21	0.57	1%	47%	48%	Negligible
5	561326.31	195918.55	1.5	18.17	18.61	0.44	1%	45%	47%	Negligible
6	561286	195923.02	1.5	18.43	18.77	0.34	1%	46%	47%	Negligible
7	561283.75	195885.69	1.5	18.93	19.28	0.35	1%	47%	48%	Negligible
8	561684.62	195703.62	1.5	13.21	13.38	0.17	0%	33%	33%	Negligible
9	561120.81	195747.34	1.5	16.68	16.91	0.23	1%	42%	42%	Negligible
10	560860.94	195043.92	1.5	18.99	19.36	0.37	1%	47%	48%	Negligible
11	559857.44	193996.95	1.5	20.48	20.80	0.32	1%	51%	52%	Negligible
12	559807.25	193963.39	1.5	23.78	24.21	0.43	1%	59%	61%	Negligible
13	559714.19	193928.48	4	25.79	26.00	0.21	1%	64%	65%	Negligible
14	559699.56	193917.19	4	23.23	23.39	0.16	0%	58%	58%	Negligible
15	559684.94	193906.2	4	27.84	28.25	0.41	1%	70%	71%	Negligible
16	559566.25	193845.7	4	21.65	22.04	0.39	1%	54%	55%	Negligible
17	559702.5	193944.11	4	24.05	24.19	0.14	0%	60%	60%	Negligible
18	559589.19	194049.95	1.5	24.12	24.20	0.08	0%	60%	61%	Negligible
20	559499.56	194165.62	1.5	20.31	20.36	0.05	0%	51%	51%	Negligible
21	559378.81	194307.38	1.5	21.09	21.15	0.06	0%	53%	53%	Negligible
22	559363.44	194353.38	1.5	19.87	19.92	0.05	0%	50%	50%	Negligible
23	558680	194787.69	1.5	20.25	20.26	0.01	0%	51%	51%	Negligible
24	558670.75	194893.05	1.5	21.61	21.61	0.00	0%	54%	54%	Negligible
Site 1	561490.88	196126.91	1.5	18.17	18.72	0.55	1%	45%	47%	Negligible

2033 NO_2										
Receptor Name	**X(m)**	**Y(m)**	**Z(m)**	**2033 DN**	**2033 DS**	**DS-DN**	**% Change**	**AQAL 2033 DN**	**AQAL 2033 DS**	**Impact Descriptor**
BRW8	559691	193912	2.5	23.50	23.65	0.15	0%	59%	59%	Negligible
BRW9	559643	193889	2.5	22.54	22.90	0.36	1%	56%	57%	Negligible
BRW10	559699	193948	2.5	31.35	31.51	0.16	0%	78%	79%	Negligible
BRW11	559604	194035	2.5	21.47	21.54	0.07	0%	54%	54%	Negligible
BRW19	558769	194873	2.5	22.47	22.47	0.00	0%	56%	56%	Negligible
BRW20	558818	194913	2.5	25.29	25.29	0.00	0%	63%	63%	Negligible
BRW21	558681	194799	2.5	21.46	21.47	0.01	0%	54%	54%	Negligible
BRW22	558683	194894	2.5	22.36	22.36	0.00	0%	56%	56%	Negligible
BRW23	558742	194928	2.5	22.35	22.36	0.01	0%	56%	56%	Negligible
1	561691.44	196309.83	1.5	20.05	20.46	0.41	1%	50%	51%	Negligible
2	561982.69	196430.8	1.5	17.48	17.87	0.39	1%	44%	45%	Negligible
3	561392.75	196010.39	1.5	19.38	20.09	0.71	2%	48%	50%	Negligible
4	561339	195931.23	1.5	18.69	19.27	0.58	1%	47%	48%	Negligible
5	561326.31	195918.55	1.5	18.22	18.66	0.44	1%	46%	47%	Negligible
6	561286	195923.02	1.5	18.48	18.82	0.34	1%	46%	47%	Negligible
7	561283.75	195885.69	1.5	18.98	19.33	0.35	1%	47%	48%	Negligible
8	561684.62	195703.62	1.5	13.22	13.40	0.18	0%	33%	34%	Negligible
9	561120.81	195747.34	1.5	16.71	16.95	0.24	1%	42%	42%	Negligible
10	560860.94	195043.92	1.5	19.03	19.39	0.36	1%	48%	48%	Negligible
11	559857.44	193996.95	1.5	20.52	20.84	0.32	1%	51%	52%	Negligible
12	559807.25	193963.39	1.5	23.83	24.25	0.42	1%	60%	61%	Negligible
13	559714.19	193928.48	4	25.83	26.04	0.21	1%	65%	65%	Negligible
14	559699.56	193917.19	4	23.27	23.42	0.15	0%	58%	59%	Negligible
15	559684.94	193906.2	4	27.88	28.29	0.41	1%	70%	71%	Negligible
16	559566.25	193845.7	4	21.67	22.06	0.39	1%	54%	55%	Negligible
17	559702.5	193944.11	4	24.08	24.22	0.14	0%	60%	61%	Negligible
18	559589.19	194049.95	1.5	24.16	24.24	0.08	0%	60%	61%	Negligible
20	559499.56	194165.62	1.5	20.33	20.39	0.06	0%	51%	51%	Negligible
21	559378.81	194307.38	1.5	21.13	21.18	0.05	0%	53%	53%	Negligible
22	559363.44	194353.38	1.5	19.90	19.95	0.05	0%	50%	50%	Negligible
23	558680	194787.69	1.5	20.44	20.45	0.01	0%	51%	51%	Negligible
24	558670.75	194893.05	1.5	21.83	21.84	0.01	0%	55%	55%	Negligible
Site 1	561490.88	196126.91	1.5	18.26	18.81	0.55	1%	46%	47%	Negligible

2028 PM_{10}										
Receptor Name	**X(m)**	**Y(m)**	**Z(m)**	**2028 DN**	**2028 DS**	**DS-DN**	**% Change**	**AQAL 2028 DN**	**AQAL 2028 DS**	**Impact Descriptor**
BRW8	559691	193912	2.5	16.59	16.62	0.03	0%	41%	42%	Negligible
BRW9	559643	193889	2.5	16.71	16.78	0.07	0%	42%	42%	Negligible
BRW10	559699	193948	2.5	17.74	17.77	0.03	0%	44%	44%	Negligible
BRW11	559604	194035	2.5	16.74	16.76	0.02	0%	42%	42%	Negligible
BRW19	558769	194873	2.5	18.98	18.98	0.00	0%	47%	47%	Negligible
BRW20	558818	194913	2.5	19.37	19.37	0.00	0%	48%	48%	Negligible
BRW21	558681	194799	2.5	18.98	18.98	0.00	0%	47%	47%	Negligible
BRW22	558683	194894	2.5	19.04	19.04	0.00	0%	48%	48%	Negligible
BRW23	558742	194928	2.5	18.94	18.94	0.00	0%	47%	47%	Negligible
1	561691.44	196309.83	1.5	19.16	19.28	0.11	0%	48%	48%	Negligible
2	561982.69	196430.8	1.5	18.48	18.59	0.11	0%	46%	46%	Negligible
3	561392.75	196010.39	1.5	18.86	19.05	0.18	0%	47%	48%	Negligible
4	561339	195931.23	1.5	16.56	16.69	0.14	0%	41%	42%	Negligible
5	561326.31	195918.55	1.5	16.45	16.55	0.10	0%	41%	41%	Negligible
6	561286	195923.02	1.5	16.51	16.59	0.08	0%	41%	41%	Negligible
7	561283.75	195885.69	1.5	16.77	16.86	0.09	0%	42%	42%	Negligible
8	561684.62	195703.62	1.5	15.36	15.41	0.05	0%	38%	39%	Negligible
9	561120.81	195747.34	1.5	16.28	16.34	0.06	0%	41%	41%	Negligible
10	560860.94	195043.92	1.5	18.66	18.76	0.10	0%	47%	47%	Negligible
11	559857.44	193996.95	1.5	16.81	16.89	0.08	0%	42%	42%	Negligible
12	559807.25	193963.39	1.5	17.15	17.24	0.09	0%	43%	43%	Negligible
13	559714.19	193928.48	4	16.91	16.95	0.04	0%	42%	42%	Negligible
14	559699.56	193917.19	4	16.55	16.58	0.03	0%	41%	41%	Negligible
15	559684.94	193906.2	4	17.15	17.23	0.08	0%	43%	43%	Negligible
16	559566.25	193845.7	4	16.63	16.70	0.08	0%	42%	42%	Negligible
17	559702.5	193944.11	4	16.68	16.71	0.03	0%	42%	42%	Negligible
18	559589.19	194049.95	1.5	17.30	17.32	0.02	0%	43%	43%	Negligible
20	559499.56	194165.62	1.5	16.93	16.95	0.01	0%	42%	42%	Negligible
21	559378.81	194307.38	1.5	16.94	16.95	0.01	0%	42%	42%	Negligible
22	559363.44	194353.38	1.5	16.88	16.89	0.01	0%	42%	42%	Negligible
23	558680	194787.69	1.5	18.81	18.81	0.00	0%	47%	47%	Negligible
24	558670.75	194893.05	1.5	19.01	19.02	0.00	0%	48%	48%	Negligible
Site 1	561490.88	196126.91	1.5	16.99	17.14	0.15	0%	42%	43%	Negligible

2033 PM_{10}										
Receptor Name	**X(m)**	**Y(m)**	**Z(m)**	**2033 DN**	**2033 DS**	**DS-DN**	**% Change**	**AQAL 2033 DN**	**AQAL 2033 DS**	**Impact Descriptor**
BRW8	559691	193912	2.5	16.60	16.63	0.03	0%	42%	42%	Negligible
BRW9	559643	193889	2.5	16.71	16.78	0.07	0%	42%	42%	Negligible
BRW10	559699	193948	2.5	17.75	17.78	0.03	0%	44%	44%	Negligible
BRW11	559604	194035	2.5	16.75	16.76	0.02	0%	42%	42%	Negligible
BRW19	558769	194873	2.5	19.02	19.02	0.00	0%	48%	48%	Negligible
BRW20	558818	194913	2.5	19.43	19.43	0.00	0%	49%	49%	Negligible
BRW21	558681	194799	2.5	19.02	19.02	0.00	0%	48%	48%	Negligible
BRW22	558683	194894	2.5	19.08	19.08	0.00	0%	48%	48%	Negligible
BRW23	558742	194928	2.5	18.98	18.98	0.00	0%	47%	47%	Negligible
2	561982.69	196430.8	1.5	18.51	18.61	0.11	0%	46%	47%	Negligible
3	561392.75	196010.39	1.5	18.88	19.06	0.18	0%	47%	48%	Negligible
4	561339	195931.23	1.5	16.57	16.71	0.14	0%	41%	42%	Negligible
5	561326.31	195918.55	1.5	16.46	16.57	0.11	0%	41%	41%	Negligible
6	561286	195923.02	1.5	16.52	16.60	0.08	0%	41%	42%	Negligible
7	561283.75	195885.69	1.5	16.78	16.87	0.09	0%	42%	42%	Negligible
8	561684.62	195703.62	1.5	15.36	15.41	0.05	0%	38%	39%	Negligible
9	561120.81	195747.34	1.5	16.29	16.35	0.06	0%	41%	41%	Negligible
10	560860.94	195043.92	1.5	18.67	18.77	0.10	0%	47%	47%	Negligible
11	559857.44	193996.95	1.5	16.81	16.89	0.08	0%	42%	42%	Negligible
12	559807.25	193963.39	1.5	17.16	17.25	0.09	0%	43%	43%	Negligible
13	559714.19	193928.48	4	16.92	16.96	0.04	0%	42%	42%	Negligible
14	559699.56	193917.19	4	16.55	16.58	0.03	0%	41%	41%	Negligible
15	559684.94	193906.2	4	17.16	17.23	0.08	0%	43%	43%	Negligible
16	559566.25	193845.7	4	16.63	16.71	0.08	0%	42%	42%	Negligible
17	559702.5	193944.11	4	16.69	16.71	0.03	0%	42%	42%	Negligible
18	559589.19	194049.95	1.5	17.31	17.33	0.02	0%	43%	43%	Negligible
20	559499.56	194165.62	1.5	16.94	16.95	0.01	0%	42%	42%	Negligible
21	559378.81	194307.38	1.5	16.95	16.96	0.01	0%	42%	42%	Negligible
22	559363.44	194353.38	1.5	16.89	16.90	0.01	0%	42%	42%	Negligible
23	558680	194787.69	1.5	18.84	18.84	0.00	0%	47%	47%	Negligible
24	558670.75	194893.05	1.5	19.05	19.05	0.00	0%	48%	48%	Negligible
Site 1	561490.88	196126.91	1.5	17.02	17.17	0.15	0%	43%	43%	Negligible

2028 $PM_{2.5}$										
Receptor Name	**X(m)**	**Y(m)**	**Z(m)**	**2028 DN**	**2028 DS**	**DS-DN**	**% Change**	**AQAL 2028 DN**	**AQAL 2028 DS**	**Impact Descriptor**
BRW8	559691	193912	2.5	10.87	10.89	0.02	0%	54%	54%	Negligible
BRW9	559643	193889	2.5	10.93	10.98	0.04	0%	55%	55%	Negligible
BRW10	559699	193948	2.5	11.54	11.56	0.02	0%	58%	58%	Negligible
BRW11	559604	194035	2.5	10.87	10.88	0.01	0%	54%	54%	Negligible
BRW19	558769	194873	2.5	11.75	11.75	0.00	0%	59%	59%	Negligible
BRW20	558818	194913	2.5	12.00	12.00	0.00	0%	60%	60%	Negligible
BRW21	558681	194799	2.5	11.73	11.73	0.00	0%	59%	59%	Negligible
BRW22	558683	194894	2.5	11.77	11.77	0.00	0%	59%	59%	Negligible
BRW23	558742	194928	2.5	11.73	11.73	0.00	0%	59%	59%	Negligible
1	561691.44	196309.83	1.5	11.58	11.64	0.06	0%	58%	58%	Negligible
2	561982.69	196430.8	1.5	11.19	11.25	0.06	0%	56%	56%	Negligible
3	561392.75	196010.39	1.5	11.41	11.51	0.10	1%	57%	58%	Negligible
4	561339	195931.23	1.5	10.54	10.62	0.08	0%	53%	53%	Negligible
5	561326.31	195918.55	1.5	10.48	10.54	0.06	0%	52%	53%	Negligible
6	561286	195923.02	1.5	10.52	10.56	0.05	0%	53%	53%	Negligible
7	561283.75	195885.69	1.5	10.66	10.71	0.05	0%	53%	54%	Negligible
8	561684.62	195703.62	1.5	9.86	9.88	0.03	0%	49%	49%	Negligible
9	561120.81	195747.34	1.5	10.38	10.41	0.04	0%	52%	52%	Negligible
10	560860.94	195043.92	1.5	11.34	11.39	0.06	0%	57%	57%	Negligible
11	559857.44	193996.95	1.5	10.97	11.01	0.04	0%	55%	55%	Negligible
12	559807.25	193963.39	1.5	11.18	11.23	0.05	0%	56%	56%	Negligible
13	559714.19	193928.48	4	11.06	11.08	0.02	0%	55%	55%	Negligible
14	559699.56	193917.19	4	10.84	10.86	0.02	0%	54%	54%	Negligible
15	559684.94	193906.2	4	11.20	11.24	0.05	0%	56%	56%	Negligible
16	559566.25	193845.7	4	10.88	10.93	0.04	0%	54%	55%	Negligible
17	559702.5	193944.11	4	10.92	10.94	0.02	0%	55%	55%	Negligible
18	559589.19	194049.95	1.5	11.20	11.21	0.01	0%	56%	56%	Negligible
20	559499.56	194165.62	1.5	10.96	10.97	0.01	0%	55%	55%	Negligible
21	559378.81	194307.38	1.5	10.97	10.98	0.01	0%	55%	55%	Negligible
22	559363.44	194353.38	1.5	10.93	10.94	0.01	0%	55%	55%	Negligible
23	558680	194787.69	1.5	11.62	11.62	0.00	0%	58%	58%	Negligible
24	558670.75	194893.05	1.5	11.75	11.75	0.00	0%	59%	59%	Negligible
Site 1	561490.88	196126.91	1.5	11.35	11.44	0.08	0%	57%	57%	Negligible

2033 $PM_{2.5}$										
Receptor Name	**X(m)**	**Y(m)**	**Z(m)**	**2033 DN**	**2033 DS**	**DS-DN**	**% Change**	**AQAL 2033 DN**	**AQAL 2033 DS**	**Impact Descriptor**
BRW8	559691	193912	2.5	10.87	10.89	0.02	0%	54%	54%	Negligible
BRW9	559643	193889	2.5	10.94	10.98	0.04	0%	55%	55%	Negligible
BRW10	559699	193948	2.5	11.55	11.57	0.02	0%	58%	58%	Negligible
BRW11	559604	194035	2.5	10.88	10.89	0.01	0%	54%	54%	Negligible
BRW19	558769	194873	2.5	11.77	11.77	0.00	0%	59%	59%	Negligible
BRW20	558818	194913	2.5	12.04	12.04	0.00	0%	60%	60%	Negligible
BRW21	558681	194799	2.5	11.75	11.75	0.00	0%	59%	59%	Negligible
BRW22	558683	194894	2.5	11.80	11.80	0.00	0%	59%	59%	Negligible
BRW23	558742	194928	2.5	11.75	11.75	0.00	0%	59%	59%	Negligible
2	561982.69	196430.8	1.5	11.20	11.26	0.06	0%	56%	56%	Negligible
3	561392.75	196010.39	1.5	11.42	11.52	0.10	1%	57%	58%	Negligible
4	561339	195931.23	1.5	10.55	10.63	0.08	0%	53%	53%	Negligible
5	561326.31	195918.55	1.5	10.49	10.55	0.06	0%	52%	53%	Negligible
6	561286	195923.02	1.5	10.52	10.57	0.05	0%	53%	53%	Negligible
7	561283.75	195885.69	1.5	10.66	10.71	0.05	0%	53%	54%	Negligible
8	561684.62	195703.62	1.5	9.86	9.89	0.03	0%	49%	49%	Negligible
9	561120.81	195747.34	1.5	10.38	10.42	0.04	0%	52%	52%	Negligible
10	560860.94	195043.92	1.5	11.34	11.40	0.06	0%	57%	57%	Negligible
11	559857.44	193996.95	1.5	10.97	11.02	0.04	0%	55%	55%	Negligible
12	559807.25	193963.39	1.5	11.18	11.24	0.05	0%	56%	56%	Negligible
13	559714.19	193928.48	4	11.06	11.09	0.02	0%	55%	55%	Negligible
14	559699.56	193917.19	4	10.85	10.86	0.02	0%	54%	54%	Negligible
15	559684.94	193906.2	4	11.20	11.25	0.05	0%	56%	56%	Negligible
16	559566.25	193845.7	4	10.89	10.93	0.04	0%	54%	55%	Negligible
17	559702.5	193944.11	4	10.92	10.94	0.02	0%	55%	55%	Negligible
18	559589.19	194049.95	1.5	11.20	11.21	0.01	0%	56%	56%	Negligible
20	559499.56	194165.62	1.5	10.97	10.97	0.01	0%	55%	55%	Negligible
21	559378.81	194307.38	1.5	10.98	10.99	0.01	0%	55%	55%	Negligible
22	559363.44	194353.38	1.5	10.93	10.94	0.01	0%	55%	55%	Negligible
23	558680	194787.69	1.5	11.64	11.64	0.00	0%	58%	58%	Negligible
24	558670.75	194893.05	1.5	11.78	11.78	0.00	0%	59%	59%	Negligible
Site 1	561490.88	196126.91	1.5	11.37	11.45	0.08	0%	57%	57%	Negligible

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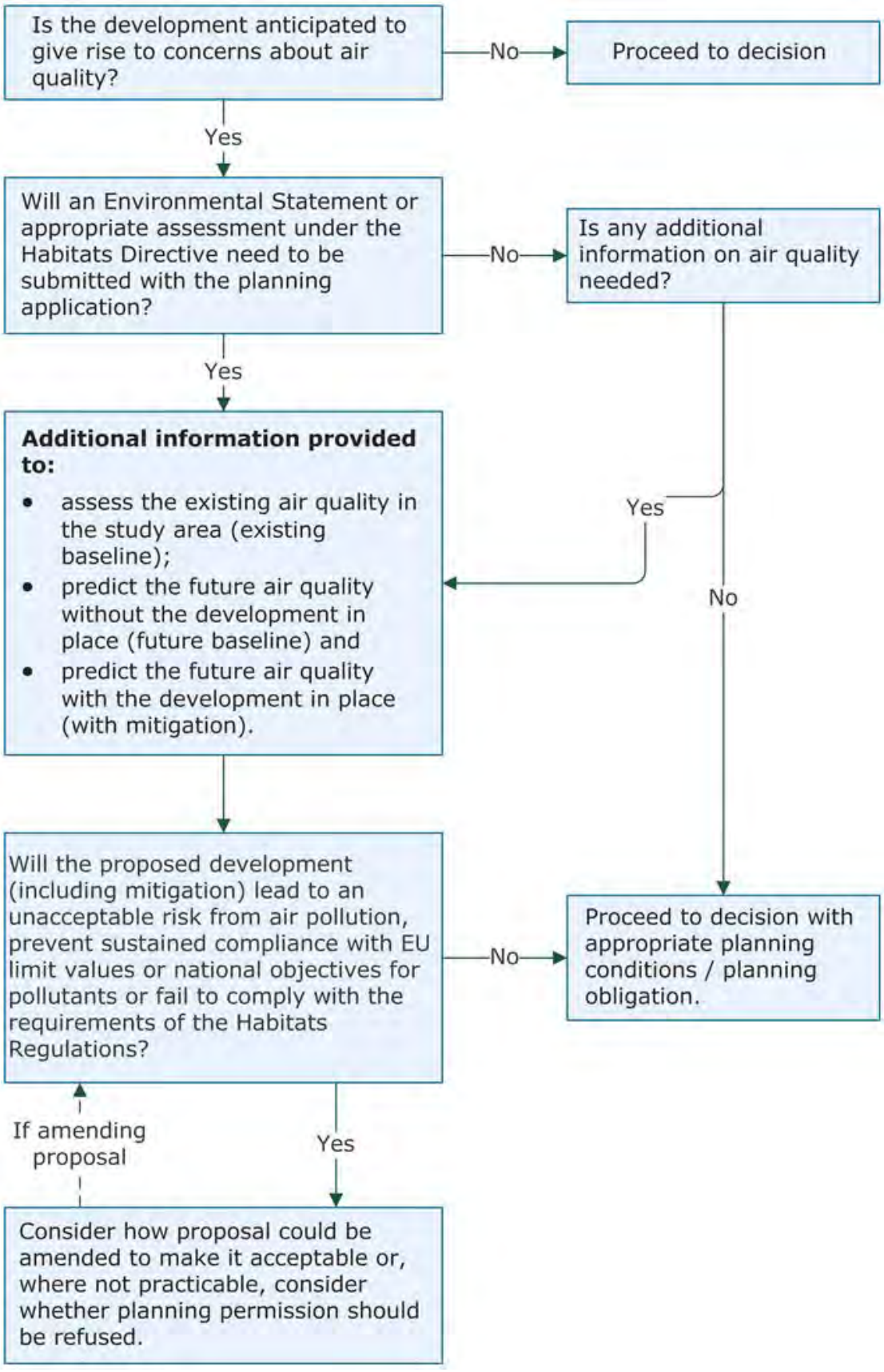
APPENDICES

APPENDIX H

Planning Practice Guidance



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APPENDICES

APPENDIX I

Mitigation for all sites: Communications

Mitigation measure	Low Risk	Medium Risk	High Risk
1. Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.	N	H	H
2. Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.	H	H	H
3. Display the head or regional office contact information	H	H	H

Mitigation for all sites: Dust Management

Mitigation measure	Low Risk	Medium Risk	High Risk
4. Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk, and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the site. In London additional measures may be required to ensure compliance with the Mayor of London's guidance. The DMP may include monitoring of dust deposition, dust flux, real-time PM10 continuous monitoring and/or visual inspections.	D	H	H
Site Management			
5. Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.	H	H	H
6. Make the complaints log available to the local authority when asked.	H	H	H
7. Record any exceptional incidents that cause dust and/or air emissions, either on- or off-site, and the action taken to resolve the situation in the log book.	H	H	H
8. Hold regular liaison meetings with other high risk construction sites within 500m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/ deliveries which might be using the same strategic road network routes.	N	N	H
Monitoring			
9. Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100m of site boundary, with cleaning to be provided if necessary.	D	D	H
10. Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked	H	H	H
11. Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.	H	H	H
12. Agree dust deposition, dust flux, or real-time PM_{10} continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site or, if it a large site, before work on a phase commences. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction.	N	H	H
Preparing and maintaining the site			
13. Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.	H	H	H
14. Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.	H	H	H
15. Fully enclose site or specific operations where there is a high potential for dust production and the site is actives for an extensive period	D	H	H
16. Avoid site runoff of water or mud.	H	H	H
17. Keep site fencing, barriers and scaffolding clean using wet methods.	D	H	H

Mitigation measure	Low Risk	Medium Risk	High Risk
18. Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.	D	H	H
19. Cover, seed or fence stockpiles to prevent wind whipping.	D	H	H
Operating vehicle/machinery and sustainable travel			
20. Ensure all on-road vehicles comply with the requirements of the London Low Emission Zone and the London NRMM standards, where applicable	H	H	H
21. Ensure all vehicles switch off engines when stationary - no idling vehicles.	H	H	H
22. Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.	H	H	H
23. Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on un-surfaced haul roads 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)	D	D	H
24. Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.	N	H	H
25. Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing)	N	D	H
Operations			
26. 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.	H	H	H
27. Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.	H	H	H
28. Use enclosed chutes and conveyors and covered skips.	H	H	H
29. Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.	H	H	H
30. 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.	D	H	H
Waste management			
31. Avoid bonfires and burning of waste materials.	H	H	H

Measures specific to demolition

Mitigation measure	Low Risk	Medium Risk	High Risk
32. Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).	D	D	H
33. Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground.	H	H	H
34. Avoid explosive blasting, using appropriate manual or mechanical alternatives.	H	H	H
35. Bag and remove any biological debris or damp down such material before demolition.	H	H	H

Measures specific to earthworks

Mitigation measure	Low Risk	Medium Risk	High Risk
36. Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable..	N	D	H
37. Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable	N	D	H
38. Only remove the cover in small areas during work and not all at once	N	D	H

Measures specific to construction

Mitigation measure	Low Risk	Medium Risk	High Risk
39. Avoid scabbling (roughening of concrete surfaces) if possible	D	D	H
40. 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.	D	H	H
41. 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.	N	D	H
42. For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust.	N	D	D

Measures specific to trackout

Mitigation measure	Low Risk	Medium Risk	High Risk
43. Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.	D	H	H
44. Avoid dry sweeping of large areas.	D	H	H
45. Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.	D	H	H
46. Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.	N	H	H
47. Record all inspections of haul routes and any subsequent action in a site log book.	D	H	H
48. Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.	N	H	H
49. Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).	D	H	H
50. 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.	N	H	H
51. Access gates to be located at least 10m from receptors where possible.	N	H	H

Key to Tables:

H	Highly recommended
D	Desirable
N	Not required

- CIVIL ENGINEERING
- TRANSPORT
- FLOOD RISK & DRAINAGE
- STRUCTURES
- GEO-ENVIRONMENTAL
- ACOUSTIC AIR
- UTILITIES
- GEOMATICS
- LIGHTING
- EXPERT WITNESS

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