APPENDIX 7.1
AIR QUALITY TECHNICAL REPORT

Kairus Ltd

Air Quality Assessment

Land South of Radwinter Road
(East of Griffin Place)
Saffron Walden

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1 Introduction

1.1 General

Kairus Ltd was commissioned by Rosconn Group to carry out an air quality assessment in connection with a proposed development on land to the south of Radwinter Road, Safron Walden comprising up to 233 residential dwellings (the 'Site').

The site is located within the district of Uttlesford District Council (UDC). Due to exceedances of the national air quality mean objective for nitrogen dioxide (NO_2), the Council has declared an air quality management area (AQMA) covering a circular area of radius 1400 m centered on Elm Grove within Saffron Walden town centre. The Site lies approximately 0.7 km to the east of the AQMA and there is the potential for traffic generated by the development to impact air quality within the AQMA.

This report addresses the impact of the proposed development on local air quality. Potential sources of emissions are identified and assessed in the context of existing air quality and emission sources and the nature and location of receptors.

A glossary of common air quality terminology is provided in Appendix A.

1.2 Scope of Assessment

The development proposals have been reviewed against the criteria set out within the UDC Air Quality Technical Planning Guidance[1], which states that an air quality assessment is required for development of more than 75 dwellings at locations outside of the AQMA and where a development is likely to result in a change in traffic volumes of more than 100 per day within an AQMA. A full air quality assessment has therefore been carried out to assess impacts associated with both the construction and operational phases of the scheme.

The scope of the assessment has been discussed and agreed with Marcus Watts, Environmental Health Manager, UDC via email dated 15th January 2021.

1 UDC (2018) Air Quality Technical Planning Guidance, June 2018

2 Site Description

2.1 The Existing Site

The Site is located on the eastern edge of Saffron Walden on a parcel of land to the south of Radwinter Road and to the east of an area of new residential development approved through planning application UTT/16/1856/DFO.

The Site is on the edge of the town with agricultural land located to the south, east and north, with residential areas immediately west and 0.3 km to the east.

The Site currently consists of an agricultural field extending to approximately 17.9 hectares.

The location of the Site is shown in Figure 2.1.

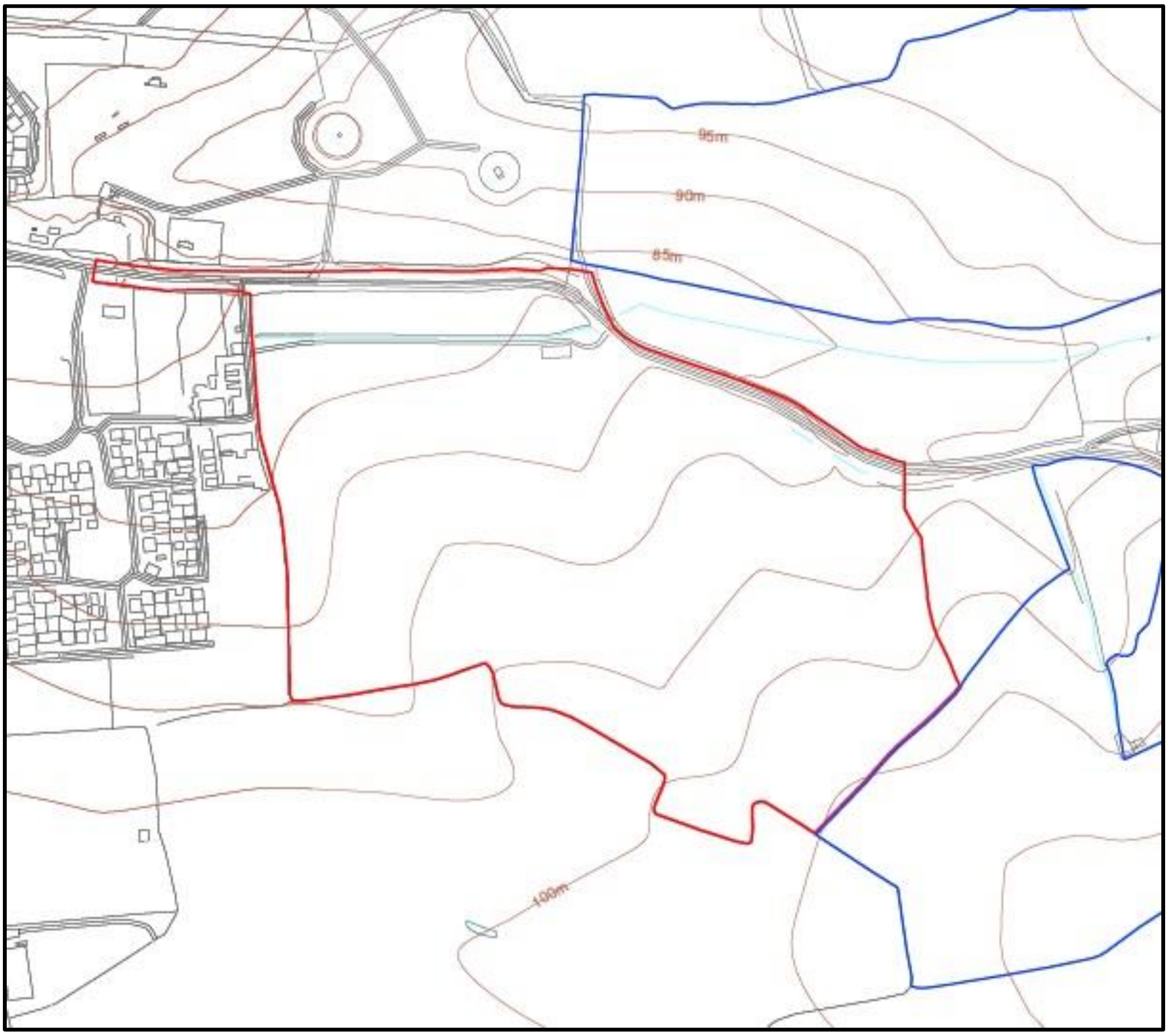

Figure 2.1: Location of Development Site

2.2 The Proposed Development

An outline planning application is being submitted for the erection of up to 233 residential dwellings including affordable housing, with public open space, landscaping and sustainable drainage system (SuDs) with vehicular access point from Radwinter Road. All maters reserved except for means of access.

An indicative masterplan for the Site is presented in Figure 2.2.

Figure 2.2: Layout of Proposed Development

3 Policy Context

3.1 International Air Quality Policy

3.1.1 EU Directive 2008

The EU Directive 2008/50/EC[2] on ambient air quality and cleaner air for Europe (the CAFE directive) sets out the ambient air quality standards for a number of pollutants and the dates by which these objectives should be met. The Air Quality Standards Regulations 2010[3] implements the requirements of the Directive into UK legislation. The Directive contains a series of limit values for the protection of human health and critical levels for the protection of vegetation. These limit values are legally binding and the UK may incur infringement action if it does not meet the required objective limits within the agreed time limits. The UK is currently exceeding the objective limits for NO_2 and PM_{10} within London and a number of other air quality zones within the UK.

3.2 National Air Quality Policy

3.2.1 The UK Air Quality Strategy

The Government's policy on air quality within the UK is set out in the Air Quality Strategy (AQS) for England, Scotland, Wales and Northern Ireland (AQS) published in July 2007[4] , pursuant to the requirements of Part IV of the Environment Act 1995. The AQS sets out a framework for reducing hazards to health from air pollution and ensuring that international commitments are met in the UK. The AQS is designed to be an evolving process that is monitored and regularly reviewed.

The AQS sets standards and objectives for ten main air pollutants to protect health, vegetation and ecosystems. These are benzene (C_6H_6), 1,3-butadiene (C4H6), carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), oxides of nitrogen (NO_x), particulate matter (PM_{10}, $PM_{2.5}$), sulphur dioxide (SO_2), ozone (O_3) and polycyclic aromatic hydrocarbons (PAHs).

The air quality standards are long-term benchmarks for ambient pollutant concentrations which represent negligible or zero risk to health, based on medical and scientific evidence reviewed by the Expert Panel on Air Quality Standards (EPAQS) and the World Health Organisation (WHO). These are general concentration limits, above which sensitive members of the public (e.g. children, the elderly and the unwell) might experience adverse health effects.

The air quality objectives are medium-term policy based targets set by the Government which take into account economic efficiency, practicability, technical feasibility and timescale. Some objectives are equal to the EPAQS recommended standards or WHO guideline limits, whereas others involve a margin of tolerance, i.e. a limited number of permitted exceedances of the standard over a given period.

For some pollutants, there is both a long-term (annual mean) standard and a short-term standard. In the case of NO_2, the short-term standard is for a 1-hour averaging period, whereas for PM_{10} it is for a 24-hour averaging period. These periods reflect the varying impacts on health of differing exposures to pollutants (e.g. temporary exposure on the pavement adjacent to a busy road, compared with the exposure of residential properties adjacent to a road).

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

3 Air Quality Regulations 2010 – Statutory Instrument 2010 No. 1001

4 The Air Quality Strategy for England, Scotland, Wales and Northern Ireland – July 2007

Of the pollutants included in the AQS, NO_2 and PM_{10} would be particularly relevant to this project as these are the primary pollutants associated with road traffic. The current statutory standards and objectives for NO_2 and PM_{10} in relation to human health are set out in Table 3.1.

The recently published DEFRA Local Air Quality Management Policy Guidance (LAQM.PG(16))[5] sets out new guidance on the role and responsibilities of local authorities and $PM_{2.5}$. There is no regulatory standard applied to the $PM_{2.5}$ role for local authorities in England however, local authorities are expected to work towards reducing emissions and concentrations of $PM_{2.5}$ in their area. The policy guidance recommends that local authorities in England use the EU Ambient Air Quality Directive[6] standards for $PM_{2.5}$ including an exposure reduction obligation, a target value and a limit value as a guide. The objective limit for $PM_{2.5}$ is also set out in Table 3.1.

Table 3.1: Relevant Objectives set out in the Air Quality Strategy			
Pollutant	**Concentrations**	**Measured As**	**Date to be Achieved By**
Nitrogen Dioxide (NO_2)	200 μgm^{-3} not to be exceeded more than 18 times per year	1 hour mean	31 December 2005
	40 μgm^{-3}	Annual mean	31 December 2005
Particulate Matter (PM_{10})	50 μgm^{-3} not to be exceeded more than 35 times per year	24 hour mean	31 December 2004
	40 μgm^{-3}	Annual mean	31 December 2004
Particulate Matter ($PM_{2.5}$)	25 $\mu g/m^3$	Annual Mean	31 December 2010

The statutory standards and objectives apply to external air where there is relevant exposure to the public over the associated averaging periods within each objective. Guidance is provided within Local Air Quality Management Technical Guidance 2016 (LAQM.TG(16))[7] issued by DEFRA for Local Authorities on where the objectives apply, as detailed in Table 3.2. The objectives do not apply in workplace locations, to internal air or where people are unlikely to be regularly exposed (i.e. centre of roadways).

Table 3.2: Locations Where Air Quality Objectives Apply		
Averaging Period	**Objectives should apply at:**	**Objectives should generally not apply at:**
Annual Mean	All locations where members of the public might be regularly exposed. Building facades of residential properties, schools, hospitals, care home etc.	Building facades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence. Gardens of residential properties.

5 DEFRA (2016) Local Air Quality Management Policy Guidance (PG16) LAQM.PG(16)

6 http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:152:0001:0044:EN:PDF

7 DEFRA (2016) Local Air Quality Management. Technical Guidance LAQM.TG(16)

Table 3.2: Locations Where Air Quality Objectives Apply		
Averaging Period	**Objectives should apply at:**	**Objectives should generally not apply at:**
		Kerbside sites (as opposed to locations at the building facade), or any other location where public exposure is expected to be short term.
24 Hour Mean	All locations where the annual mean objective would apply together with hotels. Gardens of residential properties.	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term.
1 Hour Mean	All locations where the annual mean and 24-hour mean objectives apply. Kerbside Sites (e.g. pavements of busy shopping streets). Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where the public might reasonably be expected to spend 1-hour or more. Any outdoor locations where the public might reasonably be expected to spend 1-hour or longer.	Kerbside sites where the public would not be expected to have regular access.

3.2.2 National Air Quality Plan for Nitrogen Dioxide (NO_2) in the UK

The National Air Quality Plan[8] was written as a joint venture between the Defra and the Department for Transport (DfT) and aims to tackle roadside concentrations of NO_2 in the UK. It includes a number of measures such as those aimed at investing in Ultra Low Emission Vehicles (ULEVs) charging infrastructure, public transport and grants to help local authorities in improving air quality.

The plan requires all local authorities (LAs) in England with areas expected not to meet the Limit Values by 2020 (known as 'air quality hotspots') to develop plans to bring concentrations within these values in "the shortest time possible". These plans are to be reviewed by the government and suggestions included in the plan include actions such as utilising retrofitting technologies, changing road layout and encouraging public transport and ULEV use. Where these approaches are not considered sufficient, the LA may need to consider implementation of a Clean Air Zone (CAZ) which places restrictions on vehicle access to an area and may include charging certain (or all) vehicles or restrictions on the type of vehicle allowed to access an area.

3.2.3 Road to Zero Strategy

The 'Road to Zero' strategy[9] sets out the government's plans to encourage zero emissions vehicles. These include the aim that by 2040 all new cars and vans will have zero tailpipe emissions and by 2050 almost every car will have zero emissions. Measures within the Strategy are aimed at encouraging the uptake of the cleanest vehicles and supporting electric charging infrastructure.

8 Defra and DfT. (2017). UK plan for tackling roadside nitrogen dioxide concentrations. London: HMSO

9 HM Government. (2018). Road to Zero Strategy. London: HMSO

3.2.4 Clean Air Strategy

The Clean Air Strategy[10] sets out policies to lower national emissions of pollutants in order to reduce background pollution and human exposure. It aims to create a strong framework to tackle air pollution and to reduce the number of people living in locations with $PM_{2.5}$ concentrations exceeding 10 µg/m^3 by 50% by 2025.

3.2.5 Control of Dust and Particulates Associated with Construction

Section 79 of the Environmental Protection Act (1990)[11] states that where a statutory nuisance is shown to exist, the local authority must serve an abatement notice. Statutory nuisance is defined as:

- *'any dust or other effluvia arising on industrial, trade or business premises and being prejudicial to health or a nuisance', and*
- *'any accumulation or deposit which is prejudicial to health or a nuisance'.*

Failure to comply with an abatement notice is an offence and if necessary, the local authority may abate the nuisance and recover expenses. In the context of the proposed development, the main potential for nuisance of this nature would arise during the construction phase - potential sources being the clearance, earthworks, construction and landscaping processes.

There are no statutory limit values for dust deposition above which 'nuisance' is deemed to exist - 'nuisance' is a subjective concept and its perception is highly dependent upon the existing conditions and the change which has occurred. However, research has been undertaken by a number of parties to determine community responses to such impacts and correlate these to dust deposition rates. However, impacts remain subjective and statutory limits have yet to be derived.

3.3 National Planning Policy

3.3.1 National Planning Policy Framework

The National Planning Policy Framework (NPPF)[12] sets out the Government's planning policies for England and how these are expected to be applied. At the heart of the NPPF is a presumption in favour of sustainable development. It requires Local Plans to be consistent with the principles and policies set out in the NPPF with the objective of contributing to the achievement of sustainable development.

The NPPF states that the planning system has three overarching objectives in achieving sustainable development including a requirement to *'contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy*.'

Under Section 15: Conserving and Enhancing the Natural Environment, the NPPF (paragraph 170) requires that *'planning policies and decisions should contribute to and enhance the natural 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*.'

10 Defra. (2019). Clean Air Strategy. London: HMSO

11 Secretary of State, The Environment Act 1990 HMSO

12 Ministry of Housing, Communities and Local Government: National Planning Policy Framework (February 2019)

In dealing specifically with air quality the NPPF (paragraph 181) states that *'planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan*.'

Paragraph 183 states that *'the focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively'*.

3.4 Local Planning Policy

3.4.1 The Uttlesford Local Plan 2005

The Uttlesford Loal Plan[13] was adopted in 2005 and set out the polices to guide development across the district.

Policy ENV13 – Exposure to Poor Air Quality states that '*development that would involve users being exposed on an extended long-term basis to poor air quality outdoors near ground level will not be permitted'.*

3.4.2 Uttlesford interim Climate Change Planning Policy

In 2019, the UDC declared a climate and ecological emergency which committed to achieving net-zero carbon status by 2030 and protecting and enhancing biodiversity by producing a bold plan of action that is realistic, measurable and deliverable.

The Council has produced the Interim Climate Change Planning Policy[14] setting out how it will judge whether development proposals adequately mitigate and adapt to climate change until the new local plan is adopted.

Within the document the Council set out a number of policies which relate to air quality including:

Interim Policy 5 which states that '*developers should demonstrate how their proposals would not lead to any material decrease in air quality or to significant adverse effects on the environment or amenity and, where relevant, how they would comply with the Saffron Walden Air Quality Action Plan to minimise effects on local air quality and reduce CO_2 emissions'.*

3.5 Air Quality Guidance

3.5.1 Uttlesford Air Quality Technical Planning Guidance

The Uttlesford Air Quality Technical Planning Guidance sets out the approach that should be taken in determining whether an air quality assessment should accompany a planning application, sets out

13 UDC, Uttlesford Local Plan, Adopted January 2005

14 UDC, Interim Climate Change Planning Policy, March 2021 (- https://www.uttlesford.gov.uk/media/10714/interim-climate-change-policy/pdf/Interim_Climate_Change_Planning_Policy_01.03.21_PDFA(1).pdf?m=637502093891130000)

what should be included within the assessment and details recommendations for mitigation measures to reduce emissions.

3.5.2 DEFRA Technical Guidance, LAQM.TG(16)

Local authorities are seen to play a particularly important role. Section 82 of the Environment Act 1995 requires every local authority to conduct a review of the air quality from time to time within the authority's area. The recently released DEFRA technical guidance, LAQM.TG(16), describes a new streamlined approach to the Local Air Quality Management (LAQM) regime, whereby every authority has to undertake and submit a single Annual Status Report/Annual Progress Report within its area, to identify whether the objectives have been or will be achieved at relevant locations by the applicable date. If the objectives are not being met, the authority must declare an Air Quality Management Area (section 83 of the Act) and prepare an action plan (section 84) which identifies measures that will be introduced in pursuit of the objectives.

3.5.3 IAQM Land-Use Planning and Development Control: Planning for Air Quality

Institute of Air Quality Management (IAQM) and Environmental Protection UK (EPUK) have published joint guidance on the assessment of air quality impacts for planning purposes[15] . This includes information on when an air quality assessment is required, what should be included in an assessment and criteria for assessing the significance of any impacts.

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

Guidance produced by the IAQM on assessing impacts from construction and demolition activities[16] includes a methodology for identifying the risk magnitude of potential dust sources associated with demolition, construction, earthworks and trackout. This is then used to identify the level of mitigation necessary in order for the impacts to be not significant. The London SPG 'The Control of Dust and Emissions during Construction and Demolition' is based on this guidance, however, the original document is more detailed and therefore it is used to provide additional information where necessary.

15 EPUK & IAQM (2017) Land Use Planning & Development Control: Planning for Air Quality, January 2017

16 IAQM (2014) Guidance on the Assessment of Dust from Demolition and Construction Version 1.1 , February 2014

4 Methodology

4.1 Construction Phase

4.1.1 Construction Traffic

During construction of the proposed development, lorries will require access to the Site to deliver and remove materials; earthmoving plant and other mobile machinery may also work on site including generators and cranes. These machines produce exhaust emissions; of particular concern are emissions of NO_2 and PM_{10}.

Based on the development proposals and anticipated phasing it is anticipated that there would be in the region of 20-30 additional Heavy-Duty Vehicles (HDV) generated on the adjacent road network on any given day during the construction period.

The EPUK & IAQM air quality guidance assessment criteria indicate that significant impacts on air quality are unlikely to occur where a development results in less than 25 HDV movements per day in locations within or adjacent to an AQMA and less than 100 HDV outside of an AQMA. Following distribution of the trips on the adjacent road network it is expected that there would be no more than 25 HDV movements per day on any one road link during the construction phase. It is therefore anticipated that construction traffic generated by the proposed development would result in a negligible impact on local NO_2 and PM concentrations and has not been considered any further in this assessment.

4.1.2 Construction/Fugitive Dust Emissions

Construction phase activities associated with the Proposed Development may result in the generation of fugitive dust emissions (i.e. dust emissions generated by site-specific activities that disperse beyond the construction site boundaries).

If transported beyond the site boundary, dust can have an adverse impact on local air quality. The IAQM has published a guidance document for the assessment of demolition and construction phase impacts[17].The guidance considers the potential for dust nuisance and impacts to human health and ecosystems to occur due to activities carried out during the following stages of construction:

- Demolition (removal of existing structures);
- Earthworks (soil-stripping, ground-leveling, excavation and landscaping);
- Construction (activities involved in the provision of a new structure); and
- Trackout (the transport of dust and dirt from the construction site onto the public road network where it may be deposited and then re-suspended by vehicles using the network).

A qualitative assessment of air quality impacts due to the release of fugitive dust and particulates (PM_{10}) during the construction phase was undertaken in accordance with the methodology detailed in the IAQM guidance.

The assessment takes into account the nature and scale of the activities undertaken for each source and the sensitivity of the area to an increase in dust and PM_{10} levels, thus enabling a level of risk to be assigned. Risks are described in terms of there being a low, medium or high risk of dust impacts.

Once the level of risk has been ascertained, then site specific mitigation proportionate to the level of risk is identified, and the significance of residual effects determined.

17 IAQM (June 2016) Guidance on the assessment of dust from demolition and construction Version 1.1

A summary of the IAQM assessment methodology is provided in Appendix B.

4.2 Operational Phase

4.2.1 Introduction

The prediction of traffic related emissions has been undertaken using the ADMS Roads dispersion model (Version 5.0.0.1, released March 2020, updated in September 2020). This is a commercially available dispersion model and has been widely validated for this type of assessment and used extensively in the Air Quality Review and Assessment process.

The model uses detailed information regarding traffic flows on the local road network and local meteorological conditions to predict pollution concentrations at specific locations selected by the user. Meteorological data from Stansted Airport Meteorological Station for 2019 has been used for the assessment.

Quantitative assessment of the impacts on local air quality from road traffic emissions associated with the operation of the development have been completed against the current statutory standards and objectives set out in Table 3.1 for NO_2 and PM.

4.2.2 Emissions Data

The model uses traffic flow data and vehicle related emission factors to predict road specific concentrations of NO_x and particulate matter (PM_{10} and $PM_{2.5}$) at selected receptors.

The assessment has predicted air quality during 2019 for model verification. The emission factors released by Defra in August 2020, provided in the emissions factor toolkit EFT2020_v10.0[18] have been used to predict traffic related emissions of PM and NO_x.

Emission factors and background data used in the prediction of future air quality concentrations predict a gradual decline in pollution levels over time due to improved emissions from new vehicles and the gradual renewal of the vehicle fleet. In recent years the Defra emission factors published within the Emission Factor Toolkits (EFT) have been found to predict lower NO_x concentrations in future years compared to concentrations measures at roadside locations across the UK. However, research carried out by Air Quality Consultants Ltd (AQC) has now shown that emissions of NO_x from vehicles within the recently released EFT are now matching concentrations recorded at roadside locations between 2013 to 2019. The report[19] concludes that *'the EFT is now unlikely to over-state the rate at which NOx emissions decline into the future at an 'average' site in the UK. Indeed, the balance of evidence suggests that, on average, NOx concentrations are likely to decline more quickly in the future than predicted by the EFT'.* This has removed the need for the use of any sensitivity tests for future year scenarios.

In light of the above the relevant future year EFT emissions data have be used to predict concentrations in the 2026 future year scenarios.

4.2.3 Background Concentrations

The ADMS model estimates concentrations arising as a result of vehicle emissions. It is necessary to add an estimate of local background concentrations to obtain the total concentration for comparison against the air quality objectives.

18 https://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html

19 https://www.aqconsultants.co.uk/news/march-2020/defra%E2%80%99s-emission-factor-toolkit-now-matching-measu

Background concentrations of NO_2 for use within the modelling assessment have been take from monitoring site UTO12, located at the town hall. Data for 2019 has been used.

Estimated concentrations for PM_{10} and $PM_{2.5}$ have been taken from the Defra 2018 based background maps, published in August 2020. Concentrations have been extracted from the 2019 maps for the grid square which represent the Site and adjacent road network.

Data for 2019 has been used for the 2026 scenario as a cautious approach, assuming no decline in background levels between the base year and future year scenario.

Details of the background data used within the modelling assessment are provided in Table 5.1 for NO_2 and Table 5.4 for PM_{10} and $PM_{2.5}$.

4.2.4 Traffic Data

Traffic data for use in the assessment has been provided by Cotswold Transport Planning. The 2019 base flows have been used for model verification against local monitoring data.

Future year traffic flows have been provided for the following scenarios in 2026:

- 2026 Do Minimum Scenario (including base flows and committed developments)
- 2026 Do Something Scenario (including the Do Minimum flows plus proposed development trips).

The traffic data used within the assessment is provided in Appendix C.

Traffic generated by other committed developments in the area have been included within the 2026 Do Minimum scenario, including:

- UTT/13/3467/OP – outline planning permission for up to 230 dwellings inc link road and primary school
- UTT/16/1856/DFO – RM for 200 dwellings approved Jan 2017
- 17/2832/OP – outline application for 100 dwellings approved July 2020
- 18/0824/OP – outline application approved April 2019 for up to 150 units

The 2026 assessment scenarios also take account of the new link road between Radwinter Road to the north and Thaxted Road to the south, being constructed as part of a number of committed developments east of the Site including UTT/13/3467/OP and 17/2832/OP.

Traffic speeds have been assigned to each link road based on local traffic speed restrictions and the presence of junctions. Slower speeds have been assigned at junctions to take account of queuing and turning traffic.

As part of the application a number of improvements are being proposed to include the following:

- Radwinter Road/Thaxted Road/East Street/Chatters Hill – addition of a short separate right turn lane on Radwinter Road
- Thaxted Road/Peasland Road – conversion of exiting mini roundabout to traffic signals
- High Street/Church Street – conversion of existing priority junction to traffic signals

Full details of the junction improvements are set out within the Transport Assessment along with of junction analysis. The data shows that the improvements would result in a significant reduction in queue lengths at the relevant junctions compared to the existing situation. These improvements would therefore have a positive impact on air quality.

The modelling assessment has made no change to vehicle speeds at the relevant junctions under the 'do something' scenario to account for the reduced queue lengths therefore the assessment represents a worst-case prediction of emissions at each junction.

4.2.5 Model Outputs and Results Processing

The ADMS Model has predicted traffic related annual mean emissions of NO_x and PM at a number of receptors along the road links set out in Appendix D. Relevant background concentrations have subsequently been added to the model outputs to provide the total concentrations of each pollutant.

The predicted concentrations of NO_x have been converted to NO_2 using the LAQM calculator (Version 8.1, released August 2020) available on the Defra air quality website[20].

Analysis of long-term monitoring data[21] suggests that if the annual mean NO_2 concentration is less than 60 µg/m^3 then the one-hour mean NO_2 objective is unlikely to be exceeded where road transport is the main source of pollution. Therefore, in this assessment the annual mean concentration has been used to screen whether the one-hour mean objective is likely to be achieved as recommended within LAQM.TG(16). Similar to NO_2, an annual mean PM_{10} concentrations below 32 µg/m^3 is used to screen whether the 24-hour PM_{10} mean objective is likely to be achieved, the approach also recommended within LAQM.TG(16).

4.2.6 Verification of Model Results

It is recommended that the model results are compared with measured data to determine whether the model results need adjusting to more accurately reflect local air quality. This process is known as verification.

LAQM.TG(16) recommends that model predictions should be within 25% (preferably 10%) of monitored concentrations for the model to be predicting with any degree of accuracy. Also, the guidance recommends that any adjustment factors applied to model results should be calculated based on verification using monitoring sites in a similar location i.e. roadside, intermediate or background sites.

To verify the model results, the ADMS model has been used to predict NO_x concentrations at 10 monitoring sites located within the town of Saffron Walden.

There is no suitable monitoring of PM_{10} or $PM_{2.5}$ data to allow verification of the PM model results. The adjustment applied to predicted NO_2 concentrations has also been applied to the modelled PM concentrations.

Further details on the verification and calculation of adjustment factors is provided in Appendix D.

4.2.7 Receptors

As discussed in Section 3.2.1 and set out in Table 3.2, LAQM.TG(16) describes in detail typical locations where consideration should be given to pollutants defined in the Regulations. Generally, the guidance suggests that all locations *'where members of the public are regularly present'* should be considered. At such locations, members of the public would be exposed to pollution over the time that they are present, and the most suitable averaging period of the pollutant needs to be used for assessment purposes.

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20 http://uk-air.defra.gov.uk

21 D Laxen and B Marner: Analysis of the relationship between 1-hour and annual mean nitrogen dioxide at UK roadside and kerbside monitoring sites (July 2003).

For instance, on a footpath, where exposure would be transient (for the duration of passage along that path) comparison with short-term standards (i.e. 15 minute mean or 1 hour mean) may be relevant. In a school, or adjacent to a private dwelling, however; where exposure may be for longer periods, comparison with long-term standards (such as 24 hour mean or annual mean) may be most appropriate. In general terms, concentrations associated with long-term standards are lower than short-term standards owing to the chronic health effects associated with exposure to low level pollution for longer periods of time.

For the completion of this assessment, air quality has been predicted at the facades of sensitive receptors (i.e. residential properties, schools, care homes etc) located adjacent to the road links included in the model (Appendix C). Each receptor has been selected to represent worst-case exposure to local traffic emissions.

A number of receptors have also been selected to represent exposure within the Site.

The details of each receptor are presented below in Table E1, Appendix E and their locations shown in Figure E1, Appendix E.

4.3 Significance Criteria

4.3.1 Construction Phase

The IAQM assessment methodology recommends that significance criteria are only assigned to the identified risk of dust impacts occurring from a construction activity following the application of appropriate mitigation measures. For almost all construction activities, the application of effective mitigation should prevent any significant effects occurring to sensitive receptors and therefore the residual effects will normally be negligible.

4.3.2 Operational Phase

The guidance issued by EPUK & IAQM relates to Air Quality considerations within the planning process and sets criterion which identify the need for an Air Quality Assessment, the type of Air Quality assessment required, and the significance of any predicted impact.

The guidance suggests expressing the magnitude of incremental change in concentrations as a proportion of an Air Quality Assessment Level (AQAL) such as the air quality objectives set out in Table 3.1.

The significance of impact is then identified based on the incremental change in the context of the new total concentrations and its relationship with the assessment criteria, noting whether the impact is adverse or beneficial based on a positive or negative change in concentrations. The criteria suggested for assigning significance is set out in Table 4.4 below.

To assess the overall significance of the predicted impact the assessment draws on the approach used for undertaking environmental impact assessments where a moderate and major impact is deemed to be significant while a minor or negligible impact would not be classed as significant.

Table 4.4: Impact Descriptors for Individual Receptors				
Long-term Average Concentration at Receptor in Assessment Year	**% Change in Concentrations 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% of AQAL	Moderate	Substantial	Substantial	Substantial

When assessing significance using the criteria set out in Table 4.4 the following should be taken into account:

- AQAL – Air Quality Assessment Level which in this assessment refers to the Air Quality Objectives set out in Table 3.1
- The percentage change in concentration should be rounded to a whole number
- The table should only be used with annual mean concentrations
- The descriptors are for individual receptors only: overall significance should be based on professional judgment
- When defining the concentrations as a percentage of the AQAL use the 'without scheme' concentration where there is a decrease in pollutant concentrations and the 'with scheme' concentrations for an increase
- The total concentration categories reflect the degree of potential harm by reference to the AQAL value. At exposure, less than 75% of this value i.e. well below, the degree of harm is likely to be small. As exposure approaches and exceeds the AQAL, the degree of harm increases. This change naturally becomes more important when the result is an exposure that is approximately equal to, or greater than the AQAL
- It is unwise to ascribe too much accuracy to incremental changes or background concentrations, and this is especially important when total concentrations are close to the AQAL. For a given year, it is impossible to define the new total concentrations without recognising the inherent uncertainty, which is why there is a category that has a range around the AQAL, rather than being exactly equal to it.

5 Baseline Assessment

5.1 Uttlesford Review and Assessment of Air Quality

UDC has completed a number of detailed assessments of air quality in the district which has identified exceedances of the annual mean NO_2 objective and resulted in the declaration of an AQMA covering a circular area with a radius of 1400 m centered Elm Grove in the centre of the Saffron Walden.

The Site is located 0.8 km to the east of the AQMA. Air quality in the immediate vicinity of the Site has been found to be meeting the relevant air quality objectives.

The location of the AQMA is shown in Figure 5.1.

Source: DEFRA https://uk-air.defra.gov.uk/aqma/maps/

Figure 5.1: Location of Development Site in Relation to AQMAs

5.2 Air Quality Monitoring

5.2.1 Nitrogen Dioxide

UDC operated 3 automatic monitoring sites within the district during 2019, two monitoring NO_2 within Safron Walden.

UDC also measured NO_2 using diffusion tubes at 33 locations during 2019. The tubes are supplied and analysed by Socotec using the 50% Triethanolamine (TEA) in acetone preparation method. Diffusion tubes are a passive form of monitoring, which, due to their relative in-expense, allow for a much greater spatial coverage than with automatic monitoring sites. Diffusion tubes are acknowledged as a less accurate method of monitoring ambient air pollutants than automatic monitors, with diffusion tubes over or under estimating concentrations by as much as 30 %.

To allow the results to be reliably compared with the AQ Objectives, the data should be bias corrected using data collected from tubes co-located with continuous monitoring sites. The data provided below has been adjusted by UDC using nationally derived bias correction factors. The bias correction factor for 2019 was 0.75.

No monitoring of pollution concentrations is carried out in the immediate vicinity of the development Site. However, there is an extensive network of sites located within Saffron Walden. Details of these sites are presented in Table 5.1. The location of the sites are shown in Figure 5.2.

Table 5.1: Diffusion Tube Annual Average Nitrogen Dioxide Concentrations (µgm^{-3})

Site	Classification	Year				
		2015	2016	2017	2018	2019
UTT2 – Thaxted Rd/Radwinter Rd jnct	R	-	-	-	35.3	32.7
UTT3 – London Road	R	-	23.9	18.3	21.2	19.6
UT001 – High Street	UC	36.4	**40.0**	33.9	19.2	29.9
UT003 – Gibson Gardens	UB	12.3	16.2	13.4	11.2	11.1
UT004 – YHA	K	**42.2**	**46.9**	38.0	30.6	35.1
UT005 – Thaxted Road	K	**41.2**	**47.5**	37.9	28.5	33.9
UT011 – 33 High Street	UC	32.9	38.6	30.9	29.0	26.3
UT012 – Town Hall	UB	18.5	20.5	16.2	11.1	15.5
UT015 – 57 High Street	R	-	-	-	25.8	25.9
UT016 – Radwinter Rd	R	-	-	-	32.1	30.7
UT021 – 41 East St	R	-	-	-	27.1	23.9
UT028 – London Rd	R	37.9	**44.8**	37.4	33.4	31.2
UT029 – Debden Rd	R	21.6	26.5	21.4	20.5	20.1
UTO30 – Friends School	K	29.0	35.3	26.1	27.2	24.9
UT031 – Mount Pleasant Rd	R	22.0	26.2	21.4	19.8	20.7
UTO32 – Borough Lane	R	16.8	19.7	17.4	15.2	15.0
UT036 – Church St	R	21.6	27.1	20.9	19.2	18.4

UT037 – Castle St	K	24.2	29.1	23.9	22.0	22.4
UT044/45/46-Thaxted Rd	R	-	-	-	-	36.9
R – roadside, UB – Urban Background, UC – Urban Centre, K – kerbside Numbers in **bold** – exceedances of the annual mean objective limit						

Annual mean NO_2 concentrations below the objective of 40 µg/m^3 were recorded at all sites during 2019. Historically, exceedances of the annual mean objective were recorded at monitoring sties UT001 in 2016, UT004 and UT005 in 2015 and 2016 and Uto28 in 2016. However, the data indicates a downward trend in concentrations across the town with concentrations at all four of these sites falling to below the objective between 2017 and 2019.

At monitoring sites UTT2 and UTT3 exceedances of the 200µg/m^3 1-hour objective limit have been recorded in previous year, however not on a sufficient number of occasions for the objective to be exceeded which allows up to 18 exceedances of the limit in any given year.

Short-term NO_2 concentrations cannot be recorded by diffusion tubes, therefore no short term data is available. However, as discussed in section 4.2.5 the LAQM.TG(16) guidance indicates that where the annual mean is below 60 µg/m^3 it can be assumed that exceedances of the 1 hour objective for NO_2 are unlikely to occur. Based on the information provided in Table 5.1, it is unlikely that the short-term NO_2 objective would be exceeded at any of the monitoring locations.

Figure 5.2: Location of UDC Monitoring Sites in Safron Walden

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

UDC monitor PM_{10} concentrations at one site (UTT3) within Safron Walden and $PM_{2.5}$ at two sites (UTT1 and UTT3).

PM_{10} recorded at site UTT3 is set out in Table 5.2 and $PM_{2.5}$ concentrations are presented in Table 5.3.

Monitoring of PM_{10} shows annual mean concentrations are well below the objective (less than 75% of the objective) at the monitoring site since 2016.

The monitoring site recorded exceedances of the 24-hour objective limit of 50 µg/m^3 in all four monitoring years since 2016, however, as the objective allows for up to 35 exceedances in any given year, the objective has not been exceeded at this monitoring location.

The data shows no consistent trend in concentrations with little change in the annual mean recorded during all four years presented.

Data presented in Table 5.3 shows $PM_{2.5}$ concentrations to be well below the annual mean objective of 25 µg/m^3 at the monitoring locations since 2016. The data shows no consistent trend in concentrations with some years showing an increase and others a decrease.

Table 5.2: PM_{10} concentrations recorded in Park Street, Wakefield

Site ID	Averaging period	Year				
		2015	2016	2017	2018	2019
UTT3 – London Road	Annual Mean	-	24.5	24.2	25.5	24.7
	1-hour	-	6	19	8	16

Table 5.3: $PM_{2.5}$ concentrations recorded in Park Street, Wakefield

Site ID	Averaging period	Year				
		2015	2016	2017	2018	2019
UTT1	Annual Mean	19.3	17.3	18.5	17.5	-
UTT3		-	-	-	-	13.8

5.3 DEFRA Background Maps

Additional information on estimated background pollutant concentrations has been obtained from the DEFRA 2018 background maps provided on UK-AIR, the Air Quality Information Resource (http://uk-air.defra.gov.uk). Estimated air pollution concentrations for NO_2, PM_{10} and $PM_{2.5}$ have been extracted from the 2018 based background pollution maps for the UK and are set out in Table 5.4.

These maps are available in 1km by 1km grid squares and provide an estimate of concentrations between 2018 and 2030. The average concentrations for each grid square representing each of the modelled receptor locations have been extracted from the 2019 base year and are set out in Table 5.4.

The data indicates that background concentrations in the vicinity of the Site are expected to comfortably meet the NO_2, PM_{10} and $PM_{2.5}$ objectives.

Table 5.4: Annual Mean Background Air Pollution Concentrations from DEFRA Maps

OS Grid Square	NO_2	PM_{10}	$PM_{2.5}$
553500, 237500	10.0	15.3	9.6
554500, 237500	9.5	15.5	9.8
553500, 238500	9.9	15.0	9.5
554500, 238500	11.3	14.9	9.7
555500, 238500	8.5	15.7	9.6

5.4 Air Quality at the Development Site

The Site is located on the eastern edge of the town in a relatively rural/background location in terms of air quality. The nearest monitoring site is UT016, located adjacent to Radwinter Road to the east of the junction with Thaxted Road. Data recorded at this site shows annual mean NO_2 in the region of 30 µg/m^3 during 2018 and 2019. NO_2 concentrations adjacent to Radwinter Road bounding the north of the Site are expected to be lower than recorded at Site UT016 due to free flow vehicles compared to those queuing leading up to the Thaxted Road junction. However, following the construction of the new site access vehicle speeds past the Site are expected to reduce slightly to accommodate turning movements. Furthermore, it is proposed that speed limits along Radwinter Road will be reduced in the vicinity of the Site to accommodate pedestrians crossing the road to access the Site/the bus stop on the northern side. This may increase concentrations to levels similar or just below those recorded at UT016. On this basis NO_2 concentrations along the northern boundary of the Site are expected to be meeting the annual mean objective limit of 40 µg/m^3.

NO_2 concentrations are known to decline rapidly away from source, reducing to background concentrations within 200-300 m of a road. NO_2 concentrations across the rest of the Site are therefore expected to be well below the annual mean objective for this pollutant.

Based on the expected annual mean concentrations, short-term NO_2 concentrations are also expected to be meeting the 1-hour objective across the Site.

Based on monitoring of both PM_{10} and $PM_{2.5}$ carried out within the Safron Walden AQMA, concentrations across the Site are expected to be well below the relevant air quality objectives for both these pollutants.

6 Construction Impacts

6.1 Site and Surroundings

A summary of the proposed development is provided in Section 2 of this report.

The Site covers an area of approximately 17.9 ha and there are residential properties located within 350 m to the Site. An assessment of impacts in relation to human receptors is therefore required.

Dust emissions from construction activities are unlikely to result in significant impacts on ecologically sensitive receptors beyond 50 m from the site boundary. A review of data held on the DEFRA MAGIC website[22] shows no sites designated as important for wildlife within 50 m of the Site, therefore impacts on ecological receptors has not been considered any further within this assessment.

As discussed in Section 5, PM_{10} concentrations in the vicinity of the Site are expected to be 'well below' the relevant objective limits (Table 5.4). The data indicates background concentrations in the region of 15-16 µg/m$^{3.}$ Based on professional judgment, it is anticipated that PM_{10} concentrations at the Site and at adjacent properties are unlikely to be much higher than background, therefore PM_{10} concentrations are expected to be below 24µg/m^3.

The precise behaviour of the dust, its residence time in the atmosphere, and the distance it may travel before being deposited would depend upon a number of factors. These include wind direction and strength, local topography and the presence of intervening structures (buildings, etc.) that may intercept dust before it reaches sensitive locations. Furthermore, dust would be naturally suppressed by rainfall.

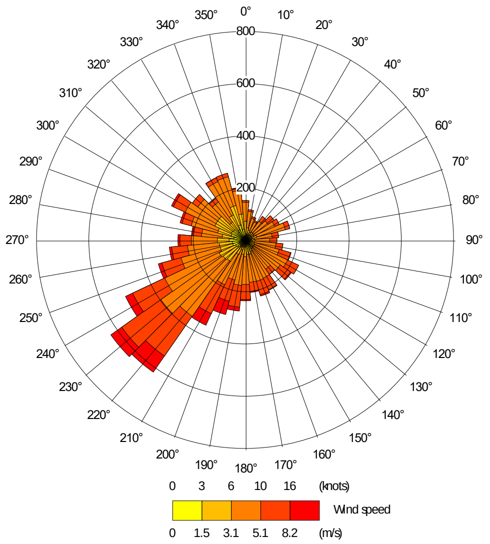

Figure 6.1: Windrose from Stansted Meteorological Station (2019)

A windrose from Stansted Airport Meteorological Station is provided below in Figure 6.1, which shows that the prevailing wind is predominately from the south west. Receptors located to the north-east are therefore most at risk of experiencing impacts. Land uses located to the north-east are predominantly agricultural fields which are of low sensitivity to dust effects. There are a few residential properties to the north-east located on Radwinter Road , however the high separation

22 http://magic.defra.gov.uk/

distance between the Site and the dwellings in this direction means the risk of impacts would be significantly reduced.

6.2 Risk Assessment of Dust Impacts

6.2.1 Potential Dust Emission Magnitude

The dust emission magnitude is based on the scale of anticipated works at the Site and has been classified as small, medium or large for each of the four activities; demolition, earthworks, construction and trackout. A summary of the dust emission magnitude for each activity is set out in Table 6.1.

Demolition

There is a single barn that would require demolition as part of the application. The barn has a volume of < 1500 m^3 and therefore has a dust emission class of 'small'.

Earthworks

Earthworks are those activities involved in preparing the Site for construction such as excavation of material, haulage, tipping, stockpiling and leveling.

The Site covers an area of approximately 17.9 ha (179,000 m^2) and during the earthworks stage it is anticipated that more than 100,000 tonnes of material would be excavated, with more than 10 heavy earth moving vehicles on site at any one time. The Site is therefore considered to have a dust emission class of 'large' with regards to earthwork activities.

Construction

There are a number of issues that can impact the dust emission class during construction activities including the size of the building, materials used for construction, the method of construction and the duration of the build.

Based on the current design layouts the total building volume proposed for the Site would be 55,000 to 65,000 m^3 and the main construction materials would be steel and concrete. The Site is therefore considered to have a dust emission class of 'medium' with regards to construction activities.

Trackout

The risk of impacts occurring during trackout is predominantly dependent on the number of vehicles accessing the Site on a daily basis. However, vehicle size and speed, the duration of activities and local geology are also factors which are used to determine the emission class of the Site as a result of trackout.

Given the size of the Site and nature of the development it is anticipated that there would be in the region of 20-30 HDV accessing the Site on a daily basis. Furthermore, vehicles would be travelling over unpaved roads, which can result in mud and dust being trackout onto the adjacent road network. The Site is therefore considered to have a dust emissions class of 'medium' with regards to trackout activities.

Table 6.1: Summary of Dust Emission Magnitude for each Activity	
Source	**Magnitude**
Demolition	Small
Earthworks	Large
Construction	Medium
Trackout	Medium

6.2.2 Sensitivity of Area

The sensitivity of the surrounding area takes account of the following factors:

- the specific sensitivities of receptors in the area;
- the proximity and number of those receptors;
- in the case of PM_{10}, the local background concentrations; and
- site-specific factors i.e. whether there are natural shelters such as trees, to reduce the risk of wind-blown dust.

Based on the IAQM guidance residential dwellings are considered as high sensitivity receptors in relation to both dust soiling and health effects of PM_{10}.

There is one property located to the west within 20 m of the Site boundary. Beyond this the nearest properties are approximately 60m to the west on Griffin Lane and Fairfax Place. To the east the nearest residential properties are over 200 m from the Site. The overall sensitivity of the surrounding area is classed as 'medium' in relation to dust soiling. However, there are no residential properties located within 250m of the building requiring demolition therefore the sensitivity to dust effects from demolition will be 'low'.

As previously discussed, annual mean PM_{10} concentrations in the vicinity of the Site are not expected to exceed 24 $\mu g/m^3$. Based on the proximity of sensitive receptors to the site boundary and the local concentrations of PM_{10} the sensitivity of the surrounding area is considered to be 'low' with regards human health impacts.

In relation to trackout, vehicles travelling to and from the Site would travel along Radwinter Road either to the east or west. As a general guidance, significant impacts from trackout may occur up to 500 m from large sites, 200 m from medium sites and 50 m from small sites, as measured from the site exit. There are fewer than 10 residential receptors within 20 m of the roadside located adjacent to Radwinter Road to the west within 500 m of the site access point. The sensitivity of receptors is therefore considered to be 'medium' in relation to dust soiling and 'low' in relation to human health impacts from trackout.

A summary of the sensitivity of the area surrounding the Site in relation to each activity is provided below in Table 6.2.

Table 6.2: Summary of Sensitivity of Surrounding Area				
Potential Impact	**Sensitivity of Surrounding Area**			
	Demolition	**Earthworks**	**Construction**	**Trackout**
Dust Soiling	N/A	Medium	Medium	Medium
Human Health	N/A	Low	Low	Low

6.2.3 Defining the Risk of Impacts

The dust emission magnitude as set out in Table 6.1 is combined with the sensitivity of the area (Table 6.2) to determine the risk of both dust soiling and human health impacts, assuming no mitigation measures applied at site. The risk of impacts associated with each activity is provided in Table 6.3 below and has been used to identify site-specific mitigation measures, which are discussed in Section 8 and set out in Appendix F.

Table 6.3: Summary of Risk Effects to Define Site-Specific Mitigation				
Potential Impact	**Activity**			
	Demolition	**Earthworks**	**Construction**	**Trackout**
Dust Soiling	Negligible	Medium Risk	Medium Risk	Low Risk
Human Health	Negligible	Low Risk	Low Risk	Low Risk

7 Operational Impacts

7.1 Impacts on Existing Receptors

7.1.1 NO_2 Concentrations

NO_2 concentrations predicted at the selected existing sensitive receptors are presented in Table G1, Appendix G.

The modelling is predicting annual mean NO_2 concentrations below the objective (AQAL) at all the selected receptors under the 2019 base scenario, although concentrations are only just below the objective at receptor R42 (London Road). Due to improvements in vehicle emissions by 2026 concentrations are predicted to have declined to well below the objective at all receptor locations.

Traffic generated by the operational development is predicted to increase annual mean NO_2 concentrations by up to 0.3 $\mu g/m^3$, which is equivalent to no more than 1% of the AQAL. As concentrations are predicted to remain at less than 70% of the AQAL at all receptor locations, the impact is deemed to be negligible based on the criteria set out in Table 4.4.

At all receptor locations considered in the assessment annual mean NO_2 concentrations are predicted to be less than 60 $\mu g/m^3$. Impact on short-term NO_2 concentrations would, therefore, also be negligible.

7.1.2 PM_{10} Concentrations

Predicted annual mean PM_{10} concentrations at the existing receptor locations are presented in Table G2, Appendix G.

The model is predicting annual mean PM_{10} concentrations at less than 75% of the AQAL at all the selected receptor locations under the 2019 base and future 2026 assessment scenarios.

Traffic generated by the development is predicted to increase annual mean PM_{10} concentrations by between 0.1 $\mu g/m^3$, which equates to less than 1% of the AQAL. The impact on annual mean concentrations would therefore be negligible.

Annual mean concentrations are predicted to remain at less than 32 $\mu g/m^3$ at all receptors. The impact on 24-hour PM_{10} concentrations would therefore be negligible.

7.1.3 $PM_{2.5}$ Concentrations

Predicted annual mean $PM_{2.5}$ concentrations at the existing receptor locations are presented in Table G3, Appendix G.

The modelling is predicting annual mean $PM_{2.5}$ concentrations at less than 60% of the AQAL at all receptor locations under all three assessment scenarios.

Traffic generated by the operational development is predicted to increase annual mean concentrations by no more than 0.1 $\mu g/m^3$, which equates to <1% of the AQAL and is deemed to be a negligible impact.

7.2 Impacts on Proposed Receptors

Annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations predicted along the northern boundary of the Site and adjacent to the proposed access road are set out in Table 7.1.

The modelling assessment is predicting annual mean concentrations of all three pollutants well below the relevant objective limits.

Annual mean NO_2 concentrations are also predicted to be significantly less than 60 µg/m^3, while annual mean PM_{10} concentrations are predicted to be well below 32 µg/m^3, therefore concentrations are meeting the short-term objectives for both pollutants.

Impacts at the Site in terms of exposure to all three pollutants are therefore deemed to be negligible.

Table 7.3: Predicted Annual Mean Concentrations at Proposed Receptors under 2026 Do Something Scenario (µg/m^3)

Receptor	Pollutant			Significance of Impact (Exposure)
	NO_2	PM_{10}	$PM_{2.5}$	
P1	16.7	15.9	9.7	Negligible
P2	18.1	16.4	10.0	Negligible
P3	18.6	16.6	10.1	Negligible
P4	16.5	15.8	9.6	Negligible
P5	17.5	16.2	9.9	Negligible
P6	16.1	15.7	9.6	Negligible

8 Mitigation

8.1.1 Construction Phase

The control of dust emissions from construction site activities relies upon management provisions and mitigation techniques to reduce emissions of dust and limit dispersion. Where dust emission controls have been used effectively, large-scale operations have been successfully undertaken without impacts to nearby properties.

The proposed development has been identified as a medium risk for dust soiling effects during, earthworks, construction and trackout. For human health, the Site has been identified as a low risk site during earthworks, construction and trackout as set out in Table 6.3.

The developer should therefore implement appropriate dust and pollution control measures as set out within the IAQM guidance. A summary of these measures is set out in Appendix F. The proposed measures should be set out within a CMP and approved by UDC prior to commencement of any work on site.

Following implementation of the measures recommended for inclusion within the DMP the impact of emissions during construction of the proposed development would be negligible.

8.1.2 Operational Phase

The modelling assessment has predicted a negligible impact on local air quality as a result of operational traffic. However, it is acknowledged that operational traffic will contribute to local air quality as a result of additional vehicle emissions.

In terms of mitigation the following mitigation measures will be implemented at the Site to reduce emissions:

- Secure cycle storage for residential units without covered parking or garages;
- Passive provision for electric charging points will be provided for all on-plot car parking spaces;.
- A travel pack will be provided to all residents as part pf the Travel Plan measures setting out public transport options, promoting cycling and walking routes;
- a Travel Plan (TP) will be developed for the Site which will implement measures to encourage the use of alternative more sustainable modes of transport and reduce the use of single occupancy car journeys;
- where provided, all gas fired boilers will meet a minimum rating of <40 $KgNO_x$/kWh.

In addition to the above, the following additional measures are being proposed for inclusion within the scheme design that will contribute to a reduction in emissions. It is expected that these measures will be secured by way of planning condition or legal agreement. These include:

- provision of a bus stop on Radwinter Road in close proximity to the new site access point providing access to services between Aduley End train station and Haverhill and providing an additional point on the east/west route connecting secondary schools in the area;
- provision of large public open space area for recreational purposes, reducing the need for residents to ravel further afield for recreational needs;
- provision of extensive walking and cycling routes through the Site connecting with routes through new development areas to the west and with Radwinter Road;

It is also noted that the Site is within walking distance of bus stops serving local bus routes between Saffron Walden and Stansted Airport and Bishops Stortford, plus a local circular route to various destinations within the town.

8.2 Residual Impacts

8.2.1 Construction Phase

The greatest potential for dust nuisance problems to occur would generally be within 200m of the construction site perimeter. There may be limited incidences of increased dust deposited on property beyond this distance.

By following the mitigation measures outlined within this appraisal the impact would be substantially minimised and residual impacts are unlikely to be significant.

8.2.2 Operational Phase

The assessment has predicted a negligible impact on local air quality. Following implementation of mitigation measures as part of the scheme design. The residual impact would remain negligible.

9 Conclusion

Kairus Ltd was commissioned by Rosconn Group to carry out an air quality assessment in connection with a proposed development on land to the south of Radwinter Road, Safron Walden comprising up to 233 residential dwellings (the 'Site').

It is inevitable that with any development, demolition and construction activities will cause some disturbance to those nearby. Dust arising from most construction activities tends to be of a coarse nature, which through dispersion by the wind can lead to soiling of property including windows, cars, external paintwork and laundry. However, as well as giving rise to annoyance due to soiling of surfaces from dust emissions, there is evidence of major construction activities causing increases in long term PM_{10} concentrations and in the number of days exceeding the short term PM_{10} objective of 50 μgm^{-3}.

The IAQM guidance on assessing impacts on air quality from construction activities and determining the likely significance has been used to determine the risk of impacts occurring during the construction of the development and to identify appropriate mitigation measures to be implemented on site to reduce dust emissions and associated impacts.

Due to the proximity and number of nearby residential receptors the Site is considered to have a medium risk of impacts with regards to dust soiling and PM_{10} concentrations. Following the implementation of appropriate mitigation measures impacts associated with the construction of the development the impacts would be reduced to insignificant.

The modelling assessment has predicted a negligible impact on local air quality as a result of operational traffic. However, it is acknowledged that operational traffic will contribute to local air quality as a result of additional vehicle emissions.

In terms of mitigation the following mitigation measures will be implemented at the Site that will reduce emissions:

- Secure cycle storage for residential units without covered parking or garages;
- Passive provision for electric charging points will be provided for all on-plot car parking spaces;.
- A travel pack will be provided to all residents as part pf the Travel Plan measures setting out public transport options, promoting cycling and walking routes;
- a Travel Plan (TP) will be developed for the Site which will implement measures to encourage the use of alternative more sustainable modes of transport and reduce the use of single occupancy car journeys;
- where provided, all gas fired boilers will meet a minimum rating of <40 $KgNO_x$/kWh.

In addition to the above, the following additional measures are being proposed for inclusion within the scheme design that will contribute to a reduction in emissions. It is expected that these measures will be secured by way of planning condition or legal agreement. These include:

- provision of a bus stop on Radwinter Road in close proximity to the new site access point providing access to services between Aduley End train station and Haverhill and providing an additional point on the east/west route connecting secondary schools in the area;
- provision of large public open space area for recreational purposes, reducing the need for residents to ravel further afield for recreational needs;
- provision of extensive walking and cycling routes through the Site connecting with routes through new development areas to the west and with Radwinter Road;

It is also noted that the Site is within walking distance of bus stops serving local bus routes between Saffron Walden and Stansted Airport and Bishops Stortford, plus a local circular route to various destinations within the town. Based on the results of this assessment and following implementation of the proposed mitigation air quality does not pose a constraint to development of the Site for the proposed use.

Appendix A – Air Quality Terminology

Term	Definition
Accuracy	A measure of how well a set of data fits the true value.
Air quality objective	Policy target generally expressed as a maximum ambient concentration to be achieved, either without exception or with a permitted number of exceedances within a specific timescale (see also air quality standard).
Air quality standard	The concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. The standards are based on the assessment of the effects of each pollutant on human health including the effects on sensitive sub groups (see also air quality objective).
Ambient air	Outdoor air in the troposphere, excluding workplace air.
Annual mean	The average (mean) of the concentrations measured for each pollutant for one year. Usually this is for a calendar year, but some species are reported for the period April to March, known as a pollution year. This period avoids splitting winter season between 2 years, which is useful for pollutants that have higher concentrations during the winter months.
AQMA	Air Quality Management Area.
DEFRA	Department for Environment, Food and Rural Affairs.
Exceedance	A period of time where the concentrations of a pollutant is greater than, or equal to, the appropriate air quality standard.
Fugitive emissions	Emissions arising from the passage of vehicles that do not arise from the exhaust system.
LAQM	Local Air Quality Management.
NO	Nitrogen monoxide, a.k.a. nitric oxide.
NO_2	Nitrogen dioxide.
NO_x	Nitrogen oxides.
O_3	Ozone.
Percentile	The percentage of results below a given value.
PM_{10}	Particulate matter with an aerodynamic diameter of less than 10 micrometres.
Ratification (Monitoring)	Involves a critical review of all information relating to a data set, in order to amend or reject the data. When the data have been ratified they represent the final data to be used (see also validation).
μgm^{-3} micrograms per cubic metre	A measure of concentration in terms of mass per unit volume. A concentration of $1ug/m^3$ means that one cubic metre of air contains one microgram (millionth of a gram) of pollutant.
UKAS	United Kingdom Accreditation Service.
Uncertainty	A measure, associated with the result of a measurement, which characterizes the range of values within which the true value is expected to lie. Uncertainty is usually expressed as the range within which the true value is expected to lie with a 95% probability, where standard statistical and other procedures have been used to evaluate this figure. Uncertainty is more clearly defined than the closely related parameter 'accuracy', and has replaced it on recent European legislation.
USA	Updating and Screening Assessment.
Validation (modelling)	Refers to the general comparison of modelled results against monitoring data carried out by model developers.
Validation (monitoring)	Screening monitoring data by visual examination to check for spurious and unusual measurements (see also ratification).
Verification (modelling)	Comparison of modelled results versus any local monitoring data at relevant locations.

Appendix B – Construction Impact Assessment Procedure

In order to assess the potential impacts, the activities on construction sites are divided into four categories. These are:

- demolition (removal of existing structures);
- earthworks (soil-stripping, ground-leveling, excavation and landscaping);
- construction (activities involved in the provision of a new structure); and
- trackout (the transport of dust and dirt from the construction site onto the public road network where it may be deposited and then re-suspended by vehicles using the network).

For each activity, the risk of dust annoyance, health and ecological impact is determined using three risk categories: low, medium and high risk. The risk category may be different for each of the four activities. The risk magnitude identified for each of the construction activities is then compared to the number of sensitive receptors in the near vicinity of the site in order to determine the risks posed by the construction activities to these receptors.

Step 1: Screen the Need for an Assessment

The first step is to screen the requirement for a more detailed assessment. An assessment is required where there is:

- a 'human receptor' within 350m of the boundary of the site or 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s); and/or
- an 'ecological receptor' within 50m of the boundary of the site; or 50m of the route(s) used by the construction vehicles on the public highway, up to 500m from the site entrance(s).

Step 2A: Define the Potential Dust Emission Magnitude

This is based on the scale of the anticipated works and the proximity of nearby receptors. The risk is classified as small, medium or large for each of the four categories.

Demolition: The potential dust emission classes for demolition are:

- Large: Total building volume >50,000m^3, potentially dusty construction material (e.g. Concrete), on site crushing and screening, demolition activities >20m above ground level;
- Medium: total building volume 20,000m^3 – 50,000m^3, potentially dusty construction material, demolition activities 10-20 m above ground level; and
- Small: total building volume <20,000m^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: This involves excavating material, haulage, tipping and stockpiling. The potential dust emission classes for earthworks are:

- Large: Total site area >10,000m^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 – 10,000m^2, moderately dusty soil (e.g. silt), 5 – 10 heavy earth moving vehicles active at any one time, formation of bunds 4m – 8m in height, total material moved 20,000 tonnes- 100,000 tonnes; and
- Small: Total site area <2,500m^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 <20,000 tonnes, earthworks during wetter months.

Construction: The important issues here when determining the potential dust emission magnitude include the size of the building(s)/infrastructure, method of construction, construction materials, and duration of build. The categories are:

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

Trackout: The risk of impacts occurring during trackout is predominantly dependent on the number of vehicles accessing the Site on a daily basis. However, vehicle size and speed, the duration of activities and local geology are also factors which are used to determine the emission class of the Site as a result of trackout. The categories are:

- 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 length 50-100m; and
- Small: <10 HDV (>3.5t) outward movements in any one day, surface material with low potential for dust release, unpaved road length >50m.

Step 2B: Defining the Sensitivity of the Area

The sensitivity of the area is defined for dust soiling, human health (PM_{10}) and ecological receptors. The sensitivity of the area takes into account the following factors:

- the specific sensitivities of receptors in the area;
- the proximity and number of receptors;
- in the case of PM_{10}, the local background concentration; and
- site specific factors, such as whether there are natural shelters, such as trees, to reduce the risk of wind-blown dust.

Table B1 is used to define the sensitivity of different types of receptors to dust soiling, health effects and ecological effects.

Based on the sensitivities assigned to the different receptors surrounding the site and numbers of receptors within certain distances of the site, a sensitivity classification can be defined for each. Tables B2 to B4 indicate the criteria used to determine the sensitivity of the area to dust soiling, human health and ecological impacts.

Table B1: Examples of Factors Defining Sensitivity of an Area			
Sensitivity of Area	**Dust Soiling**	**Human Receptors**	**Ecological Receptors**
High	Users can reasonably expect enjoyment of a high level of amenity The appearance, aesthetics or value of their property would be diminished by soiling' The people or property would reasonably be expected to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land. E.g. dwellings, museums and other important collections, medium and long term car parks and car showrooms.	10 – 100 dwellings within 20 m of site. Local PM_{10} concentrations close to the objective (e.g. annual mean 36 -40 µg/m^3). E.g. residential properties, hospitals, schools and residential care homes.	Locations with an international or national designation and the designated features may be affected by dust soiling. Locations where there is a community of a particularly dust sensitive species such as vascular species included in the Red List for Great Britain. E.g. A Special Area of Conservation (SAC).
Medium	Users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home. The appearance, aesthetics or value of their property could be diminished by soiling The people or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land. E.g. parks and places of work.	Less than 10 receptors within 20 m. Local PM_{10} concentrations below the objective (e.g. annual mean 30-36 µg/m^3). E.g. office and shop workers but will generally not include workers occupationally exposed to PM_{10} as protection is covered by the Health and Safety at Work legislation.	Locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown. Locations with a national designation where the features may be affected by dust deposition E.g. A Site of Special Scientific Interest (SSSI) with dust sensitive features.
Low	The enjoyment of amenity would not reasonably be expected. Property would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling. There is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land. E.g. playing fields, farmland unless commercially sensitive horticultural, footpaths, short lived car [parks and roads.	Locations where human exposure is transient. No receptors within 20 m. Local PM_{10} concentrations well below the objectives (less than 75%). E.g. public footpaths, playing fields, parks and shopping streets.	Locations with a local designation where the features may be affected by dust deposition. E.g. Local Nature Reserve with dust sensitive features.

Table B2: Sensitivity of the Area to Dust Soiling on People and Property					
Receptor Sensitivity	Number of Receptors	Distance from the Source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Table B3: Sensitivity of the Area to Human Health Impacts							
Receptor Sensitivity	Annual Mean PM_{10} Concentration	Number of Receptors	Distance from Source (m)				
			<20	<50	<100	<200	<350
High	>32 µg/m^3	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32 µg/m^3	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28 µg/m^3	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24 µg/m^3	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	>32 µg/m^3	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	28-32 µg/m^3	>10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	24-28 µg/m^3	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	<24 µg/m^3	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

Table B4: Sensitivity of the Area to Ecological Impacts		
Receptor Sensitivity	**Distance from the Source (m)**	
	<20	**<50**
High	High	Medium
Medium	Medium	Low
Low	Low	Low

Define the Risk of Impacts

The final step is to combine the dust emission magnitude determined in step 2A with the sensitivity of the area determined in step 2B to determine the risk of impacts with no mitigation applied. Tables B5 to B7 indicate the method used to assign the level of risk for each construction activity. The identified level of risk is then used to determine measures for inclusion within a site-specific Construction Management Plan (CMP) aimed at reducing dust emissions and hence reducing the impact of the construction phase on nearby receptors. The mitigation measures are drawn from detailed mitigation set out within the IAQM guidance document.

Table B5: Risk of Dust Impacts from Demolition			
Sensitivity of Area	**Large**	**Medium**	**Small**
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible

Table B6: Risk of Dust Impacts from Earthworks/ Construction			
Sensitivity of Area	**Large**	**Medium**	**Small**
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table B7: Risk of Dust Impacts from Trackout			
Sensitivity of Area	**Large**	**Medium**	**Small**
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible

Appendix C– Traffic Data used in Modelling

Table C1: AADT traffic Flows used in ADMS Modelling Assessment							
Link Number	**Speed (kph)**	**2019 Base**		**2026 Do Minimum**		**2026 Do Something**	
		%HGV	**AADT**	**%HGV**	**AADT**	**%HGV**	**AADT**
A	48	0.5	3963	1.1	5925	1.0	6011
B	48 (20 at junction)	-	0	-	0	0	1389
C	48	0.5	3963	1.0	5918	0.8	7222
D	48 (20 at junction)	-	0	2.6	3139	2.3	3510
E	48 (20 at junction)	-	0	2.4	3343	2.2	3713
F	48	0.5	3963	1.0	6913	0.9	7846
G	48 (15 at junctions)	1.9	8434	1.5	12515	1.4	13448
H	35 (20/15 at junctions)	3.2	5206	2.2	9627	201	10147
I	35 (15 at junctions)	3.2	8857	2.5	12067	2.4	12480
M	48	1.6	5479	1.1	8999	1.1	9444
O	48	1.9	6635	1.4	10338	1.3	10783
P	35 (15 at junction)	1.47	6445	1.3	10241	1.3	10686

Table C1: AADT traffic Flows used in ADMS Modelling Assessment							
Link Number	**Speed (kph)**	**2019 Base**		**2026 Do Minimum**		**2026 Do Something**	
		%HGV	**AADT**	**%HGV**	**AADT**	**%HGV**	**AADT**
Q	35 (15 at junction)	1.3	5468	1.2	7305	1.2	7305
R	35 (15 at junction)	1.2	7287	0.9	9960	0.9	10146
T	35 (15 at junction)	1.7	6372	1.3	8320	1.3	8362
U	35 (15 at junction)	1.2	3301	0.9	4392	0.9	4536
V	35 (15 at junction)	1.2	3030	1.7	4316	1.6	4460
W	48 (15 at junction)	1.7	10179	1.9	13237	1.8	13694
X	35 (15 at junction)	1.7	8665	2.4	10142	2.2	10785
Z	48 (35 at junction)	1.9	3871	1.5	4563	1.4	4822
A1	15 (10 at junction)	2.2	7445	3.1	7867	3.0	8041
B1	35 (15 at junction)	2.4	6103	3.1	6716	2.9	6979
C1	15 (10 at junction)	2.1	10603	3.4	11421	3.4	11570
D1	35 (15 at junction)	2.3	10894	3.4	11822	3.4	119741

Table C1: AADT traffic Flows used in ADMS Modelling Assessment							
Link Number	Speed (kph)	2019 Base		2026 Do Minimum		2026 Do Something	
		%HGV	AADT	%HGV	AADT	%HGV	AADT
E1	35 (15 at junction)	2.2	5496	2.9	6561	2.9	6711
F1	35 (15 at junction)	2.2	13120	3.2	14365	3.1	14604
G1	35 (15 at junction)	2.3	9944	3.9	10205	3.8	10444
H1	35 (15 at junction)	1.7	4267	0.9	5482	0.9	5686
I1	48	2.3	13263	2.9	14903	2.9	15346
J1	48	1.9	8866	2.4	10037	2.4	10131
K1	48	2.7	7351	3.5	8008	3.4	8359
L1	35 (15 at junction)	1.5	4017	1.1	5662	1.0	5866
M1	35 (15 at junction)	1.9	5336	1.3	5522	1.3	5522
N1	35 (15 at junction)	1.7	5654	1.4	7750	1.3	7954
O1	35 (15 at junction)	1.7	5654	1.4	7750	1.3	7954
P1	48	2.1	7699	1.6	9806	1.6	10099
Q1	35	1.0	8363	1.4	10658	1.3	10862
S1	48	2.1	7699	1.8	8773	1.8	8850

Table C1: AADT traffic Flows used in ADMS Modelling Assessment							
Link Number	**Speed (kph)**	**2019 Base**		**2026 Do Minimum**		**2026 Do Something**	
		%HGV	**AADT**	**%HGV**	**AADT**	**%HGV**	**AADT**
T1	35	3.2	8563	2.3	12041	2.3	12130
U1	15 (10 at junction)	4.7	5329	3.6	6919	3.6	7008
V1	35	3.3	8198	2.6	10514	2.6	10514
X1	35 (15 at junctions)	3.2	8251	2.4	10072	2.4	10485
Y1	35 (15 at junctions)	1.6	1921	2.4	2139	2.4	2139
Z1	15	3.5	9412	2.6	10253	2.4	10666
A2	35	2.0	4530	1.7	6062	1.6	6321

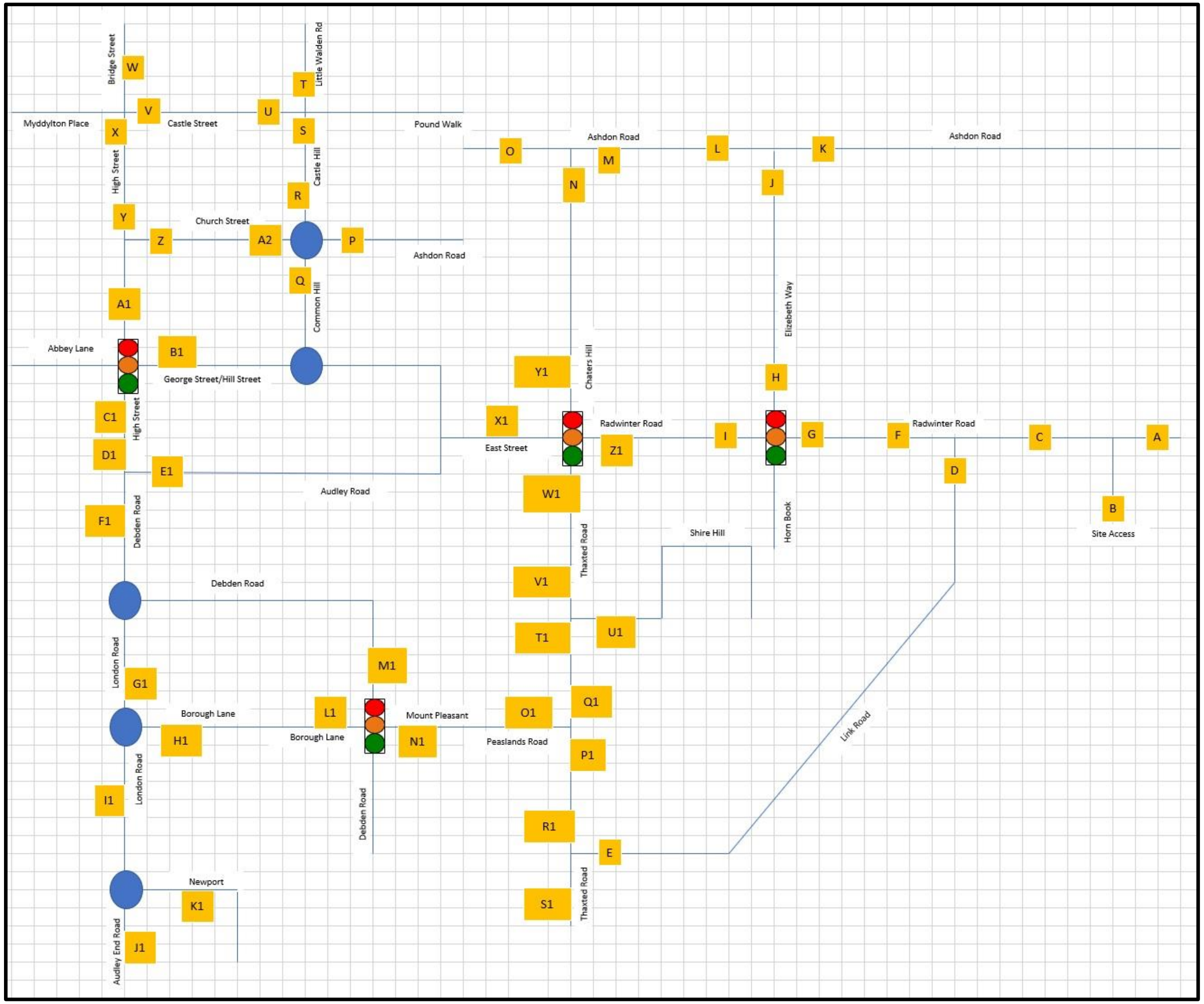

Figure C1: Location of Road Links and Monitoring Sites used in Modelling

Appendix D– Verification and Adjustment of Modelled Concentrations

Most nitrogen dioxide (NO_2) is produced in the atmosphere by reaction of nitric oxide (NO) with ozone. It is therefore most appropriate to verify the model in terms of primary pollutant emissions.

Verification of concentrations predicted by the ADMS model has followed the methodology presented in LAQM.TG(16).

Verification of the model results has been carried out against the monitoring sites UT001, UT011, UT015, UT016, UT021, UT031 and UT036 shown in Figure 5.2. The remaining sites were excluded from the verification process because they were either located at or close to a junction or no traffic data was available for that road link.

As part of the model verification and prior to calculating and applying adjustment factors, the model was checked to ensure monitoring sites where the correct distance from roadside (as specified in the UDC Air Quality Annual Status Report 2020. Vehicle speeds were also adjusted to try and improve the model accuracy, including reduced speeds at junctions to take account of slow moving, turning and queuing traffic.

The model output of road-NO_x (i.e. the component of total NO_x coming from road traffic) has been compared with the 'measured' road-NO_x (Figure D1). The 'measured' road NO_x has been calculated from the measured NO_2 concentrations by using the DEFRA NO_x from NO_2 calculator available on the UK-AIR website.

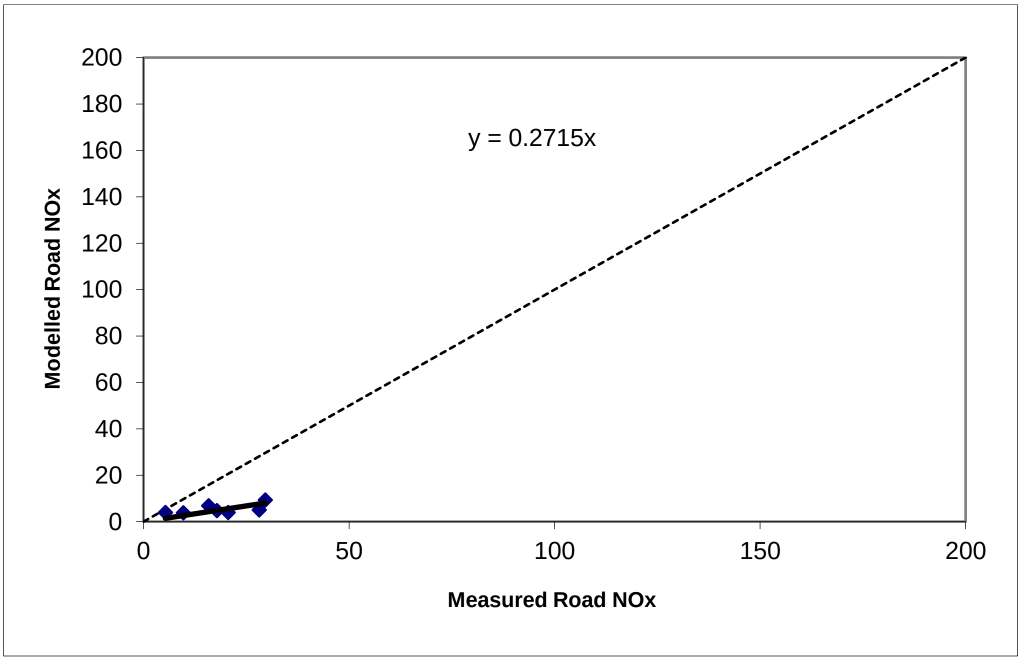

Figure D1: Comparison of Modelled Road NO_x with Measured Road NO_x

Figure D1 shows that the ADMS model is under-predicted the road-NO_x concentrations at the monitoring sites. An adjustment factor has therefore been determined as the ratio between the measured road-NO_x contribution and the modelled road-NO_x contribution, forced through zero (1/0.2715 =3.68). This factor has been applied to the modelled road-NO_x concentration for each location to provide an adjusted modelled road-NO_x concentration.

The annual mean road-NO_2 concentration was determined using the DEFRA NO_x:NO_2 spread sheet calculation tool and added to the background NO_2 concentration to produce a total adjusted NO_2 concentration.

Figure D2 shows the adjusted modelled total NO_2 vs monitored NO_2. There is good agreement, but the best fit line forced through zero still has a slight departure from a 1:1 line, thus a secondary adjustment factor, to be applied to the adjusted modelled total NO_2, was calculated (1/1.0233=0.977).

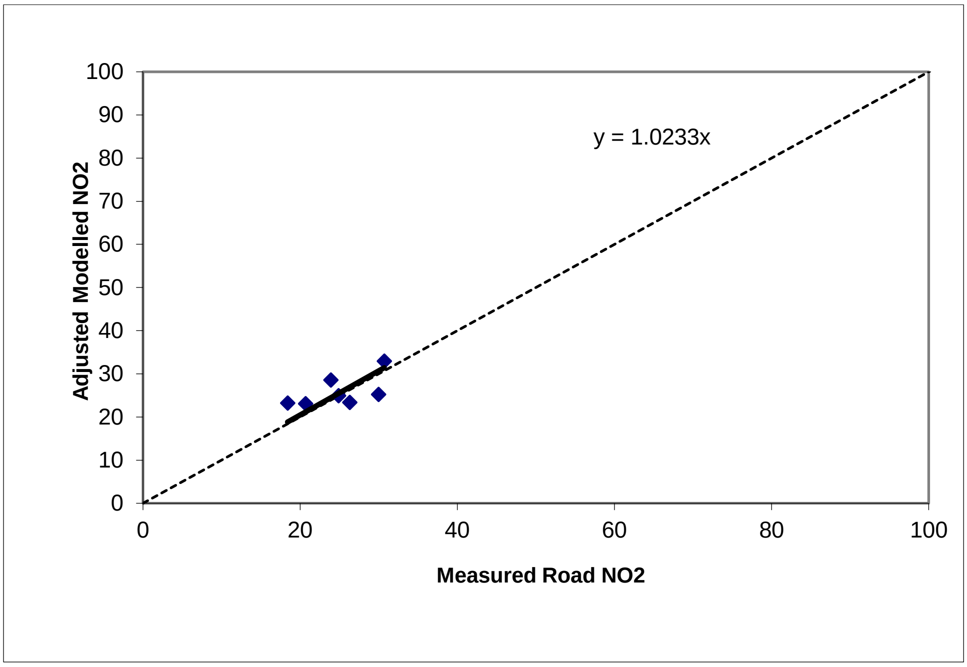

Figure D2: Comparison of Modelled NO_2 with Measured NO_x

After carrying out an initial adjustment there was a need for only a very small secondary adjustment of NO_2. The final adjustment modelled values are shown in Figure D3.

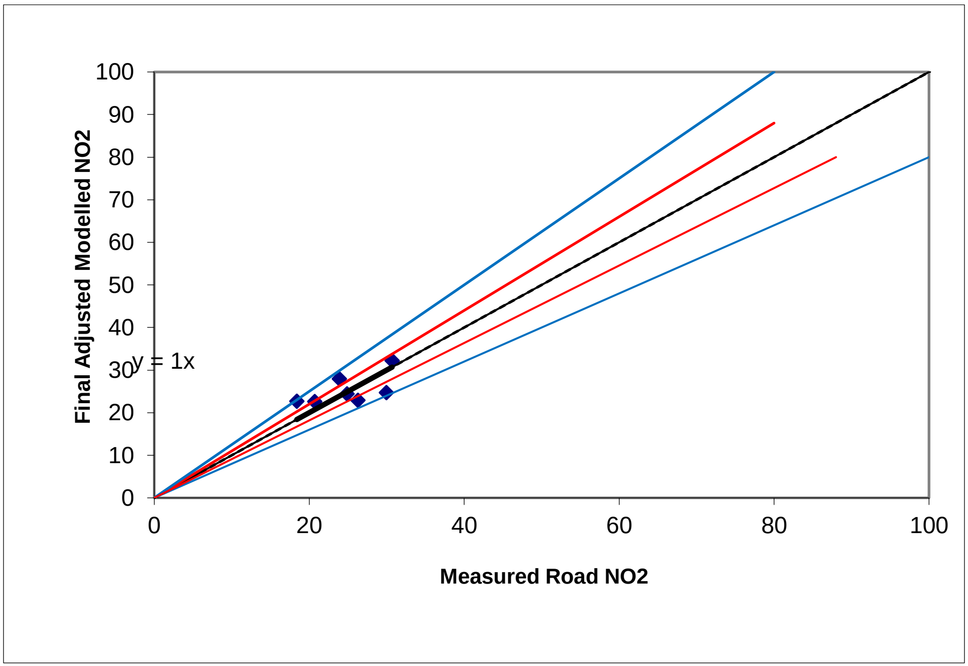

Figure D3: Comparison of Adjusted Modelled NO_2 with Measured NO_x

Further review of the verification process was undertaken to determine the uncertainty of the model results and subsequent adjusted model results. The Root Mean Square Error (RMSE) was calculated for both the unadjusted and adjusted model results. LAQM.TG(16) recommends that the RMSE should be within 10% of the air quality objective, which equates to 4 µg/m^3 for NO_2.

The RMSE of the unadjusted results was calculated as 7.5 µg/m^3. However following adjustment using both the primary and secondary adjustment factors set out above the RMSE was reduced to 3.4 µg/m^3, below the preferred 4 µg/m^3.

The adjustment factor of 3.68 has been applied to the modelled NO_x-road concentrations predicted at the selected receptor locations. The predicted NO_2-road concentrations, calculated using the NO_x-NO_2 converter tool, have subsequently been added to background NO_2 and adjusted by 0.977 to provide the final predicted annual mean NO_2 concentrations at each receptor.

These factors have also been used to adjust the predicted PM_{10} and $PM_{2.5}$ concentration.

Appendix E- Receptors Used in ADMS Modelling

Table E1: Location of Receptors used in ADMS Modelling Assessment			
Receptor Number	**Receptor Location**	**OS Grid Reference**	**Receptor Height (m)**
R1	1 Radwinter Road	556234, 238267	1.5
R2	Radwinter Road	555370, 238389	1.5
R3	Mandeville Place	555104, 238464	1.5
R4	Cavendish Court	554941, 238519	1.5
R5	81 Radwinter Road	554807, 238524	1.5
R6	1 Radwinter Road	554426, 238485	1.5
R7	66 East Street	554352, 238445	1.5
R8	45 East Street	554334, 238453	1.5
R9	3 Elizabeth Way	554885, 238681	1.5
R10	113 Ashdon Road	554760, 238745	1.5
R11	Dame Bradbury School	554625, 238760	1.5
R12	52 Ashdon Road	554518, 238709	1.5
R13	3 Ashdon Road	554330, 238660	1.5
R14	2 Charles Hill	554288, 238650	1.5
R15	41A East Street	554263, 238425	1.5
R16	25 East Street	554183, 238446	1.5
R17	41 East Street	554125, 238453	1.5
R18	2 East Street	554007, 238462	1.5
R19	27 Hill Street	553980, 238465	1.5
R20	32 High Street	553700, 238443	1.5
R21	16 High Street	553686, 238510	1.5
R22	Flint Cottage	553654, 238549	1.5
R23	1 Bridge Street	553578, 238617	1.5
R24	12 Bridge Street	553551, 238671	1.5
R25	Salmons Cottage	553596, 238613	1.5
R26	Castle Street	553660, 238643	1.5
R27	55 Castle Street	553727, 238701	1.5
R28	109 Castle Street	553936, 238780	1.5
R29	The Old Chapel	553942, 238744	1.5

Table E1: Location of Receptors used in ADMS Modelling Assessment			
Receptor Number	**Receptor Location**	**OS Grid Reference**	**Receptor Height (m)**
R30	37 Church Street	553927, 238653	1.5
R31	40 Church Street	553867, 238620	1.5
R32	21 Church Street	553773, 238562	1.5
R33	4 Church Street	553710, 238536	1.5
R34	5 Gates Corner	554003, 238472	1.5
R35	Audley Road	554217, 238396	1.5
R36	21 Audley Road	554146, 238331	1.5
R37	Audley Road	554079, 238250	1.5
R38	Audley Road	553912, 238191	1.5
R39	Audley Road	553815, 238143	1.5
R40	74 High Street	553780, 238252	1.5
R41	Quackers Church	553773, 238202	1.5
R42	98 High Street	553778, 238109	1.5
R43	13 Debden Road	553773, 238069	1.5
R44	33 Debden Road	553797, 237997	1.5
R45	50A Debden Road	553802, 237956	1.5
R46	66 Debden Road	553853, 237775	1.5
R47	24 London Road	553717, 238046	1.5
R48	Saxon Way	553527, 237889	1.5
R49	Newport Road	553546, 237840	1.5
R50	4 Brough Lane	553621, 237900	1.5
R51	15 brough Lane	553742, 237786	1.5
R52	Mount Pleasant Road	553933, 237775	1.5
R53	Mount Pleasant Road	554173, 237768	1.5
R54	18 Peasland	554323, 237711	1.5
R55	17 Peasland	554487, 237647	1.5
R56	31 Linton Close	554731, 237654	1.5
R57	Potential Development	554769, 237493	1.5
R58	169 Thaxted Road	554668, 237737	1.5
R59	Thaxted Road	554613, 237944	1.5
R60	2 Shire Hill	554592, 238039	1.5

Table E1: Location of Receptors used in ADMS Modelling Assessment			
Receptor Number	**Receptor Location**	**OS Grid Reference**	**Receptor Height (m)**
R61	Thaxted Road	554550, 238090	1.5
R62	Thaxted Road	554536, 238141	1.5
R63	Thaxted Road	554450, 238269	1.5
R64	Thaxted Road	554383, 238371	1.5
R65	Thaxted Road	554358, 238437	1.5
R66	New Development Area	555303, 238254	1.5
R67	New Development Area	554993, 238155	1.5
R68	New Development Area	555042, 237861	1.5
R69	New Development Area	554981, 237518	1.5
P1	Proposed Development	555318, 238399	1.5
P2	Proposed Development	555592, 238400	1.5
P3	Proposed Development	555606, 238401	1.5
P4	Proposed Development	555611, 238359	1.5
P5	Proposed Development	555687, 238397	1.5
P6	Proposed Development	555598, 238340	1.5

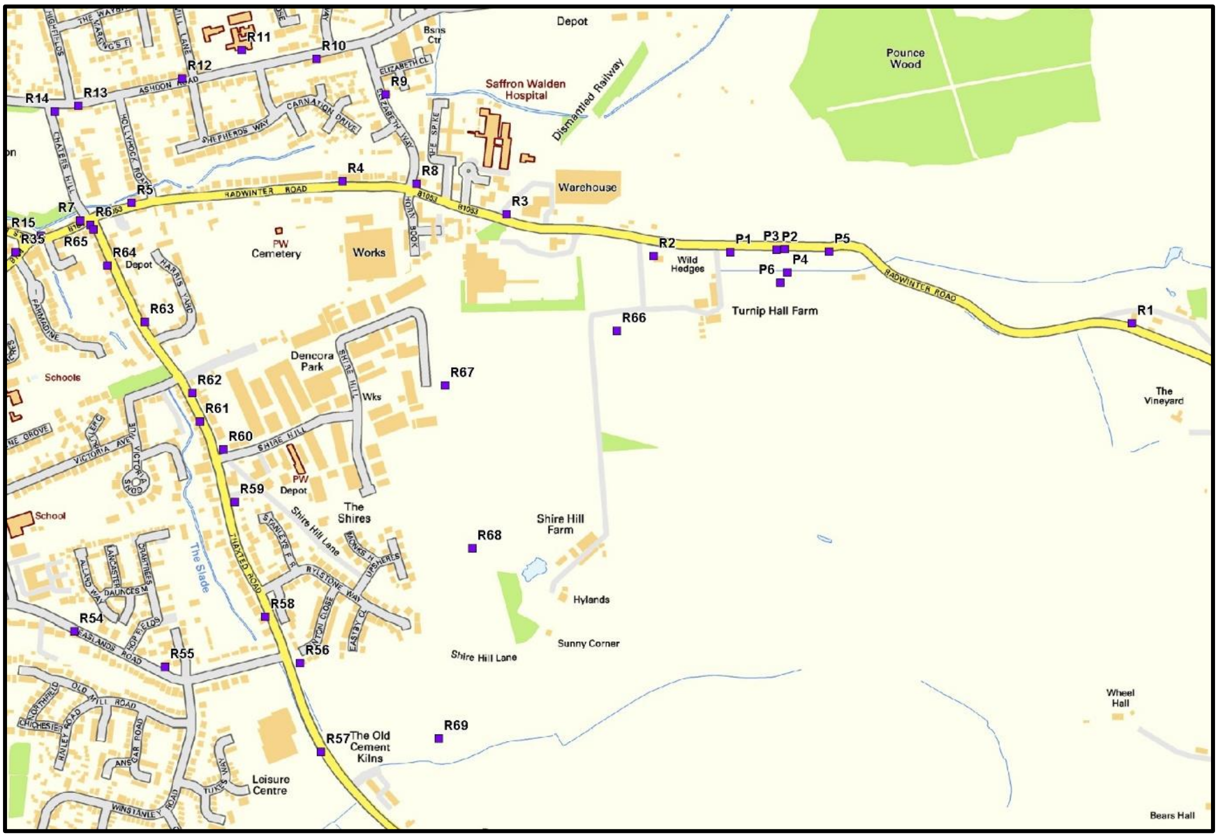

Figure E1: Receptors Used in Modelling

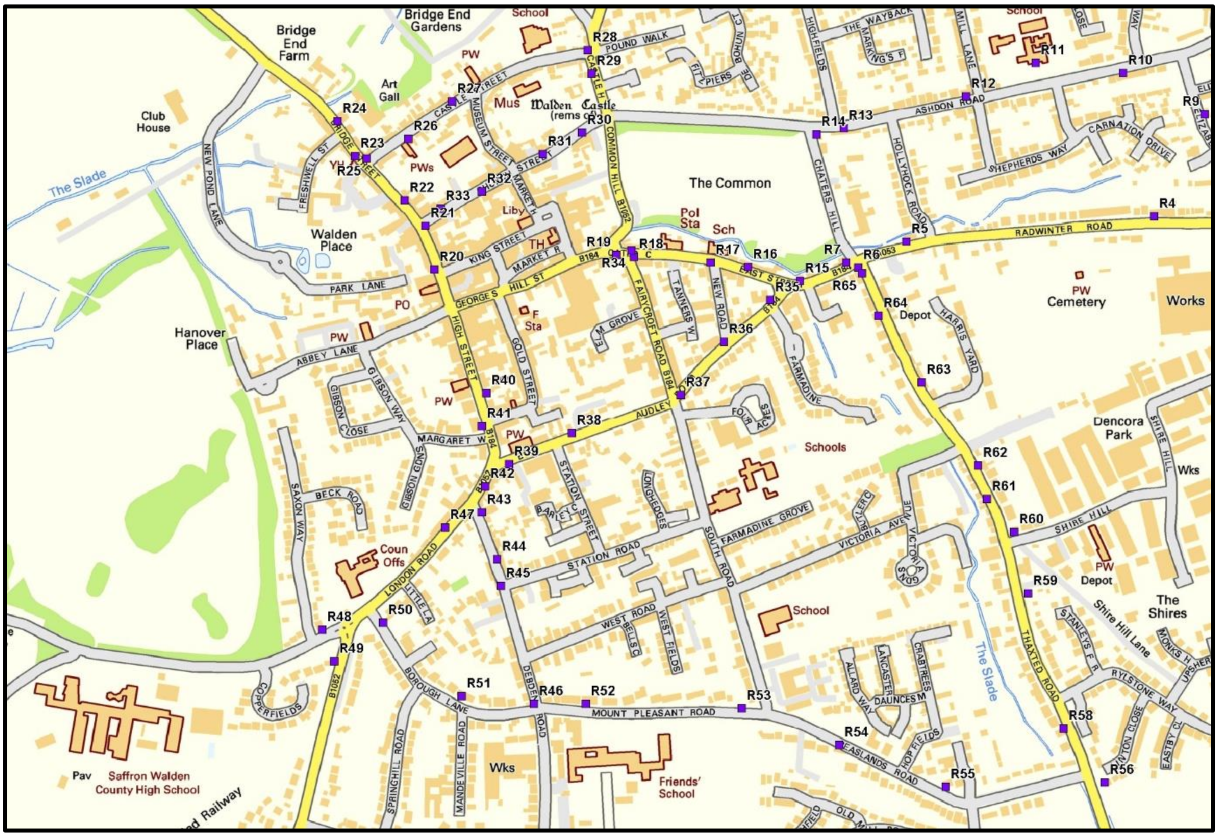

Figure E2: Receptors Used in Modelling

Appendix F- Construction Mitigation Measures

It is recommended that the 'highly recommended' measures set out below are incorporated into a DMP and approved by WMDC prior to commencement of any work on site:

- develop and implement a stakeholder communications plan that includes community engagement before work commences on site;
- display the name and contact details of the person accountable for air quality and dust issues on the site boundary (i.e. the environment manager/engineer or site manager);
- record all dust and air quality complaints, identify cause, take appropriate measures to reduce emissions in a timely manner and record the measures taken;
- make the complaints log available to the local authority when asked;
- record any exceptional incidents that cause dust and/or air emissions, either on- or off- site and the action taken to resolve the situation in the log book;
- carry out regular site inspections to monitor compliance with the DMP, record inspection results and make inspection log available to WYDC when asked;
- increase frequency of site inspection 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 periods of dry or windy conditions;
- plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible;
- erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles;
- fully enclose site or specific operations where there is a high potential for dust production and the site is active for extensive periods;
- avoid site runoff of water or mud;
- keep site fencing, 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 site;
- cover, seed or fence stockpiles to prevent wind whipping;
- ensure all vehicles switch off engines when stationary - no idling vehicles;
- avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable;
- produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials;
- implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking and car-sharing);
- only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction e.g. suitable local exhaust ventilation systems;
- ensure an adequate water supply on site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate;
- use 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 site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods;
- avoid bonfires and burning of waste materials;
- ensure sand and other
- install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned;
- 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 controls measures are in place;
-
- ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit;
- access gates to be located at least 10 m from receptors where possible.

Desirable Mitigation Measures

- 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. ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit;
- re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable;
- use hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as possible;
- only remove the cover in small areas during work and all at once;
- avoid scabbling if possible;
- ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery;
- for smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust;
- use water-assisted dust sweepers 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 the escape of materials during transport;
- implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud).

Appendix G- Results of Modelling at Existing Receptors

Table G1: Predicted Annual Mean NO_2 Concentrations at Existing Receptors (µg/m^3)					
Receptor	2019 Base	2026 Do Minimum	2026 Do Something	Increase due to Proposed Development	Significance of Impact
R1	18.2	17.5	17.5	0	Negligible
R2	16.5	169	17.1	1	Negligible
R3	18.6	18.0	18.3	1	Negligible
R4	22.7	20.0	20.2	0	Negligible
R5	28.4	21.9	22.1	1	Negligible
R6	32.6	24.5	24.7	1	Negligible
R7	28.1	22.3	22.5	1	Negligible
R8	28.4	24.8	25.3	1	Negligible
R9	22.2	20.9	21.2	1	Negligible
R10	20.1	19.1	19.3	0	Negligible
R11	17.1	16.6	16.6	0	Negligible
R12	20.0	18.8	19.0	0	Negligible
R13	22.7	20.8	21.0	1	Negligible
R14	21.4	19.3	19.5	0	Negligible
R15	29.1	23.0	23.3	1	Negligible
R16	25.0	20.8	21.0	1	Negligible
R17	27.8	22.5	22.7	1	Negligible
R18	28.9	22.9	23.2	1	Negligible
R19	27.5	22.2	22.4	1	Negligible
R20	23.8	19.8	19.9	0	Negligible
R21	29.8	23.3	23.6	1	Negligible
R22	27.8	22.6	23.0	1	Negligible
R23	24.4	21.0	21.2	0	Negligible
R24	26.4	22.4	22.6	1	Negligible
R25	25.9	22.0	22.3	1	Negligible
R26	19.8	18.2	18.3	0	Negligible
R27	19.1	17.8	17.9	0	Negligible
R28	25.6	21.8	22.0	0	Negligible

Table G1: Predicted Annual Mean NO_2 Concentrations at Existing Receptors ($\mu g/m^3$)					
Receptor	2019 Base	2026 Do Minimum	2026 Do Something	Increase due to Proposed Development	Significance of Impact
R29	22.4	19.9	20.0	0	Negligible
R30	27.0	22.7	23.0	1	Negligible
R31	21.3	19.0	19.2	0	Negligible
R32	21.6	18.9	19.1	0	Negligible
R33	21.4	18.7	18.9	0	Negligible
R34	32.1	24.8	25.1	1	Negligible
R35	23.6	20.1	20.2	0	Negligible
R36	21.8	19.1	19.2	0	Negligible
R37	25.5	21.3	21.4	0	Negligible
R38	21.9	19.1	19.2	0	Negligible
R39	29.4	23.3	23.4	0	Negligible
R40	28.2	22.4	22.5	0	Negligible
R41	24.5	20.3	20.4	0	Negligible
R42	39.8	29.0	29.2	0	Negligible
R43	29.7	22.8	22.8	0	Negligible
R44	24.7	20.1	20.1	0	Negligible
R45	21.7	18.5	18.6	0	Negligible
R46	25.7	21.1	21.2	0	Negligible
R47	249	20.3	20.4	0	Negligible
R48	20.9	18.4	18.4	0	Negligible
R49	20.5	18.1	18.2	0	Negligible
R50	26.5	21.7	21.9	1	Negligible
R51	18.7	17.4	17.5	0	Negligible
R52	20.2	18.3	18.4	0	Negligible
R53	20.8	18.8	18.9	0	Negligible
R54	24.8	21.5	21.7	0	Negligible
R55	19.6	18.1	18.1	0	Negligible
R56	19.9	18.2	18.3	0	Negligible
R57	21.7	19.4	19.5	0	Negligible
R58	20.5	18.6	18.7	0	Negligible

Table G1: Predicted Annual Mean NO_2 Concentrations at Existing Receptors ($\mu g/m^3$)					
Receptor	**2019 Base**	**2026 Do Minimum**	**2026 Do Something**	**Increase due to Proposed Development**	**Significance of Impact**
R59	21.9	19.5	19.5	0	Negligible
R60	24.1	20.5	20.5	0	Negligible
R61	26.9	22.3	22.3	0	Negligible
R62	25.1	21.1	21.1	0	Negligible
R63	26.0	20.6	20.6	0	Negligible
R64	21.6	18.5	18.5	0	Negligible
R65	30.0	22.8	22.9	0	Negligible
R66	15.7	16.7	16.8	0	Negligible
R67	15.9	17.0	17.1	0	Negligible
R68	15.8	17.4	17.5	0	Negligible
R69	15.9	16.9	17.1	0	Negligible

Table G2: Predicted Annual Mean PM_{10} Concentrations at Existing Receptors ($\mu g/m^3$)					
Receptor	**2019 Base**	**2026 Do Minimum**	**2026 Do Something**	**Increase due to Proposed Development**	**Significance of Impact**
R1	15.9	16.2	16.2	0	Negligible
R2	15.6	15.9	16.0	0	Negligible
R3	16.0	16.4	16.5	0	Negligible
R4	15.9	16.2	16.3	0	Negligible
R5	16.4	16.4	16.5	0	Negligible
R6	17.0	17.1	17.2	0	Negligible
R7	16.4	16.5	16.6	0	Negligible
R8	16.4	17.2	17.4	0	Negligible
R9	15.8	16.6	16.7	0	Negligible
R10	15.5	16.0	16.1	0	Negligible
R11	14.9	15.1	15.1	0	Negligible
R12	15.5	15.9	16.0	0	Negligible
R13	16.0	16.7	16.8	0	Negligible
R14	15.6	16.0	16.0	0	Negligible

Table G2: Predicted Annual Mean PM_{10} Concentrations at Existing Receptors (µg/m^3)					
Receptor	2019 Base	2026 Do Minimum	2026 Do Something	Increase due to Proposed Development	Significance of Impact
R15	16.5	16.7	16.8	0	Negligible
R16	16.3	16.5	16.6	0	Negligible
R17	16.8	17.1	17.2	0	Negligible
R18	16.5	16.7	16.8	0	Negligible
R19	16.4	16.6	16.6	0	Negligible
R20	15.9	15.9	15.9	0	Negligible
R21	17.0	17.2	17.3	0	Negligible
R22	17.0	17.3	17.4	0	Negligible
R23	16.5	16.9	17.0	0	Negligible
R24	17.0	17.5	17.6	0	Negligible
R25	16.7	17.1	17.2	0	Negligible
R26	15.5	15.7	15.7	0	Negligible
R27	15.4	15.6	15.6	0	Negligible
R28	16.3	16.7	16.7	0	Negligible
R29	15.9	16.2	16.3	0	Negligible
R30	16.8	17.3	17.4	0	Negligible
R31	15.7	16.0	16.0	0	Negligible
R32	15.9	16.0	16.1	0	Negligible
R33	157	15.8	15.9	0	Negligible
R34	17.0	17.2	17.3	0	Negligible
R35	15.8	16.0	16.0	0	Negligible
R36	15.7	15.9	15.9	0	Negligible
R37	16.1	16.3	16.3	0	Negligible
R38	15.8	15.9	16.0	0	Negligible
R39	16.7	16.8	16.9	0	Negligible
R40	16.5	16.6	16.6	0	Negligible
R41	16.0	16.0	16.0	0	Negligible
R42	18.3	18.4	18.5	0	Negligible
R43	16.8	16.8	16.8	0	Negligible
R44	16.7	16.6	16.6	0	Negligible

Table G2: Predicted Annual Mean PM_{10} Concentrations at Existing Receptors ($\mu g/m^3$)					
Receptor	**2019 Base**	**2026 Do Minimum**	**2026 Do Something**	**Increase due to Proposed Development**	**Significance of Impact**
R45	16.1	16.1	16.1	0	Negligible
R46	16.5	16.6	16.6	0	Negligible
R47	16.3	16.4	16.4	0	Negligible
R48	16.1	16.2	16.2	0	Negligible
R49	16.0	16.1	16.1	0	Negligible
R50	16.7	16.9	17.0	0	Negligible
R51	15.6	15.7	15.7	0	Negligible
R52	15.8	16.0	16.0	0	Negligible
R53	16.1	16.4	16.4	0	Negligible
R54	16.9	17.4	17.4	0	Negligible
R55	15.9	16.1	16.2	0	Negligible
R56	16.0	16.2	16.2	0	Negligible
R57	16.5	16.8	16.8	0	Negligible
R58	16.1	16.3	16.3	0	Negligible
R59	16.3	16.6	16.7	0	Negligible
R60	15.9	16.2	16.2	0	Negligible
R61	16.7	17.1	17.1	0	Negligible
R62	16.3	16.6	16.6	0	Negligible
R63	16.5	16.4	16.5	0	Negligible
R64	15.6	15.6	15.6	0	Negligible
R65	16.6	16.6	16.7	0	Negligible
R66	14.6	15.1	15.2	0	Negligible
R67	14.7	15.2	15.3	0	Negligible
R68	15.2	16.0	16.0	0	Negligible
R69	15.3	15.8	15.9	0	Negligible

Table G3: Predicted Annual Mean $PM_{2.5}$ Concentrations at Existing Receptors (µg/m³)					
Receptor	2019 Base	2026 Do Minimum	2026 Do Something	Increase due to Proposed Development	Significance of Impact
R1	9.7	9.9	9.9	0	Negligible
R2	9.5	9.7	9.8	0	Negligible
R3	9.8	10.0	10.0	0	Negligible
R4	10.3	10.4	10.4	0	Negligible
R5	10.6	10.5	10.6	0	Negligible
R6	11.0	10.9	11.0	0	Negligible
R7	10.6	10.6	10.6	0	Negligible
R8	10.6	11.0	11.1	0	Negligible
R9	10.2	10.6	10.7	0	Negligible
R10	10.0	10.3	10.3	0	Negligible
R11	9.7	9.8	9.8	0	Negligible
R12	10.0	10.2	10.3	0	Negligible
R13	10.3	10.7	10.7	0	Negligible
R14	10.1	10.3	10.3	0	Negligible
R15	10.7	10.7	10.8	0	Negligible
R16	10.5	10.6	10.6	0	Negligible
R17	10.8	10.9	11.0	0	Negligible
R18	10.6	10.7	10.7	0	Negligible
R19	10.3	10.4	100.4	0	Negligible
R20	10.0	10.0	10.0	0	Negligible
R21	10.7	10.7	10.8	0	Negligible
R22	10.6	10.7	10.8	0	Negligible
R23	10.3	10.5	10.6	0	Negligible
R24	10.6	10.9	10.9	0	Negligible
R25	10.5	10.7	10.7	0	Negligible
R26	9.7	9.8	9.9	0	Negligible
R27	9.7	9.8	9.8	0	Negligible
R28	100.3	10.4	10.5	0	Negligible
R29	10.0	10.2	10.2	0	Negligible
R30	10.5	10.7	10.8	0	Negligible

Table G3: Predicted Annual Mean $PM_{2.5}$ Concentrations at Existing Receptors (µg/m^3)					
Receptor	**2019 Base**	**2026 Do Minimum**	**2026 Do Something**	**Increase due to Proposed Development**	**Significance of Impact**
R31	9.9	10.0	10.0	0	Negligible
R32	10.0	10.0	10.1	0	Negligible
R33	9.9	9.9	10.0	0	Negligible
R34	10.9	11.0	11.0	0	Negligible
R35	10.2	10.3	10.3	0	Negligible
R36	10.2	10.2	10.2	0	Negligible
R37	10.4	10.5	10.5	0	Negligible
R38	10.0	10.0	10.0	0	Negligible
R39	10.5	10.5	10.5	0	Negligible
R40	10.4	10.4	10.4	0	Negligible
R41	10.1	10.1	10.1	0	Negligible
R42	11.5	11.4	11.5	0	Negligible
R43	10.6	10.5	10.5	0	Negligible
R44	10.4	10.3	10.3	0	Negligible
R45	10.1	10.0	10.0	0	Negligible
R46	10.3	10.3	10.3	0	Negligible
R47	10.3	10.2	10.3	0	Negligible
R48	10.0	10.1	10.1	0	Negligible
R49	10.0	10.0	10.0	0	Negligible
R50	10.4	10.5	10.5	0	Negligible
R51	9.7	9.8	9.8	0	Negligible
R52	9.9	10.0	10.0	0	Negligible
R53	10.2	10.3	10.3	0	Negligible
R54	10.6	10.8	10.9	0	Negligible
R55	10.0	10.1	10.1	0	Negligible
R56	10.1	10.2	10.2	0	Negligible
R57	10.3	10.5	10.5	0	Negligible
R58	10.1	10.2	10.2	0	Negligible
R59	10.3	10.4	140.4	0	Negligible
R60	10.3	10.4	10.4	0	Negligible

Table G3: Predicted Annual Mean $PM_{2.5}$ Concentrations at Existing Receptors (µg/m³)					
Receptor	2019 Base	2026 Do Minimum	2026 Do Something	Increase due to Proposed Development	Significance of Impact
R61	10.7	10.9	10.9	0	Negligible
R62	10.5	10.6	10.6	0	Negligible
R63	10.6	10.5	10.5	0	Negligible
R64	10.1	10.1	10.1	0	Negligible
R65	10.7	10.7	10.7	0	Negligible
R66	9.4	9.7	9.7	0	Negligible
R67	9.5	9.8	9.9	0	Negligible
R68	9.6	10.0	10.1	0	Negligible
R69	9.7	9.9	10.0	0	Negligible