REC
Resource & Environmental Consultants Ltd

Air Quality Assessment
Land East of Saffron Walden

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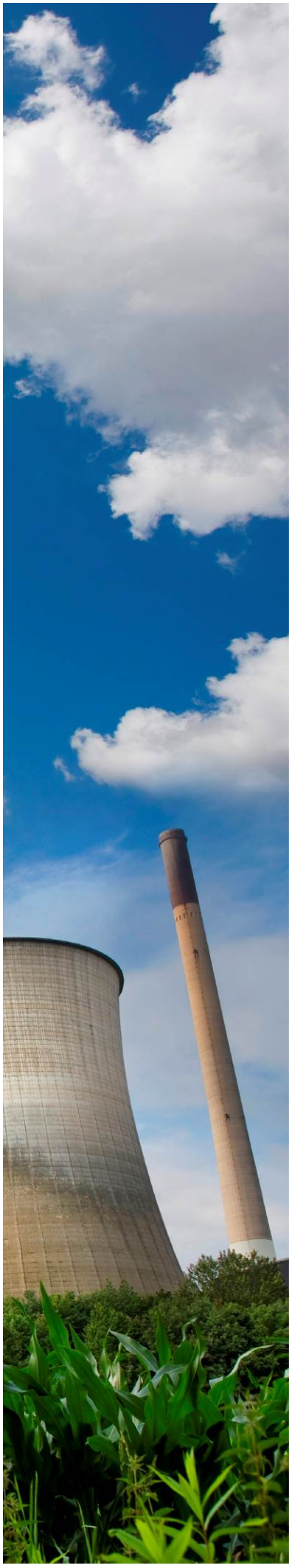

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EXECUTIVE SUMMARY

Resource and Environmental Consultants Ltd was commissioned by Manor Oak Homes to undertake an Air Quality Assessment in support of the planning application for a mixed-use development on land to the east of Saffron Walden.

The proposals comprise a residential led development with commercial land, semi-natural green space and associated infrastructure.

The development has the potential to cause air quality impacts at sensitive locations in the vicinity of the site. These may include fugitive dust emissions from construction works and road vehicle exhaust emissions associated with traffic generated by the proposals. As such, an Air Quality Assessment was required in order to identify baseline conditions at the development, determine location suitability for the proposed end-use and quantify potential impacts associated with the proposals.

Potential construction phase air quality impacts as a result of dust emissions associated with earthworks, construction and trackout activities were assessed. Suitable mitigation techniques have been identified and, assuming these are implemented, impacts from construction activities are not considered to be significant.

Potential impacts during the operational phase of the proposed development may occur due to road traffic exhaust emissions associated with vehicles travelling to and from the site. An assessment was therefore undertaken to predict pollutant concentrations both with and without the proposals in order to quantify potential changes at sensitive locations. This indicated impacts on air quality were not predicted to be significant at any sensitive location in the vicinity of the site.

Based on the assessment results, air quality issues are not considered a constraint to planning consent.

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1.0 INTRODUCTION

1.1 Background

Resource and Environmental Consultants (REC) Ltd was commissioned by Manor Oak Homes to undertake an Air Quality Assessment in support of the planning application for a proposed mixed use development on land to the east of Saffron Walden.

Sensitive locations could potentially be affected by the proposed development during the construction and operational phases. As such, an Air Quality Assessment was required to quantify potential impacts in the vicinity of the site.

1.2 Site Location and Context

The site is located off Radwinter Road, Saffron Walden, at approximate National Grid Reference (NGR): 555190, 238155. Reference should be made to Figure 1 for a location plan.

The proposals comprise approximately 230 dwellings, 1,800m^2 of office floorspace, extra care provision (Use Class C2) including 30 flats, 12 bungalows and 60 care units, access and infrastructure.

Uttlesford District Council (UDC) has declared an Air Quality Management Area (AQMA) within Saffron Walden due to exceedences of the Air Quality Limit Value (AQLV) for nitrogen dioxide (NO_2). The development site is located approximately 300m east of the AQMA boundary and any traffic generated by the proposals has the potential to cause adverse impacts to existing pollution levels within this sensitive area. Additionally, construction works may cause air quality impacts in the vicinity of the site as a result of fugitive dust emissions. An Air Quality Assessment was therefore undertaken in order to consider site suitability for the proposed land-use and assess potential impacts on pollutant levels as a result of the proposals.

1.3 Limitations

This report has been produced in accordance with REC's standard terms of engagement. REC has prepared this report solely for the use of the Client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from REC; a charge may be levied against such approval.

2.0 AIR QUALITY LEGISLATION AND POLICY

2.1 European Legislation

European Union (EU) air quality legislation is consolidated under Directive 2008/50/EC, which came into force on 11th June 2008. This Directive consolidated previous legislation which was designed to deal with specific pollutants in a consistent manner and provided new air quality objectives for particulate matter with an aerodynamic diameter of less than 2.5µm ($PM_{2.5}$). The consolidated Directives include:

- Directive 99/30/EC - the First Air Quality "Daughter" Directive - sets ambient AQLVs for NO_2, oxides of nitrogen (NO_x), sulphur dioxide, lead and particulate matter with an aerodynamic diameter of less than 10µm (PM_{10});
- Directive 2000/69/EC - the Second Air Quality "Daughter" Directive - sets ambient AQLVs for benzene and carbon monoxide; and,
- Directive 2002/3/EC - the Third Air Quality "Daughter" Directive - seeks to establish long-term objectives, target values, an alert threshold and an information threshold for concentrations of ozone in ambient air.

The fourth daughter Directive was not included within the consolidation and is described as:

- Directive 2004/107/EC - sets health-based limits on polycyclic aromatic hydrocarbons, cadmium, arsenic, nickel and mercury, for which there is a requirement to reduce exposure to as low as reasonably achievable.

2.2 UK Legislation

The Air Quality Standards Regulations (2010) came into force on 11th June 2010 and transpose the EU Directive 2008/50/EC into UK law. AQLVs were published in these regulations for 7 pollutants, as well as Target Values for an additional 5 pollutants. Table 1 presents the AQLVs for pollutants considered within this assessment.

Table 1 Air Quality Limit Values

Pollutant	Air Quality Limit Value	
	Concentration (µg/m^3)	Averaging Period
NO_2	40	Annual mean
	200	1-hour mean; not to be exceeded more than 18 times a year
PM_{10}	40	Annual mean
	50	24-hour mean; not to be exceeded more than 35 times a year

Part IV of the Environment Act (1995) requires UK government to produce a national Air Quality Strategy (AQS) which contains standards, objectives and measures for improving ambient air quality. The most recent AQS was produced by the Department for

Environment, Food and Rural Affairs (DEFRA) and published in July 2007[1]. The AQS sets out Air Quality Objectives (AQOs) that are maximum ambient pollutant concentrations that are not to be exceeded either without exception or with a permitted number of exceedences over a specified timescale.

2.3 Local Air Quality Management

Under Section 82 of the Environment Act (1995) (Part IV) Local Authorities (LAs) are required to periodically review and assess air quality within their area of jurisdiction under the system of Local Air Quality Management (LAQM). This review and assessment of air quality involves considering present and likely future air quality against the AQLVs. If it is predicted that levels at sensitive locations where members of the public are regularly present for the relevant averaging period are likely to be exceeded, the LA is required to declare an AQMA. For each AQMA the LA is required to produce an Air Quality Action Plan (AQAP), the objective of which is to reduce pollutant concentrations in pursuit of the AQOs.

2.4 Dust

The main requirements with respect to dust control from industrial or trade premises not regulated under the Environmental Permitting (England and Wales) Regulations (2010) and subsequent amendments, such as construction sites, is that provided in Section 79 of Part III of the Environmental Protection Act (1990). The Act defines nuisance as:

> "any dust, steam, smell or other effluvia arising on industrial, trade or business premises and being prejudicial to health or a nuisance."

Enforcement of the Act, in regard to nuisance, is currently under the jurisdiction of the local Environmental Health Department, whose officers are deemed to provide an independent evaluation of nuisance. If the LA is satisfied that a statutory nuisance exists, or is likely to occur or happen again, it must serve an Abatement Notice under Part III of the Environmental Protection Act (1990). Enforcement can insist that there be no dust beyond the boundary of the works. The only defence is to show that the process to which the nuisance has been attributed and its operation are being controlled according to best practice measures.

2.5 National Planning Policy

The National Planning Policy Framework (NPPF)[2] was published on 27th March 2012 and sets out the Government's core policies and principles with respect to land use planning, including air quality. The document includes the following considerations which are relevant to this assessment:

> "The planning system should contribute to and enhance the natural and local environment by: […]
>
> Preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air,

[1] The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, DEFRA, 2007.
[2] National Planning Policy Framework, Department for Communities and Local Government, 2012.

water or noise pollution or land instability"

"Planning policies should sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and the cumulative impacts on air quality from individual sites in local areas. Planning decisions should ensure that any new development in Air Quality Management Areas is consistent with the local air quality action plan."

The implications of the NPPF have been considered throughout this assessment.

2.6 Local Planning Policy

The new Uttlesford Local Plan will form the statutory development plan for the district. However, the Plan is in the developmental stages and there were no adopted Development Plan Documents at the time of this assessment. As such, the UDC Adopted Local Plan[3] provides the current basis for the determination of planning applications within UDC's area of jurisdiction.

A review of the UDC Adopted Local Plan indicated the following policies in relation to air quality that are relevant to this assessment:

"Policy GEN2 - Design

Development will not be permitted unless its design meets all the following criteria and has regard to adopted Supplementary Design Guidance and Supplementary Planning Documents.

[…]

h) It minimises the environmental impact on neighbouring properties by appropriate mitigating measures.

[…]"

And

"Policy ENV13 - Exposure to Poor Air Quality

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. A zone 100 metres on either side of the central reservation of the M11 and a zone 35 metres either side of the centre of the new A120 have been identified on the proposals map as particular areas to which this policy applies."

Reference has been made to these policies throughout the Air Quality Assessment. However, a review of the new Uttlesford Local Plan timetable[4], states that both of the above policies will be replaced when the new Local Plan is adopted.

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[3] Uttlesford District Council Adopted Local Plan, UDC, 2005.
[4] Local Development Scheme Revision 8, Uttlesford District Council, 2013.

An Air Quality Assessment[5] was commissioned by Essex County Council in order to assess the effects of the proposals included within the Local Plan on sensitive location within Saffron Walden and determine if any mitigation is required in the area. This was undertaken by Jacobs and issued in October 2013.

Annual mean NO_2 concentrations were calculated using dispersion modelling at four major junctions in Saffron Walden:

- Junction 1: Thaxted Road/East Street/Radwinter Road/Chaters Hill;
- Junction 2: London Road, Debden Road;
- Junction 3: High Street/George Street/Abbey Lane/Hill Street; and,
- Junction 4: Bridge Street/Castle Street/Myddylton Place.

The results of the assessment indicated delivery of the proposals outlined in the Local Plan would cause adverse impacts at a number of sensitive locations in the vicinity of each junction. As such, specific consideration to effects associated with the proposed development at these positions has been included within this report.

[5] Assessment of Uttlesford District's Local Plan on Air Quality in Saffron Walden, Jacobs, 2013.

3.0 METHODOLOGY

The proposed development has the potential to cause air quality impacts during the construction and operational phases. These have been assessed in accordance with the following methodology, agreed with Janet O'Boyle, Environmental Health Officer at UDC on 3rd October 2013.

3.1 Construction Phase Assessment

There is the potential for fugitive dust emissions to occur as a result of construction phase activities. These have been assessed in accordance with the methodology outlined within the Institute of Air Quality Management (IAQM) document 'Guidance on the Assessment of the Impacts of Construction on Air Quality and the Determination of their Significance'[6].

Activities on the proposed construction site have been divided into three types to reflect their different potential impacts. These are:

- Earthworks;
- Construction; and,
- Trackout.

The potential for dust emissions was assessed for each activity that is likely to take place and considered three separate dust effects:

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

The assessment steps are detailed below.

3.1.1 Step 1

Step 1 screens the requirement for a more detailed assessment. Should sensitive receptors be identified within 350m from the site boundary or 100m from the construction vehicle route up to 500m from the site entrance then the assessment should proceed to Step 2. Should sensitive receptors not be present within the relevant distances then **negligible** impacts would be expected and further assessment is not necessary.

3.1.2 Step 2

Step 2 assessed the risk of potential dust impacts. A site was allocated to a risk category based on two factors:

- The scale and nature of the works, which determines the magnitude of dust arising as: small, medium or large; and,
- The proximity of receptors, considered separately for ecological and human receptors.

[6] Guidance on the Assessment of the Impacts of Construction on Air Quality and the Determination of their Significance, Institute of Air Quality Management, 2012.

The magnitude of potential unmitigated dust emissions was determined based on the criteria shown in Table 2.

Table 2 Construction Dust - Magnitude of Emission

Magnitude	Activity	Criteria
Large	Earthworks	• Total site area greater than 10,000m^2 • Potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size) • More than 10 heavy earth moving vehicles active at any one time • Formation of bunds greater than 8m in height • More than 100,000 tonnes of material moved
	Construction	• Total building volume greater than 100,000m^3 • Piling • On site concrete batching • Sandblasting
	Trackout	• More than 100 Heavy Duty Vehicle (HDV) trips per day • Potentially dusty surface material (e.g. high clay content) • Unpaved road length greater than 100m
Medium	Earthworks	• Total site area 2,500m^2 to 10,000m^2 • Moderately dusty soil type (e.g. silt) • 5 to 10 heavy earth moving vehicles active at any one time • Formation of bunds 4m to 8m in height • Total material moved 20,000 tonnes to 100,000 tonnes
	Construction	• Total building volume 25,000m^3 to 100,000m^3 • Potentially dusty construction material (e.g. concrete) • Piling • On site concrete batching
	Trackout	• 25 to 100 HDV trips per day • Moderately dusty surface material (e.g. high clay content) • Unpaved road length 50m to 100m
Small	Earthworks	• Total site area less than 2,500m^2 • Soil type with large grain size (e.g. sand) • Less than 5 heavy earth moving vehicles active at any one time • Formation of bunds less than 4m in height • Total material moved less than 10,000 tonnes • Earthworks during wetter months
	Construction	• Total building volume less than 25,000m^3 • Construction material with low potential for dust release (e.g. metal cladding or timber)

Magnitude	Activity	Criteria
	Trackout	• Less than 25 HDV trips per day • Surface material with low potential for dust release • Unpaved road length less than 50m

The risk category was defined based upon the interaction between magnitude and receptor proximity.

Table 3 outlines the dust risk category from earthworks and construction activities.

Table 3 Dust Risk Category from Earthworks and Construction

Distance to Nearest Receptor (m)		Dust Emission Magnitude		
Dust Soiling and PM_{10}	**Ecological**	**Small**	**Medium**	**Large**
Less than 20	-	Medium	High	High
20 - 50	-	Low	Medium	High
50 - 100	Less than 20	Low	Medium	Medium
100 - 200	20 - 40	Negligible	Low	Medium
200 - 350	40 - 100	Negligible	Low	Low

Table 4 outlines the risk category from trackout.

Table 4 Dust Risk Category from Trackout

Distance to Nearest Receptor (m)		Dust Emission Magnitude		
Dust Soiling and PM_{10}	**Ecological**	**Small**	**Medium**	**Large**
Less than 20	-	Medium	Medium	High
20 - 50	Less than 20	Low	Medium	Medium
50 - 100	20 - 100	Negligible	Low	Low

3.1.3 Step 3

Step 3 required the identification of site specific mitigation measures to reduce potential dust impacts based upon the relevant risk categories identified in Step 2. This was undertaken in accordance with the Greater London Authority 'Best Practice Guidance: The Control of Dust and Emissions from Construction and Demolition'[7]. Although it is accepted that the development is not located within London, the document is considered to provide suitable

[7] Best Practice Guidance: Control of Dust and Emissions from Construction and Demolition, Greater London Authority, 2006.

mitigation for construction sites throughout the UK and is recognised as an example of industry best practice.

For sites with **negligible** risk, mitigation measures beyond those required by legislation are not required.

3.1.4 Step 4

The significance of potential dust impacts was defined within Step 4. The sensitivity of the receiving environment was first defined based on the criteria shown in Table 5.

Table 5 Construction Dust - Receptor Sensitivity

Sensitivity	Examples	
	Human Receptors	**Ecological Receptors**
Very high	• Very densely populated area • More than 100 dwellings within 20m • Local PM_{10} concentrations exceed the AQLV • Contaminated buildings present • Very sensitive receptors (e.g. oncology units) • Works continuing in one area of the site for more than one year	• European designated site
High	• Densely populated area • 10 to 100 dwellings within 20m of site • Local PM_{10} concentrations close to the AQLV (e.g. annual mean 36 - 40µg/m^3) • Commercially sensitive horticultural land within 20m	• Nationally designated site
Medium	• Suburban or edge of town area • Less than 10 receptors within 20m • Local PM_{10} concentrations below the AQLV (e.g. annual mean 30 - 36µg/m^3)	• Locally designated site
Low	• Rural or industrial area • No receptors within 20m • Local PM_{10} concentrations well below the AQLV (less than 75%) • Wooded area between site and receptors	• No designations

The impact significance was defined based on the interaction between the sensitivity of the receiving environment and risk category, as shown in Table 6.

Table 6 Construction Dust - Significance of Impact

Sensitivity	Risk Category		
	Small	Medium	Large
Very high	Negligible	Slight adverse	Slight adverse
High	Negligible	Negligible	Slight adverse
Medium	Negligible	Negligible	Negligible
Low	Negligible	Negligible	Negligible

It should be noted that the impact significance shown in Table 6 assumes that the mitigation measures identified within Step 3 are implemented at the site.

The final step is to determine the overall significance of the effects arising from the construction phase of a proposed development. This was based on professional judgement and took account of the significance of the effects for each of the potential dust generating activities.

The determination of significance relies on professional judgement and reasoning should be provided as far as practicable. This has been considered throughout the assessment when defining predicted impacts. The IAQM[8] guidance suggests the provision of details of the assessor's qualifications and experience. These are provided within Appendix III.

3.2 Operational Phase Assessment

The development has the potential to impact on existing air quality as a result of road traffic exhaust emissions, such as NO_2 and PM_{10}, associated with vehicles travelling to and from the site during the operational phase. Potential impacts have been defined by predicting pollutant concentrations using dispersion modelling at sensitive locations for the following scenarios:

- Verification;
- Do-minimum (DM) (predicted traffic flows including committed developments in the anticipated year of opening should the development not proceed); and,
- Do-something (DS) (predicted traffic flows including committed developments in the anticipated year of opening should the development be completed).

It should be noted that both the DM and DS traffic data for 2018 includes the following committed developments:

- Land adjacent to Civic Amenity and Recycling Centre;
- Extension to Tesco;
- Land at Friends School;
- Ashdon Road Commercial Centre, Ashdon Road, Saffron Walden, Essex; and,
- 60 bed care home.

[8] Guidance on the Assessment of the Impacts of Construction on Air Quality and the Determination of their Significance, Institute of Air Quality Management, 2012.

Reference should be made to Appendix II for assessment input data.

Receptors potentially sensitive to operational traffic exhaust emissions were identified within 200m of the affected highway network in accordance with the guidance provided within the DMRB[9] on the likely limits of pollutant dispersion from road sources. LAQM.TG(09)[10] provides the following examples of where annual mean AQLVs should apply:

- Residential properties;
- Schools;
- Hospitals; and,
- Care homes.

These were considered during the selection of receptor locations.

The sensitivity of each receptor was defined based on air quality conditions should the development proceed and the criteria contained within Table 7. These are based upon the guidance provided within the Environmental Protection UK (EPUK) Development Control: Planning for Air Quality (2010 update)[11].

Table 7 Operational Traffic Exhaust Emissions - Receptor Sensitivity

Sensitivity	Description
Very high	Pollutant levels above environmental assessment criteria e.g. • NO_2 or PM_{10} annual mean greater than 40µg/m^3
High	Pollutant levels between 90% and 100% of environmental assessment criteria e.g. • NO_2 or PM_{10} annual mean 36 - 40µg/m^3
Medium	Pollutant levels between 75% and 90% of environmental assessment criteria e.g. • NO_2 annual mean 30 - 36µg/m^3
Low	Pollutant levels below 75% of environmental assessment criteria e.g. • NO_2 or PM_{10} annual mean below 30µg/m^3

The magnitude of change in pollutant concentrations was defined based on the criteria outlined in Table 8.

Table 8 Operational Traffic Exhaust Emissions - Magnitude of Change

Magnitude of Change	Change in Pollutant Level as Proportion of Assessment Criteria (%)
Large	Greater than 10
Medium	5 - 10
Small	1 - 5

[9] Design Manual for Roads and Bridges Volume 11, Section 3, Part 1, HA207/07, Highways Agency, 2007.
[10] Local Air Quality Management Technical Guidance LAQM.TG(09), DEFRA, 2009.
[11] Development Control: Planning for Air Quality (2010 update), Environmental Protection UK, 2010.

Magnitude of Change	Change in Pollutant Level as Proportion of Assessment Criteria (%)
Imperceptible	Less than 1

Impact significance was defined based on the interaction between the sensitivity of the affected receptor and the magnitude of change, as outlined in Table 9.

Table 9 Operational Traffic Exhaust Emissions - Significance of Impact

Sensitivity	Magnitude of Change			
	Imperceptible	Small	Medium	Large
Very high	Negligible	Slight	Moderate	Substantial
High	Negligible	Slight	Moderate	Moderate
Medium	Negligible	Negligible	Slight	Slight
Low	Negligible	Negligible	Negligible	Slight

It should be noted that the criteria shown in Table 7 and Table 8 and the matrix shown in Table 9 are adapted from the EPUK Development Control: Planning for Air Quality (2010 update)[12] guidance document with sensitivity descriptors included to allow comparisons of various air quality impacts.

Following the prediction of impacts at discrete receptor locations the EPUK[13] document provides guidance on determining the overall air quality impact significance of the operation of a development. The following factors are identified for consideration by the assessor:

- Number of properties affected by significant air quality impacts and a judgement on the overall balance;
- Where new exposure is introduced into an existing area of poor air quality, then the number of people exposed to levels above the objective or limit value will be relevant;
- The magnitude of changes and the descriptions of the impacts at the receptors;
- Whether or not an exceedence of an objective or limit value is predicted to arise in the study area where none existed before or an exceedence area is substantially increased;
- Whether or not the study area exceeds an objective or limit value and this exceedence is removed or the exceedence area is reduced; and,
- The extent to which an objective or limit value is exceeded e.g. an annual mean NO_2 concentration of 41µg/m^3 should attract less significance than an annual mean of 51µg/m^3.

These factors were considered and an overall significance determined for the impact of operational phase road traffic emissions. It should be noted that the determination of significance relies on professional judgement and reasoning should be provided as far as

[12] Development Control: Planning for Air Quality (2010 update), Environmental Protection UK, 2010.
[13] Development Control: Planning for Air Quality (2010 update), Environmental Protection UK, 2010.

practicable. This has been considered throughout the assessment when defining predicted impacts. The EPUK[14] guidance suggests the provision of details of the assessor's qualifications and experience. These are provided in Appendix III.

[14] Development Control: Planning for Air Quality (2010 update), Environmental Protection UK, 2010.

4.0 BASELINE

Existing air quality conditions in the vicinity of the proposed development site were identified in order to provide a baseline for assessment. These are detailed in the following Sections.

4.1 Local Air Quality Management

As required by the Environmental Act (1995), UDC has undertaken Review and Assessment of air quality within their area of jurisdiction. This process has indicated that annual mean concentrations of NO_2 are above the AQLV throughout the district. As such, one AQMA has been declared which is described as:

> "Uttlesford District Council AQMA Saffron Walden - Circle of radius 700m centred on Elm Grove in Saffron Walden Town Centre. Revokes and replaces 3 previous Uttlesford AQMAs."

The proposed development is located approximately 300m east of the Saffron Walden AQMA boundary. As such, there is the potential for adverse impacts to existing pollution levels within this sensitive location as a result of traffic generated by the proposals. This has been considered within the report.

UDC has concluded that concentrations of all other pollutants considered within the AQS are currently below the relevant AQLVs and as such no further AQMAs have been designated.

The Air Quality Assessment[15] undertaken to consider potential impacts associated with the Local Plan also highlights four junctions in Saffron Walden which have elevated NO_2 concentrations, as detailed previously. The proposed development is likely to produce a number of vehicle trips which will disperse through these junctions and associated road links. As such, the potential for adverse impacts to existing pollution levels within these sensitive locations has been considered within the report.

4.2 Air Quality Monitoring

Monitoring of pollutant concentrations is undertaken by UDC using continuous and periodic methods throughout their area of jurisdiction. A review of the most recent Air Quality Progress Report[16] indicated the closest continuous monitor to the proposed development is Saffron Walden at NGR: 553823, 238408. This is approximately 1km west of the site boundary at an urban centre location. The analyser records NO_2 and PM_{10} concentrations. Recent NO_2 monitoring results are shown in Table 10.

Table 10 Automatic NO_2 Monitoring Results

Site	Annual Mean NO_2 Concentration ($\mu g/m^3$)			
	2009	2010	2011	2012
Saffron Walden	24.68	30.07	22.29	22.86

[15] Assessment of Uttlesford District's Local Plan on Saffron Walden, Jacobs, 2013.
[16] Air Quality Progress Report, Uttlesford District Council, 2013.

As shown in Table 10, the annual mean AQLV for NO_2 was not exceeded at the Saffron Walden monitoring site during recent years, despite its location within the AQMA.

Recent PM_{10} monitoring results are shown in Table 11.

Table 11 Automatic PM_{10} Monitoring Results

Site	Annual Mean PM_{10} Concentration ($\mu g/m^3$)			
	2009	2010	2011	2012
Saffron Walden	15.59	19.03	25.31	24.73

As shown in Table 11, the annual mean AQLV for PM_{10} was not exceeded at the Saffron Walden monitoring site during recent years.

UDC also utilise passive diffusion tubes to monitor NO_2 concentrations throughout the district. There are a number of sites located in close proximity to the development. Recent monitoring results from these tubes are shown in Table 12. Diffusion tubes UT031 and UT032 are new and 2012 is the first full year of data to be recorded. Exceedences of the AQLV are shown in **bold**.

Table 12 NO_2 Diffusion Tube Monitoring Results

Site Name		NGR		Annual Mean Concentration ($\mu g/m^3$)		
		X	Y	2010	2011	2012
UT001	Walden 1 PO High Street	553710	238415	**47.22**	36.60	38.67
UT003	Walden 3 Gibson Gardens	553552	238219	20.29	14.10	15.74
UT004	Walden 4 YHA	553594	238599	**48.61**	38.40	**47.51**(b)
UT005	Walden 5 Thaxted Road	554332	238450	**57.66**	**43.10**	**46.08**
UT011	Walden 11 33 High Street	553697	238452	**41.53**	30.70	33.57
UT012	Walden 12 Town Hall	553878	238509	25.41	18.20	21.14
UT013	Fire Station (co-located)(a)	553823	238408	29.10	21.20	22.68
UT028	Walden 16 London Road	553751	238086	**50.00**	**40.70**	**45.87**(b)
UT029	Walden 17 Debden Road	553770	238076	32.75	23.00	30.02(b)
UT030	Walden 18 Friends School	553875	237763	36.95	25.30	26.91
UT031	Walden Peasland Road	554193	237756	-	-	19.78
UT032	Walden Borough Lane	553619	237869	-	-	20.52(b)

Note: (a) Triplicate location
(b) Data capture less than 75% during 2012

As indicated in Table 12, the annual mean AQLV for NO_2 was exceeded at UT004, UT005

and UT028 in recent years. The AQLV was also exceeded at UT011 in 2010 but since then the monitored concentration has decreased. Although there are some exceedences, results show a general downward trend over recent years. High concentrations are to be expected at all the diffusion tubes due to their location within the AQMA.

Reference should be made to Figure 2 for a map of the automatic monitor and diffusion tube locations.

4.3 Background Pollutant Concentrations

Predictions of background pollutant concentrations on a 1km by 1km grid basis have been produced by DEFRA for the entire of the UK to assist LAs in their Review and Assessment of air quality. The proposed development site is located in grid square NGR: 555500, 238500. The most recent data for this location, released in August 2012, was downloaded from the DEFRA website[17] for the purpose of this assessment and is summarised in Table 13.

Table 13 Predicted Background Pollutant Concentrations

Pollutant	Predicted Background Concentration (µg/m^3)	
	2012	2013
NO_x	18.58	17.87
NO_2	12.28	11.87
PM_{10}	16.52	16.34

As shown in Table 13, background pollutant levels are below the relevant AQLVs at the development site location. Comparison with the diffusion tube results shows the significant influence of road vehicle exhaust emissions in the vicinity of the highway network.

4.4 Sensitive Receptors

A sensitive receptor is defined as any location which may be affected by changes in air quality as a result of a development. These have been defined for dust and road vehicle exhaust emission impacts in the following Sections.

4.4.1 Construction Phase Sensitive Receptors

Receptors sensitive to potential dust impacts during earthworks and construction were identified from a desk-top study of the area up to 350m from the development boundary. These are summarised in Table 14.

[17] http://laqm.defra.gov.uk/maps/maps2010.html.

Table 14 Earthworks and Construction Dust Sensitive Receptors

Distance from Site Boundary (m)	Approximate Number of Residential Receptors	Approximate Number of Ecological Receptors
Less than 20	Less than 10	0
20 - 50	10 - 100	0
50 - 100	10 - 100	0
100 - 350	100 - 500	0

Reference should be made to Figure 2 for a graphical representation of earthworks and construction dust sensitive locations. The desk-top study indicated that there are no ecological receptors within 350m of the site. Residential units are mainly located to the south-west and north-west of the development, off Rylestone Way and Horn Brook respectively.

Receptors sensitive to potential dust impacts from trackout were identified from a desk-top study of the area up to 100m from the road network within 500m of the site access. These are summarised in Table 15. The exact construction vehicle access routes were not available for the purpose of this assessment as they will depend on sourcing of materials. This is likely to be decided by the contractor. As such, it was assumed traffic may access the site from Radwinter Road and Shire Hill. This ensured the maximum potential trackout distance was considered.

Table 15 Trackout Dust Sensitive Receptors

Distance from Site Boundary (m)	Approximate Number of Residential Receptors	Approximate Number of Ecological Receptors
Less than 20	10 - 100	0
20 - 50	10 - 100	0
50 - 100	10 - 100	0

Reference should be made to Figure 3 for a graphical representation of trackout dust sensitive receptor locations.

Based on the criteria shown in Table 5, the sensitivity of the receiving environment to potential dust impacts is considered to be **medium**. This is because the proposals are situated in a suburban area with few sensitive receptors bordering the site, local PM_{10} concentrations are well below the AQLVs and there are no ecological receptors within the assessment extents.

4.4.2 Road Vehicle Exhaust Emission Sensitive Receptors

Receptors sensitive to potential road vehicle exhausts emission impacts were identified from a desk-top study and are summarised in Table 16.

Table 16 Road Vehicle Exhaust Emission Sensitive Receptors

Receptor		NGR (m)	
		X	Y
R1	Residential - Wild Hedges	555379	238389
R2	Saffron Walden Community Hospital	555105	238544
R3	Residential - Radwinter Road	554899	238525
R4	Residential - Radwinter Road	554685	238520
R5	Residential - Radwinter Road	554425	238486
R6	Residential - Thaxted Road	554355	238438
R7	Residential - East Street	554324	238451
R8	Residential - East Street	554219	238439
R9	Residential - Cates Corner/Fairycroft Road	554013	238476
R10	Residential - Cates Corner	553974	238460
R11	Residential - Hill Street	553939	238455
R12	Residential - Fairycroft Road	554023	238429
R13	Residential - Fairycroft Road	554062	238301
R14	Residential - Bridge Street	553546	238655
R15	Residential - Bridge Street	553607	238579
R16	Residential - High Street	553669	238508
R17	Residential - High Street	553698	238442
R18	Residential - High Street	553739	238318
R19	Residential - High Street/Audley Road Junction	553780	238153
R20	Residential - London Road	553751	238090
R21	Residential - Audley Road	553858	238174
R22	Residential - Audley Road	554061	238224
R23	Residential - Audley Road	554215	238396
R24	Residential - Thaxted Road	554422	238330
R25	Residential - Thaxted Road	554533	238112
R26	St Mary's C of E Primary School	553846	238776
R27	Residential - Church Street	553810	238598
R28	Residential - Debden Road	553780	238057

Receptor		NGR (m)	
		X	Y
R29	Residential - Debden Road	553833	237828
R30	Friends School	553907	237684
R31	Residential - Borough Lane	553724	237768
R32	Residential - Debden Road/Borough Lane	553848	237775
R33	Residential - Peasland Road	554325	237705
R34	Residential - Thaxted Road	554671	237734
R35	Residential - Ashdon Road	554140	238686
R36	Residential - Ashdon Road	554302	238678
R37	Residential - Ashdon Road	554454	238698
R38	Residential - Ashdon Road	554529	238713
R39	Dame Bradbury's School	554641	238761
R40	Residential - Ashdon Road	554773	238748
R41	Residential - Ashdon Road	554885	238808
R42	Residential - Shire Hill	554591	238039

The sensitive receptors identified in Table 16 represent worst-case locations. However, this is not an exhaustive list and there may be other locations within the vicinity of the site that may experience air quality impacts as a result of the proposed development that have not been individually identified above. Reference should be made to Figure 4 for a graphical representation of road vehicle exhaust emission sensitive receptor locations.

Receptor sensitivity was defined based upon the methodology outlined in Table 7 and predicted pollutant concentrations for the development opening year of 2018. These are detailed within Table 17.

Table 17 Road Vehicle Exhaust Emission Receptor Sensitivity

Receptor	NO_2		PM_{10}	
	Predicted Annual Mean Concentration ($\mu g/m^3$)	Sensitivity	Predicted Annual Mean Concentration ($\mu g/m^3$)	Sensitivity
R1	29.30	Low	24.67	Low
R2	25.38	Low	23.83	Low
R3	35.93	Medium	25.53	Low
R4	31.82	Medium	24.95	Low

Receptor	NO_2		PM_{10}	
	Predicted Annual Mean Concentration ($\mu g/m^3$)	Sensitivity	Predicted Annual Mean Concentration ($\mu g/m^3$)	Sensitivity
R5	35.68	Medium	25.57	Low
R6	38.91	High	25.95	Low
R7	36.10	High	25.41	Low
R8	34.60	Medium	25.40	Low
R9	33.17	Medium	25.11	Low
R10	32.82	Medium	24.91	Low
R11	32.89	Medium	24.90	Low
R12	27.66	Low	24.16	Low
R13	26.85	Low	24.04	Low
R14	25.92	Low	24.07	Low
R15	29.56	Low	24.51	Low
R16	30.18	Medium	24.60	Low
R17	28.87	Low	24.36	Low
R18	30.00	Medium	24.60	Low
R19	33.20	Medium	25.13	Low
R20	35.85	Medium	25.57	Low
R21	32.86	Medium	25.12	Low
R22	29.34	Low	24.40	Low
R23	31.38	Medium	24.75	Low
R24	35.12	Medium	25.81	Low
R25	29.15	Low	24.58	Low
R26	24.18	Low	23.59	Low
R27	27.94	Low	24.18	Low
R28	33.98	Medium	25.35	Low
R29	27.46	Low	24.18	Low
R30	25.10	Low	23.77	Low
R31	26.00	Low	23.91	Low
R32	30.90	Medium	24.73	Low

Receptor	NO_2		PM_{10}	
	Predicted Annual Mean Concentration ($\mu g/m^3$)	Sensitivity	Predicted Annual Mean Concentration ($\mu g/m^3$)	Sensitivity
R33	28.43	Low	24.33	Low
R34	30.97	Medium	24.77	Low
R35	27.45	Low	24.26	Low
R36	27.71	Low	24.30	Low
R37	28.58	Low	24.46	Low
R38	28.84	Low	24.49	Low
R39	24.99	Low	23.76	Low
R40	28.71	Low	24.47	Low
R41	25.82	Low	23.93	Low
R42	32.71	Medium	25.09	Low

As indicated in Table 17, the sensitivity to changes in annual mean NO_2 concentrations was **low** at 22 locations, **medium** at 18 locations and **high** at 2 locations. The sensitivity of all receptors to changes in annual mean PM_{10} concentrations was **low**.

5.0 IMPACT ASSESSMENT

There is the potential for air quality impacts as a result of the construction and operation of the proposed development. These are assessed in the following Sections.

5.1 Construction Phase Assessment

5.1.1 Step 1

The undertaking of activities such as excavation, ground works, cutting, construction, concrete batching and storage of materials has the potential to result in fugitive dust emissions throughout the construction phase. Vehicle movements both on-site and on the local road network also have the potential to result in the re-suspension of dust from haul road and highway surfaces.

The potential for impacts at sensitive locations depends significantly on local meteorology during the undertaking of dust generating activities, with the most significant effects likely to occur during dry and windy conditions.

As indicated in Table 13 background PM_{10} concentrations at the development site are low and significant emissions would be required to result in AQLV exceedences.

The desk-study undertaken to inform the baseline identified a number of sensitive receptors within 350m of the site boundary. As such, a detailed assessment of potential dust impacts was required.

5.1.2 Step 2

Earthworks

Earthworks will primarily involve excavating material, haulage, tipping and stockpiling, as well as site levelling and landscaping. Information on soil type was not available for the purpose of this assessment. As such, the soil type was considered to be potentially dusty in order to provide a worst-case scenario.

The area of proposed development site is anticipated to be greater than 10,000m^2. In accordance with the criteria in Table 2, the magnitude of potential dust emissions from earthworks is therefore **large**. Table 14 indicates there are a number of sensitive receptors within 20m of the site boundary. In accordance with the criteria outlined in Table 3, the development is considered to be a **high** risk site as a result of earthwork activities.

Construction

Due to the area of the site, it is likely that the building volume will be greater than 100,000m^3. In accordance with the criteria outlined in Table 2, the magnitude of potential dust emissions from construction is therefore **large**. Table 14 indicates there are a number of sensitive receptors within 20m of the site boundary. In accordance with the criteria outlined in Table 3, the development is considered to be a **high** risk site as a result of construction activities.

Trackout

Information on the number of HDV trips to be generated during the construction phase was not available for this assessment. Similarly, the surface material and unpaved road length was not known at this stage of the project.

Based on the site area, it was assumed that the unpaved road length is likely to be over 100m. In accordance with the criteria outlined in Table 2, the magnitude of potential dust emissions from trackout is therefore **large**. Table 15 indicates there are a number of sensitive receptors within 20m of the local road network. In accordance with the criteria outlined in Table 4, the development is considered to be a **high** risk site as a result of trackout.

Summary of the Risk of Dust Effects

A summary of the potential risk from each dust generating activity is provided in Table 18.

Table 18 Summary of Potential Unmitigated Dust Risks

Source	Dust Soiling Effects	Ecological Effects	PM_{10} Effects
Earthworks	High	None	High
Construction	High	None	High
Trackout	High	None	High

As indicated in Table 18, the potential risk of dust soiling and increases in PM_{10} concentrations is **high** from earthworks, construction activities and trackout.

It should be noted that the potential for impacts depends significantly on the distance between the dust generating activity and receptor location. Risk has been predicted based on a worst-case scenario of works being undertaken at the site boundary closest to each sensitive area. Therefore, actual risk is likely to be lower than that predicted during the majority of the construction phase.

5.1.3 Step 3

The Greater London Authority 'Best Practice Guidance: The Control of Dust and Emissions from Construction and Demolition' provides a number of potential mitigation measures to reduce potential impacts from **high** risk sites. These have been adapted for the proposed site as summarised in Table 19. These may be reviewed prior to the commencement of construction works and incorporated into a Construction Environmental Management Plan if required by the Local Planning Authority.

Table 19 Fugitive Dust Mitigation Measures

Issue	Control Measure
Site planning	• Erect solid barriers to site boundary • No bonfires • Plan site layout - machinery and dust causing activities should be located away from sensitive receptors • All site personnel to be fully trained • Trained and responsible manager on site during working times to maintain logbook and carry out site inspections • Hard surface site haul routes
Construction traffic	• All vehicles to switch of engines – no idling vehicles • Effective vehicle cleaning and specific fixed wheel washing on leaving site and damping down of haul routes • All loads entering and leaving site to be covered • No site runoff of water or mud • On road vehicles to comply to set emission standards • All non-road mobile machinery to use ultra low sulphur tax-exempt diesel where available and be fitted with appropriate exhaust after treatment from the approved list • Minimise movement of construction traffic around site • Hard surfacing and effective cleaning of haul routes and appropriate speed limit around site
Earth moving works	• Minimise dust generating activities • Use dust as water suppressant where applicable • Cover, seed or fence stockpiles to prevent wind whipping • Re-vegetate earthworks and exposed areas • If applicable, ensure concrete crusher or concrete batcher has permit to operate

5.1.4 Step 4

As indicated in Section 4.4.1, the receiving environment is considered to be of **medium** sensitivity to potential dust impacts. As such, assuming the relevant mitigation measures outlined in Table 19 are implemented, the residual significance of potential impacts from all dust generating activities is **negligible**, in accordance with the methodology outlined in Table 6.

5.2 Operational Phase Assessment

Additional vehicle movements associated with the operation of the proposed development will generate exhaust emissions on the local and regional road networks. An assessment was therefore undertaken using dispersion modelling in order to quantify potential changes in pollutant concentrations at sensitive locations.

The assessment considered the following scenarios:

- 2012 - Verification;
- 2018 - DM; and,
- 2018 - DS.

The "DM" (i.e. without development) scenario was representative of baseline traffic data for 2018 in addition to committed development trips. The "DS" scenario was representative of baseline traffic data for 2018 in addition to committed development trips and predicted operational traffic associated with the proposals.

For the purpose of this assessment traffic data was obtained for 2018 as the development opening year. Air quality is predicted to improve in the future. However, in order to provide a robust assessment, emission factors and background concentrations for 2012 were utilised within the dispersion model. The use of 2018 traffic data and 2012 emission factors and background concentrations is considered to provide a worst-case scenario and therefore a sufficient level of confidence can be placed within the predicted pollution concentrations.

Reference should be made to Appendix II for full assessment input details.

5.2.1 Nitrogen Dioxide

Predicted Concentrations at the Development Site

Annual mean NO_2 concentrations were predicted across the development site for the DM and DS scenarios as shown in Figure 8 and Figure 9. As indicated, concentrations were predicted to be below the AQLV across the site both with and without the proposal in place. The NO_2 concentration across the development was predicted to range from 22.52µg/m^3 to 39.47µg/m^3 in the DS scenario. The largest concentrations are predicted adjacent to the road boundary where there are currently no residential units proposed.

Based on the results of the dispersion modelling assessment, the site is considered to be suitable for the proposed end use without the implementation of mitigation techniques to protect future residents from elevated NO_2 concentrations.

Predicted Impacts at Sensitive Receptors

Annual mean NO_2 concentrations were predicted for each scenario and are summarised in Table 20.

Table 20 Predicted Annual Mean NO_2 Concentrations

Sensitive Receptor		Predicted Annual Mean NO_2 Concentration (µg/m^3)		
		Do-minimum	Do-something	Change
R1	Residential - Wild Hedges	29.25	29.30	0.05
R2	Saffron Walden Community Hospital	25.25	25.38	0.13
R3	Residential - Radwinter Road	35.11	35.93	0.82
R4	Residential - Radwinter Road	31.24	31.82	0.58

Sensitive Receptor		Predicted Annual Mean NO_2 Concentration ($\mu g/m^3$)		
		Do-minimum	Do-something	Change
R5	Residential - Radwinter Road	35.02	35.68	0.66
R6	Residential - Thaxted Road	38.68	38.91	0.23
R7	Residential - East Street	35.91	36.10	0.19
R8	Residential - East Street	34.47	34.60	0.13
R9	Residential - Cates Corner/Fairycroft Road	33.07	33.17	0.10
R10	Residential - Cates Corner	32.72	32.82	0.10
R11	Residential - Hill Street	32.79	32.89	0.10
R12	Residential - Fairycroft Road	27.63	27.66	0.03
R13	Residential - Fairycroft Road	26.79	26.85	0.06
R14	Residential - Bridge Street	25.61	25.92	0.31
R15	Residential - Bridge Street	29.30	29.56	0.26
R16	Residential - High Street	29.98	30.18	0.20
R17	Residential - High Street	28.81	28.87	0.06
R18	Residential - High Street	29.94	30.00	0.06
R19	Residential - High Street/Audley Road Junction	33.14	33.20	0.06
R20	Residential - London Road	35.81	35.85	0.04
R21	Residential - Audley Road	32.78	32.86	0.08
R22	Residential - Audley Road	29.26	29.34	0.08
R23	Residential - Audley Road	31.26	31.38	0.12
R24	Residential - Thaxted Road	35.03	35.12	0.09
R25	Residential - Thaxted Road	29.04	29.15	0.11
R26	St Mary's C of E Primary School	24.00	24.18	0.18
R27	Residential - Church Street	27.66	27.94	0.28
R28	Residential - Debden Road	33.93	33.98	0.05
R29	Residential - Debden Road	27.30	27.46	0.16
R30	Friends School	24.97	25.10	0.13
R31	Residential - Borough Lane	25.49	26.00	0.51

Sensitive Receptor		Predicted Annual Mean NO_2 Concentration ($\mu g/m^3$)		
		Do-minimum	Do-something	Change
R32	Residential - Debden Road/Borough Lane	30.18	30.90	0.72
R33	Residential - Peasland Road	27.86	28.43	0.57
R34	Residential - Thaxted Road	30.79	30.97	0.18
R35	Residential - Ashdon Road	27.04	27.45	0.41
R36	Residential - Ashdon Road	27.32	27.71	0.39
R37	Residential - Ashdon Road	28.08	28.58	0.50
R38	Residential - Ashdon Road	28.31	28.84	0.53
R39	Dame Bradbury's School	24.74	24.99	0.25
R40	Residential - Ashdon Road	28.18	28.71	0.53
R41	Residential - Ashdon Road	25.62	25.82	0.20
R42	Residential - Shire Hill	32.01	32.71	0.70

As indicated in Table 20, predicted annual mean NO_2 concentrations were below the relevant AQLV at all sensitive receptors.

Predicted impacts on annual mean NO_2 concentrations at the sensitive receptor locations are summarised in Table 21.

Table 21 Predicted NO_2 Impacts

Sensitive Receptor		Magnitude of Change	Receptor Sensitivity	Significance of Impact
R1	Residential - Wild Hedges	Imperceptible	Low	Negligible
R2	Saffron Walden Community Hospital	Imperceptible	Low	Negligible
R3	Residential - Radwinter Road	Small	Medium	Negligible
R4	Residential - Radwinter Road	Small	Medium	Negligible
R5	Residential - Radwinter Road	Small	Medium	Negligible
R6	Residential - Thaxted Road	Imperceptible	High	Negligible
R7	Residential - East Street	Imperceptible	High	Negligible
R8	Residential - East Street	Imperceptible	Medium	Negligible
R9	Residential - Cates Corner/Fairycroft Road	Imperceptible	Medium	Negligible

Sensitive Receptor		Magnitude of Change	Receptor Sensitivity	Significance of Impact
R10	Residential - Cates Corner	Imperceptible	Medium	Negligible
R11	Residential - Hill Street	Imperceptible	Medium	Negligible
R12	Residential - Fairycroft Road	Imperceptible	Low	Negligible
R13	Residential - Fairycroft Road	Imperceptible	Low	Negligible
R14	Residential - Bridge Street	Imperceptible	Low	Negligible
R15	Residential - Bridge Street	Imperceptible	Low	Negligible
R16	Residential - High Street	Imperceptible	Medium	Negligible
R17	Residential - High Street	Imperceptible	Low	Negligible
R18	Residential - High Street	Imperceptible	Medium	Negligible
R19	Residential - High Street/Audley Road Junction	Imperceptible	Medium	Negligible
R20	Residential - London Road	Imperceptible	Medium	Negligible
R21	Residential - Audley Road	Imperceptible	Medium	Negligible
R22	Residential - Audley Road	Imperceptible	Low	Negligible
R23	Residential - Audley Road	Imperceptible	Medium	Negligible
R24	Residential - Thaxted Road	Imperceptible	Medium	Negligible
R25	Residential - Thaxted Road	Imperceptible	Low	Negligible
R26	St Mary's C of E Primary School	Imperceptible	Low	Negligible
R27	Residential - Church Street	Imperceptible	Low	Negligible
R28	Residential - Debden Road	Imperceptible	Medium	Negligible
R29	Residential - Debden Road	Imperceptible	Low	Negligible
R30	Friends School	Imperceptible	Low	Negligible
R31	Residential - Borough Lane	Small	Low	Negligible
R32	Residential - Debden Road/Borough Lane	Small	Medium	Negligible
R33	Residential - Peasland Road	Small	Low	Negligible
R34	Residential - Thaxted Road	Imperceptible	Medium	Negligible
R35	Residential - Ashdon Road	Small	Low	Negligible
R36	Residential - Ashdon Road	Imperceptible	Low	Negligible
R37	Residential - Ashdon Road	Small	Low	Negligible

Sensitive Receptor		Magnitude of Change	Receptor Sensitivity	Significance of Impact
R38	Residential - Ashdon Road	Small	Low	Negligible
R39	Dame Bradbury's School	Imperceptible	Low	Negligible
R40	Residential - Ashdon Road	Small	Low	Negligible
R41	Residential - Ashdon Road	Imperceptible	Low	Negligible
R42	Residential - Shire Hill	Small	Medium	Negligible

As indicated in Table 21, the significance of impacts as a result of the development was predicted to be **negligible** at all receptors for both scenarios considered.

5.2.2 Particulate Matter

Predicted Concentrations at the Development Site

Annual mean PM_{10} concentrations were predicted across the development site for the DM and DS scenarios as shown in Figure 10 and Figure 11. As indicated, concentrations were predicted to be below the AQLV throughout the entirety of the site both with and without the proposal in place. The PM_{10} concentrations across the development were predicted to range from 23.15µg/m^3 to 26.77µg/m^3 in the DS scenario.

Based on the results of the dispersion modelling assessment, the site is considered to be suitable for the proposed land use without the implementation of mitigation techniques to protect future residents from elevated PM_{10} concentrations.

Predicted Impacts at Sensitive Receptors

Annual mean PM_{10} concentrations were predicted for each scenario and are summarised in Table 22.

Table 22 Predicted Annual Mean PM_{10} Concentrations

Sensitive Receptor		Predicted Annual Mean PM_{10} Concentration (µg/m^3)		
		Do-minimum	Do-something	Change
R1	Residential - Wild Hedges	24.66	24.67	0.01
R2	Saffron Walden Community Hospital	23.81	23.83	0.02
R3	Residential - Radwinter Road	25.38	25.53	0.15
R4	Residential - Radwinter Road	24.84	24.95	0.11
R5	Residential - Radwinter Road	25.45	25.57	0.12
R6	Residential - Thaxted Road	25.90	25.95	0.05
R7	Residential - East Street	25.37	25.41	0.04

Sensitive Receptor		Predicted Annual Mean PM_{10} Concentration ($\mu g/m^3$)		
		Do-minimum	Do-something	Change
R8	Residential - East Street	25.38	25.40	0.02
R9	Residential - Cates Corner/Fairycroft Road	25.10	25.11	0.01
R10	Residential - Cates Corner	24.89	24.91	0.02
R11	Residential - Hill Street	24.88	24.90	0.02
R12	Residential - Fairycroft Road	24.15	24.16	0.01
R13	Residential - Fairycroft Road	24.03	24.04	0.01
R14	Residential - Bridge Street	24.00	24.07	0.07
R15	Residential - Bridge Street	24.47	24.51	0.04
R16	Residential - High Street	24.56	24.60	0.04
R17	Residential - High Street	24.35	24.36	0.01
R18	Residential - High Street	24.59	24.60	0.01
R19	Residential - High Street/Audley Road Junction	25.12	25.13	0.01
R20	Residential - London Road	25.56	25.57	0.01
R21	Residential - Audley Road	25.10	25.12	0.02
R22	Residential - Audley Road	24.39	24.40	0.01
R23	Residential - Audley Road	24.73	24.75	0.02
R24	Residential - Thaxted Road	25.79	25.81	0.02
R25	Residential - Thaxted Road	24.56	24.58	0.02
R26	St Mary's C of E Primary School	23.55	23.59	0.04
R27	Residential - Church Street	24.13	24.18	0.05
R28	Residential - Debden Road	25.34	25.35	0.01
R29	Residential - Debden Road	24.15	24.18	0.03
R30	Friends School	23.75	23.77	0.02
R31	Residential - Borough Lane	23.82	23.91	0.09
R32	Residential - Debden Road/Borough Lane	24.61	24.73	0.12
R33	Residential - Peasland Road	24.23	24.33	0.10
R34	Residential - Thaxted Road	24.73	24.77	0.04

Sensitive Receptor		Predicted Annual Mean PM_{10} Concentration ($\mu g/m^3$)		
		Do-minimum	Do-something	Change
R35	Residential - Ashdon Road	24.18	24.26	0.08
R36	Residential - Ashdon Road	24.22	24.30	0.08
R37	Residential - Ashdon Road	24.36	24.46	0.10
R38	Residential - Ashdon Road	24.39	24.49	0.10
R39	Dame Bradbury's School	23.71	23.76	0.05
R40	Residential - Ashdon Road	24.37	24.47	0.10
R41	Residential - Ashdon Road	23.89	23.93	0.04
R42	Residential - Shire Hill	24.99	25.09	0.10

As indicated in Table 22, predicted PM_{10} concentrations were below the relevant AQLV at all sensitive receptor locations for both scenarios considered.

Predicted impacts on annual mean PM_{10} concentrations are summarised in Table 23.

Table 23 Predicted Annual Mean PM_{10} Impacts

Sensitive Receptor		Magnitude of Change	Receptor Sensitivity	Significance of Impact
R1	Residential - Wild Hedges	Imperceptible	Low	Negligible
R2	Saffron Walden Community Hospital	Imperceptible	Low	Negligible
R3	Residential - Radwinter Road	Imperceptible	Low	Negligible
R4	Residential - Radwinter Road	Imperceptible	Low	Negligible
R5	Residential - Radwinter Road	Imperceptible	Low	Negligible
R6	Residential - Thaxted Road	Imperceptible	Low	Negligible
R7	Residential - East Street	Imperceptible	Low	Negligible
R8	Residential - East Street	Imperceptible	Low	Negligible
R9	Residential - Cates Corner/Fairycroft Road	Imperceptible	Low	Negligible
R10	Residential - Cates Corner	Imperceptible	Low	Negligible
R11	Residential - Hill Street	Imperceptible	Low	Negligible
R12	Residential - Fairycroft Road	Imperceptible	Low	Negligible
R13	Residential - Fairycroft Road	Imperceptible	Low	Negligible
R14	Residential - Bridge Street	Imperceptible	Low	Negligible

Sensitive Receptor		Magnitude of Change	Receptor Sensitivity	Significance of Impact
R15	Residential - Bridge Street	Imperceptible	Low	Negligible
R16	Residential - High Street	Imperceptible	Low	Negligible
R17	Residential - High Street	Imperceptible	Low	Negligible
R18	Residential - High Street	Imperceptible	Low	Negligible
R19	Residential - High Street/Audley Road Junction	Imperceptible	Low	Negligible
R20	Residential - London Road	Imperceptible	Low	Negligible
R21	Residential - Audley Road	Imperceptible	Low	Negligible
R22	Residential - Audley Road	Imperceptible	Low	Negligible
R23	Residential - Audley Road	Imperceptible	Low	Negligible
R24	Residential - Thaxted Road	Imperceptible	Low	Negligible
R25	Residential - Thaxted Road	Imperceptible	Low	Negligible
R26	St Mary's C of E Primary School	Imperceptible	Low	Negligible
R27	Residential - Church Street	Imperceptible	Low	Negligible
R28	Residential - Debden Road	Imperceptible	Low	Negligible
R29	Residential - Debden Road	Imperceptible	Low	Negligible
R30	Friends School	Imperceptible	Low	Negligible
R31	Residential - Borough Lane	Imperceptible	Low	Negligible
R32	Residential - Debden Road/Borough Lane	Imperceptible	Low	Negligible
R33	Residential - Peasland Road	Imperceptible	Low	Negligible
R34	Residential - Thaxted Road	Imperceptible	Low	Negligible
R35	Residential - Ashdon Road	Imperceptible	Low	Negligible
R36	Residential - Ashdon Road	Imperceptible	Low	Negligible
R37	Residential - Ashdon Road	Imperceptible	Low	Negligible
R38	Residential - Ashdon Road	Imperceptible	Low	Negligible
R39	Dame Bradbury's School	Imperceptible	Low	Negligible
R40	Residential - Ashdon Road	Imperceptible	Low	Negligible
R41	Residential - Ashdon Road	Imperceptible	Low	Negligible
R42	Residential - Shire Hill	Imperceptible	Low	Negligible

As indicated in Table 23, predicted impacts on annual mean PM_{10} concentrations as a result

of road vehicle exhaust emissions associated with the development were predicted to be **negligible** at all receptor locations.

5.2.3 Impact Significance

The overall significance of operational phase road traffic emission impacts was determined as **negligible**. This was based on the most significant predicted impact at discrete receptor locations and the considerations outlined in Section 3.2. Further justification is provided in Table 24.

Table 24 Overall Road Traffic Exhaust Emission Impact Significance

Guidance	Comment
Number of properties affected by slight, moderate or substantial air quality impacts and a judgement on the overall balance	Impacts on annual mean NO_2 and PM_{10} concentrations at all sensitive receptors were predicted to be negligible. These represent worst-case locations and therefore it is unlikely that any other receptors would be significantly affected by the proposed development
Where new exposure is introduced into an existing area of poor air quality, then the number of people exposed to levels above the objective or limit value will be relevant	The proposed development will not result in any new exposure to pollution concentrations above the AQLVs
The magnitude of changes and the descriptions of the impacts at the receptors	Imperceptible changes in annual mean PM_{10} concentrations were predicted at all sensitive receptors. Imperceptible changes in annual mean NO_2 concentrations were predicted at 31 sensitive receptor locations. Small changes were predicted at the other 11 sensitive receptors. However, at all of these locations the resultant significance was negligible due to the magnitude of the concentration
Whether or not an exceedence of an objective or limit value is predicted to arise in the study area where none existed before or an exceedence area is substantially increased	There were exceedences of the annual mean AQLV for NO_2 within non-sensitive areas of the local highway network in both the DM and DS scenarios. There were no predicted exceedences of the annual mean AQLV for PM_{10} within the study area in either scenario. The area of exceedence was not predicted to substantially increase as a result of the development
Whether or not the study area exceeds an objective or limit value and this exceedence is removed or the exceedence area is reduced	The area of exceedence was not predicted to be removed or reduced as a result of the proposals
The extent to which an objective or limit value is exceeded e.g. an annual mean NO_2 concentration of 41µg/m^3 should attract less significance than an annual mean of 51µg/m^3	There were no predicted AQLV exceedences at any sensitive location in either scenario for NO_2 or PM_{10}

5.2.4 Comparison with Local Plan Air Quality Assessment

The Air Quality Assessment[18] produced by Jacobs to consider potential impacts associated with the Local Plan modelled air quality at four key junctions for the years of 2018 and 2026. This was undertaken to determine whether air quality was expected to comply with the AQLVs for NO_2 should the proposals included within the Local Plan be implemented.

Pollutant concentrations were predicted using two methodologies:

- LAQM.TG(09) technical guidance method; and,
- Long term air quality trends (LTT) method.

The 2018 scenario results indicate likely exceedences of the annual mean AQLV for NO_2 at Junction 3 using the LAQM.TG(09) method. The LTT method indicates exceedences at Junction 1, Junction 2 and Junction 3.

The results of the dispersion modelling undertaken for this Air Quality Assessment did not indicate any exceedences of the AQLV at any sensitive receptor at any of the four junctions included for either the DM or DS scenario. However, there were exceedences associated with non-sensitive areas, such as within the carriageway extents, at all four junctions.

The discrepancy between the predictions produced by the dispersion modelling undertaken by Jacobs and REC could be for a number of reasons and it should be noted that it is very unlikely that two assessments would produce exactly the same results due to the number of variables included within such studies. However, it would appear that one explanation for the difference could be the variation in verification factor between the two reports, with Jacobs calculating 3.149 whilst REC calculating 1.3219. As a consequence, all of the Jacobs raw modelling outputs are multiplied by a much greater factor than those of REC's. This acts to amplify predicted concentrations close to the emission source i.e. the road, and produce enlarged pollutant level predictions. The cause of the difference in factors could be for a number of reasons, including:

- Differences in source geometries;
- Variations in vehicle speeds;
- Treatment of traffic congestion;
- Selection of background concentrations; and,
- Use of monitoring data.

A lower verification factor would usually be considered preferable as it shows greater agreement between monitored and modelled pollutant concentrations. However, even minor changes within dispersion model inputs can produce significant variations in predicted pollution levels.

Although there are differences in the outputs of the Jacobs and REC reports, the dispersion modelling presented within this Air Quality Assessment has been undertaken in accordance with all relevant guidance and utilised worst-case assumptions in regards future year air quality conditions. As such, the predicted concentrations and associated impact predictions are considered to offer a sufficient degree of certainty for an assessment of this nature.

[18] Assessment of Uttlesford District's Local Plan on Air Quality in Saffron Walden, Jacobs, 2013.

6.0 MITIGATION

6.1 Construction Phase

Reference should be made to Table 19 for suggested fugitive dust mitigation measures for the construction phase of the development. These are based on the Greater London Authority guidance[19] and as such are considered suitable for proposals of this size and nature.

6.2 Operational Phase

There are a number of air quality mitigation options available to reduce potential exposure of future site users to elevated pollutant concentrations or off-set impacts associated with a development. However, all techniques have financial implications and may therefore affect scheme viability. As such, they should only be included if necessary.

Exhaust emissions from operational phase traffic have the potential to cause an adverse impact on local air quality. Although a **negligible** impact was predicted, an aim for the operational phase should to be to reduce vehicle trips to and from the site or help to reduce pollution levels in sensitive areas through funding of sustainable transport measures such as, Green Transport measures and the provision of bus stops.

A Travel Plan has been produced by JPP Consulting, the Transport Engineers for the development. The overall aim of the Travel Plan is as follows:

> "To reduce the dependency of residents on single occupancy car journeys by encouraging increased use of more sustainable forms of transport."

The Travel Plan includes a number of measures to be implemented in order to achieve the overall aim:

- Implementation of a pedestrian and cycling network which integrates with existing footpaths and bus stops;
- Creation of four more bus stops on the future Radwinter Road, Thaxted Road link road;
- Promotion of sustainable transport and Travel Plan principles;
- Encouraging the use of public transport, walking and cycling via the Residents Welcome Pack; and,
- Promotion of car sharing via a national website Liftshare (www.liftshare.com).

Implementing the above measures may result in fewer vehicle trips and, therefore, a reduction in pollution levels. These measures are therefore likely to result in reductions of mean roadside concentrations of traffic-related pollutants.

[19] Best Practice Guidance: Control of Dust and Emissions from Construction and Demolition, Greater London Authority, 2006.

7.0 CONCLUSION

REC Ltd was commissioned by Manor Oak Homes to undertake an Air Quality Assessment in support of the planning application for a proposed mixed-use development on land to the east of Saffron Walden.

The proposals comprise a residential led development with commercial land, semi-natural green space and associated infrastructure.

Sensitive locations could potentially be affected by the proposed development during the construction and operational phases. As such, an Air Quality Assessment was required to quantify potential impacts in the vicinity of the site.

An assessment of fugitive dust impacts during the construction phase of the development was undertaken in accordance with the IAQM methodology. Assuming good practice dust control measures are implemented, the residual significance of potential air quality impacts from dust generated by earthworks, construction and trackout activities was predicted to be **negligible**.

Potential impacts during the operational phase of the proposed development may occur due to road traffic exhaust emissions associated with vehicles travelling to and from the site. An assessment was therefore undertaken using dispersion modelling to quantify NO_2 and PM_{10} concentrations both with and without the proposals. Predicted concentrations were verified against monitoring results from UDC.

The dispersion modelling results indicated pollution levels at the development were below the pollutant AQLVs and the location was suitable for residential use.

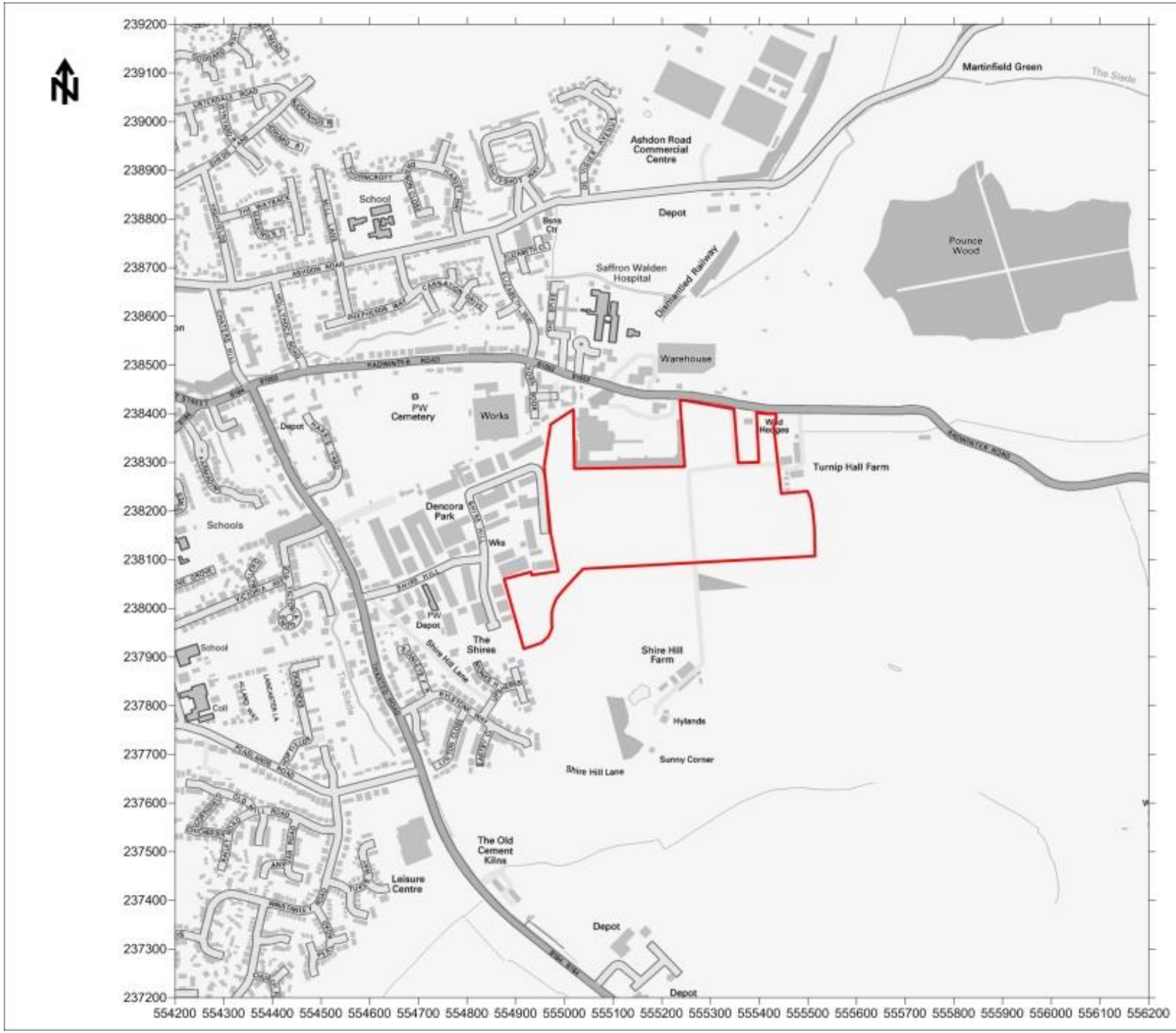
Impacts on annual mean NO_2 and PM_{10} concentrations as a result of operational phase road vehicle exhaust emissions were predicted to be **negligible** at all sensitive receptor locations within the vicinity of the site. The overall significance of potential impacts was determined to be **negligible** in accordance with EPUK guidance.

Based on the assessment results, air quality issues are not considered a constraint to planning consent.

8.0 ABBREVIATIONS

AADT	Annual Average Daily Traffic
AQAP	Air Quality Action Plan
AQLV	Air Quality Limit Value
AQMA	Air Quality Management Area
AQS	Air Quality Strategy
DEFRA	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges
EPUK	Environmental Protection UK
EU	European Union
HDV	Heavy Duty Vehicle
LA	Local Authority
LAQM	Local Air Quality Management
LDF	Local Development Framework
LDV	Light Duty Vehicle
LP	Local Plan
NGR	National Grid Reference
NO_2	Nitrogen dioxide
NO_x	Oxides of nitrogen
NPPF	National Planning Policy Framework
$PM_{2.5}$	Particulate matter with an aerodynamic diameter of less than 2.5µm
PM_{10}	Particulate matter with an aerodynamic diameter of less than 10µm
REC	Resource and Environmental Consultants
UDC	Uttlesford District Council
z_0	Roughness Length

APPENDIX I FIGURES



Legend

Site Boundary

Title

Figure 1 - Site Location Plan

Project

Air Quality Assessment
Land East of Saffron Walden

Project Number

33657

Client

Manor Oak Homes

Resource and Environmental Consultants Ltd
Osprey House, Broadway, Manchester M50 2UE

Tel – 0161 868 1300 Fax – 0161 868 1301
www.recltd.co.uk

Legend

Site Boundary

Monitoring Site Location

Title

Figure 2 - Diffusion Tube and Automatic Monitoring Site Locations

Project

Air Quality Assessment
Land East of Saffron Walden

Project Number

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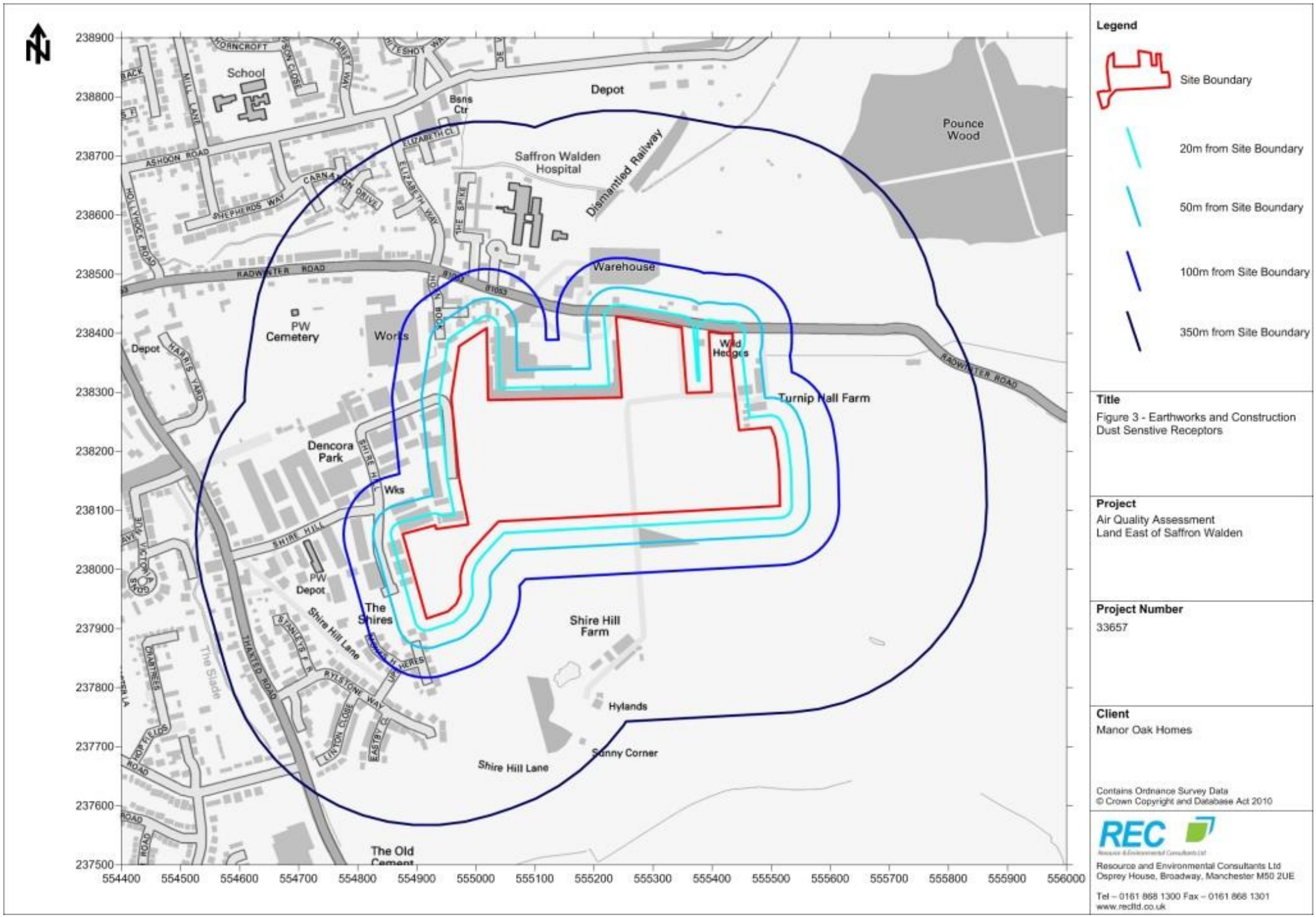

Legend

- Site Boundary
- 20m from Site Boundary
- 50m from Site Boundary
- 100m from Site Boundary
- 350m from Site Boundary

Title

Figure 3 - Earthworks and Construction Dust Senstive Receptors

Project

Air Quality Assessment
Land East of Saffron Walden

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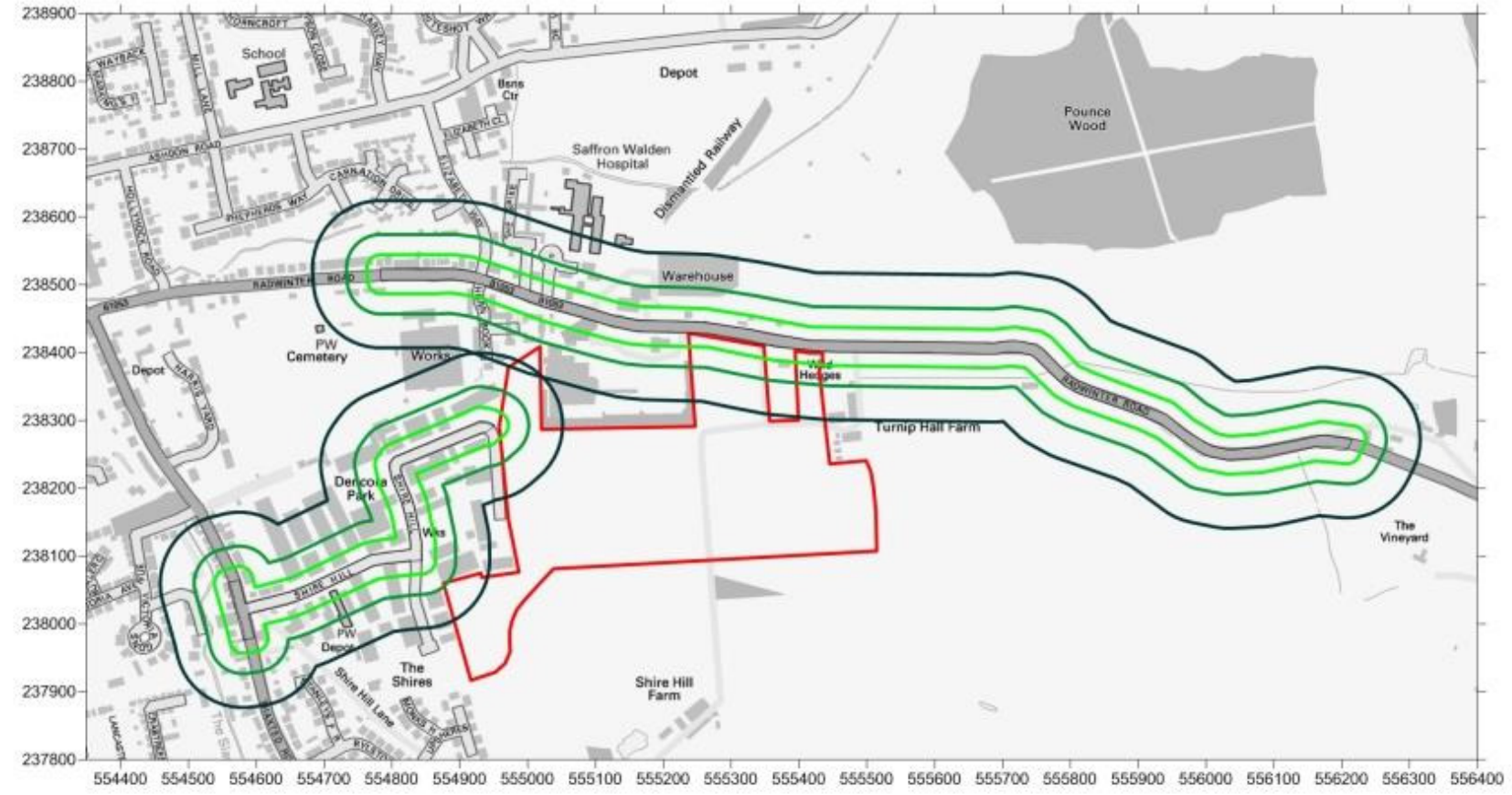

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Site Boundary

20m from Site Access

50m from Site Access

100m from Site Access

Title

Figure 4 - Trackout Dust Sensitive Receptors

Project

Air Quality Assessment
Land East of Saffron Walden

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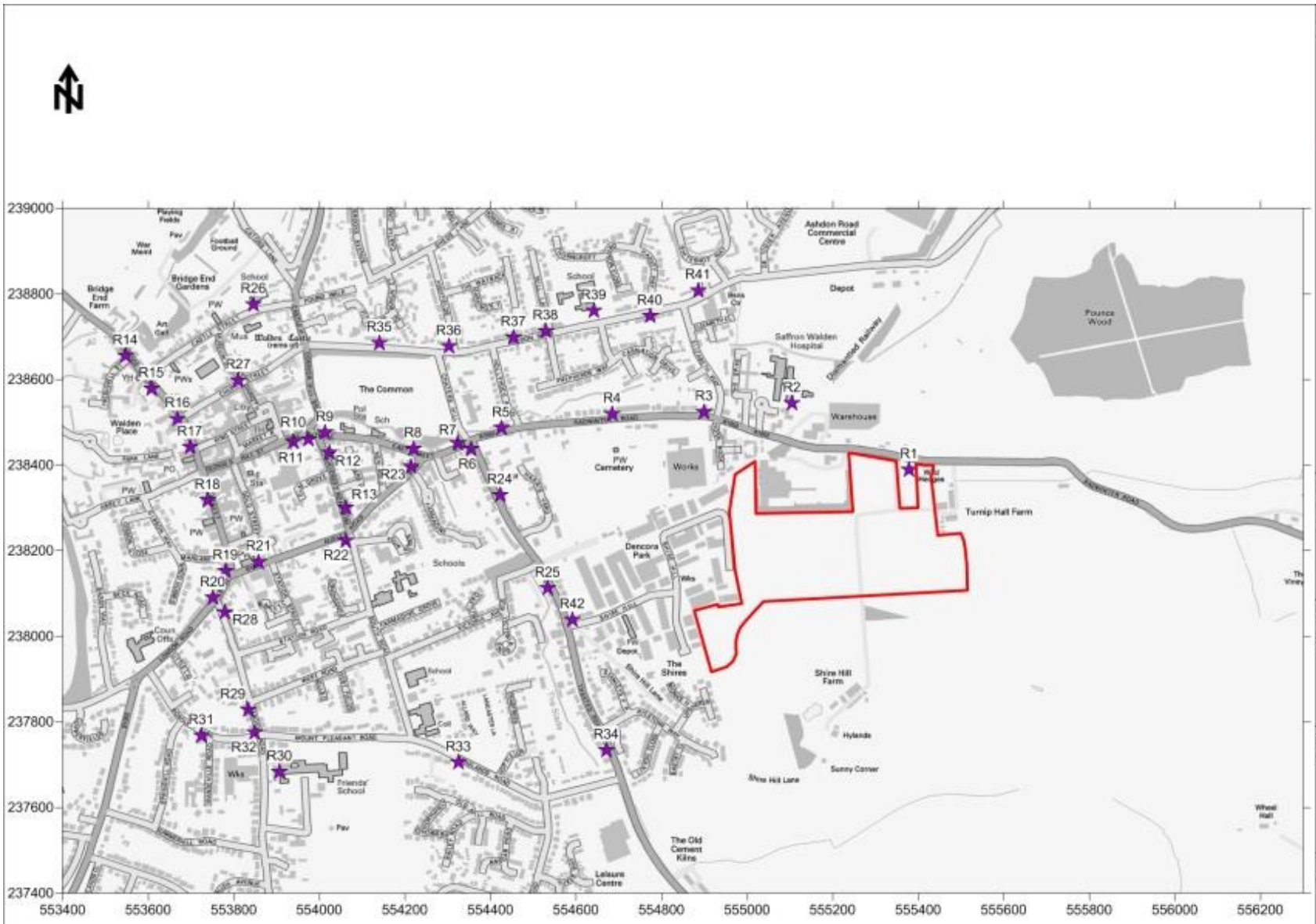

Legend

Site Boundary

Sensitive Receptor

Title

Figure 5 - Road Vehicle Exhaust Emission Sensitive Receptors

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Air Quality Assessment
Land East of Saffron Walden

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Legend

Site Boundary

Road Link Location

Output Grid

Diffusion Tube

Title

Figure 6 - ADMS Roads Inputs

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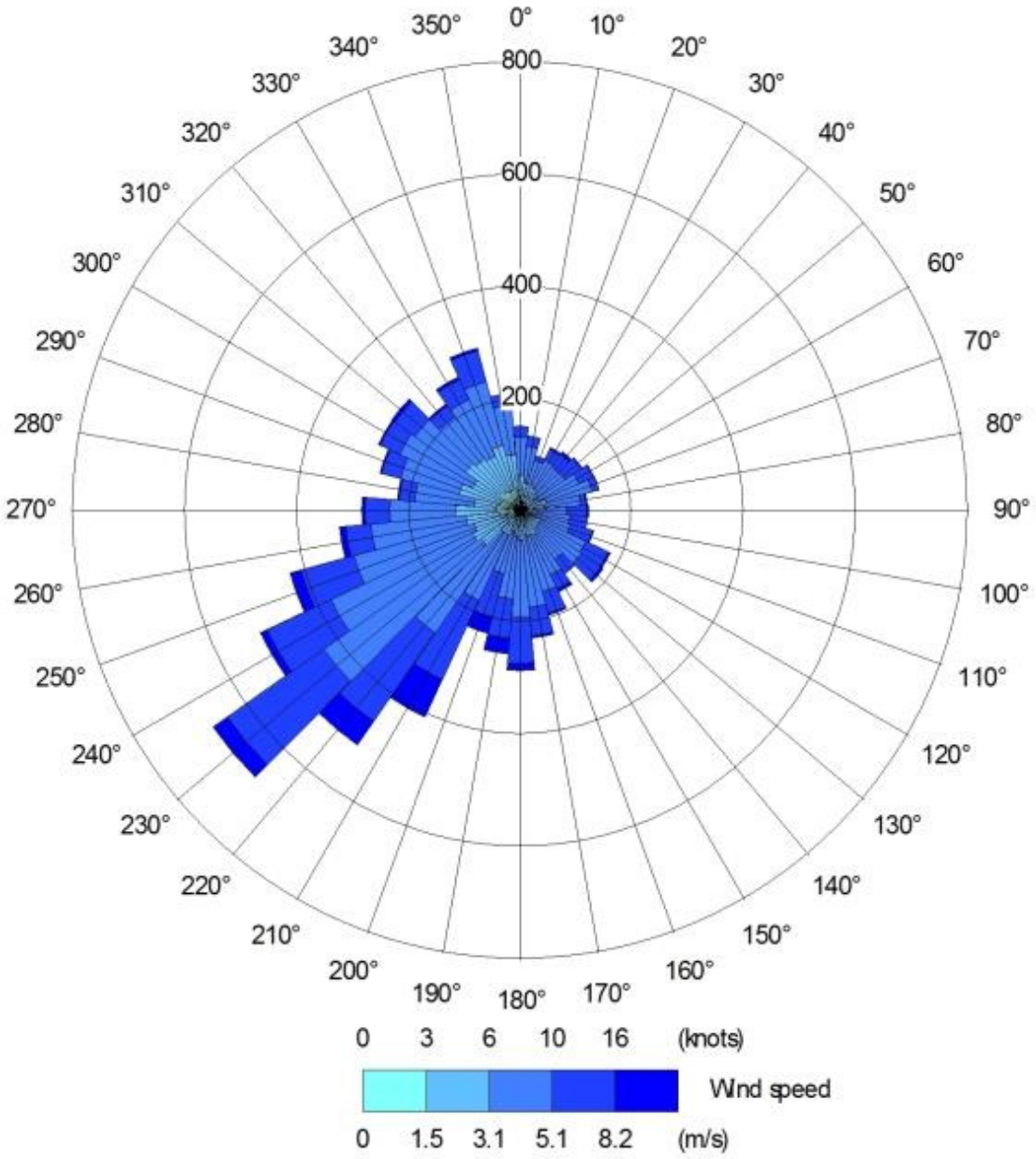

Legend

Title

Figure 7 - Wind Rose of 2012
Stansted Meteorological Data

Project

Air Quality Assessment
Land East of Saffron Walden

Project Number

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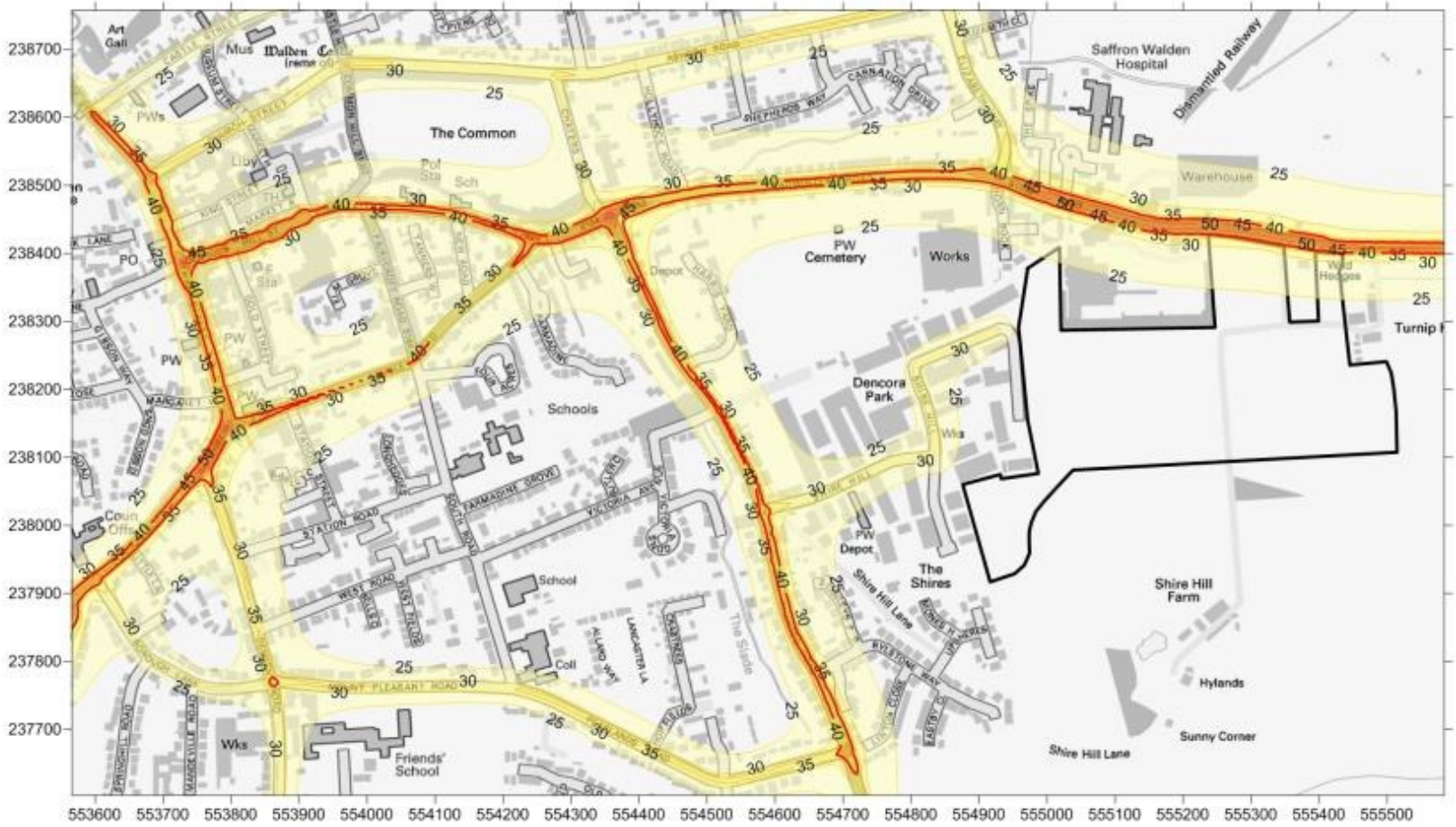

Legend

Site Boundary

Predicted Annual Mean NO_2 Concentration (µg/m³)

55
50
45
40
35
30
25

Title

Figure 8 - Predicted Annual Mean NO_2 Concentration (µg/m³)
Do-Minimum

Project

Air Quality Assessment
Land East of Saffron Walden

Project Number

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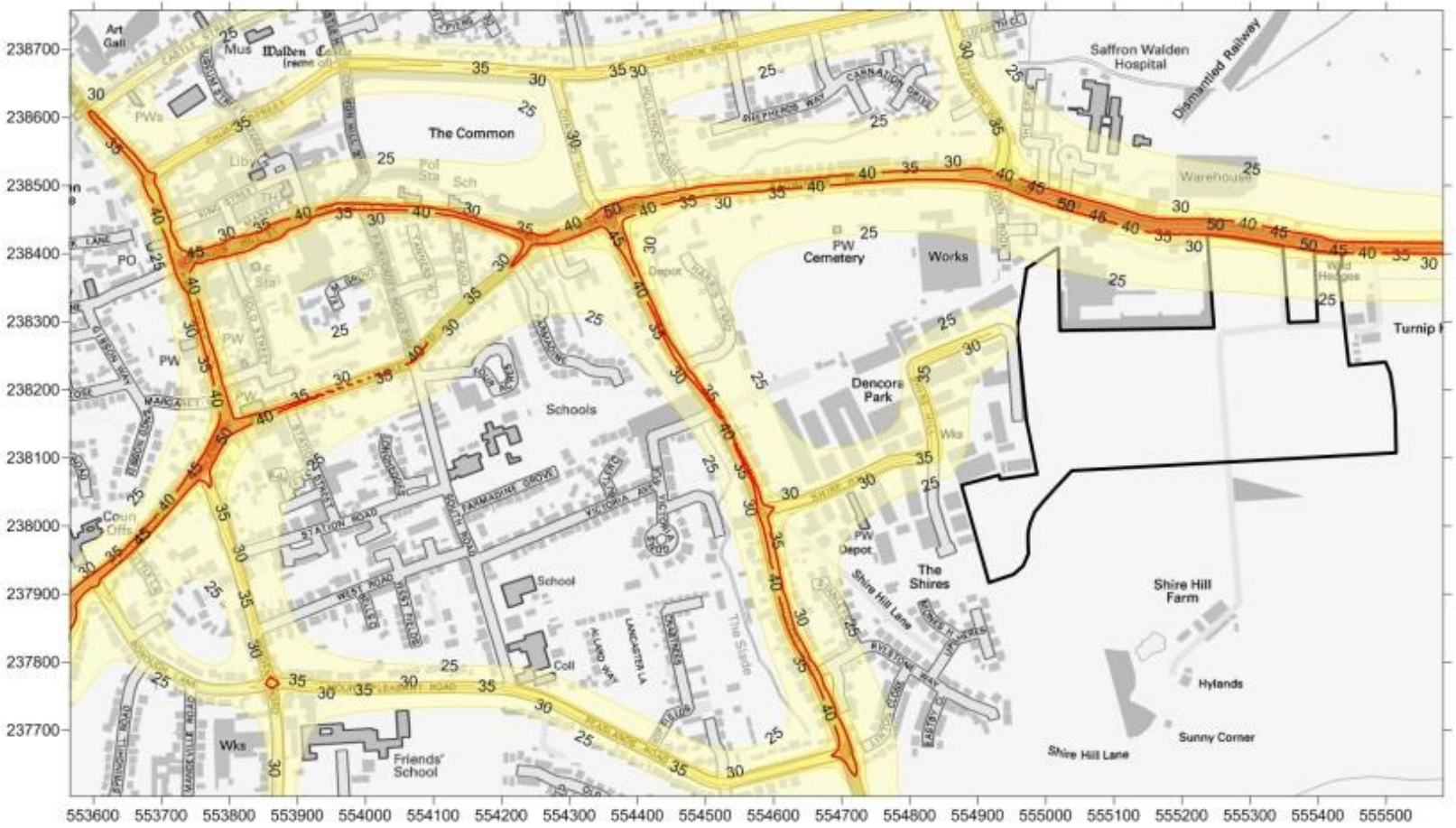

Legend

Site Boundary

Predicted Annual Mean NO_2 Concentration (µg/m³)

55
50
45
40
35
30
25

Title

Figure 9 - Predicted Annual Mean NO_2 Concentration (µg/m³)
Do-Something

Project

Air Quality Assessment
Land East of Saffron Walden

Project Number

33657

Client

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Legend

Site Boundary

Predicted Annual Mean PM_{10} Concentration (µg/m³)

30
29
28
27
26
25
24

Title

Figure 10 - Predicted Annual Mean PM_{10} Concentration (µg/m³)
Do-Minimum

Project

Air Quality Assessment
Land East of Saffron Walden

Project Number

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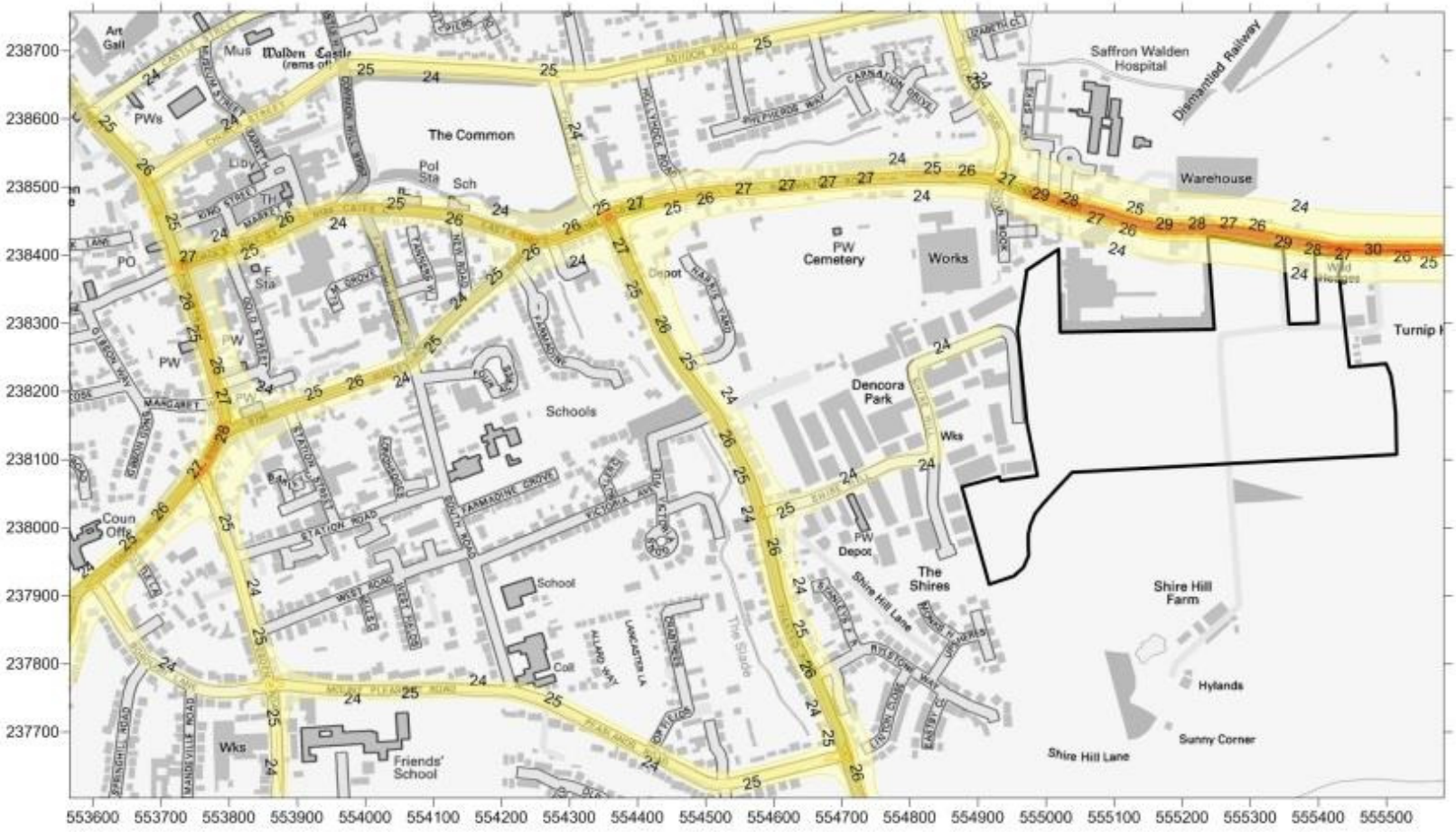

Legend

Site Boundary

Predicted Annual Mean PM_{10} Concentration (µg/m³)

30
29
28
27
26
25
24

Title

Figure 11 - Predicted Annual Mean PM_{10} Concentration (µg/m³)
Do-Something

Project

Air Quality Assessment
Land East of Saffron Walden

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APPENDIX II ASSESSMENT INPUT DATA

ASSESSMENT INPUTS

The proposed development has the potential to result in air quality impacts as a result of increased traffic exhaust emissions. Dispersion modelling using ADMS-Roads was therefore undertaken to predict pollutant concentrations at sensitive locations both with and without the development in order to consider potential changes as a result of the proposals.

The dispersion model requires input data that details the following parameters:

- Assessment area;
- Traffic flow data;
- Vehicle emission factors;
- Spatial co-ordinates of emissions;
- Street width;
- Meteorological data;
- Roughness length; and,
- Monin-Obukhov length.

Assessment inputs are described in the following subsections.

Dispersion Model

Dispersion modelling was undertaken using the ADMS-Roads dispersion model (version 3.2). ADMS-Roads is developed by Cambridge Environmental Research Consultants (CERC) and is routinely used throughout the world for the prediction of pollutant dispersion from road sources. Modelling predictions from this software package are accepted within the UK by the Environment Agency and DEFRA.

Assessment Area

Ambient concentrations were predicted over the area NGR: 553566, 237603 to 555584, 238757. One Cartesian grid with a resolution of 19m and a height of 1.5m was used within the model to produce data suitable for contour plotting using the Surfer software package. This grid spacing was the minimum available within ADMS-Roads for an area of such dimensions and was considered suitable for an assessment of this nature.

Reference should be made to Figure 6 for a graphical representation of the assessment extents.

Traffic Flow Data

Traffic data for the use in this assessment, including 24-hour Annual Average Daily Traffic (AADT) flows and fleet composition as HDV proportion was provided by Essex Highways and JPP Consulting, the Transport Consultants for the development.

Growth factors were taken from DfT 2011 growth forecasts[20] to allow for conversion from 2012 data to projected 2018 AADTs.

[20] English Regional plus Welsh Traffic Growth and Speed Forecasts, DfT, 2011

Vehicle speeds were estimated based on the free flow potential of each link and local speed limits. Road widths were estimated from aerial photography and UK highway design standards.

A summary of traffic data used in this assessment is provided in Table All.1 and Table All.2. Reference should be made to Figure 6 for a graphical representation of the road link locations.

Table All.1 2012 Traffic Data

Road Link		Road/ Canyon Width (m)	Canyon Height (m)	24-hour AADT Flow	Mean Vehicle Speed (km/h)
L1	Radwinter Road	5.0	0.0	26,466	70
L1a	Radwinter Road into Saffron Walden	7.3	0.0	26,466	45
L1b	Radwinter Road/Horn Brook	8.5	0.0	13,473	25
L1c	Radwinter Road	7.3	0.0	13,473	35
L1d	Radwinter Road/Thaxted Road	8.5	0.0	13,473	20
L2	Thaxted Road	7.3	0.0	8,927	60
L2a	Thaxted Road/Peasland Road	9.0	0.0	12,257	30
L2b	Thaxted Road	6.5	0.0	12,375	40
L2c	Thaxted Road/Harris Yard	7.5	0.0	12,375	30
L2d	Thaxted Road	6.5	0.0	12,375	40
L2e	Thaxted Road/Radwinter Road	7.3	0.0	12,375	20
L3	George Street	4.7	0.0	8,809	20
L4	Hill Street	3.8	0.0	8,809	20
L5	Cates Corner	4.5	0.0	10,834	20
L5a	Cates Corner	4.5	0.0	11,999	30
L6	East Street	3.9	0.0	11,999	35
L6a	East Street/Audley Road	3.5	0.0	12,120	25
L6b	East Street	6.5	0.0	12,120	20
L7	Fairycroft Road	4.8	0.0	2,105	25
L8	Audley Road/East Street	4.3	0.0	7,448	25
L8a	Audley Road	4.7	0.0	7,448	40
L8b	Audley Road/Fairycroft Road	4.8	0.0	7,448	25

Road Link		Road/ Canyon Width (m)	Canyon Height (m)	24-hour AADT Flow	Mean Vehicle Speed (km/h)
L8c	Audley Road	5.0	0.0	10,595	35
L8d	Audley Road/High Street	5.3	0.0	10,595	25
L9	Bridge Street	8.2	0.0	6,750	60
L9a	Bridge Street	8.2	0.0	6,750	30
L9b	High Street	5.7	0.0	11,905	30
L9c	High Street	15.0	9.0	7,832	30
L9d	High Street/George Street	15.0	9.0	7,832	25
L9e	High Street	7.3	0.0	15,006	40
L10	Debden Road	5.5	0.0	18,722	30
L10a	London Road	5.5	0.0	13,629	40
L10b	London Road/Newport Road	8.0	0.0	13,629	30
L10c	Newport Road	7.3	0.0	17,060	50
L11	Debden Road	5.0	0.0	7,263	35
L11a	Debden Road	6.5	0.0	7,139	35
L12	Borough Lane	5.5	0.0	4,127	40
L12a	Borough Lane/Debden Road	5.5	0.0	4,127	25
L13	Mount Pleasant Road	5.2	0.0	6,855	35
L14	Peasland Road	6.2	0.0	7,875	35
L15	Castle Street	5.5	0.0	3,818	30
L16	Church Street	4.8	0.0	6,261	25
L17	Chaters Hill	5.7	0.0	3,429	30
L17a	Chaters Hill	3.0	0.0	3,429	20
L18	Ashdon Road	7.3	0.0	8,178	25
L18a	Ashdon Road	5.9	0.0	8,178	40
L18b	Ashdon Road	4.4	0.0	8,178	35
L18c	Ashdon Road/Elizabeth Way	5.3	0.0	8,178	40
L19	Elizabeth Way	7.5	0.0	5,326	40
L19a	Elizabeth Way	7.0	0.0	5,326	25

Road Link		Road/ Canyon Width (m)	Canyon Height (m)	24-hour AADT Flow	Mean Vehicle Speed (km/h)
L20	Shire Hill	6.0	0.0	2,864	30

Table AII.2 2018 Traffic Data

Road Link		24-hour AADT Flow		HDV Proportion of Fleet (%)
		Do-minimum	Do-something	
L1	Radwinter Road	29,315	29,339	4.0
L1a	Radwinter Road into Saffron Walden	29,315	29,339	4.0
L1b	Radwinter Road/Horn Brook	15,092	16,078	4.0
L1c	Radwinter Road	15,092	16,078	4.0
L1d	Radwinter Road/Thaxted Road	15,092	16,078	4.0
L2	Thaxted Road	11,186	11,370	3.5
L2a	Thaxted Road/Peasland Road	14,307	14,411	3.4
L2b	Thaxted Road	14,257	14,257	2.9
L2c	Thaxted Road/Harris Yard	14,257	14,257	2.9
L2d	Thaxted Road	14,257	14,257	2.9
L2e	Thaxted Road/Radwinter Road	14,257	14,257	2.9
L3	George Street	9,435	9,501	3.6
L4	Hill Street	9,435	9,501	3.6
L5	Cates Corner	11,603	11,669	3.3
L5a	Cates Corner	12,851	12,917	3.1
L6	East Street	12,851	12,917	3.1
L6a	East Street/Audley Road	13,679	13,811	4.2
L6b	East Street	13,679	13,811	4.2
L7	Fairycroft Road	2,254	2,254	1.4
L8	Audley Road/East Street	7,977	8,043	4.6
L8a	Audley Road	7,977	8,043	4.6
L8b	Audley Road/Fairycroft Road	7,977	8,043	4.6
L8c	Audley Road	11,347	11,413	3.6

Road Link		24-hour AADT Flow		HDV Proportion of Fleet (%)
		Do-minimum	Do-something	
L8d	Audley Road/High Street	11,347	11,413	3.6
L9	Bridge Street	8,023	8,696	3.0
L9a	Bridge Street	8,023	8,696	3.0
L9b	High Street	13,628	13,968	3.5
L9c	High Street	9,141	9,141	3.5
L9d	High Street/George Street	9,141	9,141	3.5
L9e	High Street	16,071	16,137	4.8
L10	Debden Road	20,439	20,439	4.7
L10a	London Road	14,609	14,609	5.3
L10b	London Road/Newport Road	14,609	14,609	5.3
L10c	Newport Road	18,659	18,659	5.3
L11	Debden Road	8,166	8,166	3.3
L11a	Debden Road	8,053	8,053	2.4
L12	Borough Lane	4,795	5,713	4.6
L12a	Borough Lane/Debden Road	4,795	5,713	4.6
L13	Mount Pleasant Road	8,113	9,031	3.5
L14	Peasland Road	9,206	10,124	4.0
L15	Castle Street	4,121	4,454	2.6
L16	Church Street	6,832	7,172	3.0
L17	Chaters Hill	3,822	3,822	2.2
L17a	Chaters Hill	3,822	3,822	2.2
L18	Ashdon Road	9,173	9,978	2.6
L18a	Ashdon Road	9,173	9,978	2.6
L18b	Ashdon Road	9,084	9,889	2.6
L18c	Ashdon Road/Elizabeth Way	9,472	9,480	2.6
L19	Elizabeth Way	6,511	7,324	4.9
L19a	Elizabeth Way	6,511	7,324	4.9
L20	Shire Hill	3,067	4,171	13.3

It should be noted that both the DM and DS traffic data for 2018 includes the following

committed developments:

- Land adjacent to Civic Amenity and Recycling Centre;
- Extension to Tesco;
- Land at Friends School;
- Ashdon Road Commercial Centre, Ashdon Road, Saffron Walden, Essex; and,
- 60 bed care home.

Street Canyon

High Street is a narrow road in the centre of Saffron Walden. The link is also within a designated AQMA. Segments of this road are flanked by tall buildings on both sides. Therefore, this road link was input as a street canyon for the purpose of the dispersion modelling assessment. This addition allows the additional turbulent flow patterns occurring within a street with high structures on either side to be considered within the predicted concentrations. The height of the tallest building on the road link was included in the model to provide robust assessment results.

Emission Factors

Emission rates for NO_x for each link road were calculated from the information shown in Table All.1 and Table All.2 and the Emission factor Toolkit (version 5.2c). This incorporates updated COPERT4v8 vehicle emission factors for NO_x and vehicle fleet information.

There is current uncertainty over NO_2 concentrations within the UK, with roadside levels not reducing as previously expected due to the implementation of new vehicle emission standards. Therefore, 2012 emission factors have been utilised in preference to the development opening year in order to provide a robust assessment. However, it should be noted that 2018 traffic data was utilised in the assessment, which includes anticipated future growth. Therefore, predicted concentrations are likely to be an overestimate of actual concentrations, resulting in a worst-case scenario.

Meteorological Data

Meteorological data used in this assessment was taken from Stansted Meteorological station over the period 1st January 2012 to 31st December 2012 (inclusive). Stansted observation station is located at approximate NGR: 553591, 222509, which is approximately 16km south of the proposed development. DEFRA guidance LAQM.TG(09)[21] recommends meteorological stations within 30km of an assessment area as being suitable for detailed modelling.

All meteorological data used in the assessment was provided by Atmospheric Dispersion Modelling (ADM) Ltd, which is an established distributor of meteorological data within the UK. Reference should be made to Figure 6 for a wind rose of utilised meteorological data.

Roughness Length

For consistency with other assessments in the district, Janet O'Boyle Environmental Health

[21] Local Air Quality Management Technical Guidance LAQM.TG(09), DEFRA, 2009.

Officer at UDC requested the use of specific roughness lengths to be used at Stansted meteorological station and throughout the dispersion modelling area.

A roughness length (z_0) of 0.2m was used at Stansted airport. This value of z_0 is considered appropriate and is suggested within ADMS-Roads as being suitable for 'agricultural area (min)'.

A roughness length (z_0) of 0.5m was used in the dispersion modelling study. This value of z_0 is considered appropriate for the morphology of the dispersion modelling assessment area and is suggested within ADMS-Roads as being suitable for 'parkland, open suburbia'.

Monin-Obukhov Length

The Monin-Obukhov length provides a measure of the stability of the atmosphere. A minimum Monin-Obukhov length of 10m was used in this dispersion modelling study. This value is considered appropriate for the nature of the assessment area and is suggested within ADMS-Roads as being suitable for 'small towns < 50,000'.

Background Concentrations

An annual mean NO_2 concentration of 21.14µg/m^3, as measured by diffusion tube UT012 during 2012, was used to represent background levels in the vicinity of the site. This monitoring site was thought to represent a worst-case background location because it is distanced from main road sources but is still situated within the town centre, the main area of concern. As such, it is considered to provide a reasonable estimation of background pollutant concentrations for an assessment of this nature.

Similarly to emission factors, background concentrations for 2012 were utilised in preference to the development opening year. This provided a robust assessment and is likely to overestimate actual pollutant concentrations during the operation of the proposal.

NO_x to NO_2 Conversion

Predicted annual mean NO_x concentrations from the dispersion model were converted to NO_2 concentrations using the spreadsheet provided by DEFRA, which is the method detailed within LAQM.TG(09).

Verification

The predicted results from a dispersion model may differ from measured concentrations for a large number of reasons, including:

- Estimates of background concentrations;
- Uncertainties in source activity data such as traffic flows and emission factors;
- Variations in meteorological conditions;
- Overall model limitations; and,
- Uncertainties associated with monitoring data, including locations.

Model verification is the process by which these and other uncertainties are investigated and where possible minimised. In reality, the differences between modelled and monitored results are likely to be a combination of all of these aspects.

For the purpose of this assessment model verification was undertaken for 2012, using traffic data, meteorological data and monitoring results from this year.

UDC undertakes monitoring for NO_2 at thirteen locations within the modelling area. Six of these sites have been used for verification due to their roadside location within the AQMA with data capture of 75% or above during 2012.

The road contribution to total NO_x concentration was calculated from monitored NO_2 results following the methodology contained within DEFRA guidance LAQM.TG(09)[22]. The monitored annual mean NO_2 concentrations and calculated roadside NO_x concentrations are summarised in Table AII.3.

Table AII.3 2012 Monitoring Results

Monitoring Location		Monitored NO_2 Concentration ($\mu g/m^3$)	Calculated Roadside NO_x Concentration ($\mu g/m^3$)
Saffron Walden		22.86	3.44
UT001	Walden 1 PO High Street	38.67	38.51
UT005	Walden 5 Thaxted Road	46.08	57.62
UT011	Walden 11 33 High Street	33.57	26.43
UT013	Fire Station (co-located)*	22.68	3.07
UT030	Walden 18 Friends School	26.91	11.79

The dispersion model was run with the traffic input data previously detailed for 2012 to predict NO_x concentrations at the monitoring locations. The results are shown in Table AII.4.

Table AII.4 NO_x Verification Results

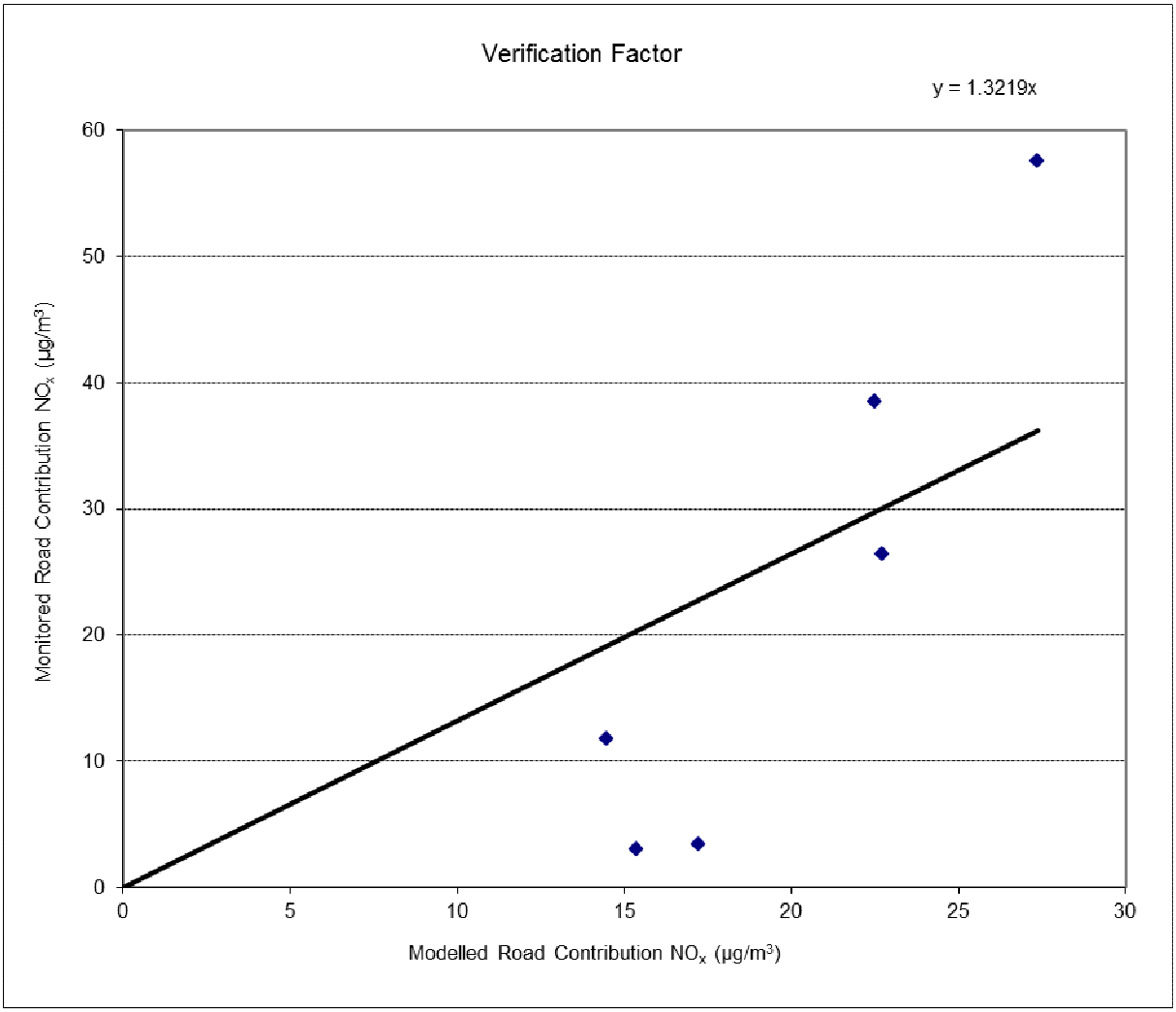
Monitoring Location		Monitored Roadside NO_x Concentration ($\mu g/m^3$)	Modelled Roadside NO_x Concentration ($\mu g/m^3$)
Saffron Walden		3.44	17.21
UT001	Walden 1 PO High Street	38.51	22.47
UT005	Walden 5 Thaxted Road	57.62	27.36
UT011	Walden 11 33 High Street	26.43	22.71
UT013	Fire Station (co-located)*	3.07	15.35
UT030	Walden 18 Friends School	11.79	14.45

The monitored and modelled NO_x road contribution concentrations were graphed and the

[22] Local Air Quality Management Technical Guidance LAQM.TG(09), DEFRA, 2009.

equation of the trendline based on linear progression though zero calculated. This indicated that a verification factor of **1.3219** was required to be applied to NO_x modelling results, as shown in Graph 1.

Graph 1 Verification Factor



UDC also undertakes monitoring of PM_{10} concentrations at the Saffron Walden continuous monitor. The monitored annual mean concentration was compared against the modelled total PM_{10}, as shown in Table All.6.

Table All.6 2012 PM_{10} Monitoring Results

Monitoring Location	Monitored Total PM_{10} ($\mu g/m^3$)	Modelled Roadside PM_{10} Contribution ($\mu g/m^3$)	Modelled Total PM_{10} including background ($\mu g/m^3$)
Saffron Walden	24.73	1.14	17.03

The ratio between monitored total PM_{10} and modelled total PM_{10} was calculated. This

indicated a verification factor of **1.4516** was required to be applied to the total PM_{10} modelling results.

APPENDIX III ASSESSOR'S CURRICULUM VITAE

JETHRO REDMORE

Manager - Air Quality Impact Group

BEng (Hons), MSc, MIAQM, MIEnvSc, AIEMA, CEnv

KEY EXPERIENCE:

Jethro is a Chartered Environmentalist with specialist experience in the air quality and odour sector. His key capabilities include:

- Production and management of Air Quality and Odour Assessments to DEFRA, Environment Agency and EPUK methodologies for a wide-range of clients from the retail, residential, infrastructure, commercial and industrial sectors.
- Significant proportion of assessments produced as part of over-arching Environmental Statements (ES) for large developments throughout the UK.
- Detailed dispersion modelling of road vehicle and industrial emissions using ADMS-ROADS, ADMS-5, AERMOD-PRIME and BREEZE-ROADS. Studies have included impact assessment of ground level pollutant and odour concentrations and assessment of suitability of development sites for proposed end-use.
- Project management and co-ordination of EIAs and scoping reports for developments throughout the UK.
- Design and project management of pollutant monitoring campaigns to define baseline conditions and inform future assessment in accordance with DEFRA and Environment Agency guidance.
- Co-ordination and management of large-scale multi-disciplinary projects and submissions.
- Provision of expert advice to local government and international environmental bodies.

PROJECTS SUMMARY:

Residential Developments

Project Maltravers, Sheffield - Air Quality Assessment for a residential development consisting of 114 units and associated infrastructure.

North Street, Rugby - Air Quality Assessment in support of the conversion of office space into residential units in Rugby centre.

North Wharf Gardens, London - peer review of Environmental Impact Assessment undertaken for residential development.

Wheatstone House, London - Air Quality Assessment of mixed use scheme in AQMA.

Elephant and Castle Leisure Centre - baseline Air Quality Assessment for redevelopment.

Brook House, Tottenham - Air Quality Assessment for large residential development.

Poplar Business Park, Tower Hamlets - Air Quality Assessment for residential development.

Bicester Ecotown - dispersion modelling of energy centre for Environmental Impact Assessment.

Castleford Growth Delivery Plan - baseline air quality constraints assessment for town redevelopment.

Temple Point, Leeds - Air Quality Assessment for residential development adjacent to M1.

Commercial and Retail Developments

Pleasington Lakes, Blackburn - Environmental Impact Assessment for holiday village adjacent to M65.

Wakefield College - Air Quality Assessment for redevelopment of city centre campus in AQMA.

Deptford Terrace, Sunderland - Air Quality Assessment for mixed use development.

Stonebridge Lane, Liverpool - Air Quality Assessment for large superstore, local centre and retail uses.

Witton Park School, Blackburn - biomass boiler feasibility assessment.

Manchester Airport Cargo Shed - Air Quality Assessment of commercial development.

New Crown Wood School, Greenwich - Air Quality Assessment of biomass boiler.

Basford West, Crewe - Air Quality Assessment of industrial and business park.

Farnworth Superstore - Air Quality Assessment in support of new food superstore.

Wild Rose Holiday Park, Cumbria - Environmental Impact Assessment for holiday park extension.

Coolmore Estates, Seaham - Environmental Impact Assessment in support of creative centre of excellence.

Morton District Shopping Centre, Carlisle - air quality Environmental Impact Assessment for commercial development.

Manchester Airport Apron Extension - Environmental Impact Assessment including aircraft emission modelling.

Industrial Developments

Yorkshire Feedstuffs, Goole - Air Quality Assessment of new biomass installation.

Maesgwyn Biomass Plant - Air Quality Assessment including ecological assessment.

Cottesmore Lane Waste Transfer Station - Air Quality Assessment of waste facility in Lincolnshire.

Barnes Wallis Heat and Power, Cobham - biomass facility adjacent to AQMA.

Countrystyle Biomass Plant, Kent - Environmental Impact Assessment for biomass facility.

Brook Bridge Poultry Farm - Ammonia dispersion modelling of quail farm.

Lauren Haynes

Graduate Air Quality Consultant

BSc (Hons), IEMA

KEY EXPERIENCE:

Lauren is a Graduate Environmental Consultant with specialist experience in the air quality sector. Her key capabilities include:

- Production of Air Quality Assessments to the Department for Environment, Food and Rural Affairs (DEFRA), Environment Agency and Environmental Protection UK (EPUK) methodologies for clients from the residential, retail, infrastructure and commercial sectors.
- Detailed dispersion modelling of road vehicle emissions using ADMS-Roads. Studies have included impact assessment of pollutant concentrations at various floor levels and assessment of suitability of development sites for proposed end-use.
- Assessment of road vehicle exhaust emissions using the Design Manual for Roads and Bridges (DMRB) calculation spreadsheet.
- Assessment of dust impacts from construction sites to the Institute of Air Quality Management (IAQM) methodology.
- Production of air quality mitigation strategies for developments throughout the UK.
- Defining baseline air quality conditions and identification of sensitive areas.

QUALIFICATIONS:

- Bachelor of Science
- Graduate IEMA

PROJECTS SUMMARY:

Mixed-Use Development, Rutherglen Low Carbon Zone, Glasgow

Air Quality Assessment in support of a mixed-use development consisting of a multi-purpose business space. Construction phase assessment of fugitive dust emissions in accordance with IAQM methodology was undertaken. Additionally, dispersion modelling of road vehicle exhaust emissions was undertaken using ADMS-Roads to provide consideration of potential impacts to the surrounding area as a result of the proposals. Impacts were not predicted to be significant at any sensitive receptors in the vicinity of the site and no mitigation was required.

Residential Development, Land at Former Cathedral Choir School, Whitcliffe Lane, Ripon

Air Quality Assessment in support of the development of 98 residential units. The site had the potential to create adverse impacts to sensitive receptors in the vicinity of the site during both the construction and operational phases. These impacts were assessed using the DMRB Calculation spreadsheet. The potential impacts on NO_2 and PM_{10} concentrations were assessed and determined to be negligible for both the construction and operational phases of the development. Therefore, air quality was not considered to be a constraint to planning consent.

Retail Development, Aldi Stores Ltd, Chelmsford

Air Quality Assessment in support of a new retail development in Chelmsford. The site is located on the edge of an Air Quality Management Area and therefore, there were concerns that traffic generated by the scheme could have adverse effects to both the AQMA and sensitive receptors in the vicinity of the site. Dispersion modelling of road vehicle exhaust emissions was completed using ADMS Roads. Changes in concentrations of both NO_2 and PM_{10} were predicted to be negligible at all sensitive receptors and within the AQMA. Therefore, air quality was not considered a planning constraint.

Educational and Residential Development, Romford Road, London

Air Quality Assessment in support of the creation of a mixed use development comprising an educational college and seven residential units. The development was located within Newham AQMA. Residential units were proposed on each of the buildings four storeys. Therefore, there was potential for future residents to be exposed to elevated pollution concentrations. Dispersion modelling was undertaken over all floors using ADMS-Roads to consider site suitability for the proposed end-use. As a result of the modelling, suitable mitigation techniques, including mechanical ventilation and non-opening windows were suggested for both the ground and first floor.

Residential Development, Borough High Street, Southwark

Air Quality Assessment in support of change of use to five residential units. Dispersion modelling of road vehicle exhaust emissions was completed using ADMS-Roads. Due to the site location, within central London, the AQLV for NO_2 was exceeded on each of the developments four floors. Therefore, in order to protect future residents a mechanical ventilation system combined with NOx filtration was suggested.