Air Quality Assessment

Wrexham Road, Holt

Client: Pridding Farming Partnership

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Executive Summary

Redmore Environmental Ltd was commissioned by Pridding Farming Partnership Limited to undertake an Air Quality Assessment in support of a planning application for a residential development on land off Wrexham Road, Holt.

The development may lead to the exposure of future residents to any existing air quality issues at the site, as well as adverse air quality impacts at sensitive locations during the construction and operational phases. As such, an Air Quality Assessment was undertaken in order to determine baseline conditions, consider location suitability for the proposed end-use and assess potential impacts associated with the scheme.

Potential construction phase air quality impacts from fugitive dust emissions were assessed as a result of demolition, earthworks, construction and trackout activities. It is considered that the use of good practice control measures would provide suitable mitigation for a development of this size and nature and reduce potential impacts to an acceptable level.

During the operational phase of the development there is the potential for the exposure of future residents to elevated pollution levels. Dispersion modelling was therefore undertaken in order to predict concentrations across the proposed development site as a result of emissions from the highway network. Results were subsequently verified using local monitoring data.

The dispersion modelling assessment indicated that predicted pollution levels were below the relevant criteria at all locations across the development. The site is therefore considered suitable for the proposed use from an air quality perspective.

During the operational phase of the development there is the potential for air quality impacts as a result of traffic exhaust emissions associated with vehicles travelling to and from the site. Due to the low number of vehicle movements from the proposals, road traffic exhaust impacts were not predicted to be significant.

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

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1.0 INTRODUCTION

1.1 Background

1.1.1 Redmore Environmental Ltd was commissioned by Pridding Farm Partnership Limited to undertake an Air Quality Assessment in support of a planning application for a residential development on land off Wrexham Road, Holt.

1.1.2 The development may lead to the exposure of future residents to any existing air quality issues at the site, as well as adverse air quality impacts at sensitive locations during the construction and operational phases. As such, an Air Quality Assessment was undertaken in order to determine baseline conditions, consider location suitability for the proposed end-use and assess potential impacts associated with the scheme.

1.2 Site Location and Context

1.2.1 The site is located on land off Wrexham Road, Holt at approximate National Grid Reference (NGR): 340605, 353382. Reference should be made to Figure 1 for a map of the site and surrounding area.

1.2.2 The proposals comprise the demolition of existing buildings and subsequent construction of 39 residential units alongside associated infrastructure and landscaping.

1.2.3 The proposals have the potential to cause impacts at sensitive locations during the construction and operational phases. These may include fugitive dust emissions associated with construction works and road traffic exhaust emissions from vehicles travelling to and from the development during the operational phase. There is also the potential for the exposure of future residents to any existing air quality issues at the site. An Air Quality Assessment was therefore undertaken in order to determine baseline conditions and consider potential air quality effects as a result of the scheme. This is detailed in the following report.

2.0 LEGISLATION AND POLICY

2.1 Legislation

2.1.1 The Air Quality Standards (Wales) Regulations (2010) and subsequent amendments include Air Quality Limit Values (AQLVs) for the following pollutants:

- Nitrogen dioxide (NO_2);
- Sulphur dioxide;
- Lead;
- Particulate matter with an aerodynamic diameter of less than 10µm (PM_{10});
- Particulate matter with an aerodynamic diameter of less than 2.5µm ($PM_{2.5}$);
- Benzene; and,
- Carbon monoxide.

2.1.2 Air Quality Target Values were also provided for several additional pollutants. It should be noted that the AQLV for $PM_{2.5}$ stated in the Air Quality Standards Regulations (2010) was amended in the Environment (Miscellaneous Amendments) (EU Exit) Regulations (2020).

2.1.3 The Air Quality Strategy (AQS) was produced by Department for Environment, Food and Rural Affairs (DEFRA) and published in July 2007[1]. The document contains standards, objectives and measures for improving ambient air quality, including a number of Air Quality Objectives (AQOs). These are maximum ambient pollutant concentrations that are not to be exceeded either without exception or with a permitted number of exceedances over a specified timescale. These are generally in line with the AQLVs, although the requirements for the determination of compliance vary.

2.1.4 Table 1 presents the AQOs and AQLVs for pollutants considered within this assessment.

Table 1 Air Quality Objectives/Air Quality Limit Values

Pollutant	Air Quality Objective/Air Quality Limit Value	
	Concentration (µg/m³)	Averaging Period
NO_2	40	Annual mean

[1] The Air Quality Strategy for England, Scotland and Northern Ireland, DEFRA, 2007.

Pollutant	Air Quality Objective/Air Quality Limit Value	
	Concentration (µg/m³)	Averaging Period
	200	1-hour mean, not to be exceeded on more than 18 occasions per annum
PM_{10}	40	Annual mean
	50	24-hour mean, not to be exceeded on more than 35 occasions per annum
$PM_{2.5}$	20	Annual mean

2.1.5 The Environment Act (2021) was published on 9th November 2021 and makes provision for the setting of lower $PM_{2.5}$ targets. The final criteria will be included in legislation to be put before parliament by 31st October 2022. Prior to this time the AQLV outlined in Table 1 remains the adopted air quality standard within the UK.

2.1.6 Table 2 summarises the advice provided in DEFRA guidance[2] on where the AQOs for pollutants considered within this report apply.

Table 2 Examples of Where the Air Quality Objectives Apply

Averaging Period	Objective Should Apply At	Objective Should Not Apply At
Annual mean	All locations where members of the public might be regularly exposed Building façades of residential properties, schools, hospitals, care homes etc.	Building façades of offices or other places of work where members of the public do not have regular access Hotels, unless people live there as their permanent residence Gardens of residential properties Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term
24-hour mean	All locations where the annual mean objective would apply, together with hotels Gardens of residential properties	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term

[2] Local Air Quality Management Technical Guidance (TG16), DEFRA, 2021.

Averaging Period	Objective Should Apply At	Objective Should Not Apply At
1-hour mean	All locations where the annual mean and 24 and 8-hour mean objectives apply. Kerbside sites (for example, pavements of busy shopping streets) Those parts of car parks, bus stations and railway stations etc which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more Any outdoor locations where members of the public might reasonably be expected to spend one hour or longer	Kerbside sites where the public would not be expected to have regular access

2.2 Local Air Quality Management

2.2.1 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 comparing present and likely future pollutant concentrations against the AQOs. If it is predicted that levels at locations of relevant exposure, as summarised in Table 2, are likely to be exceeded, the LA is required to declare an Air Quality Management Area (AQMA). For each AQMA the LA is required to produce an Air Quality Action Plan, the objective of which is to reduce pollutant concentrations in pursuit of the AQOs.

2.3 Dust

2.3.1 The main requirements with respect to dust control from industrial or trade premises not regulated under the Environmental Permitting (England and Wales) Regulations (2016) 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."

2.3.2 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). 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 practicable means.

2.4 National Planning Policy

2.4.1 Planning Policy Wales[3] was published in February 2021 and sets out the land use planning policies of the Welsh Government, including air quality. Chapter 6, Section 6.7 - Air Quality and Soundscape, provides a framework for addressing air quality and states that:

> "The planning system should maximise its contribution to achieving the well-being goals, and in particular a healthier Wales, by aiming to reduce average population exposure to air and noise pollution alongside action to tackle high pollution hotspots. In doing so, it should consider the long-term effects of current and predicted levels of air and noise pollution on individuals, society and the environment and identify and pursue any opportunities to reduce, or at least, minimise population exposure to air and noise pollution, and improve soundscapes, where it is practical and feasible to do so.
>
> […]
>
> In proposing new development, planning authorities and developers must, therefore:
>
> • address any implication arising as a result of its association with, or location within, air quality management areas, noise action planning priority areas or areas where there are sensitive receptors;
> • not create areas of poor air quality or inappropriate soundscape; and,
> • seek to incorporate measures which reduce overall exposure to air and noise pollution and create appropriate soundscapes."

2.4.2 This has been considered throughout this assessment.

[3] Planning Policy Wales Edition 11, Welsh Assembly Government, 2021.

2.5 Local Planning Policy

2.5.1 The Wrexham Unitary Development Plan[4] (WUDP) 1996 - 2011 was adopted by Wrexham County Borough Council (WCBC) on 14th February 2005. A review of the WUDP identified the following policy of relevance to this assessment:

> "Policy GDP1
>
> All new development should:-
>
> […]
>
> f) Ensure the safety and amenity of the public and safeguard the environment from the adverse effects of pollution of water, land or air, hazards from industry and quarrying, and associated noise, odour or vibration arising from development.
>
> […]
>
> k) Secure the development of sustainable communities, through the promotion of the economic, social and environmental well-being of the area."

2.5.2 This policy has been considered throughout the undertaking of this assessment.

[4] WUDP 1996 - 2011, WCBC, 2005.

3.0 METHODOLOGY

3.1 Introduction

3.1.1 The proposed development has the potential to exposure future residents to elevated pollution levels, as well as cause air quality impacts during the construction and operational phases. These issues have been assessed in accordance with the following methodology.

3.2 Construction Phase Assessment

3.2.1 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 Dust from Demolition and Construction V1.1'[5].

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

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

3.2.3 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}.

3.2.4 The assessment steps are detailed below.

[5] Guidance on the Assessment of Dust from Demolition and Construction V1.1, IAQM, 2016.

Step 1

3.2.5 Step 1 screens the requirement for a more detailed assessment. Should human receptors be identified within 350m from the boundary or 50m from the construction vehicle route up to 500m from the site entrance, then the assessment proceeds to Step 2. Additionally, should ecological receptors be identified within 50m of the site or the construction vehicle route up to 500m from the site entrance, then the assessment also proceeds to Step 2.

3.2.6 Should sensitive receptors not be present within the relevant distances then **negligible** impacts would be expected and further assessment is not necessary.

Step 2

3.2.7 Step 2 assesses the risk of potential dust impacts. A site is allocated 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 (Step 2A); and,
- The sensitivity of the area to dust impacts, which can be defined as low, medium or high sensitivity (Step 2B).

3.2.8 The two factors are combined in Step 2C to determine the risk of dust impacts without mitigation applied.

3.2.9 Step 2A defines the potential magnitude of dust emission through the construction phase. The relevant criteria are summarised in Table 3.

Table 3 Construction Dust - Magnitude of Emission

Magnitude	Activity	Criteria
Large	Demolition	• Total volume of building to be demolished greater than 50,000m^3 • Potentially dusty material (e.g. concrete) • On-site crushing and screening • Demolition activities more than 20m above ground level

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 • On site concrete batching • Sandblasting
	Trackout	• More than 50 Heavy Duty Vehicle (HDV) trips per day • Potentially dusty surface material (e.g. high clay content) • Unpaved road length greater than 100m
Medium	Demolition	• Total volume of building to be demolished between 20,000m^3 and 50,000m^3 • Potentially dusty construction material • Demolition activities 10m to 20m above ground level
	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) • On site concrete batching
	Trackout	• 10 to 50 HDV trips per day • Moderately dusty surface material (e.g. high clay content) • Unpaved road length 50m to 100m
Small	Demolition	• Total volume of building to be demolished less than 20,000m^3 • Construction material with low potential for dust release (e.g. metal cladding or timber) • Demolition activities less than 10m above ground and during wetter months

Magnitude	Activity	Criteria
	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 20,000 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)
	Trackout	• Less than 10 HDV trips per day • Surface material with low potential for dust release • Unpaved road length less than 50m

3.2.10 Step 2B defines the sensitivity of the area around the development to potential dust impacts. The influencing factors are shown in Table 4.

Table 4 Construction Dust - Examples of Factors Defining Sensitivity of an Area

Receptor Sensitivity	Examples	
	Human Receptors	Ecological Receptors
High	• Users expect high levels of amenity • High aesthetic or value property • People expected to be present continuously for extended periods of time • Locations where members of the public are exposed over a time period relevant to the AQO for PM_{10}. e.g. residential properties, hospitals, schools and residential care homes	• Internationally or nationally designated site e.g. Special Area of Conservation
Medium	• Users would expect to enjoy a reasonable level of amenity • Aesthetics or value of their property could be diminished by soiling • People or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land e.g. parks and places of work	• Nationally designated site e.g. Sites of Special Scientific Interest

Receptor Sensitivity	Examples	
	Human Receptors	Ecological Receptors
Low	• Enjoyment of amenity would not reasonably be expected • Property would not be expected to be diminished in appearance • Transient exposure, where people would only be expected to be present for limited periods. e.g. public footpaths, shopping streets, playing fields, farmland, short term car parks and roads	• Locally designated site e.g. Local Nature Reserve

3.2.11 The guidance also provides the following factors to consider when determining the sensitivity of an area to potential dust impacts:

- Any history of dust generating activities in the area;
- The likelihood of concurrent dust generating activity on nearby sites;
- Any pre-existing screening between the source and receptors;
- Any conclusions drawn from analysing local meteorological data which accurately represent the area; and if relevant the season during which works will take place;
- Any conclusions drawn from local topography;
- Duration of the potential impact, as a receptor may become more sensitive over time; and,
- Any known specific receptor sensitivities which go beyond the classifications given in the document.

3.2.12 These factors were considered in the undertaking of this assessment.

3.2.13 The criteria for determining the sensitivity of the area to dust soiling effects on people and property is summarised in Table 5.

Table 5 Construction Dust - Sensitivity of the Area to Dust Soiling Effects on People and Property

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)			
		Less than 20	Less than 50	Less than 100	Less than 350
High	More than 100	High	High	Medium	Low
	10 - 100	High	Medium	Low	Low

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)			
		Less than 20	Less than 50	Less than 100	Less than 350
	1 - 10	Medium	Low	Low	Low
Medium	More than 1	Medium	Low	Low	Low
Low	More than 1	Low	Low	Low	Low

3.2.14 Table 6 outlines the criteria for determining the sensitivity of the area to human health impacts.

Table 6 Construction Dust - Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Background Annual Mean PM_{10} Concentration	Number of Receptors	Distance from the Source (m)				
			Less than 20	Less than 50	Less than 100	Less than 200	Less than 350
High	Greater than 32µg/m^3	More than 100	High	High	High	Medium	Low
		10 - 100	High	High	Medium	Low	Low
		1 - 10	High	Medium	Low	Low	Low
	28 - 32µg/m^3	More than 100	High	High	Medium	Low	Low
		10 - 100	High	Medium	Low	Low	Low
		1 - 10	High	Medium	Low	Low	Low
	24 - 28µg/m^3	More than 100	High	Medium	Low	Low	Low
		10 - 100	High	Medium	Low	Low	Low
		1 - 10	Medium	Low	Low	Low	Low
	Less than 24µg/m^3	More than 100	Medium	Low	Low	Low	Low
		10 - 100	Low	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
Medium	Greater than 32µg/m^3	More than 10	High	Medium	Low	Low	Low
		1 - 10	Medium	Low	Low	Low	Low

Receptor Sensitivity	Background Annual Mean PM_{10} Concentration	Number of Receptors	Distance from the Source (m)				
			Less than 20	Less than 50	Less than 100	Less than 200	Less than 350
	28 - 32µg/m^3	More than 10	Medium	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
	24 - 28µg/m^3	More than 10	Low	Low	Low	Low	Low
		1 -10	Low	Low	Low	Low	Low
	Less than 24µg/m^3	More than 10	Low	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
Low	-	1 or more	Low	Low	Low	Low	Low

3.2.15 Table 7 outlines the criteria for determining the sensitivity of the area to ecological impacts.

Table 7 Construction Dust - Sensitivity of the Area to Ecological Impacts

Receptor Sensitivity	Distance from the Source (m)	
	Less than 20	Less than 50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

3.2.16 Step 2C combines the dust emission magnitude with the sensitivity of the area to determine the risk of unmitigated impacts.

3.2.17 Table 8 outlines the risk category from demolition activities.

Table 8 Construction Dust - Dust Risk Category from Demolition Activities

Receptor Sensitivity	Dust Emission Magnitude		
	Large	Medium	Small
High	High	Medium	Medium
Medium	High	Medium	Low
Low	Low	Low	Negligible

3.2.18 Table 9 outlines the risk category from earthworks and construction activities.

Table 9 Construction Dust - Dust Risk Category from Earthworks and Construction Activities

Receptor Sensitivity	Dust Emission Magnitude		
	Large	Medium	Small
High	High	Medium	Low
Medium	Medium	Medium	Low
Low	Low	Low	Negligible

3.2.19 Table 10 outlines the risk category from trackout activities.

Table 10 Construction Dust - Dust Risk Category from Trackout Activities

Receptor Sensitivity	Dust Emission Magnitude		
	Large	Medium	Small
High	High	Medium	Low
Medium	Medium	Low	Negligible
Low	Low	Low	Negligible

Step 3

3.2.20 Step 3 requires the identification of site specific mitigation measures within the IAQM guidance[6] to reduce potential dust impacts based upon the relevant risk categories identified in Step 2. For sites with **negligible** risk, mitigation measures beyond those required by legislation are not required. However, additional controls may be applied as part of good practice.

Step 4

3.2.21 Once the risk of dust impacts has been determined and the appropriate mitigation measures identified, the final step is to determine the significance of any residual impacts. For almost all construction activity, the aim should be to control effects through the use of effective mitigation. Experience shows that this is normally possible. Hence the residual effect will normally be **not significant**.

3.2.22 The determination of significance relies on professional judgement and reasoning should be provided as far as practicable. The IAQM guidance suggests the provision of details of the assessor's qualifications and experience. These are provided in Appendix 2.

3.3 Operational Phase Assessment

Potential Future Exposure

3.3.1 The proposals have the potential to expose future residents to elevated pollution levels. In order to assess NO_2, PM_{10} and $PM_{2.5}$ concentrations across the development site, detailed dispersion modelling was undertaken. Reference should be made to Appendix 1 for a full description of the assessment input data.

3.3.2 The dispersion modelling results were compared against the relevant AQOs and AQLV in order to determine the potential for exposure of future residents to elevated pollutant concentrations and identify appropriate mitigation, if necessary.

6 Guidance on the Assessment of Dust from Demolition and Construction V1.1, IAQM, 2016.

Potential Development Impacts

3.3.3 The development has the potential to increase concentrations of NO_2, PM_{10} and $PM_{2.5}$ as a result of road traffic exhaust emissions associated with vehicles travelling to and from the site during the operational phase. An assessment was therefore undertaken using the criteria contained within the IAQM 'Land-Use Planning & Development Control: Planning for Air Quality'[7] guidance to determine the potential for trips generated by the development to affect local air quality.

3.3.4 The following criteria are provided to help establish when an assessment of potential road traffic impacts on the local area is likely to be considered necessary:

- A change of Light Duty Vehicle (LDV) flows of more than 100 Annual Average Daily Traffic (AADT) within or adjacent to an AQMA or more than 500 AADT elsewhere;
- A change of HDV flows of more than 25 AADT within or adjacent to an AQMA or more than 100 AADT elsewhere;
- Realignment of roads where the change is 5m or more and the road is within an AQMA; or,
- Introduction of a new junction or removal of an existing junction near to relevant receptors.

3.3.5 Should these criteria not be met, then the IAQM guidance[8] considers air quality impacts associated with a scheme to be **not significant** and no further assessment is required.

3.3.6 Should screening of the relevant data indicate that any of the above criteria are met, then potential impacts at sensitive receptor locations can be assessed by calculating the change in pollutant concentrations as a result of the proposed development. The significance of predicted impacts can then be determined in accordance with the methodology outlined in the IAQM guidance[9].

7 Land-Use Planning & Development Control: Planning for Air Quality, IAQM, 2017.

8 Land-Use Planning & Development Control: Planning for Air Quality, IAQM, 2017.

9 Land-Use Planning & Development Control: Planning for Air Quality, IAQM, 2017.

4.0 BASELINE

4.1 Introduction

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

4.2 Local Air Quality Management

4.2.1 As required by the Environment Act (1995), WCBC has undertaken Review and Assessment of air quality within their area of jurisdiction. This process has indicated that concentrations of all pollutants considered within the AQS are currently below the relevant AQOs. As such, no AQMAs have been designated within the county.

4.3 Air Quality Monitoring

4.3.1 Monitoring of pollutant concentrations is undertaken by WCBC throughout their area of jurisdiction. Recent annual mean NO_2 concentrations recorded in the vicinity of the development are shown in Table 11.

Table 11 Monitoring Results - NO_2

Monitoring Site		Monitored Annual Mean NO_2 Concentration (µg/m³)		
		2018	2019	2020
42	Llan-Y-Pwll	23.2	20.6	17.1
60	St Pauls School	-	7.7	6.8

4.3.2 As shown in Table 11, annual mean NO_2 concentrations were below the relevant AQO at both monitoring locations in recent years.

4.3.3 It should be noted that pollutant concentrations during 2020 were lower than previous years due to a reduction in road traffic and associated emissions caused by the COVID-19 pandemic. The results should therefore be viewed with caution.

4.3.4 Reference should be made to Figure 2 for a map of the survey positions.

4.3.5 WCBC do not undertake monitoring of PM_{10} or $PM_{2.5}$ within the vicinity of the proposed development.

4.4 Background Pollutant Concentrations

4.4.1 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: 340500, 353500. Data for this location was downloaded from the DEFRA website[10] for the purpose of the assessment and is summarised in Table 12.

Table 12 Background Pollutant Concentration Predictions

Pollutant	Predicted Background Pollutant Concentration (µg/m³)		
	2019	2022	2027
NO_2	6.89	6.18	5.43
PM_{10}	11.75	11.32	10.96
$PM_{2.5}$	7.10	6.76	6.46

4.4.2 As shown in Table 12, predicted background NO_2, PM_{10} and $PM_{2.5}$ concentrations are below the relevant AQOs and AQLV at the development site.

4.5 Sensitive Receptors

4.5.1 A sensitive receptor is defined as any location which may be affected by changes in air quality as a result of a development. Receptors sensitive to potential dust impacts during demolition, 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 13.

Table 13 Demolition, Earthworks and Construction Dust Sensitive Receptors

Distance from Site Boundary (m)	Approximate Number of Human Receptors	Approximate Number of Ecological Receptors
Up to 20	10 - 100	0

[10] http://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018.

Distance from Site Boundary (m)	Approximate Number of Human Receptors	Approximate Number of Ecological Receptors
Up to 50	10 - 100	0
Up to 100	More than 100	-
Up to 350	More than 100	-

4.5.2 Receptors sensitive to potential dust impacts from trackout were identified from a desk-top study of the area up to 50m from the road network within 500m of the site access. These are summarised in Table 14.

Table 14 Trackout Dust Sensitive Receptors

Distance from Site Access Route (m)	Approximate Number of Human Receptors	Approximate Number of Ecological Receptors
Up to 20	More than 100	0
Up to 50	More than 100	0

4.5.3 There are no ecological receptors within 50m of the development boundary or the access route within 500m of the site entrance. As such, ecological impacts have not been assessed further within this report.

4.5.4 A number of additional factors have been considered when determining the sensitivity of the surrounding area. These are summarised in Table 15.

Table 15 Additional Area Sensitivity Factors to Potential Dust Impacts

Guidance	Comment
Whether there is any history of dust generating activities in the area	The baseline study indicated that construction of 24 residential dwellings is underway adjacent to the site (planning ref: P/2013/0823). As such, it is possible that there has been a history of dust generation in the area
The likelihood of concurrent dust generating activity on nearby sites	As outlined above, construction of 24 residential dwellings is underway adjacent to the site. It is therefore possible that there will be concurrent dust generation should the construction phases of this scheme and the proposals overlap

Guidance	Comment
Pre-existing screening between the source and the receptors	The site is bordered by a dense cover of shrubs and trees along the southern, eastern and western border. These may screen dust emissions to receptors in these directions
Conclusions drawn from analysing local meteorological data which accurately represent the area: and if relevant the season during which works will take place	As shown in Figure 3, the predominant wind bearing at the site is from the south-west. As such, receptors to the north-east of the boundary are most likely to be affected by dust releases
Conclusions drawn from local topography	There are no significant topographical constraints to dust dispersion
Duration of the potential impact, as a receptor may become more sensitive over time	Currently it is unclear as to the duration of the construction phase. However, it is likely that it will extend over one year. The sensitivity of the surrounding area is unlikely to change over this period
Any known specific receptor sensitivities which go beyond the classifications given in the document	No specific receptor sensitivities identified during the baseline assessment

4.5.5 Based on the criteria shown in Table 4, the sensitivity of the receiving environment to potential dust impacts was determined as **high**. This was because the identified receptors included residential properties.

4.5.6 The sensitivity of the receiving environment to specific potential dust impacts, based on the criteria shown in Section 3.2, is shown in Table 16.

Table 16 Sensitivity of the Surrounding Area to Potential Dust Impacts

Potential Impact	Sensitivity of the Surrounding Area			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	High	High	High	High
Human Health	Low	Low	Low	Medium

5.0 ASSESSMENT

5.1 Introduction

5.1.1 The proposal has the potential to expose future residents to elevated pollution levels, as well as cause adverse air quality impacts at sensitive locations. These factors are assessed in the following Sections.

5.2 Construction Phase Assessment

Step 1

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

5.2.2 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.

5.2.3 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.

Step 2

Demolition

5.2.4 Demolition will be undertaken at the start of the construction phase and will involve clearance of existing buildings on site. It is estimated that the total building volume to be demolished is less than 20,000m^3. In accordance with the criteria outlined in Table 3, the magnitude of potential dust emissions from demolition is therefore **small**.

5.2.5 Table 16 indicates the sensitivity of the area to dust soiling effects on people and property is **high**. In accordance with the criteria outlined in Table 8, the development is considered to be a **medium** risk site for dust soiling as a result of demolition activities.

5.2.6 Table 16 indicates the sensitivity of the area to human health impacts is **low**. In accordance with the criteria outlined in Table 8, the development is considered to be a **negligible** risk site for human health impacts as a result of demolition activities.

Earthworks

5.2.7 Earthworks may involve excavating material, haulage, tipping and stockpiling. The area of the proposed development site is greater than 10,000m^2. In accordance with the criteria outlined in Table 3, the magnitude of potential dust emissions from earthworks is therefore **large**.

5.2.8 Table 16 indicates the sensitivity of the area to dust soiling effects on people and property is **high**. In accordance with the criteria outlined in Table 9, the development is considered to be a **high** risk site for dust soiling as a result of earthworks.

5.2.9 Table 16 indicates the sensitivity of the area to human health impacts is **low**. In accordance with the criteria outlined in Table 9, the development is considered to be a **low** risk site for human health impacts as a result of earthworks.

Construction

5.2.10 Due to the size of the proposals, the total building volume was estimated to be less than 25,000m^3. In accordance with the criteria outlined in Table 3, the magnitude of potential dust emissions from construction is therefore **small**.

5.2.11 Table 16 indicates the sensitivity of the area to dust soiling effects on people and property is **high**. In accordance with the criteria outlined in Table 9, the development is considered to be a **low** risk site for dust soiling as a result of construction activities.

5.2.12 Table 16 indicates the sensitivity of the area to human health impacts is **low**. In accordance with the criteria outlined in Table 9, the development is considered to be a **negligible** risk site for human health impacts as a result of construction activities.

Trackout

5.2.13 Based on the site area, it is anticipated that the unpaved road length will be between 50m to 100m. In accordance with the criteria outlined in Table 3, the magnitude of potential dust emissions from trackout is therefore **medium**.

5.2.14 Table 16 indicates the sensitivity of the area to dust soiling effects to people and property is **high**. In accordance with the criteria outlined in Table 10, the development is considered to be a **medium** risk site for dust soiling as a result of trackout activities.

5.2.15 Table 16 indicates the sensitivity of the area to human health impacts is **medium**. In accordance with the criteria outlined in Table 10, the development is considered to be a **low** risk site for human health impacts as a result of trackout activities.

Summary of the Risk of Dust Effects

5.2.16 A summary of the risk from each dust generating activity is provided in Table 17.

Table 17 Summary of Potential Unmitigated Dust Risks

Potential Impact	Risk			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Medium	High	Low	Medium
Human Health	Negligible	Low	Negligible	Low

5.2.17 As indicated in Table 17, the potential risk of dust soiling is **high** from earthworks, **medium** from demolition and trackout and **low** from construction. The potential risk of human health effects is **low** from earthworks and trackout and **negligible** from demolition and construction.

5.2.18 It should be noted that the potential for impacts depends significantly on the distance between the dust generating activity and receptor location. Risk was 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.

Step 3

5.2.19 The IAQM guidance[11] provides potential mitigation measures to reduce impacts as a result of fugitive dust emissions during the construction phase. These have been adapted for the development site as summarised in Table 18. These may be reviewed prior to the commencement of construction works and incorporated into a Construction Environmental Management Plan or similar if required by the LA.

Table 18 Fugitive Dust Emission Mitigation Measures

Issue	Control Measure
Communications	• Develop and implement a stakeholder communications plan that includes community engagement before work commences on site. • Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager • Display the head or regional office contact information • Develop and implement a Dust Management Plan (DMP) or similar, which may include measures to control other emissions, approved by the LA
Site management	• Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken • Make the complaints log available to the LA upon request • Record any exceptional incidents that cause dust and/or air emissions, either on- or off- site, and the action taken to resolve the situation in the log book
Monitoring	• Undertake daily on-site and off-site inspection to monitor dust, record inspection results, and make the log available to the LA upon request • Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the LA upon request • Increase the frequency of site inspections when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions

[11] Guidance on the Assessment of Dust from Demolition and Construction V1.1, IAQM, 2017.

Issue	Control Measure
Site preparation	• Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible • Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site • Fully enclose specific operations where there is a high potential for dust production and they are active for an extensive period • Avoid site runoff of water or mud • Keep site fencing, barriers and scaffolding clean using wet methods • Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used • Cover, seed or fence stockpiles to prevent wind whipping
Operating vehicle/machinery and sustainable travel	• Ensure all vehicles switch off engines when stationary - no idling vehicles • Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable • Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials
Operations	• Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques • Ensure an adequate water supply on the site for effective dust suppression, using non-potable water where possible and appropriate • Use enclosed chutes and conveyors and covered skips • Minimise drop heights and use fine water sprays wherever appropriate • Ensure equipment is available to clean any dry spillages, and clean up spillages as soon as reasonably practicable using wet cleaning methods
Waste management	• Avoid bonfires and burning of waste materials
Earthworks	• Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable • Use Hessian, mulches or tackifiers where it is not possible to re-vegetate or cover topsoil, as soon as practicable • Only remover the cover in small areas during work and not all at once
Construction	• Avoid scabbling (roughening of concrete surfaces), if possible • Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out • Ensure bulk cement and other fine powder materials are delivered in enclosed tankers to prevent escape of material and overfilling during delivery

Issue	Control Measure
Trackout	• Use water-assisted dust sweeper on access and local roads, if required • Avoid dry sweeping of large areas • Ensure vehicles entering and leaving site are covered to prevent escape of materials • Implement a wheel washing system, if required • Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits • Access gates to be located at least 10m from receptors where possible

Step 4

5.2.20 Assuming the relevant mitigation measures outlined in Table 18 are implemented, the residual impact from all dust generating activities is predicted to be **not significant**, in accordance with the IAQM guidance[12].

5.3 Operational Phase Assessment

Potential Future Exposure

5.3.1 The proposed development has the potential to expose future residents to elevated pollution levels. Dispersion modelling was therefore undertaken with the inputs described in Appendix 1 to quantify air quality conditions at the site. Reference should be made to Figures 4, 5 and 6 for graphical representations of predicted annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations.

5.3.2 As shown in Figure 4, annual mean NO_2 concentrations were predicted to be below the AQO of 40µg/m^3 across the site. The maximum level at the boundary was 20.71µg/m^3.

5.3.3 As shown in Figure 5, annual mean PM_{10} concentrations were predicted to be below the AQO of 40µg/m^3 at all locations across the site. The maximum level at the boundary was 13.00µg/m^3.

[12] Guidance on the Assessment of Dust from Demolition and Construction V1.1, IAQM, 2016.

5.3.4 As shown in Figure 6, annual mean $PM_{2.5}$ concentrations were predicted to be below the AQLV of 20µg/m^3 at all locations across the site. The maximum level at the boundary was 9.26µg/m^3.

5.3.5 Based on the assessment results, future residents are not predicted to be exposed to pollutant concentrations above the relevant AQOs and AQLV. As such, the site is considered suitable for the proposed use from an air quality perspective.

Potential Development Impacts

5.3.6 Any vehicle movements associated with the proposals will generate exhaust emissions on the local and regional road networks. Information provided by Eddisons, the Transport Consultants for the project, indicated that the development is predicted to produce 164 daily vehicle movements.

5.3.7 Based on the provided information, the development is not predicted to result in an increase in AADT flows of more than 500 on any individual road link, include significant highway realignment or the introduction of a junction and there will not be a requirement for more than 100 HDV deliveries per day. As such, potential air quality impacts associated with operational phase road vehicle exhaust emissions are predicted to be **not significant**, in accordance with the IAQM screening criteria shown in Section 3.3.

6.0 CONCLUSION

6.1.1 Redmore Environmental Ltd was commissioned by Pridding Farming Partnership to undertake an Air Quality Assessment in support of a planning application for a residential development on land off Wrexham Road, Holt.

6.1.2 The development may lead to the exposure of future residents to any existing air quality issues at the site, as well as adverse air quality impacts at sensitive locations during the construction and operational phases. As such, an Air Quality Assessment was undertaken in order to determine baseline conditions, consider location suitability for the proposed end-use and assess potential impacts associated with the scheme.

6.1.3 During the construction phase of the development there is the potential for air quality impacts as a result of fugitive dust emissions from the site. These were assessed 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 demolition, earthworks, construction and trackout activities was predicted to be **not significant**.

6.1.4 The proposal has the potential to expose future residents to elevated pollution levels. Dispersion modelling was therefore undertaken using ADMS-Roads in order to predict concentrations as a result of emissions from the local highway network. Results were subsequently verified using monitoring data collected by WCBC.

6.1.5 The results of the dispersion modelling assessment indicated that predicted annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations were below the relevant AQOs and AQLV across the development. The site is therefore considered suitable for the proposed use from an air quality perspective.

6.1.6 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. These were assessed against the screening criteria provided within the IAQM[13] guidance. Due to the low number of trips from the proposals, road traffic exhaust impacts were predicted to be **not significant**.

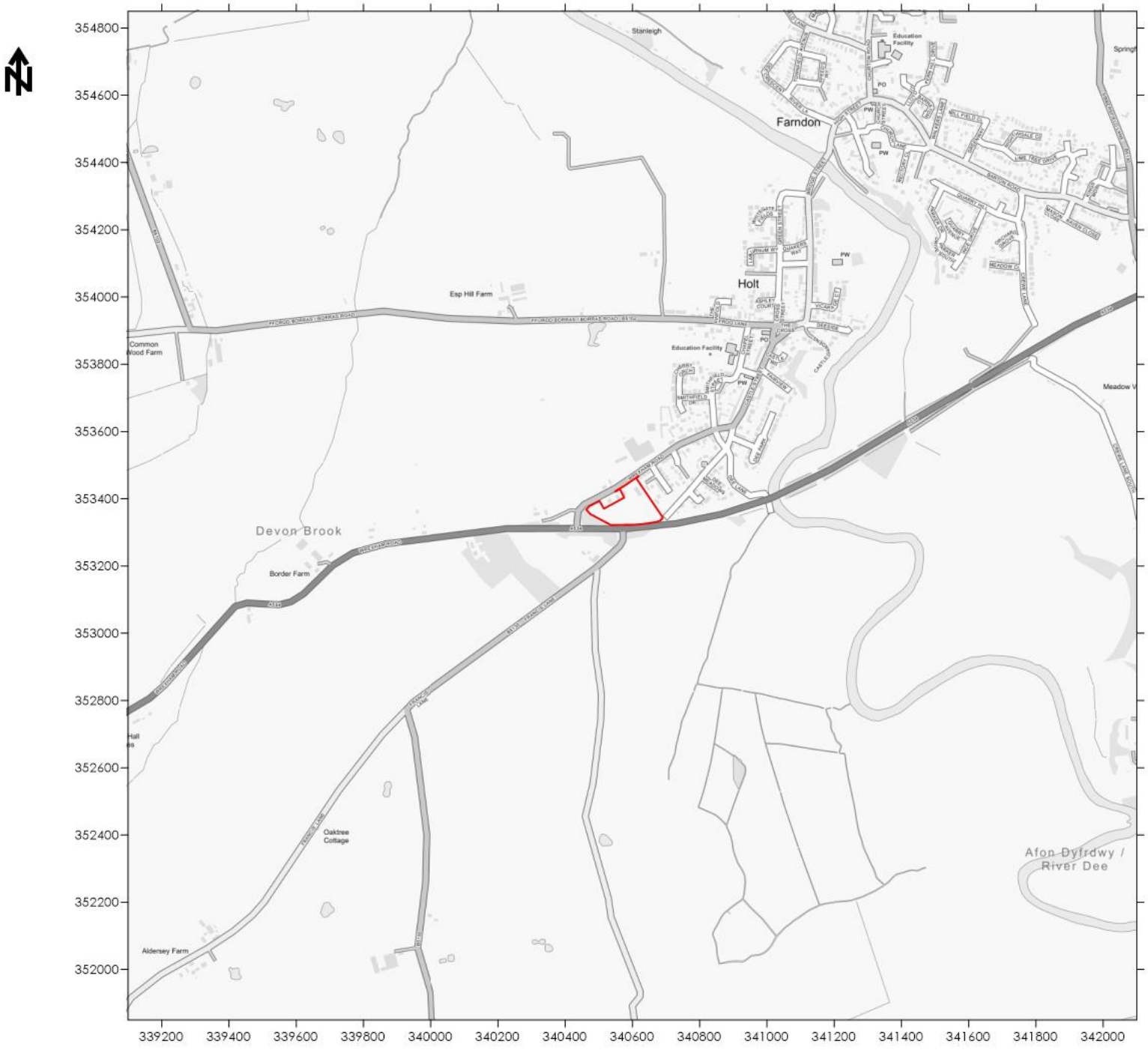
[13] Land-Use Planning & Development Control: Planning for Air Quality, IAQM, 2017.

6.1.7 Based on the assessment results, air quality factors are not considered a constraint to planning consent for the development.

7.0 ABBREVIATIONS

AADT	Annual Average Daily Traffic
ADM	Atmospheric Dispersion Modelling
AQLV	Air Quality Limit Value
AQMA	Air Quality Management Area
AQO	Air Quality Objective
AQS	Air Quality Strategy
CERC	Cambridge Environmental Research Consultants
DEFRA	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DMP	Dust Management Plan
EB	Eastbound
HDV	Heavy Duty Vehicle
IAQM	Institute of Air Quality Management
LA	Local Authority
LAQM	Local Air Quality Management
LDV	Light Duty Vehicle
NB	Northbound
NGR	National Grid Reference
NO_2	Nitrogen dioxide
NO_x	Oxides of nitrogen
PM_{10}	Particulate matter with an aerodynamic diameter of less than 10µm
$PM_{2.5}$	Particulate matter with an aerodynamic diameter of less than 2.5µm
RB	Roundabout
SB	Southbound
SP	Slow Phase
WB	Westbound
WCBC	Wrexham County Borough Council
WUDP	Wrexham Unitary Development Plan
z_0	Roughness length

Figures



Legend

Site Boundary

Title
Figure 1 - Site Location Plan

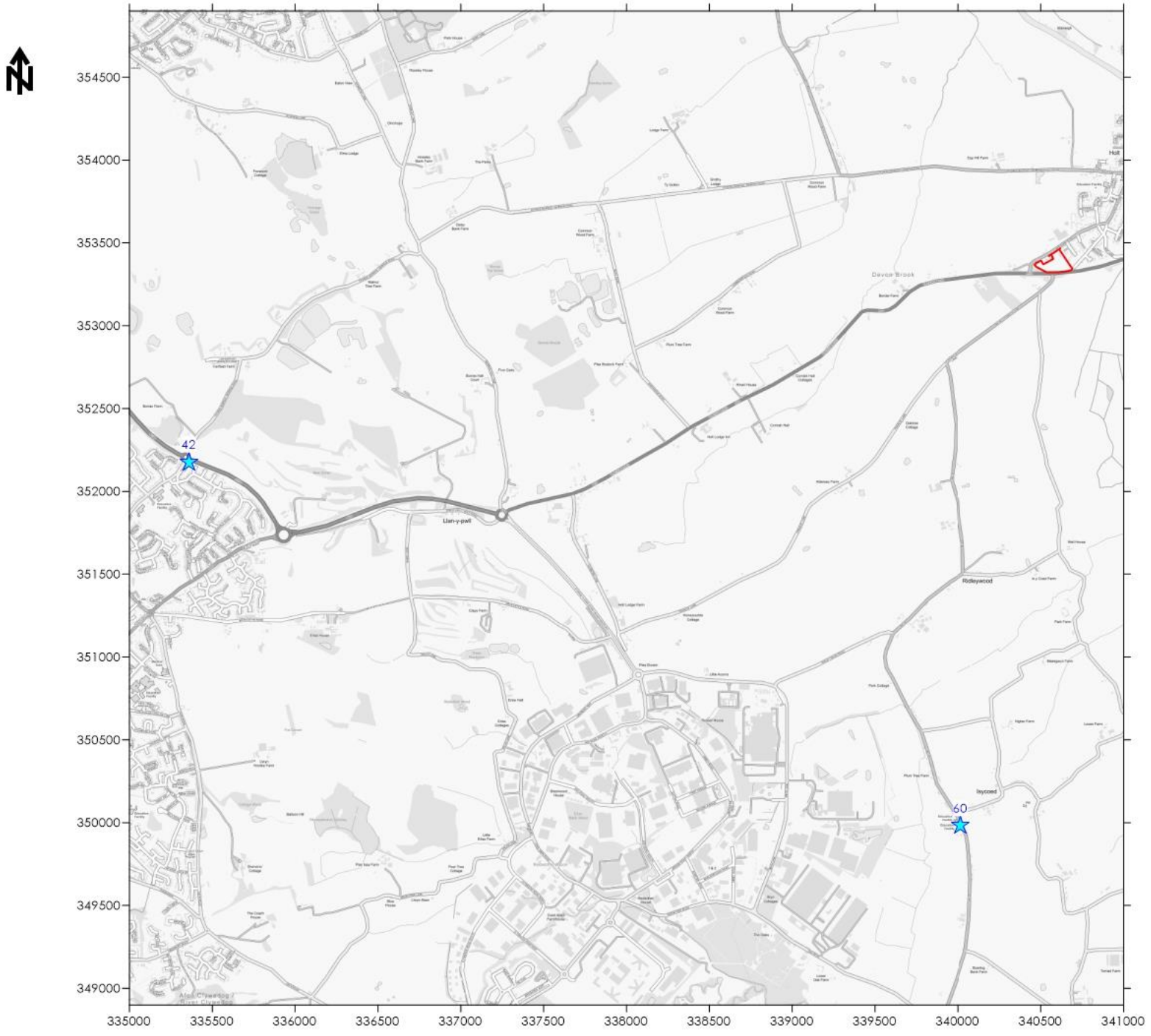
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Wrexham Road, Holt

Project Reference
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Legend

Site Boundary

Monitor

Title
Figure 2 - Monitoring Positions

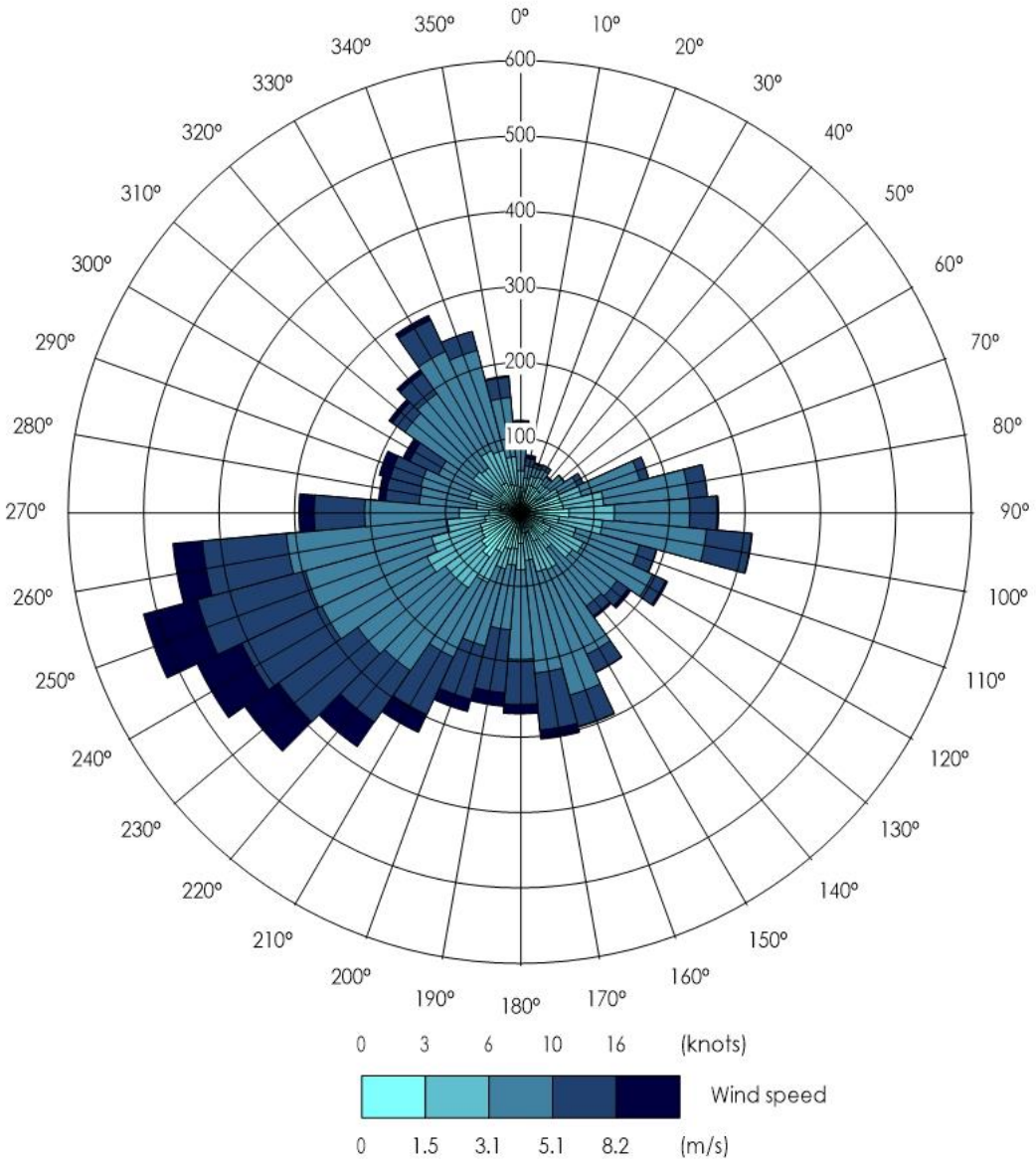
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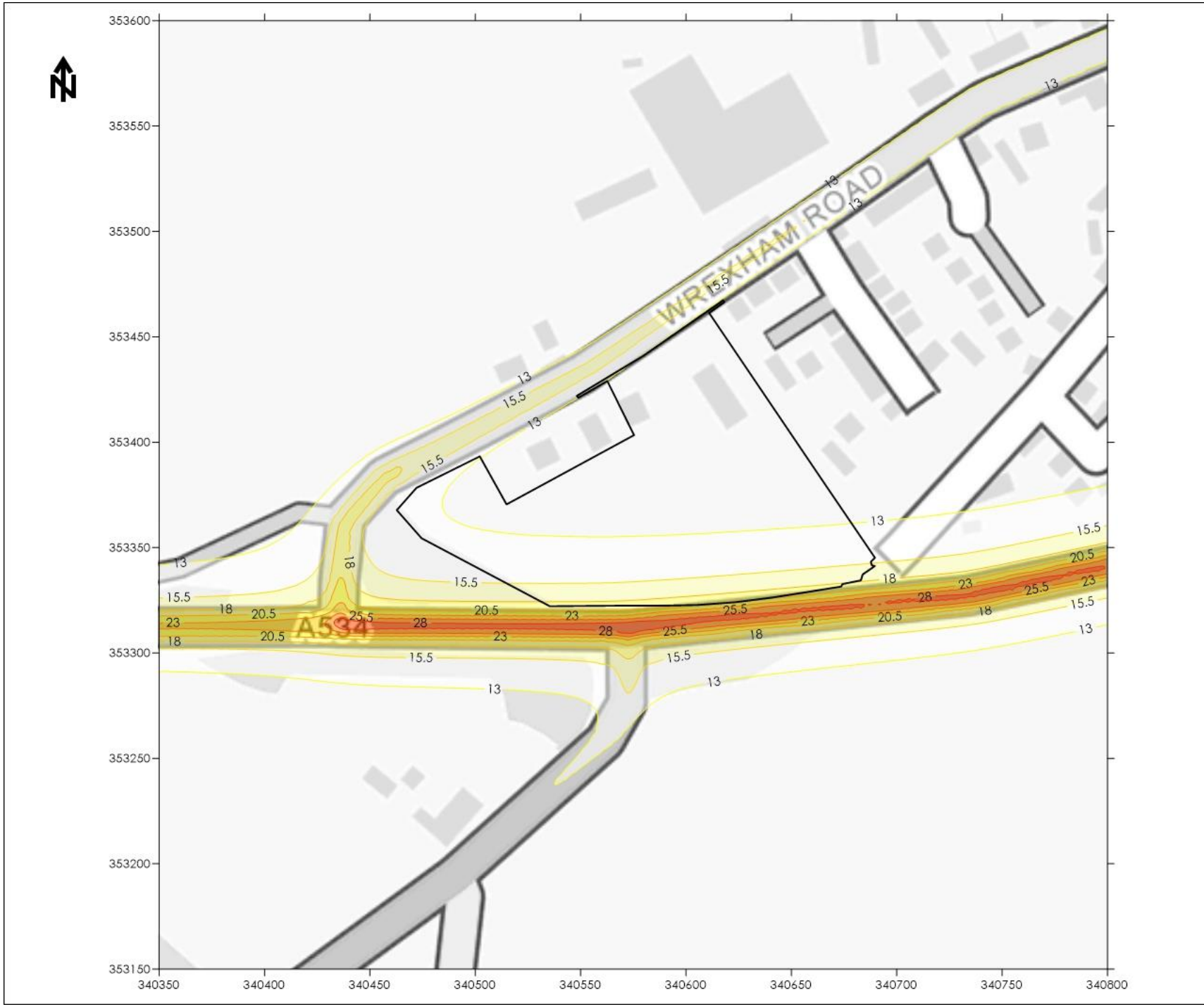
Title
Figure 3 - Wind Rose of 2019
Shawbury Meteorological Data

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Site Boundary

Annual Mean NO_2 Concentration (µg/m³)

28
25.5
23
20.5
18
15.5
13

Title
Figure 4 - Predicted Annual Mean NO_2 Concentrations (µg/m³)

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Site Boundary

Annual Mean PM_{10} Concentration ($\mu g/m^3$)

13.9
13.7
13.5
13.3
13.1
12.9
12.7
12.5

Title
Figure 5 - Predicted Annual Mean PM_{10} Concentrations ($\mu g/m^3$)

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Site Boundary

Annual Mean $PM_{2.5}$ Concentration (µg/m³)

11
10.5
10
9.5
9
8.5
8

Title
Figure 6 - Predicted Annual Mean $PM_{2.5}$ Concentrations (µg/m³)

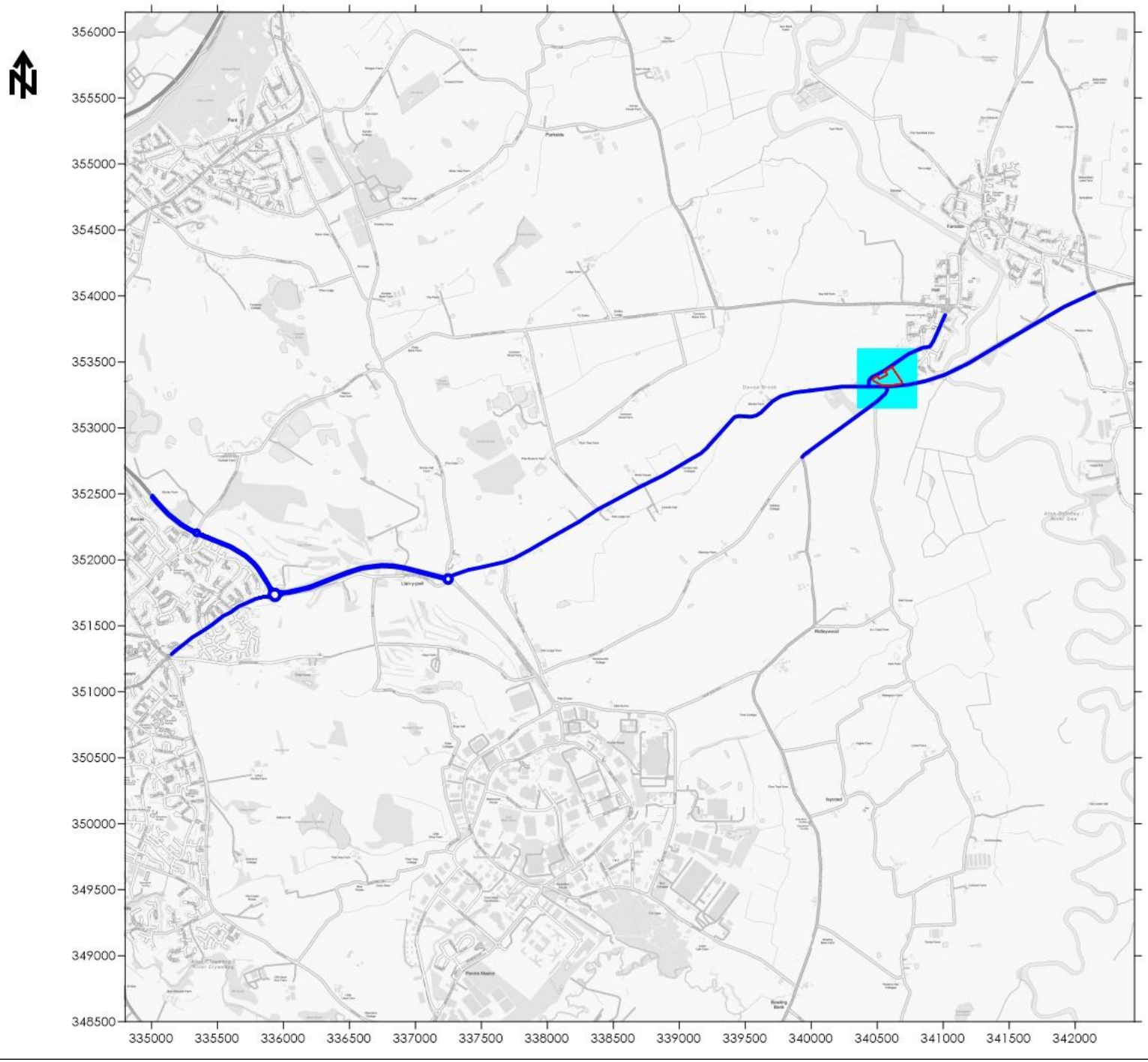
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Site Boundary

Road Link

Output Grid

Title
Figure 7 - ADMS-Roads Inputs

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Appendix 1 - Assessment Input Data

Introduction

The proposals have the potential to expose future residents to elevated pollution levels. In order to assess NO_2, PM_{10} and $PM_{2.5}$ concentrations across the development site, dispersion modelling was undertaken in accordance with the following methodology.

Modelling was undertaken for 2019 to allow verification against recent monitoring results and 2027 to represent likely conditions in the opening year of the scheme.

Dispersion Model

Dispersion modelling was undertaken using the ADMS-Roads dispersion model (version 5.0.1.3). 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.

The 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 (z_0); and,
- Monin-Obukhov length.

The relevant inputs are detailed in the following Sections.

Assessment Area

The assessment area was defined based on the location of the development and roads likely to impact pollutant levels across the site. Ambient concentrations were predicted over NGR: 340350, 353150 to 340800, 353600. One Cartesian grid was used within the model to produce data suitable for contour plotting using the Surfer software package. It should be noted that

although the grid only covered the proposed site, source geometries were extended in order to ensure the impact of all relevant emissions in the vicinity of the scheme were considered.

Reference should be made to Figure 7 for a graphical representation of the assessment grid extents.

Traffic Flow Data

Traffic data for use in the assessment, including 24-hour AADT flows and fleet composition as HDV proportion, was provided by Eddisons, the Transport Consultants for the project.

Traffic data was not available from Eddisons for a number of roads included within the model. As such, data for these links was obtained from the Department for Transport (DfT)[14]. The DfT web tool enables the user to view and download traffic flows on every link of the 'A' road and motorway network, as well as selected minor roads, in Great Britain for the years 1999 to 2020. It should be noted that the DfT web tool is referenced in DEFRA guidance[15] as being a suitable source of data for air quality assessments and it is therefore considered to provide a reasonable estimate of traffic flows in the vicinity of the site.

The baseline traffic data was converted to the site opening year utilising a factor obtained from TEMPro (version 7.2). This software package has been developed by the DfT to calculate future traffic growth throughout the UK.

Road widths and vehicle speeds were estimated from aerial photography and UK highway design standards. A summary of the traffic data used in the assessment is provided in Table A1.1.

Table A1.1 Traffic Data

Link		24-hour AADT Flow		HDV Prop. of Fleet (%)	Road Width (m)	Avg. Vehicle Speed (km/h)
		2019	2027			
L1	A534 west from Wrexham Rd Junction	14,567	15,799	2.95	9.0	65
L2	A534	14,567	15,799	2.95	9.1	110

[14] https://roadtraffic.dft.gov.uk/#16/51.4518/-0.9760/basemap-countpoints.

[15] Local Air Quality Management (TG16) Technical Guidance, DEFRA, 2021.

Link		24-hour AADT Flow		HDV Prop. of Fleet (%)	Road Width (m)	Avg. Vehicle Speed (km/h)
		2019	2027			
L3	A534 west to Roundabout (RB), connecting A534, Holt Road, Black Wood Way and Borras Hall Lane	7,218	7,828	3.04	9.1	30
L4	A534 Eastbound (EB) Slow Phase (SP) approaching A534 RB 1	7,283	7,900	2.95	7.1	25
L5	A534 EB	7,283	7,900	2.95	7.2	110
L6	A534 EB, exiting A534 RB 2	7,283	7,900	2.95	7.2	40
L7	A534 RB 2, connecting A534, Holt Road and A5156	6,679	7,190	9.80	9.7	30
L8	A5156 Northbound (NB) SP, exiting A534 RB 2	9,685	10,381	9.80	8.8	40
L9	A5156 NB	9,685	10,381	9.80	7.1	110
L10	A5156 NB, SP, approaching RB	9,685	10,381	9.80	7.4	30
L11	A5156 RB	10,742	11,515	9.80	9.2	30
L12	A5156 NB, SP, exiting RB	11,451	12,274	8.98	10.2	30
L13	A5156 NB	11,451	12,274	8.98	7.1	110
L14	A5156, Southbound (SB)	11,152	11,954	9.60	7.5	110
L15	A5156 SB, SP, approaching A5156 RB	11,152	11,954	9.60	7.5	30
L16	A5156 SB, SP, exiting A5156 RB	10,681	11,449	9.35	7.5	30
L17	A5156 SB	10,681	11,449	9.35	7.5	110
L18	A5156 SB, SP, approaching A534 RB 2	10,681	11,449	9.35	7.5	30
L19	Holt Road SP	10,681	11,449	1.20	9.0	30
L20	Stryt Holt/ Holt Road	10,681	11,449	1.20	7.1	45
L21	Castle Street	5,188	2,947	2.31	9.5	65
L22	Wrexham Road, adj. to Site	4,905	5,320	2.57	8.8	45
L23	Wrexham Road SP to A534	5,188	5,626	1.93	6.7	25
L24	A534 WB, exiting A534 RB 1	7,087	7,686	3.04	6.7	30
L25	A534 WB	7,087	7,686	3.04	7.2	110

Link		24-hour AADT Flow		HDV Prop. of Fleet (%)	Road Width (m)	Avg. Vehicle Speed (km/h)
		2019	2027			
L26	A534 WB, SP, approaching A534 RB 2	7,087	7,686	3.04	7.2	30
L27	A534 East from Wrexham Rd Junction	14,173	15,373	3.04	7.2	110
L28	Francis Lane SP, approaching A534 Junction	2,109	2,260	2.75	6.0	25
L29	Francis Lane	2,109	2,260	2.75	6.0	80
L30	A534 west SP approaching A534 RB 1	14,566	15,799	2.95	6.9	30

Reference should be made to Figure 7 for a graphical representation of the road link locations.

Emission Factors

Emission factors for each link were calculated using the relevant traffic flows and the Emissions Factor Toolkit (version 11.0). This has been produced by DEFRA and incorporates COPERT 5.3 vehicle emission factors and fleet information.

There is current uncertainty over NO_2 concentrations within the UK, with the implementation of new vehicle emission standards not resulting in the previously expected reduction in roadside levels. Therefore, 2019 emission factors were utilised in preference to the development opening year in order to provide robust model outputs. As predictions for 2019 were verified, it is considered the results are a robust indication of worst case concentrations for the future year.

Meteorological Data

Meteorological data used in the assessment was taken from Shawbury meteorological station over the period 1st January 2019 to 31st December 2019 (inclusive). Shawbury is located at NGR: 354931, 322117, which is approximately 34km south-east of the development. It is anticipated that conditions would be reasonably similar over a distance of this magnitude. The data was therefore considered suitable for an assessment of this nature.

All meteorological records used in the assessment were provided by Atmospheric Dispersion Modelling (ADM) Ltd, which is an established distributor of data within the UK. Reference should be made to Figure 3 for a wind rose of the utilised meteorological data.

Roughness Length

The z_0 is a modelling parameter applied to allow consideration of surface height roughness elements. A z_0 of 0.5m was used to describe the modelling extents. This is considered appropriate for the morphology of the area and is suggested within ADMS-Roads as being suitable for 'parkland and open suburbia'.

A z_0 of 0.3m was used to describe the meteorological site. This value is considered appropriate for the morphology of the area and is suggested within ADMS-Roads as being suitable for 'agricultural areas (max)'.

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 to describe the modelling extents and meteorological site. This value is considered appropriate for the nature of both areas and is suggested within ADMS-Roads as being suitable for 'small towns <50,000'.

Background Concentrations

Annual mean NO_2, PM_{10} and $PM_{2.5}$ background concentrations for use in the assessment were taken from the grid square containing the 42 Llan-Y-Pwll monitor, NGR: 33500, 352500. These are shown in Table A1.2.

Table A1.2 Background Concentrations - Modelling Extents

Pollutant	Predicted 2019 Background Pollutant Concentration (µg/m^3)
NO_2	8.63
PM_{10}	11.22
$PM_{2.5}$	7.30

The values shown in Table A1.2 were chosen to represent concentrations throughout the dispersion modelling extents without the contribution from road vehicles as they were higher than the DEFRA background for the grid square containing the site, as shown in Table 12.

Similarly to emission factors, background concentrations from 2019 were utilised in preference to the future year. This provided a robust assessment and is likely to overestimate pollutant concentrations during the operation of the proposal.

NO_x to NO_2 Conversion

Predicted annual mean NO_x concentrations were converted to NO_2 concentrations using the spreadsheet (version 8.1) provided by DEFRA, which is the method detailed within DEFRA guidance[16].

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 the assessment, model verification was undertaken for 2019 using traffic data, meteorological data and monitoring results from this year. The choice of 2019 as the verification year aligns with the IAQM position statement 'Use of 2020 and 2021 Monitoring Datasets'[17], which states:

> "If you are carrying out an air quality study that includes validation against monitoring data, use 2019 monitoring data as the last typical year"

16 Local Air Quality Management Technical Guidance (TG16), DEFRA, 2021.

17 Use of 2020 and 2021 Monitoring Datasets, IAQM, 2021.

Monitoring of NO_2 concentrations was undertaken at one location within the vicinity of roads included within the model during 2019. The result was obtained and the road contribution to total NO_x concentration calculated following the methodology contained within DEFRA guidance[18]. The monitored annual mean NO_2 concentration and calculated road NO_x concentration is summarised in Table A1.3.

Table A1.3 NO_x Verification - Monitoring Result

Monitoring Location		Monitored NO_2 Concentration (µg/m³)	Calculated Road NO_x Concentration (µg/m³)
42	Llan-Y-Pwll	20.6	22.33

The annual mean road NO_x concentration predicted from the dispersion model and the 2019 road NO_x concentration calculated from the monitoring result are summarised in Table A1.4.

Table A1.4 NO_x Verification - Modelling Result

Monitoring Location		Calculated Road NO_x Concentration (µg/m³)	Modelled Road NO_x Concentration (µg/m³)
42	Llan-Y-Pwll	22.33	20.59

The monitored and modelled road NO_x concentrations were compared to calculate the associated ratio. This indicated that a verification factor of 1.0845 was required to be applied to all NO_x modelling results.

Monitoring of PM_{10} and $PM_{2.5}$ concentrations is not undertaken within the assessment extents. The NO_x verification factor was therefore used to adjust model predictions of these species in lieu of more accurate data in accordance with DEFRA guidance[19].

[18] Local Air Quality Management Technical Guidance (TG16), DEFRA, 2021.

[19] Local Air Quality Management Technical Guidance (TG16), DEFRA, 2021.

Appendix 2 - Curricula Vita

JETHRO REDMORE

Director

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

KEY EXPERIENCE:

Jethro is a Chartered Environmentalist and Director of Redmore Environmental with specialist experience in the air quality and odour sectors. His key capabilities include:

- Production and management of Air Quality, Dust and Odour Assessments for a wide-range of clients from the retail, residential, infrastructure, commercial and industrial sectors.
- Production and co-ordination of Environmental Permit applications for a variety of industrial sectors.
- 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 Environmental Impact Assessments and scoping reports for developments throughout the UK.
- Provision of expert witness services at Planning Inquiries.
- Design and project management of pollutant monitoring campaigns.
- Co-ordination and management of large-scale multi-disciplinary projects and submissions.
- Provision of expert advice to local government and international environmental bodies, as well as involvement in production of industry guidance.

SELECT PROJECTS SUMMARY:

Industrial

Shanks Waste Management - Odour Assessments of two waste management facilities to support Environmental Permit Applications.

Tatweer Petroleum - dispersion modelling of Bahrain oil field.

Doha South Sewage Treatment Works - AQA for works extension in Qatar.

IRIS Environmental Appraisal Report Reviews, Isle of Man Government - odour assessment reviews.

Lankem, Greater Manchester - Environmental Permit Application for chemical manufacturing plant.

Newport Docks Bulk Drying, Pelleting and CHP Facility - air quality EIA for gas CHP.

Springshades, Leicester - Environmental Permit Variation Application for textile manufacturing plant.

Valspar, Chester - Odour Assessment and production of Odour Management Plan for a paint manufacturing plant in response to neighbour complaints.

Agrivert - dispersion modelling of odour and CHP emissions from numerous AD plants.

James Cropper Paper Mill, Cumbria - air quality EIA, Environmental Permit Variation and Human Health Risk Assessment for new biomass boiler adjacent to SSSI.

Rigg Approach, Leyton - Air Quality Assessment in support of waste transfer site.

Lynchford Lane Waste Transfer Station - biomass facility energy recovery plant.

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

Residential

Wood St Mill, Bury - residential development adjacent to scrap metal yard.

Hyams Lane, Holbrook - Odour Assessment to support residential development adjacent to sewage works.

North Wharf Gardens, London - peer review of EIA undertaken for large residential development.

Loxford Road, Alford - Air Quality EIA for residential development, included consideration of impacts from associated package sewage works

Elephant and Castle Leisure Centre - baseline AQA for redevelopment.

Carr Lodge, Doncaster - EIA for large residential development.

Queensland Road, Highbury - residential scheme including CHP.

Bicester Ecotown - dispersion modelling of energy centre.

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

York St, Bury - residential development adjacent to AQMA.

Temple Point Leeds - residential development adjacent to M1.

Commercial and Retail

Etihad Stadium - Air Quality EIA for the extension to the capacity of the Etihad Stadium, Manchester.

Wakefield College - redevelopment of city centre campus in AQMA.

Manchester Airport Cargo Shed - commercial development.

Manchester Airport Apron Extension - EIA including aircraft emission modelling.

National Youth Theatre, Islington - redevelopment to provide new arts space and accommodation.

OLLY HANLON

Senior Air Quality Consultant

BSc (Hons), GradIEMA

Tel: 0161 706 0075 | Email: oliver.hanlon@red-env.co.uk

KEY EXPERIENCE:

Olly is a Senior Environmental Consultant with specialist experience in the air quality sector. His key capabilities include:

- Production of Air Quality Assessments in accordance with Department for Environment, Food and Rural Affairs (DEFRA) methodologies for a range of residential, commercial and industrial sectors.
- Detailed dispersion modelling of road vehicle exhaust emissions using ADMS-Roads. Studies have included assessment of road traffic exhaust emissions on sensitive receptors and exposure of new residents to poor air quality.
- Detailed dispersion modelling of industrial emission sources using ADMS-5. Studies have included assessment of pollutant concentrations and consideration of associated impacts.
- Assessment of construction dust impacts from a range of development sizes.
- Production of air quality mitigation strategies specifically tailored to address issues at individual sites.
- Definition of baseline air quality and identification of sensitive areas across the UK.
- Air quality monitoring at industrial sites to quantify pollutant concentrations.

SELECT PROJECTS SUMMARY:

Millharbour, Isle of Dogs

Air Quality Assessment for the development of residential units within an Air Quality Management Area (AQMA). Concerns were raised regarding the exposure of future occupants to poor air quality due to road traffic emissions. Detailed dispersion modelling was undertaken using ADMS-roads to assess PM_{10} and NO_2 concentrations across the site. Results identified that pollution levels were below the air quality standards across the development.

Station Road, Howden

Air Quality Assessment in support of a residential development. Using sensitive receptors located in areas where increased road traffic may affect NO_2 concentrations, a comparison was made between overall concentrations with and without the development in place. Results indicated pollutant concentrations were below the relevant standards across the site and impacts associated with the development were not significant.

Honeycombe Beach, Bournemouth

Air Quality Assessment to determine air quality conditions within a covered car park serving a residential complex and evaluate the effectiveness of the existing ventilation system. Monitoring of pollutant concentrations over a three-month period at four locations at the site was undertaken. Internal concentrations of pollutants were below the relevant Work Exposure Limits (WELs) at all locations. As such, natural ventilation was considered to provide adequate control of internal air quality.

Matching Airport, Abbess Roding

Air Quality Assessment in support of a flexible generation facility. Dispersion modelling was undertaken to determine potential changes in pollution levels as a result of emissions from the installation and consider the potential impact at nearby sensitive receptor locations. Predicted concentrations of NO_2 were below the relevant air quality criteria at all locations of relevant exposure across all meteorological data sets modelled. The overall effects of the development were predicted to be not significant in accordance with the stated guidance.

High Road, Wood Green, London

Air Quality Assessment for a residential scheme located in an AQMA. Detailed dispersion modelling was undertaken at several heights reflective of residential units within the development. Results indicated that NO_2 and PM_{10} concentrations were below air quality criteria across the development.

Anlaby Road, Hull

Air Quality Assessment for the development of a six storey hotel and associated infrastructure within an AQMA. Concerns were raised about the exposure of future occupants to elevated pollution concentrations during operation due to road traffic exhaust emissions. Detailed dispersion modelling was undertaken using ADMS-roads to assess PM_{10} and NO_2 concentrations across the site. Results indicated that pollution levels were below the air quality standards across the development.