

Appendix 9.1: Air Quality Impact Assessment

Air Quality Impact Assessment
Technical Appendix 9.1

Bryn Lane, Wrexham



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1.0 **LEGISLATION AND POLICY**

1.1 **Legislation**

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

- Nitrogen dioxide (NO₂);
- Sulphur dioxide;
- Lead;
- Particulate matter with an aerodynamic diameter of less than 10µm (PM₁₀);
- Particulate matter with an aerodynamic diameter of less than 2.5µm (PM_{2.5});
- Benzene; and,
- Carbon monoxide.

1.1.2 Air Quality Target Values have also been 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).

1.1.3 The Air Quality Strategy (AQS) was produced by the Department for Environment, Food and Rural Affairs (DEFRA) and published in July 2007¹. 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.

1.1.4 The Environmental Improvement Plan 2023² was published in January 2023, providing long term and Interim Targets in order to reduce population exposure to PM_{2.5}. The concentration target for 2040 was subsequently adopted in the Environmental Targets (Fine Particulate Matter) (England) Regulations (2023).

¹ The AQS for England, Scotland, Wales and Northern Ireland, DEFRA, 2007.

² Environmental Improvement Plan 2023, DEFRA, 2023.

1.1.5 Table 1 presents the AQOs and Interim Target for pollutants considered within this assessment.

Table 1 Air Quality Objectives/Interim Target

Pollutant	Air Quality Objective/Interim Target	
	Concentration ($\mu\text{g}/\text{m}^3$)	Averaging Period
NO ₂	40	Annual mean
	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}	12 ^(a)	Annual mean

Note: (a) Interim Target to be achieved by end of January 2028.

1.1.6 Table 2 summarises the advice provided in DEFRA guidance³ 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

³ Local Air Quality Management Technical Guidance (TG22), DEFRA, 2022.

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

1.2 **Local Air Quality Management**

- 1.2.1 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 (AQAP), the objective of which is to reduce pollutant concentrations in pursuit of the AQOs.

1.3 **Dust**

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

- 1.3.2 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 practice measures.

1.4 National Planning Policy

1.4.1 Planning Policy Wales⁴ 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."

1.4.2 This has been considered throughout this assessment.

⁴ Planning Policy Wales Edition 11, Welsh Assembly Government, 2021.

1.5 **Local Planning Policy**

- 1.5.1 The Wrexham Unitary Development Plan 1996 - 2011⁵ was adopted by Wrexham County Borough Council (WCBC) on 14th February 2005. Review of the document indicated 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."

- 1.5.2 The above policy has been taken into consideration throughout the undertaking of the assessment.

⁵ Wrexham Unitary Development Plan 1996-2011, WCBC, 2005.

2.0 METHODOLOGY

2.1 Introduction

2.1.1 The proposed development has the potential to cause air quality impacts during the demolition and construction stage and completed development stage. These have been assessed in accordance with the following methodology.

2.2 Demolition and Construction Stage

Fugitive Dust Emissions

2.2.1 There is the potential for fugitive dust emissions to occur as a result of demolition and construction stage 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 V1.1'⁶.

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

- Earthworks;
- Construction; and
- Trackout.

2.2.3 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 PM₁₀.

2.2.4 The assessment steps are detailed below.

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

Step 1

- 2.2.5 Step 1 screens the requirement for a more detailed assessment. Should human receptors be identified within 350m from the application site 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 application site or the construction vehicle route up to 500m from the site entrance, then the assessment also proceeds to Step 2.
- 2.2.6 Should sensitive receptors not be present within the relevant distances then **negligible** impacts would be expected and further assessment is not necessary.

Step 2

- 2.2.7 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).
- 2.2.8 The two factors are combined in Step 2C to determine the significance of potential dust impacts without mitigation applied.
- 2.2.9 Step 2A defines the potential magnitude of dust emission through the demolition and construction stage. The relevant criteria are summarised in Table 3.

Table 3 Construction Dust - Magnitude of Emission

Magnitude	Activity	Criteria
Large	Earthworks	- Total site area greater than 10,000m² - 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 100,000m³ - 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	Earthworks	- Total site area 2,500m² to 10,000m² - 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 25,000m³ to 100,000m³ - 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	Earthworks	- Total site area less than 2,500m² - 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 25,000m³ - Construction material with low potential for dust release (e.g. metal cladding or timber)

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

2.2.13 Step 2B defines the overall sensitivity of the area around the development application site 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 PM₁₀. 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
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

2.2.14 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.

2.2.15 These factors were considered in the undertaking of the assessment.

2.2.16 Additional steps are included in the assessment to determine the specific sensitivity of the area to dust soiling effects on people and property and to human health impacts.

2.2.17 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
	1 - 10	Medium	Low	Low	Low
Medium	More than 1	Medium	Low	Low	Low
Low	More than 1	Low	Low	Low	Low

2.2.18 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
	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

2.2.19 Step 2C combines the dust emission magnitude with the specific sensitivity of the area to determine the significance of unmitigated impacts.

2.2.20 Table 7 outlines the risk category from earthworks and construction activities.

Table 7 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

2.2.21 Table 8 outlines the risk category from trackout activities.

Table 8 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

2.2.22 Step 3 requires the identification of site specific mitigation measures within the IAQM guidance⁷ 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.

⁷ Guidance on the Assessment of Dust from Demolition and Construction V1.1, IAQM, 2016.

Step 4

2.2.23 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**.

Road Vehicle Exhaust Emissions

2.2.24 The proposed development has the potential to cause air quality impacts during the demolition and construction stage. In order to assess NO₂, PM₁₀ and PM_{2.5} concentrations at sensitive locations, detailed dispersion modelling was undertaken in accordance with the following methodology.

2.2.25 Modelling was undertaken for the following scenarios:

- Scenario 1: 2019 Baseline – (Verification of model);
- Scenario 2: 2030 Future Baseline + Cumulative Schemes; and,
- Scenario 3: 2030 Future Baseline + Cumulative Schemes + Demolition and Construction Traffic.

Dispersion Model

2.2.26 Dispersion modelling was undertaken in order to predict NO₂, PM₁₀ and PM_{2.5} concentrations 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.

2.2.27 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.

2.2.28 These are detailed in the following sections.

Assessment Area

2.2.29 The assessment area was defined based on the development location, the traffic distribution and the positioning of residential properties. Ambient concentrations were predicted over the area National Grid Reference (NGR): 333680, 350600 to 339280, 353460. One Cartesian grid was used within the model to produce data suitable for contour plotting using the Surfer software package.

2.2.30 Human receptors sensitive to potential road vehicle exhaust emission impacts were identified using the methodology outlined in **Chapter 9: Air Quality, Section 9.2.7**, and are summarised in **Table 9.3.1**.

Traffic Flow Data

2.2.31 The traffic data used in the assessment, including 24-hour Annual Average Daily Traffic (AADT) flows and fleet composition as Heavy Goods Vehicle (HGV) proportion, was provided by Cora IHT, the Transport Consultants for the project. The traffic data is provided in **ES Volume IV, Appendix 8.1: AADT Traffic Figures**.

2.2.32 Road widths were estimated from aerial photography and UK highway design standards. A summary of the traffic data is provided in Table 9.

Table 9 Traffic Data - Demolition and Construction Stage

Link		24-hour AADT Flow			HGV Prop. of Fleet (%)		Road Width (m)	Avg. Vehicle Speed (km/h)
		2019 (Verif)	2030 DM	2030 DS	Verif & 2030 DM	2030 DS		
L1	Bryn Lane, east of site access	5,219	5,747	5,747	10.47	10.47	7.7	65
L2	Bryn Lane, south of Ridley Wood Road	5,107	5,624	5,624	10.24	10.24	7.3	65
L3	Ridley Wood Lane	2,170	2,390	2,390	1.77	1.77	5.7	65
L4	B5130 north of Ridley Wood Land	2,980	3,282	3,282	1.29	1.29	5.5	65
L5	B5130 south of Ridley Wood Land	1,534	1,689	1,689	2.51	2.51	5.5	65
L6	Bryn Lane, west of site access	5,219	5,747	8,865	10.47	10.30	7.5	65
L7	Ash Road (North) approach to roundabout	6,693	9,047	9,196	11.95	9.92	7.0	65
L8	Abbey Road	6,693	9,047	9,196	11.95	9.92	7.9	65
L9	Ash Road (North)	6,693	9,047	9,196	11.95	9.92	7.7	65
L10	Coed Aben Road	5,062	5,584	5,740	21.28	20.95	7.5	65
L11	Redwither Road	5,062	5,584	5,740	21.28	20.95	7.1	65
L12	Abenbury Way	5,062	5,584	5,740	21.28	20.95	7.7	65
L13	Industrial Estate Road	22,352	26,283	28,778	9.33	8.89	15.4	80
L14	Sandy Lane	470	564	1,312	42.56	22.67	8.0	80
L15	Sandy Lane south	470	564	1,312	42.56	22.67	8.0	80
L16	A534 Wrexham Road	10,963	12,271	12,365	5.47	5.42	7.6	95
L17	A534 westbound (WB)	13,260	15,507	16,333	8.01	7.69	7.9	95
L18	A534 eastbound (EB)	13,260	15,507	16,333	8.01	7.69	7.9	95
L19	KSS2	0	5,030	5,030	0.00	0.00	7.7	35
L20	A534 Holt Road approach to roundabout Slow Phase (SP)	13,151	15,834	16,831	2.75	3.00	7.5	35

Link		24-hour AADT Flow			HGV Prop. of Fleet (%)		Road Width (m)	Avg. Vehicle Speed (km/h)
		2019 (Verif)	2030 DM	2030 DS	Verif & 2030 DM	2030 DS		
L21	A534 Holt Road west of Birkdale Road SP	13,151	15,834	16,831	2.75	3.00	10.1	35
L22	A534 Holt Road west of Birkdale Road	13,151	15,834	16,831	2.75	3.00	7.8	45
L23	A534 Holt Road east of Dean Road SP	13,151	15,834	16,831	2.75	3.00	7.6	35
L24	A534 Holt Road west of Dean Road SP	13,151	15,834	16,831	2.75	3.00	7.2	35
L25	A534 Holt Road west of Dean Road	13,151	15,834	16,831	2.75	3.00	7.5	45
L26	A534 Holt Road south of Bickleywood Drive	13,151	15,834	16,831	2.75	3.00	12.8	45
L27	A534 Holt Road west of Hullah Lane	13,151	15,834	16,831	2.75	3.00	8.3	45
L28	A534 Holt Road south of Aston Grove	13,151	15,834	16,831	2.75	3.00	10.9	45
L29	A534 Holt Road west of Montgomery Road	13,151	15,834	16,831	2.75	3.00	9.4	45
L30	A5156 Northbound (NB) north of A524	13,943	16,390	16,717	8.36	7.89	8.0	95
L31	A5156 NB north of A525 SP	13,943	16,390	16,717	8.36	7.89	8.5	35
L32	A5156 Southbound (SB) north of A524	13,943	16,390	16,717	8.36	7.89	8.0	95
L33	A5156 NB south of A483	13,943	16,390	16,717	8.36	7.89	8.0	95
L34	A5156 NB south of A483 SP	13,943	16,390	16,717	8.36	7.89	11.7	20
L35	A5156 SB south of A483 SP	13,943	16,390	16,717	8.36	7.89	8.2	35
L36	A5156 SB south of A483	13,943	16,390	16,717	8.36	7.89	8.0	95
L37	A5152 Chester Road exit from roundabout	6,922	7,622	7,622	2.17	2.17	8.9	45
L38	A5152 Chester Road approach to roundabout SP	6,922	7,622	7,622	2.17	2.17	10.4	20

Link		24-hour AADT Flow			HGV Prop. of Fleet (%)		Road Width (m)	Avg. Vehicle Speed (km/h)
		2019 (Verif)	2030 DM	2030 DS	Verif & 2030 DM	2030 DS		
L39	A5152 Chester Road	13,844	15,245	15,245	2.17	2.17	8.0	45
L40	B5445 Chester Road	16,082	17,709	17,709	1.77	1.77	7.8	85
L41	Blue Bell Lane	9,374	10,322	10,322	3.28	3.28	7.8	45
L42	A483 NB north of roundabout slip road	5,299	6,862	7,049	14.23	12.06	8.5	95
L43	A483 NB between slip roads	8,260	9,870	10,063	8.68	8.05	7.9	95
L44	A483 NB south of roundabout slip road	11,429	12,595	12,735	3.53	3.61	7.9	95
L45	A483 SB south of roundabout slip road	11,429	12,595	12,735	3.53	3.61	7.9	95
L46	A483 SB between slip roads	10,559	12,019	12,195	5.55	5.44	7.9	95
L47	A483 SB north of roundabout slip road	5,299	6,862	7,049	14.23	12.06	8.5	95
L48	Slip road approach to A483 NB	1,325	1,716	1,762	14.23	12.06	5.6	65
L49	Slip road exit from A483 NB	2,857	3,149	3,184	3.53	3.61	10.7	25
L50	Slip road approach to A483 SB	2,857	3,149	3,184	3.53	3.61	4.6	65
L51	Slip road exit from A483 SB	1,325	1,716	1,762	14.23	12.06	11.7	25
L52	Industrial Park Access	1,193	1,314	1,314	3.22	3.22	8.4	45
L53	Borras Hall Lane	2,152	2,369	2,369	0.36	0.36	7.5	80
R1	Bryn Lane/Ash Road North roundabout	9,831	11,665	13,145	21.28	20.95	10.2	35
R2	Industrial Estate Road/A534 roundabout	10,409	12,083	12,915	42.56	22.67	8.9	35
R3	A534/A5156 roundabout	11,259	14,109	14,660	8.36	7.89	9.6	35
R4	A5156 roundabout	13,943	16,390	16,717	8.36	7.89	10.7	35
R5	Gresford Interchange	8,380	8,628	9,573	14.23	12.06	11.3	20

Link		24-hour AADT Flow			HGV Prop. of Fleet (%)		Road Width (m)	Avg. Vehicle Speed (km/h)
		2019 (Verif)	2030 DM	2030 DS	Verif & 2030 DM	2030 DS		
R6	A534 roundabout south of Birkdale Road	13,151	15,834	16,831	2.75	3.00	7.5	35
R7	A534 roundabout south of Dean Road	13,151	15,834	16,831	2.75	3.00	9.5	35

2.2.33 Reference should be made to Figure 9.1 for a graphical representation of the road link locations.

Emission Factors

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

2.2.35 There is current uncertainty over NO₂ 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 scheme 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

2.2.36 Meteorological data used in the assessment was taken from Shawbury meteorological station over the period 1st January 2019 to 31st December 2019 (inclusive). Shawbury meteorological station is located at NGR: 354931, 322117, which is approximately 32.7km south-east of the application site. 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.

2.2.37 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 9.5 for a wind rose of the utilised meteorological data.

Roughness Length

- 2.2.38 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 value is considered appropriate for the morphology of the area and is suggested within ADMS-Roads as being suitable for 'parkland and open suburbia'.
- 2.2.39 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

- 2.2.40 The Monin-Obukhov length provides a measure of the stability of the atmosphere. A minimum Monin-Obukhov length of 30m was used to describe the modelling extents. This is considered appropriate for the nature of the area and is suggested within ADMS-Roads as being suitable for 'cities and large towns'.
- 2.2.41 A minimum Monin-Obukhov length of 10m was used to describe the meteorological site. This is considered appropriate for the nature of the area and is suggested within ADMS-Roads as being suitable for 'small towns <50,000'.

Background Concentration

- 2.2.42 Background NO₂, PM₁₀ and PM_{2.5} concentrations for use in the assessment were obtained from the DEFRA mapping study for the grid square containing the 32 - Sycamores monitor, NGR: 333500, 353500. These are shown in Table 10.

Table 10 Background Pollutant Concentrations - Modelling Extents

Pollutant	Predicted 2019 Background Pollutant Concentration (µg/m ³)
NO ₂	12.62
PM ₁₀	12.13

Pollutant	Predicted 2019 Background Pollutant Concentration ($\mu\text{g}/\text{m}^3$)
PM _{2.5}	7.84

2.2.43 The values shown in Table 10 were chosen to represent concentrations throughout the dispersion modelling extents without the contribution from road vehicles as they are higher than the DEFRA background for the grid square containing the application site, as shown in Table 16.

2.2.44 Similar to emission factors, background concentrations from 2019 were utilised throughout the assessment in preference to the development opening year. This provided a robust assessment and is likely to overestimate pollutant concentrations during the operation of the proposed development.

NO_x to NO₂ Conversion

2.2.45 Predicted annual mean NO_x concentrations were converted to NO₂ concentrations using the spreadsheet (version 8.1) provided by DEFRA, which is the method detailed within DEFRA guidance⁸.

Short Term PM₁₀ Concentrations

2.2.46 The number of days with PM₁₀ concentrations greater than 50 $\mu\text{g}/\text{m}^3$ at the proposed hotel was calculated based on predicted annual mean concentrations and the methodology outlined within DEFRA guidance⁹.

Verification

2.2.47 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;

⁸ Local Air Quality Management Technical Guidance (TG22), DEFRA, 2022.

⁹ Local Air Quality Management Technical Guidance (TG22), DEFRA, 2022.

- Variations in meteorological conditions;
- Overall model limitations; and,
- Uncertainties associated with monitoring data, including locations.

2.2.48 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.

2.2.49 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'¹⁰, produced following the COVID-19 pandemic, 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."

2.2.50 Monitoring of NO₂ concentrations was undertaken at three locations within the vicinity of roads included within the model during 2019. Review of the data indicated that the 60 - St Pauls School diffusion tube was recording levels below background concentrations. As such, it was removed from the verification process. The results for the remaining monitors were obtained and the road contributions to total NO_x concentrations calculated following the methodology contained within DEFRA guidance¹¹. The monitored annual mean NO₂ concentrations and calculated road NO_x concentrations are summarised in Table 11.

Table 11 Verification - Monitoring Results

Monitoring Location		Monitored NO ₂ Concentration (µg/m ³)	Calculated Road NO _x Concentration (µg/m ³)
32	Sycamores	23.70	20.92
42	Llan-Y-Pwll	20.60	14.88
54	Pandy Lane	22.70	18.96

¹⁰ Use of 2020 and 2021 Monitoring Datasets, IAQM, 2021.

¹¹ Local Air Quality Management Technical Guidance (TG22), DEFRA, 2022.

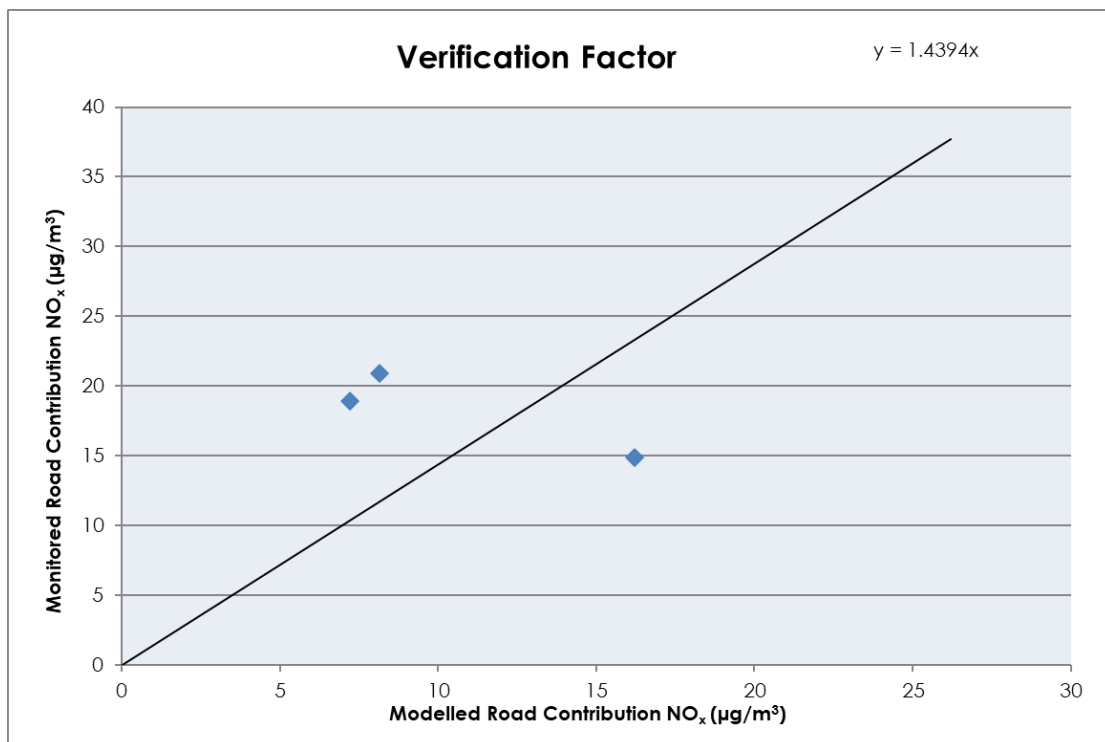
2.2.51 The annual mean road NO_x concentrations predicted from the dispersion model and the 2019 road NO_x concentrations calculated from the monitoring results are summarised in Table 12.

Table 12 Verification - Modelling Results

Monitoring Location		Calculated Road NO _x Concentration (µg/m ³)	Modelled Road NO _x Concentration (µg/m ³)
32	Sycamores	20.92	8.14
42	Llan-Y-Pwll	14.88	16.20
54	Pandy Lane	18.96	7.22

2.2.52 The monitored and modelled road NO_x concentrations were graphed and the equation of the trendline based on linear progression through zero calculated. This indicated that a verification factor of 1.4394 was required to be applied to all monitoring results, as shown in Graph 1.

Graph 1 NO_x Verification Factor



2.2.53 Monitoring of PM₁₀ and PM_{2.5} concentrations is not undertaken within the assessment extents. The NO_x verification factor was therefore used to adjust PM₁₀ model predictions in accordance with DEFRA guidance¹².

Impact Significance

2.2.54 The significance of predicted air quality effects was determined in accordance with the guidance provided within the IAQM document 'Land-Use Planning & Development Control: Planning for Air Quality'¹³. Using this methodology, impacts were defined based on the interaction between the predicted pollutant concentration from the scenario 3 and the magnitude of change between scenario 2 and scenario 3. This is shown in Table 13. Reference should be made to **Chapter 9: Air Quality** for the relevant categories for receptor sensitivity and magnitude of impact.

Table 13 Significance of Road Vehicle Exhaust Emissions Effect

Receptor Sensitivity	Magnitude of Impact			
	Very Small	Small	Medium	Large
Very High	Moderate	Major	Major	Major
High	Moderate	Moderate	Major	Major
Medium	Minor	Moderate	Moderate	Major
Low	Negligible	Minor	Moderate	Moderate
Very Low	Negligible	Negligible	Minor	Moderate

2.2.55 The matrix shown in Table 13 is intended to be used by rounding the change in percentage pollutant concentration to whole numbers, which makes it clearer which cell the impact falls within. It should be noted that changes of 0%, i.e. less than 0.5%, are described as negligible.

2.2.56 Following the prediction of impacts at discrete receptor locations, the IAQM document¹⁴ provides guidance on determining the overall air quality impact significance of the

¹² Local Air Quality Management Technical Guidance (TG22), DEFRA, 2022.

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

¹⁴ Land-Use Planning & Development Control: Planning for Air Quality, IAQM, 2017.

operation of a development. The following factors are identified for consideration by the assessor:

- The existing and future air quality in the absence of the proposed development;
- The extent of current and future population exposure to the impacts; and,
- The influence and validity of any assumptions adopted when undertaking the prediction of impacts.

2.3 Completed Development Stage

2.3.1 The proposed development has the potential to cause air quality impacts during the completed development stage. In order to assess NO₂, PM₁₀ and PM_{2.5} concentrations at sensitive locations, detailed dispersion modelling was undertaken in accordance with the methodology as provided in Section 2.2.

2.3.2 All model inputs, including road width, average speed, Monin-Obuhkov length, z₀, the NO_x to NO₂ conversion method, background pollutant concentrations and meteorological data, utilised during completed development stage modelling were identical to those described previously for the demolition and construction stage, in order to provide continuity throughout the assessment.

2.3.3 Modelling was undertaken based on the following scenarios:

- Scenario 1: 2019 Baseline – (Verification of model);
- Scenario 2: 2030 Future Baseline + Cumulative Schemes;
- Scenario 4: 2030 Future Baseline + Cumulative Schemes + Completed Development Traffic (Option 1 - Full B2/B8 use); and,
- Scenario 5: 2030 Future Baseline + Cumulative Schemes + Completed Development (Option 2 – B2/B8 use plus alternative uses).

2.3.4 Due to the flexibility in potential uses being sought by the Applicant in respect of the outline component, two options (Scenarios 4 and 5) have been considered for the completed development stage to ensure worst-case vehicular trip calculations have been assessed (refer to Section 9.2.7 Assessment Method for further information). The two assessment options are set out in the Assessment Method section in ES Chapter 8: Transport and are summarised below. Concentrations were predicted for both options

and the scenario which produced the highest change from the future baseline used for the purpose of this assessment (refer to Section 9.7: Assessment of Effects).

Option 1

2.3.5 For Option 1 it has been assumed that all floorspace to be delivered as part of the proposed development would comprise industrial floorspace (use classes B1c, B2 and B8 uses) as industrial floorspace is considered to be the highest trip-generating use proposed. As such, the worst-case highest-trip generating uses that have been used to inform the assessment are as follows:

- Detailed Component: it has been assumed that the total 65,550 sqm GEA comprises B8 uses (storage and distribution). It should be noted that 65,550 sqm GEA was the floorspace proposed prior to further design amendments. Given that it is larger than what is being proposed now for the detailed component (63,254 sqm GEA), it considered to be representative of a worst-case; and,
- Outline Component: it has been assumed that the total 72,635 sqm GEA comprises B8 uses (storage and distribution).

Option 2

2.3.6 For Option 2 it has been assumed that the alternative use classes would be delivered as part of the proposed development, including A1, A3, C1 and sui generis use classes. The worst-case highest-trip generating uses that have been used to inform the assessment are as follows:

- Detailed Component: it has been assumed that the total 63,254 sqm GEA comprises B8 uses (storage and distribution); and,
- Outline Component: it has been assumed that the total 72,635 sqm GEA comprises 56,485 sqm GEA B8 uses (storage and distribution), with the remaining 16,150 sqm GEA comprising a mix of A1, A3, C1 or sui generis uses (ancillary retail / drive thru-facilities and potential for a hotel and petrol filling station).

2.3.7 Traffic flow data for use in the completed development stage assessment was provided by Cora IHT. This is summarised in Table 14.

Table 14 Traffic Data - Completed Development Stage

Link		24-hour AADT Flow			HGV Prop. of Fleet (%)		
		2030 DM	2030 DS1	2030 DS2	2030 DM	2030 DS1	2030 DS2
L1	Bryn Lane, east of site access	5,747	5,747	5,747	10.47	10.47	10.47
L2	Bryn Lane, south of Ridley Wood Road	5,624	5,624	5,624	10.24	10.24	10.24
L3	Ridley Wood Lane	2,390	2,390	2,390	1.77	1.77	1.77
L4	B5130 north of Ridley Wood Land	3,282	3,282	3,282	1.29	1.29	1.29
L5	B5130 south of Ridley Wood Land	1,689	1,689	1,689	2.51	2.51	2.51
L6	Bryn Lane, west of site access	5,747	9,249	6,625	10.47	12.39	10.54
L7	Ash Road (North) approach to roundabout	9,047	9,196	13,665	11.95	9.92	6.66
L8	Abbey Road	9,047	9,196	13,665	11.95	9.92	6.66
L9	Ash Road (North)	9,047	9,196	13,665	11.95	9.92	6.66
L10	Coed Aben Road	5,584	5,740	6,606	21.28	20.95	18.55
L11	Redwither Road	5,584	5,740	6,606	21.28	20.95	18.55
L12	Abenbury Way	5,584	5,740	6,606	21.28	20.95	18.55
L13	Industrial Estate Road	26,283	29,162	29,838	9.33	9.57	8.70
L14	Sandy Lane	564	1,404	1,347	42.56	25.15	22.33
L15	Sandy Lane south	564	1,404	1,347	42.56	25.15	22.33
L16	A534 Wrexham Road	12,271	12,376	12,381	5.47	5.48	5.42
L17	A534 westbound (WB)	15,507	16,473	16,426	8.01	8.14	7.67
L18	A534 eastbound (EB)	15,507	16,473	16,426	8.01	8.14	7.67
L19	KSS2	5,030	5,030	5,349	0.00	0.00	0.00
L20	A534 Holt Road approach to roundabout Slow Phase (SP)	15,834	16,954	16,960	2.75	3.41	3.00
L21	A534 Holt Road west of Birkdale Road SP	15,834	16,954	16,960	2.75	3.41	3.00

Link		24-hour AADT Flow			HGV Prop. of Fleet (%)		
		2030 DM	2030 DS1	2030 DS2	2030 DM	2030 DS1	2030 DS2
L22	A534 Holt Road west of Birkdale Road	15,834	16,954	16,960	2.75	3.41	3.00
L23	A534 Holt Road east of Dean Road SP	15,834	16,954	16,960	2.75	3.41	3.00
L24	A534 Holt Road west of Dean Road SP	15,834	16,954	16,960	2.75	3.41	3.00
L25	A534 Holt Road west of Dean Road	15,834	16,954	16,960	2.75	3.41	3.00
L26	A534 Holt Road south of Bickleywood Drive	15,834	16,954	16,960	2.75	3.41	3.00
L27	A534 Holt Road west of Hullah Lane	15,834	16,954	16,960	2.75	3.41	3.00
L28	A534 Holt Road south of Aston Grove	15,834	16,954	16,960	2.75	3.41	3.00
L29	A534 Holt Road west of Montgomery Road	15,834	16,954	16,960	2.75	3.41	3.00
L30	A5156 Northbound (NB) north of A524	16,390	16,796	16,797	8.36	8.13	7.86
L31	A5156 NB north of A525 SP	16,390	16,796	16,797	8.36	8.13	7.86
L32	A5156 Southbound (SB) north of A524	16,390	16,796	16,797	8.36	8.13	7.86
L33	A5156 NB south of A483	16,390	16,796	16,797	8.36	8.13	7.86
L34	A5156 NB south of A483 SP	16,390	16,796	16,797	8.36	8.13	7.86
L35	A5156 SB south of A483 SP	16,390	16,796	16,797	8.36	8.13	7.86
L36	A5156 SB south of A483	16,390	16,796	16,797	8.36	8.13	7.86
L37	A5152 Chester Road exit from roundabout	7,622	7,622	7,622	2.17	2.17	2.17
L38	A5152 Chester Road approach to roundabout SP	7,622	7,622	7,622	2.17	2.17	2.17
L39	A5152 Chester Road	15,245	15,245	15,245	2.17	2.17	2.17
L40	B5445 Chester Road	17,709	17,709	17,709	1.77	1.77	57.79
L41	Blue Bell Lane	10,322	10,322	10,322	3.28	3.28	3.28

Link		24-hour AADT Flow			HGV Prop. of Fleet (%)		
		2030 DM	2030 DS1	2030 DS2	2030 DM	2030 DS1	2030 DS2
L42	A483 NB north of roundabout slip road	6,862	7,111	7,122	14.23	12.48	11.95
L43	A483 NB between slip roads	9,870	10,115	10,120	8.68	8.32	8.01
L44	A483 NB south of roundabout slip road	12,595	12,752	12,741	3.53	3.69	3.61
L45	A483 SB south of roundabout slip road	12,595	12,752	12,741	3.53	3.69	3.61
L46	A483 SB between slip roads	12,019	12,231	12,227	5.55	5.60	5.43
L47	A483 SB north of roundabout slip road	6,862	7,111	7,122	14.23	12.48	11.95
L48	Slip road approach to A483 NB	1,716	1,778	1,781	14.23	12.48	11.95
L49	Slip road exit from A483 NB	3,149	3,188	3,185	3.53	3.69	3.61
L50	Slip road approach to A483 SB	3,149	3,188	3,185	3.53	3.69	3.61
L51	Slip road exit from A483 SB	1,716	1,778	1,781	14.23	12.48	11.95
L52	Industrial Park Access	1,314	1,314	1,314	3.22	3.22	3.22
L53	Borras Hall Lane	2,369	2,369	2,369	0.36	0.36	0.36
R1	Bryn Lane/Ash Road North roundabout	11,665	13,337	14,184	21.28	20.95	18.55
R2	Industrial Estate Road/ A534 roundabout	12,083	13,107	13,131	42.56	25.15	22.33
R3	A534/A5156 roundabout	14,109	14,730	14,792	8.36	8.13	7.86
R4	A5156 roundabout	16,390	16,756	16,797	8.36	8.13	7.86
R5	Gresford Interchange	8,628	9,612	9,593	14.23	12.48	11.95
R6	A534 roundabout south of Birkdale Road	15,834	16,893	16,960	2.75	3.41	3.00
R7	A534 roundabout south of Dean Road	15,834	16,893	16,960	2.75	3.41	3.00

2.3.8 Reference should be made to Figure 9.1 for a graphical representation of the road link locations.

3.0 **BASELINE**

3.1 **Introduction**

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

3.2 **Local Air Quality Management**

1.1.7 As required by the Environment Act (1995), as amended by the Environment Act (2021), Wrexham CBC 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.

3.3 **Air Quality Monitoring**

3.3.1 Monitoring of pollutant concentrations is undertaken by Wrexham CBC throughout their area of jurisdiction. Recent NO₂ results recorded in the vicinity of the proposed development are shown in Table 15.

Table 15 Monitoring Results

Monitoring Site		Monitored NO ₂ Concentration (µg/m ³)		
		2018	2019	2020
32	Sycamores	27.2	23.7	18.2
33	Smithfield Road	18.5	15.6	19.3
42	Llan-Y-Pwll	23.2	20.6	17.1
43	Hightown	19.3	17.0	14.4
54	Pandy Lane	-(a)	22.7	15.2
58	St Annes School	-(a)	12.7	10.5
60	St Pauls School	-(a)	7.7	6.8

Note: (a) Data not available.

3.3.2 As shown in Table 15, annual mean NO₂ concentrations were below the AQO of 40µg/m³ at all monitoring locations in recent years.

3.4 **Background Pollutant Concentrations**

3.4.1 Predictions of background pollutant concentrations on a 1km by 1km grid basis have been produced by DEFRA. These maps cover the entire of the UK to assist LAs in their Review and Assessment of air quality. The proposed development is located in grid square NGR: 338500, 350500. Data for this location was downloaded from the DEFRA website¹⁵ for the purpose of the assessment and is summarised in Table 16.

Table 16 Background Pollutant Concentration Predictions

Pollutant ^(a)	Predicted Background Pollutant Concentration (µg/m ³)		
	2019	2023	2030
NO ₂	12.29	11.18	10.30
PM ₁₀	11.45	10.91	10.64
PM _{2.5}	7.21	6.76	6.51

Note: (a) AQO for NO₂ and PM₁₀ is 40µg/m³. The Interim Target for PM_{2.5} is 12µg/m³ to be achieved by the end of January 2028.

3.4.2 As shown in Table 16, predicted background NO₂, PM₁₀ and PM_{2.5} concentrations are below the relevant AQOs and Interim Target at the application site.

3.5 **Sensitive Receptors**

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

¹⁵ <https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018>.

Demolition and Construction Stage Fugitive Dust Emissions Sensitive Receptors

- 3.5.2 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 17.

Table 17 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
Up to 50	10 - 100	0
Up to 100	More than 100	-
Up to 350	More than 100	-

- 3.5.3 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 application site access. These are summarised in Table 18.

Table 18 Trackout Dust Sensitive Receptors

Distance from Site Access Route (m)	Approximate Number of Human Receptors	Approximate Number of Ecological Receptors
Up to 20	10 - 100	0
Up to 50	10 - 100	0

- 3.5.4 There are no ecological receptors within 50m of the application site boundary or the access route within 500m of the application site entrance. As such, fugitive dust emission impacts on ecological receptors have not been assessed further within this report.
- 3.5.5 A number of additional factors have been considered when determining the sensitivity of the surrounding area. These are summarised in Table 19.

Table 19 Additional Area Sensitivity Factors to Potential Dust Impacts

Guidance	Comment
Whether there is any history of dust generating activities in the area	A review of Google Maps imagery indicated a commercial development is currently undergoing construction approximately 600m south-east of the application site. It is possible that this may have caused dust generation in the area over recent months
The likelihood of concurrent dust generating activity on nearby sites	A review of the planning portal indicated that a number of applications have recently been submitted in the vicinity of the site. It is therefore possible that there will be concurrent dust generation should these be granted permission and the construction phases overlap with the proposed development. However, as set out in ES Volume II Chapter 2, only three schemes have been identified within 1km of the application site that have potential to result in cumulative effects based on their similar nature and scale. Of these schemes, one is already constructed and the other two are located approximately 670m and 1.1km away, respectively
Pre-existing screening between the source and the receptors	Trees and shrubs are located sporadically along the site boundary. Those proposed for retention may act as a barrier between emission sources and receptors
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 9.5, 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	The construction stage is estimated to last until 2030. However, it is considered unlikely that the sensitivity of receptors will change over this time
Any known specific receptor sensitivities which go beyond the classifications given in the document	No specific receptor sensitivities identified during the baseline assessment

3.5.6 Based on the criteria shown in Table 4, the sensitivity of identified human receptors within the vicinity of the site was determined as **high**. This was because the identified receptors included residential properties.

- 3.5.7 The sensitivity of the area to dust soiling effects on people and property was determined using the individual receptor sensitivity identified above, the number of receptors at different distances from the site and the criteria shown in Table 5. Similarly, the sensitivity of the area to human health impacts was determined using the individual receptor sensitivity identified above, the background annual mean PM₁₀ concentration, the number of receptors at different distances from the site and the criteria shown in Table 6 . The results are shown in Table 20.

Table 20 Sensitivity of the Surrounding Area to Potential Dust Impacts

Potential Impact	Sensitivity of the Surrounding Area		
	Earthworks	Construction	Trackout
Dust Soiling to people and buildings	Medium	Medium	Medium
Dust impacts to Human Health	Low	Low	Low

Demolition and Construction Stage and Completed Development Stage Road Vehicle Exhaust Emission Sensitive Receptors

- 3.5.8 Locations sensitive to potential road vehicle exhaust emission impacts were identified from a desk-top study and are summarised in **Chapter 9: Air Quality, Table 9.3.1**.
- 3.5.9 Reference should be made to Figure 9.2 for a map of the road vehicle exhaust emission sensitive receptor locations.

4.0 **ASSESSMENT**

4.1 **Introduction**

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

4.2 **Demolition and Construction Stage - Fugitive Dust Emissions**

Step 1

- 4.2.1 The undertaking of activities such as excavation, ground works, cutting, construction and storage of materials has the potential to result in fugitive dust emissions throughout the demolition and construction stage. 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 roads and highway surfaces.
- 4.2.2 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.
- 4.2.3 A number of sensitive receptors are situated within 350m of the site boundary. As such, a detailed assessment of potential dust impacts was required.

Step 2

Earthworks

- 4.2.4 Earthworks will primarily involve excavating material, haulage, tipping and stockpiling, as well as site levelling and landscaping. The application site covers an area greater than 10,000m². In accordance with the criteria outlined in Table 3, the magnitude of potential dust emissions from earthworks is therefore **large**.
- 4.2.5 Table 20 indicates the sensitivity of the area to dust soiling effects on people and property is **medium**. In accordance with the criteria outlined in Table 7, the proposed

development is considered to be a **medium** risk site for dust soiling as a result of earthworks.

- 4.2.6 Table 20 indicates the sensitivity of the area to human health impacts is **low**. In accordance with the criteria outlined in Table 7, the proposed development is considered to be a **low** risk site for human health impacts as a result of earthworks.

Construction

- 4.2.7 Due to the size of the proposed development the total building volume is likely to be greater than 100,000m³. In accordance with the criteria outlined in Table 3, the magnitude of potential dust emissions from construction is therefore **large**.

- 4.2.8 Table 20 indicates the sensitivity of the area to dust soiling effects on people and property is **medium**. In accordance with the criteria outlined in Table 7, the development is considered to be a **medium** risk site for dust soiling as a result of construction activities.

- 4.2.9 Table 20 indicates the sensitivity of the area to human health impacts is **low**. In accordance with the criteria outlined in Table 7, the development is considered to be a **low** risk site for human health impacts as a result of construction activities.

Trackout

- 4.2.10 Based on the site area, it is anticipated that the unpaved road length may be greater than 100m during certain stages of construction. In accordance with the criteria outlined in Table 3, the magnitude of potential dust emissions from trackout is therefore **large**.

- 4.2.11 Table 20 indicates the sensitivity of the area to dust soiling effects to people and property is **medium**. In accordance with the criteria outlined in Table 8, the proposed development is considered to be a **medium** risk site for dust soiling as a result of trackout activities.

- 4.2.12 Table 20 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 **low** risk site for human health impacts as a result of trackout activities.

4.2.13 A summary of the potential unmitigated impact for each construction phase is provided in Table 21.

Table 21 Summary of Potential Unmitigated Impacts

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

Step 3

4.2.14 The IAQM guidance¹⁶ provides potential mitigation measures to reduce impacts as a result of fugitive dust emissions during the demolition and construction stage. These have been adapted for the application site from measures outlined for **medium** risk sites, as summarised in Table 22.

Table 22 Fugitive Dust Emission Mitigation Measures

Issue	Control Measure
Communications	- Develop and implement 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), 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 offsite, and the action taken to resolve the situation in the log book

¹⁶ Guidance on the Assessment of Dust from Demolition and Construction V1.1, IAQM, 2016.

Issue	Control Measure
Monitoring	• 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
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 site or 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 or burning of waste materials
Earthworks	• Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable • Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil as soon as practicable • Only remove cover in small areas during work and not all at once

Issue	Control Measure
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 and stored in silos with suitable emission control systems
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 • Record all inspections of haul routes and any subsequent action in a site log book • Inspect haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably possible • 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

4.2.15 Assuming the relevant mitigation measures outlined in Table 20 are implemented, the residual impacts from all dust generating activities is predicted to be **not significant**, in accordance with the IAQM guidance¹⁷.

4.3 Demolition and Construction Stage - Road Vehicle Exhaust Emissions

4.3.1 Vehicle movements associated with the demolition and construction stage of the proposed development will generate exhaust emissions on the local and regional road networks. An assessment was therefore undertaken using dispersion modelling, with the inputs described in Section 2.0, in order to quantify potential changes in pollutant concentrations at sensitive locations in the vicinity of the application site.

4.3.2 The assessment was undertaken under the scenarios mentioned in Section 2.2.

¹⁷ Guidance on the Assessment of Dust from Demolition and Construction V1.1, IAQM, 2016.

4.3.3 For the purpose of the assessment traffic data for 2030 was utilised as the final year of construction works prior to the opening of the proposed development. Air quality is predicted to improve in the future. However, in order to provide a robust assessment, emission factors for 2019 were utilised within the dispersion model. The use of 2030 traffic data and 2019 emission factors is considered to provide a worst-case scenario and therefore a sufficient level of confidence can be placed within the predicted pollution concentrations.

Predicted Concentrations

4.3.4 Annual mean NO₂ concentrations were predicted at the sensitive receptor locations for the scenario 2 and scenario 3. These are summarised in Table 23.

Table 23 Demolition and Construction Stage - Predicted Annual Mean NO₂ Concentrations

Receptor		Predicted Annual Mean NO ₂ Concentration (µg/m ³)		
		Scenario 2	Scenario 3	Change
R1	Residential - Hugmore Lane	16.63	17.24	0.61
R2	Residential - Holt Road	16.07	16.64	0.57
R3	Residential - Sandy Lane	14.66	15.17	0.51
R4	Residential - A534 Wrexham Road	18.33	18.50	0.17
R5	Residential - A534 Wrexham Road	15.98	16.04	0.06
R6	Residential - Sandy Lane	13.36	13.72	0.36
R7	Residential - Borrass Hall Lane	15.46	15.94	0.48
R8	Residential - Borrass Hall Lane	13.96	14.06	0.10
R9	Residential - The Links	17.49	18.11	0.62
R10	Residential - Birkdale Road	22.05	23.57	1.52
R11	Residential - A534 Holt Road	19.80	20.52	0.72
R12	Residential - A534 Holt Road	19.86	20.64	0.78
R13	Residential - A534 Holt Road	17.30	17.77	0.47
R14	Residential - Bader Court	19.49	19.74	0.25

Receptor		Predicted Annual Mean NO ₂ Concentration (µg/m ³)		
		Scenario 2	Scenario 3	Change
R15	Residential - Avondale Grove	17.85	18.46	0.61
R16	Residential - Bieston Close	20.21	20.44	0.23
R17	Residential - Ffordd Llywelyn	16.62	16.77	0.15
R18	Residential - Ffordd Garmonydd	18.44	18.81	0.37
R19	Residential - Chester Road	18.97	19.35	0.38
R20	Residential - Plas Acton Close	18.10	18.23	0.13
R21	Residential - A5152 Chester Road	19.32	19.43	0.11
R22	Residential - A5152 Chester Road	16.91	16.94	0.03
R23	Residential - A5152 Chester Road	16.88	16.90	0.02

4.3.5 As indicated in Table 23, predicted annual mean NO₂ concentrations were below the relevant AQO at all receptors in both scenarios.

4.3.6 Annual mean PM₁₀ concentrations were predicted at the sensitive receptor locations for scenario 2 and scenario 3. These are summarised in Table 24.

Table 24 Demolition and Construction Stage - Predicted Annual Mean PM₁₀ Concentrations

Receptor		Predicted Annual Mean PM ₁₀ Concentration (µg/m ³)		
		Scenario 2	Scenario 3	Change
R1	Residential - Hugmore Lane	12.97	13.09	0.12
R2	Residential - Holt Road	12.80	12.92	0.11
R3	Residential - Sandy Lane	12.53	12.64	0.11
R4	Residential - A534 Wrexham Road	13.22	13.25	0.03
R5	Residential - A534 Wrexham Road	12.76	12.77	0.01
R6	Residential - Sandy Lane	12.29	12.36	0.08
R7	Residential - Borrass Hall Lane	12.68	12.75	0.07

Receptor		Predicted Annual Mean PM ₁₀ Concentration (µg/m ³)		
		Scenario 2	Scenario 3	Change
R8	Residential - Borrass Hall Lane	12.39	12.40	0.02
R9	Residential - The Links	13.00	13.09	0.09
R10	Residential - Birkdale Road	13.79	14.02	0.23
R11	Residential - A534 Holt Road	13.47	13.60	0.13
R12	Residential - A534 Holt Road	13.42	13.55	0.13
R13	Residential - A534 Holt Road	12.99	13.08	0.08
R14	Residential - Bader Court	13.47	13.52	0.05
R15	Residential - Avondale Grove	13.09	13.17	0.09
R16	Residential - Bieston Close	13.62	13.67	0.05
R17	Residential - Ffordd Llywelyn	12.90	12.92	0.03
R18	Residential - Ffordd Garmonydd	13.17	13.21	0.04
R19	Residential - Chester Road	13.29	13.33	0.04
R20	Residential - Plas Acton Close	13.15	13.18	0.02
R21	Residential - A5152 Chester Road	13.38	13.40	0.02
R22	Residential - A5152 Chester Road	12.92	12.93	0.00
R23	Residential - A5152 Chester Road	12.91	12.92	0.00

4.3.7 As indicated in Table 24, predicted annual mean PM₁₀ concentrations were below the relevant AQO at all receptors in both scenarios.

4.3.8 Annual mean PM_{2.5} concentrations were predicted at the sensitive receptor locations for scenario 2 and scenario 3. These are summarised in Table 25.

Table 25 Demolition and Construction Stage - Predicted Annual Mean PM_{2.5} Concentrations

Receptor		Predicted Annual Mean PM _{2.5} Concentration (µg/m ³)		
		Scenario 2	Scenario 3	Change
R1	Residential - Hugmore Lane	8.33	8.40	0.07
R2	Residential - Holt Road	8.23	8.30	0.06
R3	Residential - Sandy Lane	8.08	8.14	0.06
R4	Residential - A534 Wrexham Road	8.48	8.50	0.02
R5	Residential - A534 Wrexham Road	8.21	8.22	0.01
R6	Residential - Sandy Lane	7.93	7.98	0.04
R7	Residential - Borrass Hall Lane	8.16	8.20	0.04
R8	Residential - Borrass Hall Lane	7.99	8.00	0.01
R9	Residential - The Links	8.35	8.41	0.05
R10	Residential - Birkdale Road	8.82	8.95	0.14
R11	Residential - A534 Holt Road	8.62	8.70	0.08
R12	Residential - A534 Holt Road	8.60	8.67	0.08
R13	Residential - A534 Holt Road	8.34	8.39	0.05
R14	Residential - Bader Court	8.62	8.65	0.03
R15	Residential - Avondale Grove	8.40	8.45	0.05
R16	Residential - Bieston Close	8.71	8.74	0.03
R17	Residential - Ffordd Llywelyn	8.29	8.31	0.02
R18	Residential - Ffordd Garmonydd	8.45	8.48	0.02
R19	Residential - Chester Road	8.52	8.54	0.03
R20	Residential - Plas Acton Close	8.44	8.45	0.01
R21	Residential - A5152 Chester Road	8.57	8.58	0.01
R22	Residential - A5152 Chester Road	8.30	8.31	0.00
R23	Residential - A5152 Chester Road	8.30	8.30	0.00

4.3.9 As indicated in Table 25, predicted annual mean PM_{2.5} concentrations were below the Interim Target at all receptors in both scenarios.

Predicted Impacts

4.3.10 Predicted impacts on annual mean NO₂ concentrations at the sensitive receptor locations are summarised in Table 26.

Table 26 Demolition and Construction Stage - Predicted Impacts - NO₂

Receptor		Sensitivity	Magnitude of Impact	Impact Significance
R1	Residential - Hugmore Lane	Very Low	Small	Negligible
R2	Residential - Holt Road	Very Low	Very Small	Negligible
R3	Residential - Sandy Lane	Very Low	Very Small	Negligible
R4	Residential - A534 Wrexham Road	Very Low	Negligible	Negligible
R5	Residential - A534 Wrexham Road	Very Low	Negligible	Negligible
R6	Residential - Sandy Lane	Very Low	Very Small	Negligible
R7	Residential - Borrass Hall Lane	Very Low	Very Small	Negligible
R8	Residential - Borrass Hall Lane	Very Low	Negligible	Negligible
R9	Residential - The Links	Very Low	Small	Negligible
R10	Residential - Birkdale Road	Very Low	Small	Negligible
R11	Residential - A534 Holt Road	Very Low	Small	Negligible
R12	Residential - A534 Holt Road	Very Low	Small	Negligible
R13	Residential - A534 Holt Road	Very Low	Very Small	Negligible
R14	Residential - Bader Court	Very Low	Very Small	Negligible
R15	Residential - Avondale Grove	Very Low	Small	Negligible
R16	Residential - Bieston Close	Very Low	Very Small	Negligible
R17	Residential - Ffordd Llywelyn	Very Low	Negligible	Negligible
R18	Residential - Ffordd Garmonydd	Very Low	Very Small	Negligible
R19	Residential - Chester Road	Very Low	Very Small	Negligible

Receptor		Sensitivity	Magnitude of Impact	Impact Significance
R20	Residential - Plas Acton Close	Very Low	Negligible	Negligible
R21	Residential - A5152 Chester Road	Very Low	Negligible	Negligible
R22	Residential - A5152 Chester Road	Very Low	Negligible	Negligible
R23	Residential - A5152 Chester Road	Very Low	Negligible	Negligible

4.3.11 As indicated in Table 26, impacts on annual mean NO₂ concentrations as a result of the demolition and construction stage were predicted to be **negligible** at all receptors.

4.3.12 Predicted impacts on annual mean PM₁₀ concentrations at the sensitive receptor locations are summarised in Table 27.

Table 27 Demolition and Construction Stage - Predicted Impacts - PM₁₀

Receptor		Sensitivity	Magnitude of Impact	Impact Significance
R1	Residential - Hugmore Lane	Very Low	Negligible	Negligible
R2	Residential - Holt Road	Very Low	Negligible	Negligible
R3	Residential - Sandy Lane	Very Low	Negligible	Negligible
R4	Residential - A534 Wrexham Road	Very Low	Negligible	Negligible
R5	Residential - A534 Wrexham Road	Very Low	Negligible	Negligible
R6	Residential - Sandy Lane	Very Low	Negligible	Negligible
R7	Residential - Borrass Hall Lane	Very Low	Negligible	Negligible
R8	Residential - Borrass Hall Lane	Very Low	Negligible	Negligible
R9	Residential - The Links	Very Low	Negligible	Negligible
R10	Residential - Birkdale Road	Very Low	Negligible	Negligible
R11	Residential - A534 Holt Road	Very Low	Negligible	Negligible
R12	Residential - A534 Holt Road	Very Low	Negligible	Negligible
R13	Residential - A534 Holt Road	Very Low	Negligible	Negligible
R14	Residential - Bader Court	Very Low	Negligible	Negligible
R15	Residential - Avondale Grove	Very Low	Negligible	Negligible

Receptor		Sensitivity	Magnitude of Impact	Impact Significance
R16	Residential - Bieston Close	Very Low	Negligible	Negligible
R17	Residential - Ffordd Llywelyn	Very Low	Negligible	Negligible
R18	Residential - Ffordd Garmonydd	Very Low	Negligible	Negligible
R19	Residential - Chester Road	Very Low	Negligible	Negligible
R20	Residential - Plas Acton Close	Very Low	Negligible	Negligible
R21	Residential - A5152 Chester Road	Very Low	Negligible	Negligible
R22	Residential - A5152 Chester Road	Very Low	Negligible	Negligible
R23	Residential - A5152 Chester Road	Very Low	Negligible	Negligible

4.3.13 As indicated in Table 27, impacts on annual mean PM₁₀ concentrations as a result of the demolition and construction stage were predicted to be **negligible** at all receptors.

4.3.14 Predicted impacts on annual mean PM_{2.5} concentrations at the sensitive receptor locations are summarised in Table 28.

Table 28 Demolition and Construction Stage - Predicted Impacts - PM_{2.5}

Receptor		Sensitivity	Magnitude of Impact	Impact Significance
R1	Residential - Hugmore Lane	Very Low	Very Small	Negligible
R2	Residential - Holt Road	Very Low	Very Small	Negligible
R3	Residential - Sandy Lane	Very Low	Very Small	Negligible
R4	Residential - A534 Wrexham Road	Very Low	Negligible	Negligible
R5	Residential - A534 Wrexham Road	Very Low	Negligible	Negligible
R6	Residential - Sandy Lane	Very Low	Negligible	Negligible
R7	Residential - Borrass Hall Lane	Very Low	Negligible	Negligible
R8	Residential - Borrass Hall Lane	Very Low	Negligible	Negligible
R9	Residential - The Links	Very Low	Negligible	Negligible
R10	Residential - Birkdale Road	Low	Very Small	Negligible
R11	Residential - A534 Holt Road	Very Low	Very Small	Negligible

Receptor		Sensitivity	Magnitude of Impact	Impact Significance
R12	Residential - A534 Holt Road	Very Low	Very Small	Negligible
R13	Residential - A534 Holt Road	Very Low	Negligible	Negligible
R14	Residential - Bader Court	Very Low	Negligible	Negligible
R15	Residential - Avondale Grove	Very Low	Negligible	Negligible
R16	Residential - Bieston Close	Very Low	Negligible	Negligible
R17	Residential - Ffordd Llywelyn	Very Low	Negligible	Negligible
R18	Residential - Ffordd Garmonydd	Very Low	Negligible	Negligible
R19	Residential - Chester Road	Very Low	Negligible	Negligible
R20	Residential - Plas Acton Close	Very Low	Negligible	Negligible
R21	Residential - A5152 Chester Road	Very Low	Negligible	Negligible
R22	Residential - A5152 Chester Road	Very Low	Negligible	Negligible
R23	Residential - A5152 Chester Road	Very Low	Negligible	Negligible

4.3.15 As indicated in Table 28, impacts on annual mean PM_{2.5} concentrations as a result of the demolition and construction stage were predicted to be **negligible** at all receptors.

4.4 Completed Development Stage

4.4.1 Vehicle movements associated with the completed development stage of the proposed development will generate exhaust emissions on the local and regional road networks. An assessment was therefore undertaken using dispersion modelling, with the inputs described in Section 2.0, in order to quantify potential changes in pollutant concentrations at sensitive locations in the vicinity of the site.

4.4.2 The assessment was undertaken under the scenarios mentioned in Section 2.3.

Scenario 4

Predicted Concentrations

4.4.3 Annual mean NO₂ concentrations were predicted at the sensitive receptor locations for scenario 2 and scenario 4. These are summarised in Table 29.

Table 29 Completed Development Stage - Predicted Annual Mean NO₂ Concentrations

Receptor		Predicted Annual Mean NO ₂ Concentration (µg/m ³)		
		Scenario 2	Scenario 4	Change
R1	Residential - Hugmore Lane	16.63	17.13	0.50
R2	Residential - Holt Road	16.07	16.53	0.46
R3	Residential - Sandy Lane	14.66	15.08	0.42
R4	Residential - A534 Wrexham Road	18.33	18.47	0.14
R5	Residential - A534 Wrexham Road	15.98	16.03	0.05
R6	Residential - Sandy Lane	13.36	13.66	0.30
R7	Residential - Borrás Hall Lane	15.46	15.87	0.41
R8	Residential - Borrás Hall Lane	13.96	14.04	0.08
R9	Residential - The Links	17.49	18.02	0.53
R10	Residential - Birkdale Road	22.05	23.35	1.30
R11	Residential - A534 Holt Road	19.80	20.36	0.56
R12	Residential - A534 Holt Road	19.86	20.47	0.61
R13	Residential - A534 Holt Road	17.30	17.66	0.36
R14	Residential - Bader Court	19.49	19.68	0.19
R15	Residential - Avondale Grove	17.85	18.41	0.56
R16	Residential - Bieston Close	20.21	20.38	0.17
R17	Residential - Ffordd Llywelyn	16.62	16.74	0.12
R18	Residential - Ffordd Garmonydd	18.44	18.78	0.34
R19	Residential - Chester Road	18.97	19.32	0.35

Receptor		Predicted Annual Mean NO ₂ Concentration (µg/m ³)		
		Scenario 2	Scenario 4	Change
R20	Residential - Plas Acton Close	18.10	18.21	0.11
R21	Residential - A5152 Chester Road	19.32	19.42	0.10
R22	Residential - A5152 Chester Road	16.91	16.94	0.03
R23	Residential - A5152 Chester Road	16.88	16.90	0.02

4.4.4 As shown in Table 29, predicted annual mean NO₂ concentrations were below the relevant AQO at all receptors in both scenarios.

4.4.5 Reference should be made to Figure 9.6 and 9.7 for graphical representations of annual mean NO₂ concentrations for scenario 2 and scenario 4, respectively.

4.4.6 Annual mean PM₁₀ concentrations were predicted at the sensitive receptor locations for scenario 2 and scenario 4. These are summarised in Table 30.

Table 30 Completed Development Stage - Predicted Annual Mean PM₁₀ Concentrations

Receptor		Predicted Annual Mean PM ₁₀ Concentration (µg/m ³)		
		Scenario 2	Scenario 4	Change
R1	Residential - Hugmore Lane	12.97	13.07	0.10
R2	Residential - Holt Road	12.80	12.89	0.09
R3	Residential - Sandy Lane	12.53	12.62	0.08
R4	Residential - A534 Wrexham Road	13.22	13.25	0.03
R5	Residential - A534 Wrexham Road	12.76	12.77	0.01
R6	Residential - Sandy Lane	12.29	12.35	0.06
R7	Residential - Borrass Hall Lane	12.68	12.74	0.06
R8	Residential - Borrass Hall Lane	12.39	12.40	0.01
R9	Residential - The Links	13.00	13.08	0.08
R10	Residential - Birkdale Road	13.79	13.99	0.20

Receptor		Predicted Annual Mean PM ₁₀ Concentration (µg/m ³)		
		Scenario 2	Scenario 4	Change
R11	Residential - A534 Holt Road	13.47	13.57	0.10
R12	Residential - A534 Holt Road	13.42	13.52	0.10
R13	Residential - A534 Holt Road	12.99	13.06	0.06
R14	Residential - Bader Court	13.47	13.50	0.04
R15	Residential - Avondale Grove	13.09	13.16	0.08
R16	Residential - Bieston Close	13.62	13.65	0.03
R17	Residential - Ffordd Llywelyn	12.90	12.92	0.02
R18	Residential - Ffordd Garmonydd	13.17	13.20	0.03
R19	Residential - Chester Road	13.29	13.32	0.04
R20	Residential - Plas Acton Close	13.15	13.17	0.02
R21	Residential - A5152 Chester Road	13.38	13.39	0.01
R22	Residential - A5152 Chester Road	12.92	12.93	0.00
R23	Residential - A5152 Chester Road	12.91	12.92	0.00

- 4.4.7 As shown in Table 30, predicted annual mean PM₁₀ concentrations were below the relevant AQO at all receptors in both scenarios.
- 4.4.8 Reference should be made to Figure 9.8 and 9.9 for graphical representations of annual mean PM₁₀ concentrations for scenario 2 and scenario 4, respectively.
- 4.4.9 Annual mean PM_{2.5} concentrations were predicted at the sensitive receptor locations for scenario 2 and scenario 4. These are summarised in Table 31.

Table 31 Completed Development Stage - Predicted Annual Mean PM_{2.5} Concentrations

Receptor		Predicted Annual Mean PM _{2.5} Concentration (µg/m ³)		
		Scenario 2	Scenario 4	Change
R1	Residential - Hugmore Lane	8.33	8.38	0.06
R2	Residential - Holt Road	8.23	8.29	0.05
R3	Residential - Sandy Lane	8.08	8.13	0.05
R4	Residential - A534 Wrexham Road	8.48	8.49	0.02
R5	Residential - A534 Wrexham Road	8.21	8.22	0.01
R6	Residential - Sandy Lane	7.93	7.97	0.04
R7	Residential - Borrass Hall Lane	8.16	8.20	0.03
R8	Residential - Borrass Hall Lane	7.99	8.00	0.01
R9	Residential - The Links	8.35	8.40	0.05
R10	Residential - Birkdale Road	8.82	8.93	0.12
R11	Residential - A534 Holt Road	8.62	8.68	0.06
R12	Residential - A534 Holt Road	8.60	8.66	0.06
R13	Residential - A534 Holt Road	8.34	8.38	0.04
R14	Residential - Bader Court	8.62	8.64	0.02
R15	Residential - Avondale Grove	8.40	8.45	0.04
R16	Residential - Bieston Close	8.71	8.73	0.02
R17	Residential - Ffordd Llywelyn	8.29	8.30	0.01
R18	Residential - Ffordd Garmonydd	8.45	8.47	0.02
R19	Residential - Chester Road	8.52	8.54	0.02
R20	Residential - Plas Acton Close	8.44	8.45	0.01
R21	Residential - A5152 Chester Road	8.57	8.58	0.01
R22	Residential - A5152 Chester Road	8.30	8.31	0.00
R23	Residential - A5152 Chester Road	8.30	8.30	0.00

4.4.10 As indicated in Table 31, predicted annual mean PM_{2.5} concentrations were below the Interim Target at all receptors in both scenarios.

4.4.11 Reference should be made to Figure 9.10 and 9.11 for graphical representations of annual mean PM_{2.5} concentrations for scenario 2 and scenario 4, respectively.

Predicted Impacts

4.4.12 Predicted impacts on annual mean NO₂ concentrations at sensitive receptor locations are summarised in Table 32.

Table 32 Completed Development Stage - Predicted Impacts - NO₂

Receptor		Sensitivity	Magnitude of Impact	Impact Significance
R1	Residential - Hugmore Lane	Very Low	Very Small	Negligible
R2	Residential - Holt Road	Very Low	Very Small	Negligible
R3	Residential - Sandy Lane	Very Low	Very Small	Negligible
R4	Residential - A534 Wrexham Road	Very Low	Negligible	Negligible
R5	Residential - A534 Wrexham Road	Very Low	Negligible	Negligible
R6	Residential - Sandy Lane	Very Low	Very Small	Negligible
R7	Residential - Borrass Hall Lane	Very Low	Very Small	Negligible
R8	Residential - Borrass Hall Lane	Very Low	Negligible	Negligible
R9	Residential - The Links	Very Low	Very Small	Negligible
R10	Residential - Birkdale Road	Very Low	Small	Negligible
R11	Residential - A534 Holt Road	Very Low	Very Small	Negligible
R12	Residential - A534 Holt Road	Very Low	Small	Negligible
R13	Residential - A534 Holt Road	Very Low	Very Small	Negligible
R14	Residential - Bader Court	Very Low	Negligible	Negligible
R15	Residential - Avondale Grove	Very Low	Very Small	Negligible
R16	Residential - Bieston Close	Very Low	Negligible	Negligible
R17	Residential - Ffordd Llywelyn	Very Low	Negligible	Negligible

Receptor		Sensitivity	Magnitude of Impact	Impact Significance
R18	Residential - Ffordd Garmonydd	Very Low	Very Small	Negligible
R19	Residential - Chester Road	Very Low	Very Small	Negligible
R20	Residential - Plas Acton Close	Very Low	Negligible	Negligible
R21	Residential - A5152 Chester Road	Very Low	Negligible	Negligible
R22	Residential - A5152 Chester Road	Very Low	Negligible	Negligible
R23	Residential - A5152 Chester Road	Very Low	Negligible	Negligible

4.4.13 As indicated in Table 32, impacts on annual mean NO₂ concentrations as a result of the proposed development were predicted to be **negligible** at all receptors.

4.4.14 Predicted impacts on annual mean PM₁₀ concentrations at the sensitive receptor locations are summarised in Table 33.

Table 33 Completed Development Stage - Predicted Impacts - PM₁₀

Receptor		Sensitivity	Magnitude of Impact	Impact Significance
R1	Residential - Hugmore Lane	Very Low	Negligible	Negligible
R2	Residential - Holt Road	Very Low	Negligible	Negligible
R3	Residential - Sandy Lane	Very Low	Negligible	Negligible
R4	Residential - A534 Wrexham Road	Very Low	Negligible	Negligible
R5	Residential - A534 Wrexham Road	Very Low	Negligible	Negligible
R6	Residential - Sandy Lane	Very Low	Negligible	Negligible
R7	Residential - Borrass Hall Lane	Very Low	Negligible	Negligible
R8	Residential - Borrass Hall Lane	Very Low	Negligible	Negligible
R9	Residential - The Links	Very Low	Negligible	Negligible
R10	Residential - Birkdale Road	Very Low	Negligible	Negligible
R11	Residential - A534 Holt Road	Very Low	Negligible	Negligible
R12	Residential - A534 Holt Road	Very Low	Negligible	Negligible
R13	Residential - A534 Holt Road	Very Low	Negligible	Negligible

Receptor		Sensitivity	Magnitude of Impact	Impact Significance
R14	Residential - Bader Court	Very Low	Negligible	Negligible
R15	Residential - Avondale Grove	Very Low	Negligible	Negligible
R16	Residential - Bieston Close	Very Low	Negligible	Negligible
R17	Residential - Ffordd Llywelyn	Very Low	Negligible	Negligible
R18	Residential - Ffordd Garmonydd	Very Low	Negligible	Negligible
R19	Residential - Chester Road	Very Low	Negligible	Negligible
R20	Residential - Plas Acton Close	Very Low	Negligible	Negligible
R21	Residential - A5152 Chester Road	Very Low	Negligible	Negligible
R22	Residential - A5152 Chester Road	Very Low	Negligible	Negligible
R23	Residential - A5152 Chester Road	Very Low	Negligible	Negligible

4.4.15 As indicated in Table 33, impacts on annual mean PM₁₀ concentrations as a result of the proposed development were predicted to be **negligible** at all receptors.

4.4.16 Predicted impacts on annual mean PM_{2.5} concentrations at the sensitive receptor locations are summarised in Table 34.

Table 34 Completed Development Stage - Predicted Impacts - PM_{2.5}

Receptor		Sensitivity	Magnitude of Impact	Impact Significance
R1	Residential - Hugmore Lane	Very Low	Negligible	Negligible
R2	Residential - Holt Road	Very Low	Negligible	Negligible
R3	Residential - Sandy Lane	Very Low	Negligible	Negligible
R4	Residential - A534 Wrexham Road	Very Low	Negligible	Negligible
R5	Residential - A534 Wrexham Road	Very Low	Negligible	Negligible
R6	Residential - Sandy Lane	Very Low	Negligible	Negligible
R7	Residential - Borrass Hall Lane	Very Low	Negligible	Negligible
R8	Residential - Borrass Hall Lane	Very Low	Negligible	Negligible
R9	Residential - The Links	Very Low	Negligible	Negligible

Receptor		Sensitivity	Magnitude of Impact	Impact Significance
R10	Residential - Birkdale Road	Low	Very Small	Negligible
R11	Residential - A534 Holt Road	Very Low	Negligible	Negligible
R12	Residential - A534 Holt Road	Very Low	Very Small	Negligible
R13	Residential - A534 Holt Road	Very Low	Negligible	Negligible
R14	Residential - Bader Court	Very Low	Negligible	Negligible
R15	Residential - Avondale Grove	Very Low	Negligible	Negligible
R16	Residential - Bieston Close	Very Low	Negligible	Negligible
R17	Residential - Ffordd Llywelyn	Very Low	Negligible	Negligible
R18	Residential - Ffordd Garmonydd	Very Low	Negligible	Negligible
R19	Residential - Chester Road	Very Low	Negligible	Negligible
R20	Residential - Plas Acton Close	Very Low	Negligible	Negligible
R21	Residential - A5152 Chester Road	Very Low	Negligible	Negligible
R22	Residential - A5152 Chester Road	Very Low	Negligible	Negligible
R23	Residential - A5152 Chester Road	Very Low	Negligible	Negligible

4.4.17 As indicated in Table 34, impacts on annual mean PM_{2.5} concentrations as a result of the proposed development were predicted to be **negligible** at all receptors.

Scenario 5

Predicted Concentrations

4.4.18 Annual mean NO₂ concentrations were predicted at the sensitive receptor locations for the scenario 2 and scenario 5. These are summarised in Table 35.

Table 35 Completed Development Stage - Predicted Annual Mean NO₂ Concentrations

Receptor		Predicted Annual Mean NO ₂ Concentration (µg/m ³)		
		Scenario 2	Scenario 5	Change
R1	Residential - Hugmore Lane	16.63	17.31	0.68
R2	Residential - Holt Road	16.07	16.57	0.50
R3	Residential - Sandy Lane	14.66	15.11	0.45
R4	Residential - A534 Wrexham Road	18.33	18.51	0.18
R5	Residential - A534 Wrexham Road	15.98	16.04	0.06
R6	Residential - Sandy Lane	13.36	13.72	0.36
R7	Residential - Borrass Hall Lane	15.46	15.90	0.44
R8	Residential - Borrass Hall Lane	13.96	14.06	0.10
R9	Residential - The Links	17.49	18.06	0.57
R10	Residential - Birkdale Road	22.05	23.44	1.39
R11	Residential - A534 Holt Road	19.80	20.43	0.63
R12	Residential - A534 Holt Road	19.86	20.54	0.68
R13	Residential - A534 Holt Road	17.30	17.71	0.41
R14	Residential - Bader Court	19.49	19.72	0.23
R15	Residential - Avondale Grove	17.85	18.44	0.59
R16	Residential - Bieston Close	20.21	20.43	0.22
R17	Residential - Ffordd Llywelyn	16.62	16.80	0.18
R18	Residential - Ffordd Garmonydd	18.44	18.87	0.43
R19	Residential - Chester Road	18.97	19.40	0.43
R20	Residential - Plas Acton Close	18.10	18.24	0.14
R21	Residential - A5152 Chester Road	19.32	19.46	0.14
R22	Residential - A5152 Chester Road	16.91	16.95	0.04
R23	Residential - A5152 Chester Road	16.88	16.91	0.03

4.4.19 As shown in Table 29, predicted annual mean NO₂ concentrations were below the relevant AQO at all receptors in both scenarios.

4.4.20 Reference should be made to Figure 9.6 and 9.12 for graphical representations of annual mean NO₂ concentrations for scenario 2 and scenario 5, respectively.

4.4.21 Annual mean PM₁₀ concentrations were predicted at the sensitive receptor locations for the scenario 2 and scenario 5. These are summarised in Table 36.

Table 36 Completed Development Stage - Predicted Annual Mean PM₁₀ Concentrations

Receptor		Predicted Annual Mean PM ₁₀ Concentration (µg/m ³)		
		Scenario 2	Scenario 5	Change
R1	Residential - Hugmore Lane	12.97	13.10	0.13
R2	Residential - Holt Road	12.80	12.90	0.10
R3	Residential - Sandy Lane	12.53	12.62	0.09
R4	Residential - A534 Wrexham Road	13.22	13.25	0.03
R5	Residential - A534 Wrexham Road	12.76	12.77	0.01
R6	Residential - Sandy Lane	12.29	12.36	0.07
R7	Residential - Borrass Hall Lane	12.68	12.75	0.07
R8	Residential - Borrass Hall Lane	12.39	12.40	0.02
R9	Residential - The Links	13.00	13.09	0.09
R10	Residential - Birkdale Road	13.79	14.01	0.21
R11	Residential - A534 Holt Road	13.47	13.58	0.12
R12	Residential - A534 Holt Road	13.42	13.54	0.12
R13	Residential - A534 Holt Road	12.99	13.07	0.07
R14	Residential - Bader Court	13.47	13.51	0.05
R15	Residential - Avondale Grove	13.09	13.17	0.08
R16	Residential - Bieston Close	13.62	13.66	0.05
R17	Residential - Ffordd Llywelyn	12.90	12.94	0.04
R18	Residential - Ffordd Garmonydd	13.17	13.23	0.06

Receptor		Predicted Annual Mean PM ₁₀ Concentration (µg/m³)		
		Scenario 2	Scenario 5	Change
R19	Residential - Chester Road	13.29	13.35	0.06
R20	Residential - Plas Acton Close	13.15	13.18	0.03
R21	Residential - A5152 Chester Road	13.38	13.41	0.02
R22	Residential - A5152 Chester Road	12.92	12.93	0.01
R23	Residential - A5152 Chester Road	12.91	12.92	0.01

4.4.22 As shown in Table 30, predicted annual mean PM₁₀ concentrations were below the relevant AQO at all receptors in both scenarios.

4.4.23 Reference should be made to Figure 9.8 and 9.13 for graphical representations of annual mean PM₁₀ concentrations for scenario 2 and scenario 5, respectively.

4.4.24 Annual mean PM_{2.5} concentrations were predicted at the sensitive receptor locations for scenario 2 and scenario 5. These are summarised in Table 37.

Table 37 Completed Development Stage - Predicted Annual Mean PM_{2.5} Concentrations

Receptor		Predicted Annual Mean PM _{2.5} Concentration (µg/m³)		
		Scenario 2	Scenario 5	Change
R1	Residential - Hugmore Lane	8.33	8.40	0.08
R2	Residential - Holt Road	8.23	8.29	0.06
R3	Residential - Sandy Lane	8.08	8.13	0.05
R4	Residential - A534 Wrexham Road	8.48	8.50	0.02
R5	Residential - A534 Wrexham Road	8.21	8.22	0.01
R6	Residential - Sandy Lane	7.93	7.98	0.04
R7	Residential - Borrass Hall Lane	8.16	8.20	0.04
R8	Residential - Borrass Hall Lane	7.99	8.00	0.01
R9	Residential - The Links	8.35	8.40	0.05

Receptor		Predicted Annual Mean PM _{2.5} Concentration (µg/m³)		
		Scenario 2	Scenario 5	Change
R10	Residential - Birkdale Road	8.82	8.94	0.13
R11	Residential - A534 Holt Road	8.62	8.69	0.07
R12	Residential - A534 Holt Road	8.60	8.67	0.07
R13	Residential - A534 Holt Road	8.34	8.39	0.04
R14	Residential - Bader Court	8.62	8.65	0.03
R15	Residential - Avondale Grove	8.40	8.45	0.05
R16	Residential - Bieston Close	8.71	8.73	0.03
R17	Residential - Ffordd Llywelyn	8.29	8.31	0.02
R18	Residential - Ffordd Garmonydd	8.45	8.49	0.04
R19	Residential - Chester Road	8.52	8.55	0.04
R20	Residential - Plas Acton Close	8.44	8.46	0.02
R21	Residential - A5152 Chester Road	8.57	8.59	0.01
R22	Residential - A5152 Chester Road	8.30	8.31	0.01
R23	Residential - A5152 Chester Road	8.30	8.30	0.00

4.4.25 As indicated in Table 31, predicted annual mean PM_{2.5} concentrations were below the Interim Target at all receptors in both scenarios.

4.4.26 Reference should be made to Figure 9.10 and 9.14 for graphical representations of annual mean PM_{2.5} concentrations for scenario 2 and scenario 5, respectively.

Predicted Impacts

4.4.27 Predicted impacts on annual mean NO₂ concentrations at sensitive receptor locations are summarised in Table 38..

Table 38 Completed Development Stage - Predicted Impacts - NO₂

Receptor		Sensitivity	Magnitude of Impact	Impact Significance
R1	Residential - Hugmore Lane	Very Low	Small	Negligible
R2	Residential - Holt Road	Very Low	Very Small	Negligible
R3	Residential - Sandy Lane	Very Low	Very Small	Negligible
R4	Residential - A534 Wrexham Road	Very Low	Negligible	Negligible
R5	Residential - A534 Wrexham Road	Very Low	Negligible	Negligible
R6	Residential - Sandy Lane	Very Low	Very Small	Negligible
R7	Residential - Borrass Hall Lane	Very Low	Very Small	Negligible
R8	Residential - Borrass Hall Lane	Very Low	Negligible	Negligible
R9	Residential - The Links	Very Low	Very Small	Negligible
R10	Residential - Birkdale Road	Very Low	Small	Negligible
R11	Residential - A534 Holt Road	Very Low	Small	Negligible
R12	Residential - A534 Holt Road	Very Low	Small	Negligible
R13	Residential - A534 Holt Road	Very Low	Very Small	Negligible
R14	Residential - Bader Court	Very Low	Very Small	Negligible
R15	Residential - Avondale Grove	Very Low	Very Small	Negligible
R16	Residential - Bieston Close	Very Low	Very Small	Negligible
R17	Residential - Ffordd Llywelyn	Very Low	Negligible	Negligible
R18	Residential - Ffordd Garmonydd	Very Low	Very Small	Negligible
R19	Residential - Chester Road	Very Low	Very Small	Negligible
R20	Residential - Plas Acton Close	Very Low	Negligible	Negligible
R21	Residential - A5152 Chester Road	Very Low	Negligible	Negligible
R22	Residential - A5152 Chester Road	Very Low	Negligible	Negligible
R23	Residential - A5152 Chester Road	Very Low	Negligible	Negligible

4.4.28 As indicated in Table 32, impacts on annual mean NO₂ concentrations as a result of the proposed development were predicted to be **negligible** at all receptors.

4.4.29 Predicted impacts on annual mean PM₁₀ concentrations at the sensitive receptor locations are summarised in Table 39.

Table 39 Completed Development Stage - Predicted Impacts - PM₁₀

Receptor		Sensitivity	Magnitude of Impact	Impact Significance
R1	Residential - Hugmore Lane	Very Low	Negligible	Negligible
R2	Residential - Holt Road	Very Low	Negligible	Negligible
R3	Residential - Sandy Lane	Very Low	Negligible	Negligible
R4	Residential - A534 Wrexham Road	Very Low	Negligible	Negligible
R5	Residential - A534 Wrexham Road	Very Low	Negligible	Negligible
R6	Residential - Sandy Lane	Very Low	Negligible	Negligible
R7	Residential - Borrass Hall Lane	Very Low	Negligible	Negligible
R8	Residential - Borrass Hall Lane	Very Low	Negligible	Negligible
R9	Residential - The Links	Very Low	Negligible	Negligible
R10	Residential - Birkdale Road	Very Low	Negligible	Negligible
R11	Residential - A534 Holt Road	Very Low	Negligible	Negligible
R12	Residential - A534 Holt Road	Very Low	Negligible	Negligible
R13	Residential - A534 Holt Road	Very Low	Negligible	Negligible
R14	Residential - Bader Court	Very Low	Negligible	Negligible
R15	Residential - Avondale Grove	Very Low	Negligible	Negligible
R16	Residential - Bieston Close	Very Low	Negligible	Negligible
R17	Residential - Ffordd Llywelyn	Very Low	Negligible	Negligible
R18	Residential - Ffordd Garmonydd	Very Low	Negligible	Negligible
R19	Residential - Chester Road	Very Low	Negligible	Negligible
R20	Residential - Plas Acton Close	Very Low	Negligible	Negligible
R21	Residential - A5152 Chester Road	Very Low	Negligible	Negligible
R22	Residential - A5152 Chester Road	Very Low	Negligible	Negligible
R23	Residential - A5152 Chester Road	Very Low	Negligible	Negligible

4.4.30 As indicated in Table 33, impacts on annual mean PM₁₀ concentrations as a result of the proposed development were predicted to be **negligible** at all receptors.

4.4.31 Predicted impacts on annual mean PM_{2.5} concentrations at the sensitive receptor locations are summarised in Table 40.

Table 40 Completed Development Stage - Predicted Impacts - PM_{2.5}

Receptor		Sensitivity	Magnitude of Impact	Impact Significance
R1	Residential - Hugmore Lane	Very Low	Very Small	Negligible
R2	Residential - Holt Road	Very Low	Negligible	Negligible
R3	Residential - Sandy Lane	Very Low	Negligible	Negligible
R4	Residential - A534 Wrexham Road	Very Low	Negligible	Negligible
R5	Residential - A534 Wrexham Road	Very Low	Negligible	Negligible
R6	Residential - Sandy Lane	Very Low	Negligible	Negligible
R7	Residential - Borrass Hall Lane	Very Low	Negligible	Negligible
R8	Residential - Borrass Hall Lane	Very Low	Negligible	Negligible
R9	Residential - The Links	Very Low	Negligible	Negligible
R10	Residential - Birkdale Road	Low	Very Small	Negligible
R11	Residential - A534 Holt Road	Very Low	Very Small	Negligible
R12	Residential - A534 Holt Road	Very Low	Very Small	Negligible
R13	Residential - A534 Holt Road	Very Low	Negligible	Negligible
R14	Residential - Bader Court	Very Low	Negligible	Negligible
R15	Residential - Avondale Grove	Very Low	Negligible	Negligible
R16	Residential - Bieston Close	Very Low	Negligible	Negligible
R17	Residential - Ffordd Llywelyn	Very Low	Negligible	Negligible
R18	Residential - Ffordd Garmonydd	Very Low	Negligible	Negligible
R19	Residential - Chester Road	Very Low	Negligible	Negligible
R20	Residential - Plas Acton Close	Very Low	Negligible	Negligible
R21	Residential - A5152 Chester Road	Very Low	Negligible	Negligible

Receptor		Sensitivity	Magnitude of Impact	Impact Significance
R22	Residential - A5152 Chester Road	Very Low	Negligible	Negligible
R23	Residential - A5152 Chester Road	Very Low	Negligible	Negligible

4.4.32 As indicated in Table 34, impacts on annual mean PM_{2.5} concentrations as a result of the proposed development were predicted to be **negligible** at all receptors.

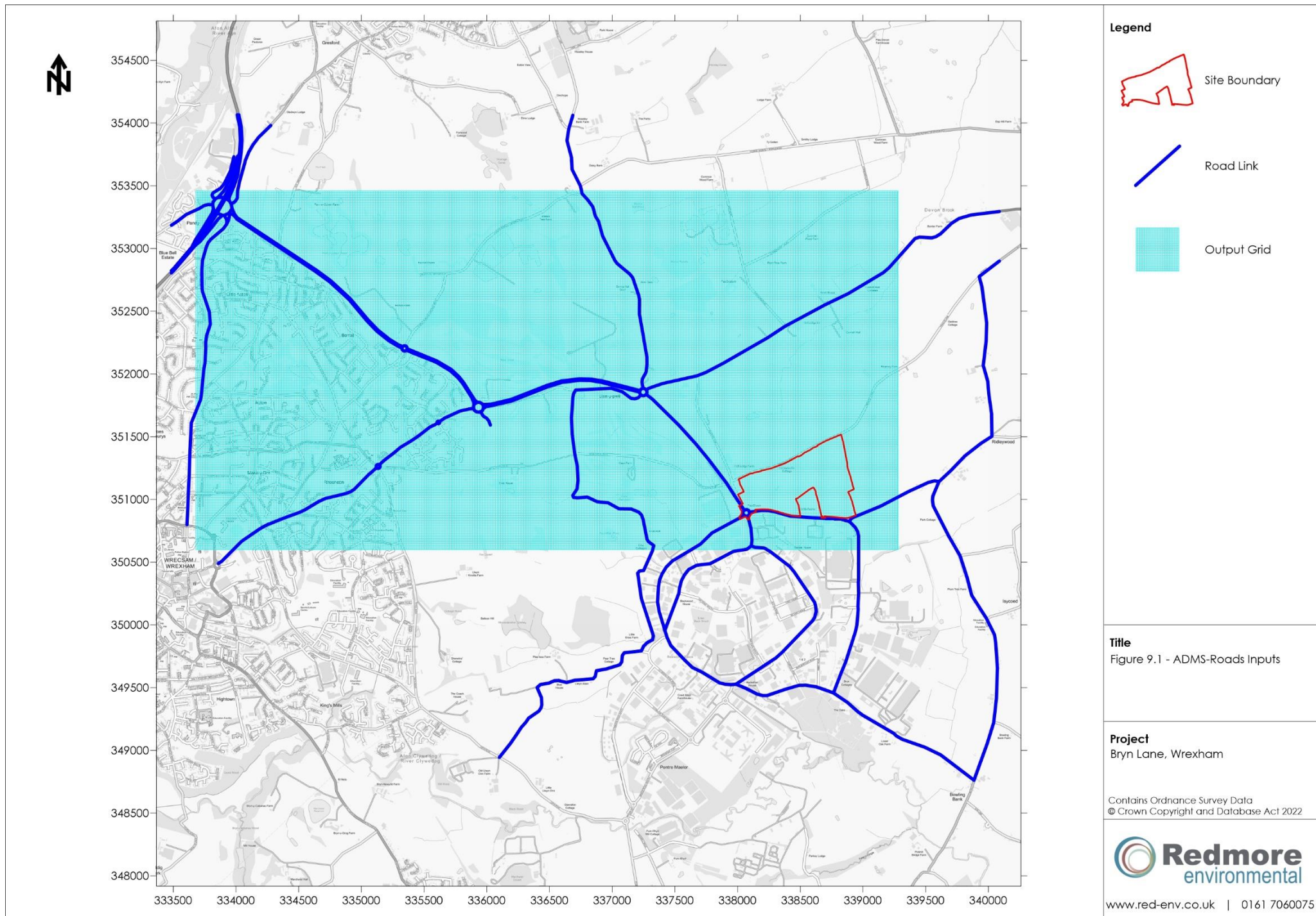
Completed Development Stage Scenario Comparison

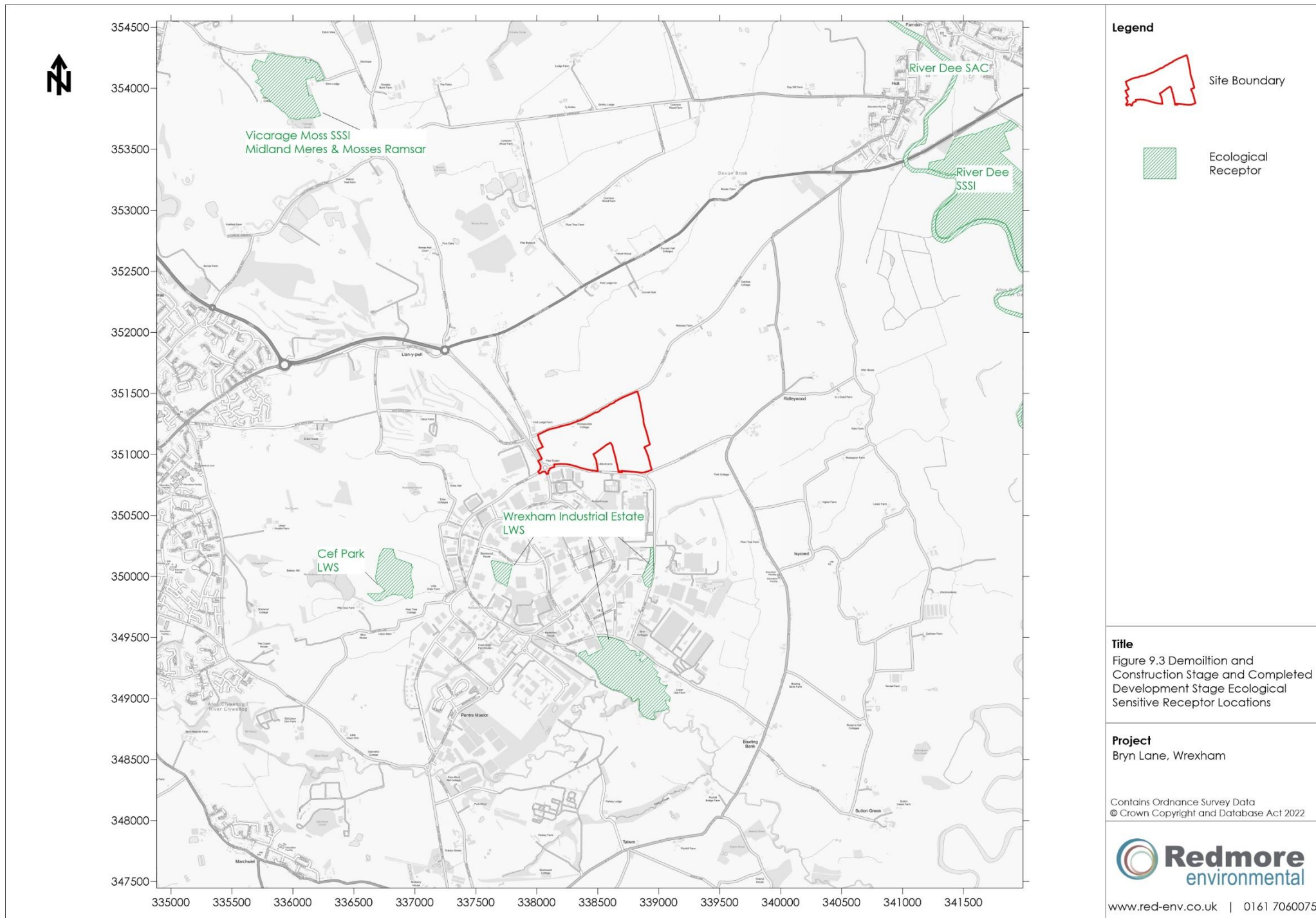
4.4.33 Two Completed Development Stage scenarios to represent different land use classes within the final proposed development were assessed to determine potential variations in predicted impacts. This indicated impacts on annual mean NO₂, PM₁₀ and PM_{2.5} concentrations were predicted to be **negligible** at all receptors for scenario 4 and scenario 5. As such, overall impacts associated with the two development options are predicted to be identical. Nevertheless, concentrations from scenario 5 were slightly higher than those for scenario 4. As such, the assessment presented within **Chapter 9: Air Quality** utilises these results as a worst case.

5.0 CONCLUSION

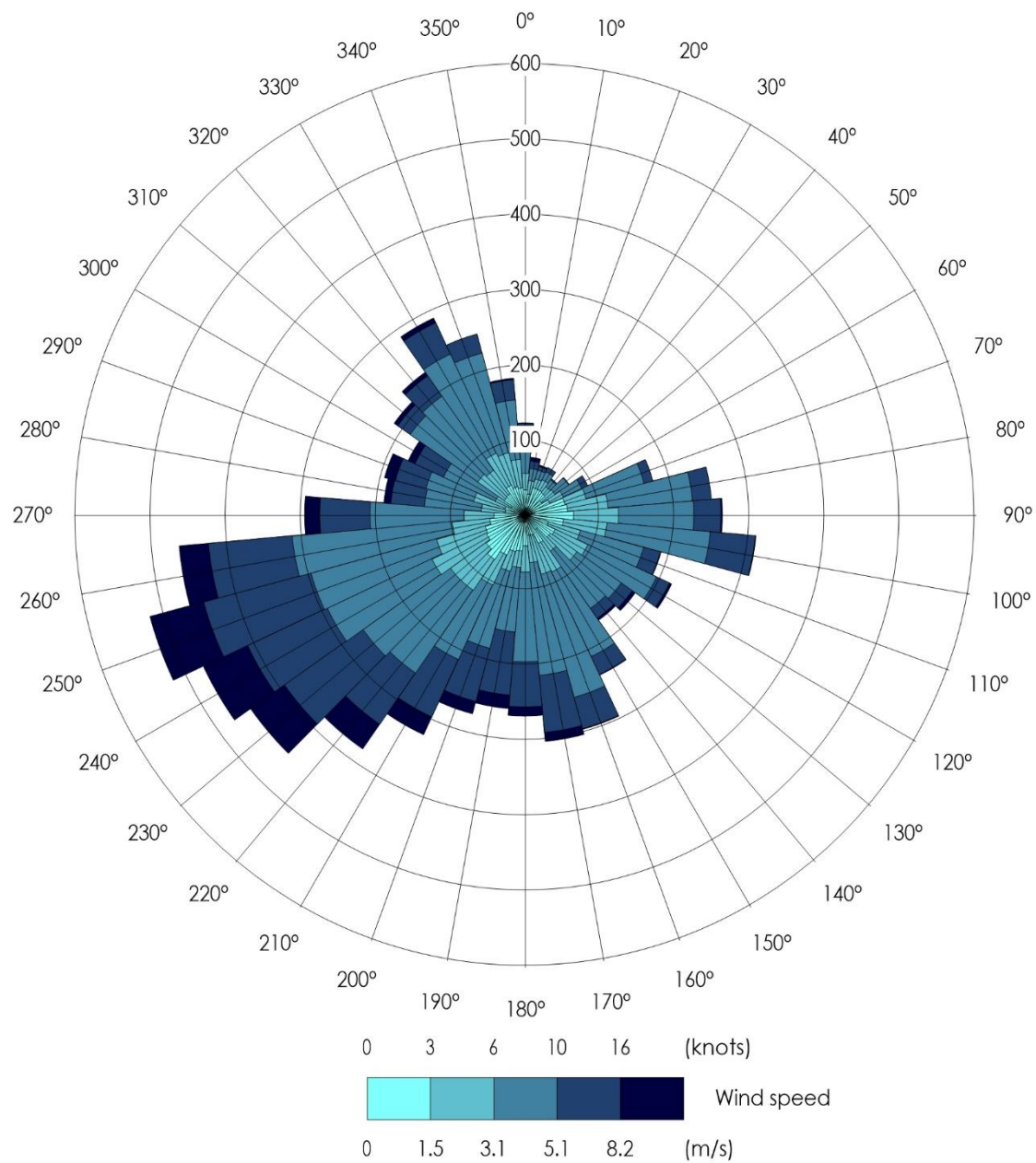
- 5.1.1 The proposed development has the potential to cause air quality impacts as a result of fugitive dust emissions during the demolition and construction stage and road traffic exhaust emissions associated with vehicles travelling to and from the site during the demolition and construction stage and the completed development stage. As such, an Air Quality Assessment was undertaken in order to determine baseline conditions and assess potential effects as a result of the proposed development.
- 5.1.2 During the demolition and construction stage of the development there is the potential for air quality impacts as a result of fugitive dust emissions from the application site. These were assessed in accordance with the IAQM methodology. Assuming good practice dust control measures are implemented for a **medium risk** site, the residual significance of potential air quality impacts from dust generated by earthworks, construction and trackout activities was predicted to be **not significant**.
- 5.1.3 Potential impacts during the demolition and construction stage and completed development stage of the proposed development may occur due to road traffic exhaust emissions associated with vehicles travelling to and from the application site. Dispersion modelling was therefore undertaken in order to predict pollutant concentrations at sensitive locations as a result of emissions from the highway network both with and without the development in place. Results were subsequently verified using local monitoring data.
- 5.1.4 Review of the dispersion modelling results indicated that impacts on annual mean NO₂, PM₁₀ and PM_{2.5} concentrations as a result of traffic generated by the demolition and construction stage and completed development stage were predicted to be **negligible** at all sensitive receptor locations. Following consideration of the relevant issues, air quality impacts as a result of the demolition and construction stage and completed development stage were considered to be **not significant**, in accordance with the IAQM guidance.

Figures









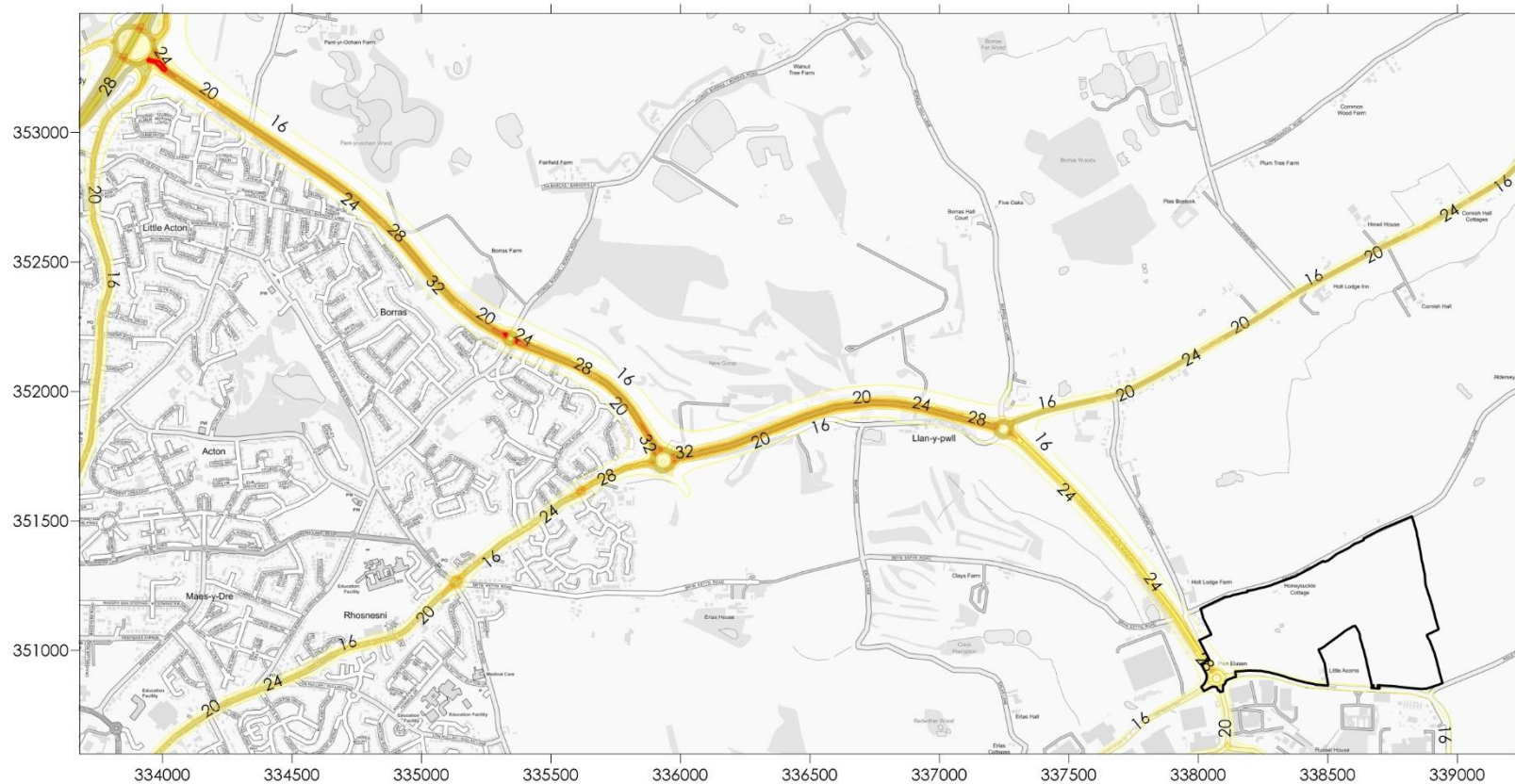
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Title
Figure 9.5 - Wind Rose of 2019
Shawbury Meteorological Data

Project
Bryn Lane, Wrexham



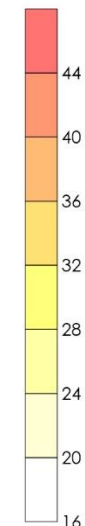
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Legend



Site Boundary



Annual Mean
NO₂ Concentration
(µg/m³)

Title

Figure 9.6 - Predicted Annual Mean
NO₂ Concentrations (µg/m³)
Scenario 2

Project

Bryn Lane, Wrexham

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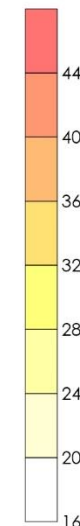
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Site Boundary



Annual Mean
NO₂ Concentration
(µg/m³)

Title

Figure 9.7 - Predicted Annual Mean
NO₂ Concentrations (µg/m³)
Scenario 4

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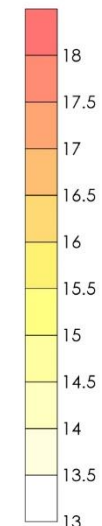
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Site Boundary



Annual Mean
PM₁₀ Concentration
($\mu\text{g}/\text{m}^3$)

Title

Figure 9.8 - Predicted Annual Mean
PM₁₀ Concentrations ($\mu\text{g}/\text{m}^3$)
Scenario 2

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Legend



Site Boundary



18
17.5
17
16.5
16
15.5
15
14.5
14
13.5
13

Annual Mean
PM₁₀ Concentration
($\mu\text{g}/\text{m}^3$)

Title

Figure 9.9 - Predicted Annual Mean
PM₁₀ Concentrations ($\mu\text{g}/\text{m}^3$)
Scenario 4

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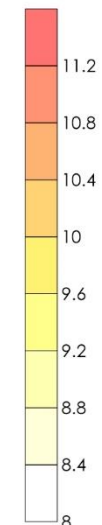
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Site Boundary



Annual Mean
PM_{2.5} Concentration
($\mu\text{g}/\text{m}^3$)

Title

Figure 9.10 - Predicted Annual Mean
PM_{2.5} Concentrations ($\mu\text{g}/\text{m}^3$)
Scenario 2

Project

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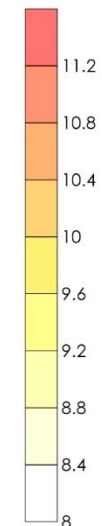
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Legend



Site Boundary



Annual Mean
PM_{2.5} Concentration
($\mu\text{g}/\text{m}^3$)

Title

Figure 9.11 - Predicted Annual Mean
PM_{2.5} Concentrations ($\mu\text{g}/\text{m}^3$)
Scenario 4

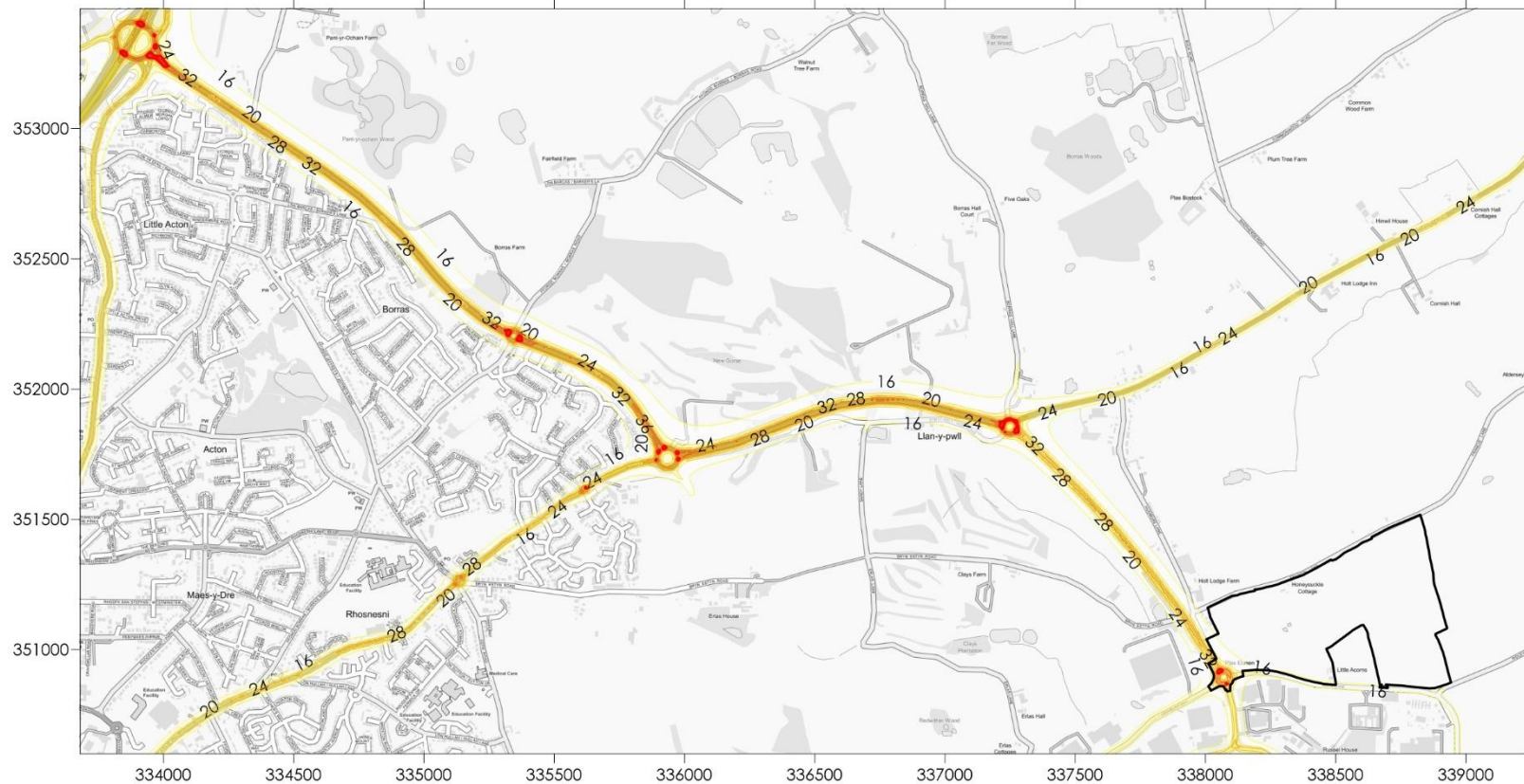
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Number of days

16 20 24 28 32 36 40 44

Annual Mean
NO₂ Concentration
(µg/m³)

Figure 9.12 - Predicted Annual Mean NO₂ Concentrations (µg/m³) Scenario 5

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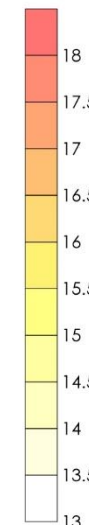
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Legend



Site Boundary



Annual Mean
PM₁₀ Concentration
($\mu\text{g}/\text{m}^3$)

Title

Figure 9.13 - Predicted Annual Mean
PM₁₀ Concentrations ($\mu\text{g}/\text{m}^3$)
Scenario 5

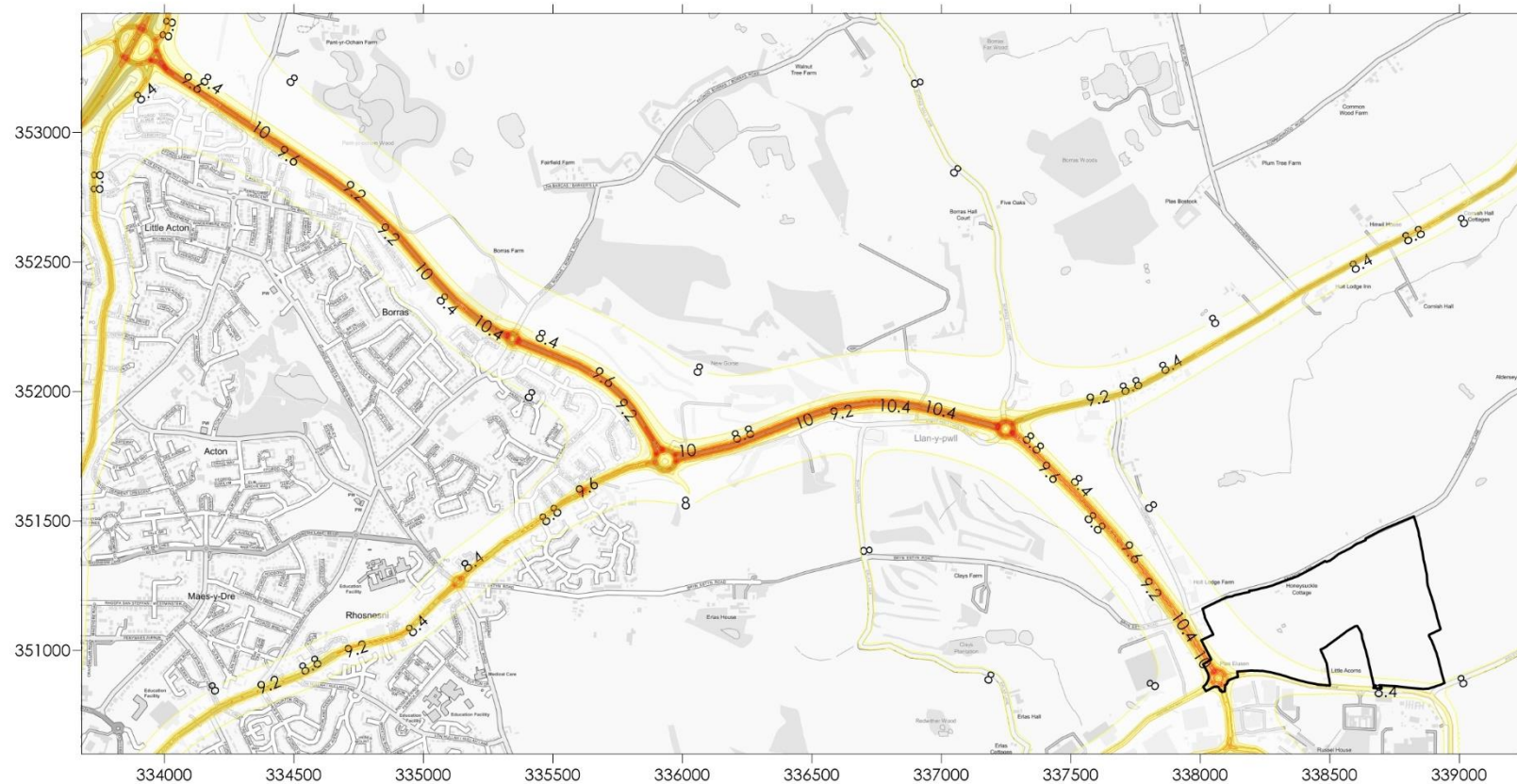
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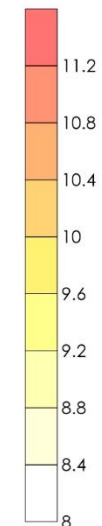
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Legend



Site Boundary



Annual Mean
PM_{2.5} Concentration
($\mu\text{g}/\text{m}^3$)

Title

Figure 9.14 - Predicted Annual Mean
PM_{2.5} Concentrations ($\mu\text{g}/\text{m}^3$)
Scenario 5

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