



Air Quality Assessment  
Proposed Residential Development,  
Land off Main Road, Rhosrobin, Wrexham

Reference: 14-931-R1-2  
Date: August 2021



## AIR QUALITY ASSESSMENT

Proposed Residential Development  
Land off Main Road, Rhosrobin,  
Wrexham

Prepared for:  
Castle Green Homes Limited

**Report Ref: 14-931-R1-2**  
**Date Issued: August 2021**

## E3P

Taylor Road  
Trafford Park  
Urmston  
M41 7JQ

+ 44 (0) 161 707 9612

<https://e3p.co.uk/>

Registered in England  
CRN: 807255262

## QUALITY ASSURANCE

|                       |                                               |                                                       |  |
|-----------------------|-----------------------------------------------|-------------------------------------------------------|--|
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| <b>PREPARED BY</b>    | Ceri Haines                                   | Ceri Haines                                           |  |
| <b>QUALIFICATIONS</b> | BSc MSc GradIEMA                              | BSc MSc GradIEMA                                      |  |
| <b>CHECKED BY</b>     | Jethro Redmore                                | Jethro Redmore                                        |  |
| <b>QUALIFICATIONS</b> | BEng MSc CEnv<br>PIEMA MIEEnvSc<br>MIAQM      | BEng MSc CEnv<br>PIEMA MIEEnvSc<br>MIAQM              |  |
| <b>AUTHORISED BY</b>  | S. Cox                                        | D. Cox                                                |  |
| <b>QUALIFICATIONS</b> | BSc (Hons), FGS,<br>PIEMA. MIEEnvSci,<br>CEnv | BSc (Hons), FGS,<br>PIEMA, MIEEnvSci,<br>CEnv         |  |



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## **1. INTRODUCTION**

### **1.1. BACKGROUND**

E3P has been commissioned by Castle Green Homes Limited to produce an Air Quality Assessment in support of the proposed residential development on land off Main Road, Rhosrobin, Wrexham.

The development has the potential to expose future residents to existing air quality issues due to the proximity of the site to the A483 and associated vehicle exhaust emissions. An Air Quality Assessment was therefore undertaken in order to determine baseline conditions and consider site suitability for the proposed end-use. This is detailed in the following report.

### **1.2. SITE LOCATION AND CONTEXT**

The site is located on land off Main Road, Rhosrobin, at National Grid Reference (NGR): 333263, 352756. Reference should be made to Figure 1 for a map of the site and surrounding area.

The proposals comprise construction of circa 189 residential dwellings and associated infrastructure. Reference should be made to Figure 2 for a site layout plan.

The development is located in close proximity to the A483. As such, concerns have been raised by Wrexham County Borough Council (WCBC) that future residents may be exposed to elevated pollution levels<sup>1</sup>. An Air Quality Assessment was therefore undertaken in order to determine baseline conditions and consider site suitability for the proposed end-use.

### **1.3. REPORT AMENDMENTS**

Following submission of the Air Quality Assessment to WCBC in March 2021 as part of the planning application for the proposals (ref: P/2021/0135), a consultation response<sup>2</sup> was provided by Mark Emmett, Climate Change Programme Manager at the Welsh Government on 22<sup>nd</sup> July 2021. In order to address the provided comments, the following updates have been implemented:

- ✳ Inclusion of Welsh Government 2018 - 2019 NO<sub>2</sub> monitoring data from the A483 Wrexham;
- ✳ Reference to Welsh Air Quality Standards Regulations; and,
- ✳ Reference to the Welsh Government Supplemental Plan (WGSP) and work undertaken to address elevated nitrogen dioxide (NO<sub>2</sub>) concentrations along the A483.

The updated assessment is provided in the following report.

### **1.4. LIMITATIONS**

The limitations of this report are presented in Appendix II.

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<sup>1</sup> Memorandum P/2021/0135, Ian Jones, Public Protection Service Manager at WCBC, 29<sup>th</sup> March 2021.

<sup>2</sup> Planning Consultation - P/2021/0135 - Tan y Bont Main Road, Rhosrobin, Development Control, 2021.



## **1.5. CONFIDENTIALITY**

E3P has prepared this report solely for the use of the client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from E3P; a charge may be levied against such approval.



## 2. LEGISLATION AND POLICY

### 2.1. LEGISLATION

The Air Quality Standards Regulations (Wales) (2010) came into force on 11<sup>th</sup> June 2010 and include Air Quality Limit Values (AQLVs) for the following pollutants:

- ✳ Nitrogen dioxide (NO<sub>2</sub>);
- ✳ Sulphur dioxide;
- ✳ Lead;
- ✳ Particulate matter with an aerodynamic diameter of less than 10µm (PM<sub>10</sub>);
- ✳ Particulate matter with an aerodynamic diameter of less than 2.5µm;
- ✳ Benzene; and,
- ✳ Carbon monoxide.

Air Quality Target Values were also provided for an additional 5 pollutants.

Part IV of the Environment Act (1995) requires UK government to produce a national Air Quality Strategy (AQS) which contains standards, objectives and measures for improving ambient air quality. The most recent AQS was produced by the Department for Environment, Food and Rural Affairs (DEFRA) and published in July 2007<sup>3</sup>. The AQS sets out Air Quality Objectives (AQOs) that are maximum ambient pollutant concentrations that are not to be exceeded either without exception or with a permitted number of exceedences over a specified timescale. These are generally in line with the AQLVs, although the requirements for the determination of compliance vary.

Table 2.1 presents the AQOs for pollutants considered within this assessment.

TABLE 2.1 AIR QUALITY OBJECTIVES

| POLLUTANT        | AIR QUALITY OBJECTIVE              |                                                                      |
|------------------|------------------------------------|----------------------------------------------------------------------|
|                  | Concentration (µg/m <sup>3</sup> ) | Averaging Period                                                     |
| NO <sub>2</sub>  | 40                                 | Annual mean                                                          |
|                  | 200                                | 1-hour mean, not to be exceeded on more than 18 occasions per annum  |
| PM <sub>10</sub> | 40                                 | Annual mean                                                          |
|                  | 50                                 | 24-hour mean, not to be exceeded on more than 35 occasions per annum |

Table 2.2 summarises the advice provided in DEFRA guidance<sup>4</sup> on where the AQOs for pollutants considered within this report apply.

<sup>3</sup> The AQS for England, Scotland, Wales and Northern Ireland, DEFRA, 2007.

<sup>4</sup> Local Air Quality Management Technical Guidance (TG16), DEFRA, 2021.



TABLE 2.2 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<br>Building façades of residential properties, schools (including all of playgrounds), hospitals (and their grounds), care homes (and their grounds) etc.                                                                                                                                                                                                                 | Building façades of offices or other places of work where members of the public do not have regular access<br>Hotels, unless people live there as their permanent residence<br>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                                                                                                                                                                                                                                                                                                                                                                | Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term                                                                                                                                                                                |
| 1-hour mean      | All locations where the annual mean and 24 and 8-hour mean objectives apply.<br>Kerbside sites (for example, pavements of busy shopping street)<br>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 more<br>Any outdoor locations where members of the public might reasonably be expected to spend one hour or longer | Kerbside sites where the public would not be expected to have regular access                                                                                                                                                                                                                                             |

## 2.2. LOCAL AIR QUALITY MANAGEMENT

Under Section 82 of the Environment Act (1995) (Part IV) Local Authorities (LAs) are required to periodically review and assess air quality within their area of jurisdiction under the system of Local Air Quality Management (LAQM). This review and assessment of air quality involves 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 2.2, 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.

## 2.3. NATIONAL PLANNING POLICY

Planning Policy Wales<sup>5</sup> was published in December 2018 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:

<sup>5</sup> Planning Policy Wales Edition 11, Welsh Assembly Government, 2021.



*"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."*

This has been considered throughout this assessment.

## 2.4. LOCAL PLANNING POLICY

The Wrexham Unitary Development Plan<sup>6</sup> (WUDP) was adopted by WCBC on 14<sup>th</sup> February 2005. A review of the WUDP identified the following policy which was relevant 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.*

*[...]"*

This policy has been considered throughout this assessment.

## 2.5. WELSH GOVERNMENT SUPPLEMENTAL PLAN

The Welsh Government have published the WGSP<sup>7</sup> to the UK Plan for Tackling Roadside NO<sub>2</sub> Concentrations (2017)<sup>8</sup>. This plan sets out work that has been and continues to be done to identify areas of NO<sub>2</sub> exceedences and ways to reduce concentrations.

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<sup>6</sup> WUDP, WCBC, 2005.

<sup>7</sup> WGSP, Welsh Government, 2017.

<sup>8</sup> UK Plan for Tackling Roadside NO<sub>2</sub> Concentrations, DEFRA, 2017.



In North Wales, the annual AQLV for NO<sub>2</sub> is exceeded on 2.6km of road from Junction 5 to Junction 6 on the A483 through Wrexham. To identify suitable measures in order to reduce NO<sub>2</sub> concentrations to below the relevant criteria, the Welsh Transport Appraisal Guidance (WelTAG)<sup>9</sup> has been utilised. The WelTAG provides a robust framework for identifying and appraising the likely effectiveness of proposed measures in delivering specific objectives, in this case, reducing NO<sub>2</sub> levels in the shortest possible time.

As a result of the WelTAG assessment, Welsh Ministers introduced the following measures on the A483 to reduce NO<sub>2</sub> concentrations:

*"A reduced 50mph speed limit (current speed limit 70mph) over the length of the exceedance, combined with variable message signs informing drivers of the reason for the new speed limit and encouraging smooth traffic flows."*

The introduction of the reduced speed limit in June 2018 has led to a significant reduction in NO<sub>2</sub> concentrations on this section of the A483, which are now only slightly above the AQO of 40µg/m<sup>3</sup>. The speed limit is to be kept in place to continue to work towards reducing NO<sub>2</sub> concentrations in the shortest possible time.

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<sup>9</sup> WelTAG, Welsh Government, 2017.



### 3. BASELINE

#### 3.1. INTRODUCTION

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

#### 3.2. LOCAL AIR QUALITY MANAGEMENT

As required by the Environment Act (1995), WCBC has undertaken Review and Assessment of air quality within their area of jurisdiction. This process has indicated that concentration of air 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

Monitoring of pollutant concentrations is undertaken by WCBC and the Welsh Government in the vicinity of the site. Recent NO<sub>2</sub> results are shown in Table 3.1. Exceedances of the relevant AQO are shown in **bold**.

TABLE 3.1 MONITORING RESULTS NO<sub>2</sub>

| MONITORING SITE |                                                | MONITORED NO <sub>2</sub> CONCENTRATION (µg/m <sup>3</sup> ) |             |             |
|-----------------|------------------------------------------------|--------------------------------------------------------------|-------------|-------------|
|                 |                                                | 2017                                                         | 2018        | 2019        |
| 32              | Sycamores                                      | 26.7                                                         | 27.2        | 23.7        |
| 54              | Pandy Lane <sup>(a)</sup>                      | -                                                            | -           | 22.7        |
| 56              | Top Farm Road <sup>(a)</sup>                   | -                                                            | -           | 18.8        |
| A483            | A483 Wrexham <sup>(b)</sup>                    | -                                                            | <b>50.2</b> | <b>40.9</b> |
| A483-1          | A483 Wrexham Continuous Monitor <sup>(c)</sup> | -                                                            | -           | 26.6        |

Note: (a) Monitor commissioned in 2019.

(b) Monitor commissioned in 2018.

(c) Average of continuous monitoring data from 1<sup>st</sup> September 2019 to 31<sup>st</sup> December 2019.

As shown in Table 3.1, annual mean NO<sub>2</sub> concentrations were below the AQO of 40µg/m<sup>3</sup> at four locations and above at one site in recent years. It is noted that levels at the A483 Wrexham position reduced significantly from 2018 to 2019 following the introduction of a 50mph speed limit on the relevant section of road. Reference should be made to Figure 3 for a map of the survey locations.

WCBC do not undertake monitoring of PM<sub>10</sub> concentrations in the vicinity of the site.

#### 3.4. BACKGROUND POLLUTANT CONCENTRATIONS

Predictions of background pollutant concentrations on a 1km by 1km grid basis have been produced by DEFRA for the entire of the UK to assist LAs in their Review and Assessment of air quality. The proposed development site is located in grid square NGR: 333500, 352500. Data for this location was downloaded from the DEFRA website<sup>10</sup> for the purpose of the assessment and is summarised in Table 3.2.

<sup>10</sup> <http://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018>.



TABLE 3.2 BACKGROUND POLLUTANT CONCENTRATIONS

| POLLUTANT              | PREDICTED BACKGROUND POLLUTANT CONCENTRATION ( $\mu\text{g}/\text{m}^3$ ) |       |       |
|------------------------|---------------------------------------------------------------------------|-------|-------|
|                        | 2019                                                                      | 2021  | 2024  |
| <b>NO<sub>2</sub></b>  | 10.75                                                                     | 9.76  | 8.54  |
| <b>PM<sub>10</sub></b> | 11.83                                                                     | 11.48 | 11.14 |

As shown in Table 3.2 predicted background NO<sub>2</sub> and PM<sub>10</sub> concentrations are below the relevant AQOs at the development site.



## 4. METHODOLOGY

### 4.1. INTRODUCTION

The proposed development has the potential to expose future occupants to elevated pollution concentrations. Conditions at the site have therefore been assessed in accordance with the following methodology, which was agreed with Paul Campini, Environmental Health Officer at WCBC on 6<sup>th</sup> May, 2021.

### 4.2. DISPERSION MODEL

Dispersion modelling was undertaken in order to predict NO<sub>2</sub> and PM<sub>10</sub> concentrations across the site using the ADMS-Roads dispersion model (version 5.0.0.1). 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.

Modelling was undertaken for 2019 to allow verification against recent monitoring results and 2024 to represent the development opening year.

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.

These are detailed in the following Sections.

### 4.3. ASSESSMENT AREA

Ambient concentrations were predicted over the area NGR: 332860, 352280 to 333770, 353190. One Cartesian grid was used within the model to produce data suitable for contour plotting using the Surfer software package.

It should be noted that although the grid only covered the proposed site, road links were extended in order to ensure the impact of all relevant vehicle emissions in the vicinity of the development were considered.

Reference should be made to Figure 4 for a graphical representation of the assessment area grid extents.



#### 4.4. TRAFFIC FLOW DATA

Baseline traffic data for use in the assessment, including 24-hour Annual Average Daily Traffic (AADT) flows and fleet composition as Heavy Duty Vehicle (HDV) proportion, was obtained from the Department for Transport (DfT)<sup>11</sup>. The DfT web tool enables the user to view and download traffic flows on every link of the 'A' road and motorway network, as well as selected minor roads, in Great Britain for the years 1999 to 2019. It should be noted that the DfT web tool is referenced in DEFRA guidance<sup>12</sup> as being a suitable source of data for air quality assessments and it is therefore considered to provide a reasonable estimate of traffic flows in the vicinity of the site.

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

Road widths and vehicle speeds were estimated from aerial photography and UK highway design standards. A summary of the traffic data used in the assessments is provided in Table 4.1.

TABLE 4.1 TRAFFIC DATA

| LINK |                                        | 24-HOUR AADT FLOW |        | HDV PROP. OF FLEET (%) | ROAD WIDTH (m) | AVG. VEHICLE SPEED (km/h) |
|------|----------------------------------------|-------------------|--------|------------------------|----------------|---------------------------|
|      |                                        | 2019              | 2024   |                        |                |                           |
| L1   | B5425 Main Road                        | 8,965             | 9,519  | 3.43                   | 7.1            | 45                        |
| L2   | A483 Northbound (NB)                   | 26,490            | 28,124 | 5.87                   | 7.0            | 80                        |
| L3   | A483 Southbound (SB)                   | 28,678            | 30,447 | 5.74                   | 7.0            | 80                        |
| L4   | A483 NB slip road south of roundabout  | 7,947             | 8,437  | 5.87                   | 6.0            | 65                        |
| L5   | A483 NB approach to roundabout         | 7,947             | 8,437  | 5.87                   | 10.5           | 25                        |
| L6   | A483 SB slip road south of roundabout  | 8,603             | 9,134  | 5.74                   | 7.0            | 50                        |
| L7   | A483 SB approach to roundabout         | 8,603             | 9,134  | 5.74                   | 7.0            | 25                        |
| L8   | A483 NB approach to roundabout         | 7,947             | 8,437  | 5.87                   | 6.0            | 25                        |
| L9   | A483 NB slip road north of roundabout  | 7,947             | 8,437  | 5.87                   | 4.0            | 65                        |
| L10  | A483 SB slip road north of roundabout  | 8,603             | 9,134  | 5.74                   | 6.5            | 65                        |
| L11  | A483 SB approach to roundabout         | 8,603             | 9,134  | 5.74                   | 10.5           | 25                        |
| L12  | A5156                                  | 22,603            | 23,998 | 9.29                   | 13.0           | 90                        |
| L13  | A5156 approach to roundabout SB        | 11,302            | 11,999 | 9.29                   | 7.5            | 25                        |
| L14  | A5156 Approach to roundabout NB        | 11,302            | 11,999 | 9.29                   | 10.5           | 25                        |
| L15  | A5152                                  | 10,796            | 11,462 | 2.18                   | 8.0            | 45                        |
| L16  | A5152 Westbound approach to roundabout | 5,398             | 5,731  | 2.18                   | 7.7            | 25                        |
| L17  | A5152 Eastbound from roundabout        | 5,398             | 5,731  | 2.18                   | 8.0            | 25                        |

<sup>11</sup> <https://roadtraffic.dft.gov.uk/>.

<sup>12</sup> Local Air Quality Management Technical Guidance (TG16), DEFRA, 2021.



| LINK |            | 24-HOUR AADT FLOW |        | HDV<br>PROP.<br>OF<br>FLEET<br>(%) | ROAD<br>WIDTH<br>(m) | AVG.<br>VEHICLE<br>SPEED<br>(km/h) |
|------|------------|-------------------|--------|------------------------------------|----------------------|------------------------------------|
|      |            | 2019              | 2024   |                                    |                      |                                    |
| R1   | Roundabout | 16,625            | 17,651 | 9.29                               | 12.0                 | 25                                 |

Reference should be made to Figure 4 for a graphical representation of the road link locations.

#### 4.5. EMISSION FACTORS

Emission factors for each link were calculated using the relevant traffic flows and the Emissions Factor Toolkit (version 10.1). This has been produced by DEFRA and incorporates COPERT 5.3 vehicle emission factors and fleet information.

There is current uncertainty over NO<sub>2</sub> concentrations within the UK, with the implementation of new vehicle emission standards not resulting in the previously expected reduction in roadside levels. Therefore, 2019 emission factors were utilised in preference to the development opening year in order to provide robust model outputs. As predictions for 2019 were verified, it is considered the results are a robust indication of worst case concentrations for the future year.

#### 4.6. METEOROLOGICAL DATA

Meteorological data used in the assessment was taken from Shawbury meteorological station over the period 1<sup>st</sup> January 2019 to 21<sup>st</sup> December 2019 (inclusive). Shawbury meteorological station is located at NGR: 354931, 322117, which is approximately 37.5km south-east of the development. It is anticipated that conditions would be reasonably similar over a distance of this magnitude. The data was therefore considered suitable for an assessment of this nature.

All meteorological records used in the assessment were provided by Atmospheric Dispersion Modelling (ADM) Ltd, which is an established distributor of data within the UK. Reference should be made to Figure 5 for a wind rose of the utilised meteorological data.

#### 4.7. ROUGHNESS LENGTH

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

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

#### 4.8. MONIN-OBUKHOV LENGTH

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 value is considered appropriate for the nature of the area and is suggested within ADMS-Roads as being suitable for 'cities and large towns'.



A minimum Monin-Obukhov length of 10m was used to describe the meteorological site. This value is considered appropriate for the nature of the area and is suggested within ADMS-Roads as being suitable for 'small towns <50,000'.

## **4.9. BACKGROUND CONCENTRATIONS**

Background NO<sub>2</sub> and PM<sub>10</sub> concentrations for use in the assessment were obtained from the DEFRA mapping study for the grid square containing the development site, as shown in Table 3.2.

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

## **4.10. NO<sub>x</sub> TO NO<sub>2</sub> CONVERSION**

Predicted annual mean oxides of nitrogen (NO<sub>x</sub>) concentrations were converted to NO<sub>2</sub> concentrations using the spreadsheet (version 8.1) provided by DEFRA, which is the method detailed within DEFRA guidance<sup>13</sup>.

## **4.11. VERIFICATION**

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

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

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

For the purpose of the assessment model verification was undertaken for 2019 using traffic data, meteorological data and monitoring results from this year.

WCBC undertook monitoring of NO<sub>2</sub> concentrations at three locations within the vicinity of the roads included in the model in 2019. The results were obtained and the road contribution to total NO<sub>x</sub> concentrations calculated following the methodology contained within DEFRA guidance<sup>14</sup>.

The Welsh Government undertook monitoring of NO<sub>2</sub> concentrations using triplicate diffusion tubes at one location within the vicinity of the roads included in the model in 2019. These were supplemented with a continuous monitor. However, only four months of data from the analyser were available. As such, the values were not included in the verification process in order to reduce potential uncertainties.

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<sup>13</sup> Local Air Quality Management Technical Guidance (TG16), DEFRA, 2021.

<sup>14</sup> Local Air Quality Management Technical Guidance (TG16), DEFRA, 2021.



The monitored annual mean NO<sub>2</sub> concentrations and calculated road NO<sub>x</sub> concentrations are summarised in Table 4.2.

TABLE 4.2 NO<sub>x</sub> VERIFICATION - MONITORING RESULTS

| MONITORING LOCATION |               | MONITORED NO <sub>2</sub><br>CONCENTRATION (µg/m <sup>3</sup> ) | CALCULATED ROAD NO <sub>x</sub><br>CONCENTRATION (µg/m <sup>3</sup> ) |
|---------------------|---------------|-----------------------------------------------------------------|-----------------------------------------------------------------------|
| 32                  | Sycamores     | 23.7                                                            | 24.45                                                                 |
| 54                  | Pandy Lane    | 22.7                                                            | 22.47                                                                 |
| 56                  | Top Farm Road | 18.8                                                            | 14.90                                                                 |
| A483                | A483 Wrexham  | 40.9                                                            | 61.45                                                                 |

The annual mean road NO<sub>x</sub> concentrations predicted from the dispersion model and road NO<sub>x</sub> concentrations calculated from the 2019 monitoring results are summarised in Table 4.3.

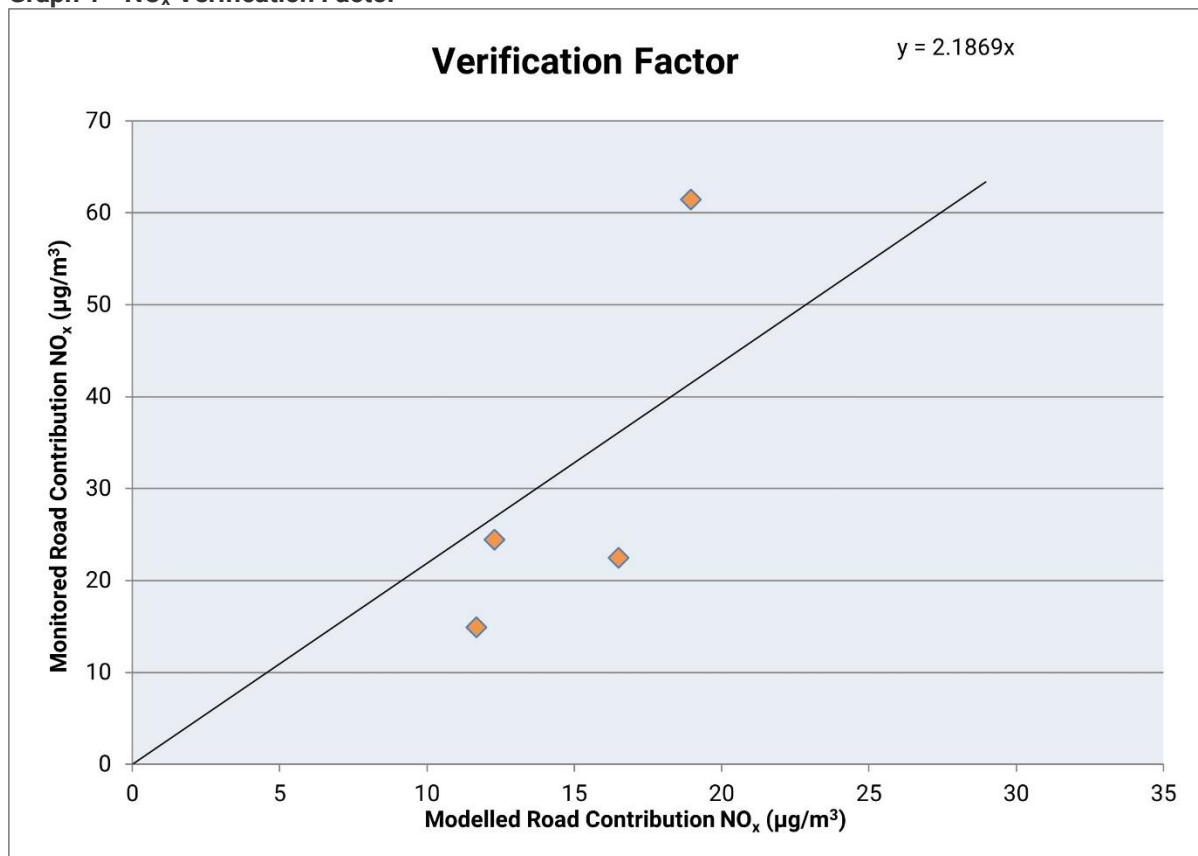
TABLE 4.3 NO<sub>x</sub> VERIFICATION - MODELLING RESULTS

| MONITORING LOCATION |               | CALCULATED ROAD NO <sub>x</sub><br>CONCENTRATION (µg/m <sup>3</sup> ) | MODELLED ROAD NO <sub>x</sub><br>CONCENTRATION (µg/m <sup>3</sup> ) |
|---------------------|---------------|-----------------------------------------------------------------------|---------------------------------------------------------------------|
| 32                  | Sycamores     | 24.45                                                                 | 12.29                                                               |
| 54                  | Pandy Lane    | 22.47                                                                 | 16.50                                                               |
| 56                  | Top Farm Road | 14.90                                                                 | 11.68                                                               |
| A483                | A483 Wrexham  | 61.45                                                                 | 18.03                                                               |

The monitored and modelled road NO<sub>x</sub> concentrations were graphed and the equation of the trendline based on linear progression through zero calculated. This indicated a verification factor of 2.1869 was required to be applied to all modelling results within the assessment area, as shown in Graph 1.



Graph 1 - NO<sub>x</sub> Verification Factor



Monitoring of PM<sub>10</sub> concentrations is not undertaken within the assessment extents. The NO<sub>2</sub> verification factor was therefore used to adjust PM<sub>10</sub> model predictions in lieu of more accurate data in accordance with the guidance provided within DEFRA guidance<sup>15</sup>.

<sup>15</sup> Local Air Quality Management Technical Guidance (TG16), DEFRA, 2021.



## **5. ASSESSMENT**

The proposed development has the potential to cause the exposure of future residents to elevated pollution levels. Dispersion modelling was therefore undertaken with the inputs described in Section 4 to quantify air quality conditions at the site. Reference should be made to Figures 6 and 7 for graphical representations of the results.

As shown in Figure 6, annual mean NO<sub>2</sub> concentrations were predicted to be below the AQO of 40µg/m<sup>3</sup> at all proposed residential dwellings. The maximum concentration at any building facade was 26.17µg/m<sup>3</sup>. As such, future residents are not predicted to be exposed to NO<sub>2</sub> concentrations above the AQO.

Exceedences of the NO<sub>2</sub> AQO of 40µg/m<sup>3</sup> were predicted within the north-eastern part of the site. There are not currently any proposals to introduce residential properties at this location. However, should any further applications seek to utilise the land for residential use then a further Air Quality Assessment should be undertaken to define the relevant conditions in the area based on the latest baseline data. It is considered likely that NO<sub>2</sub> concentrations will continue to decrease in the vicinity of the site due to the measures introduced by the Welsh Ministers to tackle roadside NO<sub>2</sub> as outlined in Section 2.5. As such, it is possible that the whole of the site may be suitable for residential use in future years.

As shown in Figure 7, annual mean PM<sub>10</sub> concentrations were predicted to be below the AQO of 40µg/m<sup>3</sup> at all proposed residential dwellings. The maximum concentration at any building facade was 15.07µg/m<sup>3</sup>. As such, future residents are not predicted to be exposed to PM<sub>10</sub> concentrations above the AQO.

Based on the assessment results, future residents are not predicted to be exposed to pollutant concentrations above the AQOs. The site is therefore considered to be suitable for residential use from an air quality perspective.



## **6. CONCLUSION**

E3P was commissioned by Castle Green Homes Limited to undertake an Air Quality Assessment in support of a proposed residential development on land off Main Road, Rhosrobin, Wrexham.

The development has the potential to expose future residents to existing air quality issues due to the proximity of the site to the A483 and associated vehicle exhaust emissions. An Air Quality Assessment was therefore undertaken in order to determine baseline conditions and consider site suitability for the proposed end-use.

Dispersion modelling was undertaken in order to predict pollutant concentrations across the proposed development site as a result of emissions from the local highway network. Outputs were subsequently verified using local monitoring data obtained from WCBC and the Welsh Government.

The results of the dispersion modelling assessment indicated that predicted NO<sub>2</sub> and PM<sub>10</sub> concentrations were below the relevant AQOs at proposed residential dwellings. The site is therefore considered suitable for the proposed use from an air quality perspective.

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

# **END OF REPORT**



# APPENDIX I LIMITATIONS

1. This report and its findings should be considered in relation to the terms of reference and objectives agreed between E3P and the client as indicated in Section 1.4.
2. For the work, reliance has been placed on publicly available data obtained from the sources identified. The information is not necessarily exhaustive and further information relevant to the site may be available from other sources. When using the information it has been assumed it is correct. No attempt has been made to verify the information.
3. This report has been produced in accordance with current UK policy and legislative requirements for land and groundwater contamination which are enforced by the local authority and the Environment Agency. Liabilities associated with land contamination are complex and requires advice from legal professionals.
4. During the site walkover, reasonable effort has been made to obtain an overview of the site conditions. However, during the site walkover, no attempt has been made to enter areas of the site that are unsafe or present a risk to health and safety, are locked, barricaded, overgrown, or the location of the area has not been made known or accessible.
5. Access considerations, the presence of services and the activities being carried out on the site limited the locations where sampling locations could be installed and the techniques that could be used.
6. Site sensitivity assessments have been made based on available information at the time of writing and are ultimately for the decision of the regulatory authorities.
7. Where mention has been made to the identification of Japanese Knotweed and other invasive plant species and asbestos or asbestos-containing materials, this is for indicative purposes only and do not constitute or replace full and proper surveys.
8. The executive summary, conclusions and recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon without considering the context of the report in full.
9. E3P cannot be held responsible for any use of the report or its contents for any purpose other than that for which it was prepared. The copyright in this report and other plans and documents prepared by E3P is owned by them and no such plans or documents may be reproduced, published or adapted without written consent. Complete copies of this may, however, be made and distributed by the client as is expected in dealing with matters related to its commission. Should the client pass copies of the report to other parties for information, the whole report should be copied, but no professional liability or warranties shall be extended to other parties by E3P in this connection without their explicit written agreement there to by E3P.
10. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part.



# APPENDIX II GLOSSARY

## TERMS

|                        |                                                                   |
|------------------------|-------------------------------------------------------------------|
| <b>AADT</b>            | Annual Average Daily Traffic                                      |
| <b>ADM</b>             | Atmospheric Dispersion Modelling                                  |
| <b>AQAP</b>            | Air Quality Action Plan                                           |
| <b>AQLV</b>            | Air Quality Limit Value                                           |
| <b>AQMA</b>            | Air Quality Management Area                                       |
| <b>AQO</b>             | Air Quality Objective                                             |
| <b>AQS</b>             | Air Quality Strategy                                              |
| <b>CERC</b>            | Cambridge Environmental Research Consultants                      |
| <b>DEFRA</b>           | Department for Environment, Food and Rural Affairs                |
| <b>DfT</b>             | Department for Transport                                          |
| <b>HDV</b>             | Heavy Duty Vehicle                                                |
| <b>IAQM</b>            | Institute of Air Quality Management                               |
| <b>LA</b>              | Local Authority                                                   |
| <b>LAQM</b>            | Local Air Quality Management                                      |
| <b>NB</b>              | Northbound                                                        |
| <b>NGR</b>             | National Grid Reference                                           |
| <b>NO<sub>2</sub></b>  | Nitrogen dioxide                                                  |
| <b>NO<sub>x</sub></b>  | Nitrogen oxide                                                    |
| <b>PM<sub>10</sub></b> | Particulate matter with an aerodynamic diameter of less than 10µm |
| <b>SB</b>              | Southbound                                                        |
| <b>WCBC</b>            | Wrexham County Borough Council                                    |
| <b>WeITAG</b>          | Welsh Transport Appraisal Guidance                                |
| <b>WGSP</b>            | Welsh Government Supplemental Plan                                |
| <b>WUDP</b>            | Wrexham Unitary Development Plan                                  |
| <b>Z<sub>0</sub></b>   | Roughness length                                                  |



# APPENDIX III DRAWINGS



#### Legend



Site Boundary

#### Title

Figure 1 - Site Location

#### Project

Air Quality Assessment  
Main Road, Rhosrobin

#### Project Reference

14-931

#### Client

Castle Green Homes Limited

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# Legend



Site Boundary

## Title

Figure 2 - Site Layout Plan

## Project

Air Quality Assessment  
Main Road, Rhosrobin

## Project Reference

14-931

## Client

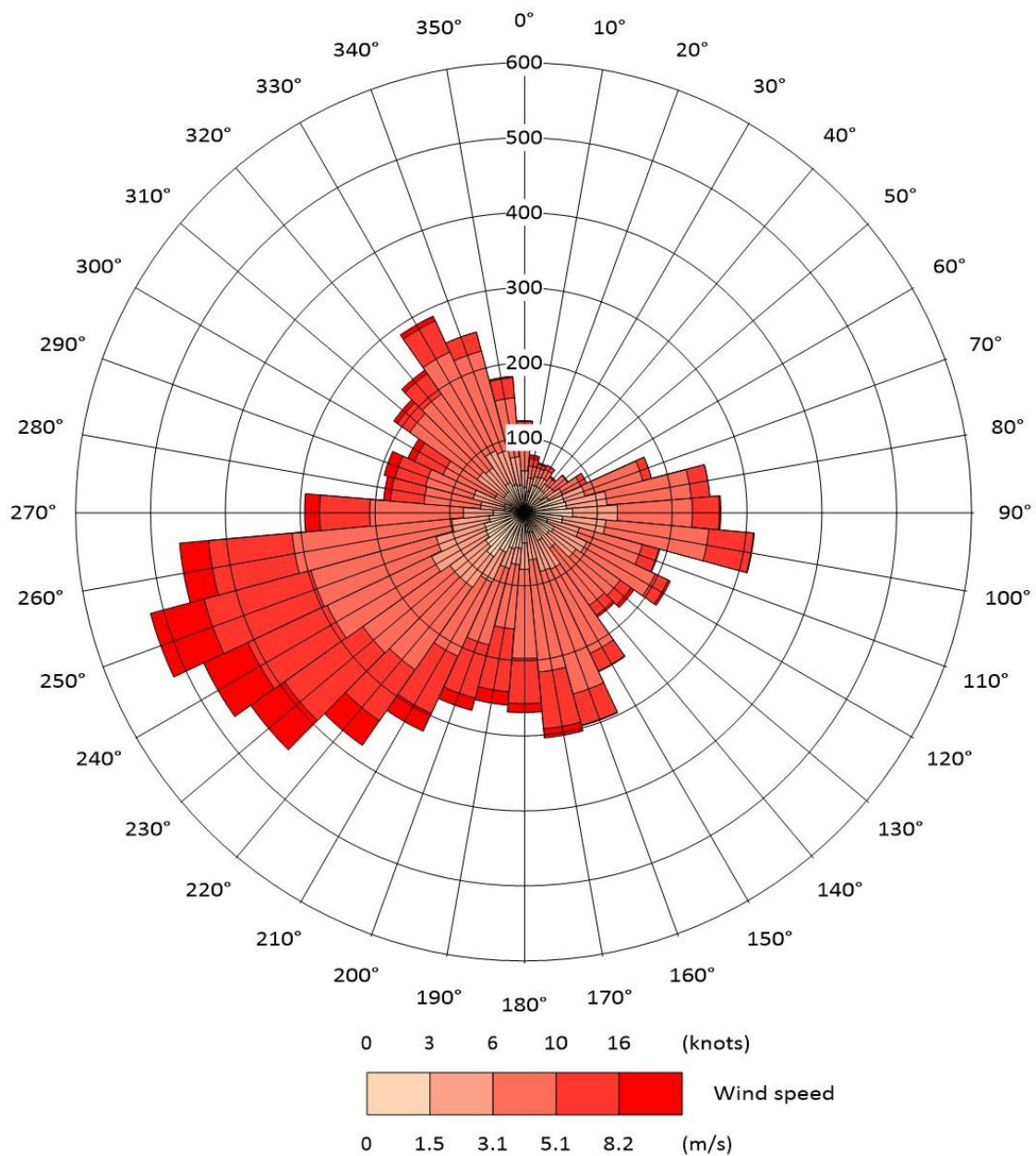
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#### Legend

#### Title

Figure 5 - Wind Rose of 2019  
Shawbury Meteorological Station  
Data

#### Project

Air Quality Assessment  
Main Road, Rhosrobin

#### Project Reference

14-931

#### Client

Castle Green Homes Limited





#### Legend



Site Boundary



Area of Residential Development



Annual Mean NO<sub>2</sub> Concentrations (µg/m<sup>3</sup>)

#### Title

Figure 6 - Predicted Annual Mean NO<sub>2</sub> Concentrations (µg/m<sup>3</sup>)

#### Project

Air Quality Assessment  
Main Road, Rhosrobin

#### Project Reference

14-931

#### Client

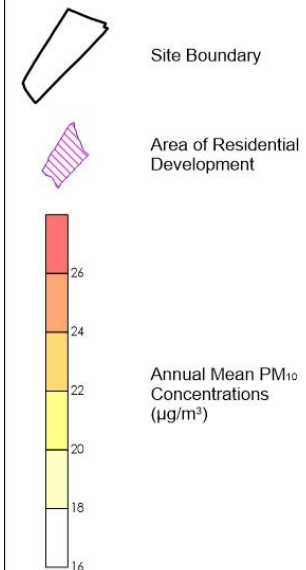
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#### Legend



#### Title

Figure 7 - Predicted Annual Mean PM<sub>10</sub> Concentrations (µg/m<sup>3</sup>)

#### Project

Air Quality Assessment  
Main Road, Rhosrobin

#### Project Reference

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