Air Quality Assessment

Fforest Wood Quarry, Cowbridge Road, CF72 9XD

March, 2023

Ryan Jones Group

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Document Control Sheet

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Glossary of Terms

Term	Definition
AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
AQO	Air Quality Objectives
AQS	Air Quality Strategy
ASR	Annual Status Report
Defra	Department for Environment, Food and Rural Affairs
DMP	Dust Management Plan
EPUK	Environmental Protection UK
EU	European Union
IAQM	Institute of Air Quality Management
LAQM	Local Air Quality Management
LNR	Local Nature Reserve
NAQS	National Air Quality Strategy
NO	Nitric oxide
NO_2	Nitrogen dioxide
NO_x	Oxides of nitrogen
NRMM	Non-road Mobile Machinery
PM	Particulate Matter
Ramsar Sites	Designated Wetland
RCT	Rhondda Cynon Taf County Borough Council
SAC	Special Areas of Conservation
SPA	Special Protection Areas
SPG	Supplementary Planning Guidance
SSSI	Sites of Special Scientific Interest
WHO	World Health Organisation

1 Introduction

DustScanAQ (DS) have been appointed by Ryan Jones Group to prepare an air quality assessment following the submission of a planning application at Fforest Wood Quarry, Cowbridge Road, Talygarn, Pontyclun, CF72 9XD.

The proposal is for the construction of an aggregates recovery facility at Fforest Wood Quarry. This is hereby referred to as the 'proposed development'. The development will include:

- Limited excavation and works on the southern and western storage areas to create level platforms for the Aggregates Recovery Plant, and for tipping, crushing and storage operations;
- Construction of an acoustic screening bund to the south of the storage and crushing area;
- Construction of an Aggregates Recovery Plant including the concrete pads on which the equipment will stand and an access ramp; and
- Ancillary works including landscaping, acoustic barriers and drainage infrastructure.

The proposed development will introduce additional HGV movements to the road network. The potential impact of these additional movements on local air quality is assessed in this report using dispersion modelling software.

The local planning authority is Rhondda Cynon Taf County Borough Council (RCT). RCT have requested an Air Quality Report to accompany the already submitted and validated planning application with the following note:

> *"Air Quality*
>
> *Public Health colleagues have requested that the application be supported by an air quality report, and this should consider the route from the quarry through RCT to the M4 relating to the increase in HGVs. Please could you arrange for this to be provided, with a particular focus on Talygarn, Brynsadler and Pontyclun, to include reporting at various daily times during the quarry's working hours."*

The potential air quality impacts arising as a result of the proposed development are assessed using the latest planning guidance from Environmental Protection UK (EPUK), the Institute of Air Quality Management (IAQM)[1] and the Department for Environment, Food and Rural Affairs (Defra)[2].

[1] IAQM (2017): 'Land Use Planning and Development Control: Planning for Air Quality v1.2'.
[2] Defra (2022): 'Local Air Quality Management – Technical Guidance (TG22)'.

1.1 Objectives

This report provides an assessment on the following key issues associated with the operational phase of the proposed development:

- Characterisation of the baseline conditions along the modelled network using monitored pollutant data from RCT and background concentrations from Defra background maps;
- Assessment of the impact of the proposed development on existing sensitive receptors from transport emissions; and
- If required, make recommendations for mitigation measures.

1.2 Site Location

The proposed development site is located at Fforest Wood Quarry, Cowbridge Road, Talygarn, Pontyclun, CF72 9XD. Fforest Wood Quarry is accessed from Cowbridge Road to the east which joins the M4 to the north via nearby villages Brynsadler, Pontyclun and Miskin. The site is not located within a designated AQMA.

The location of the site is shown below in Figure 1.1.

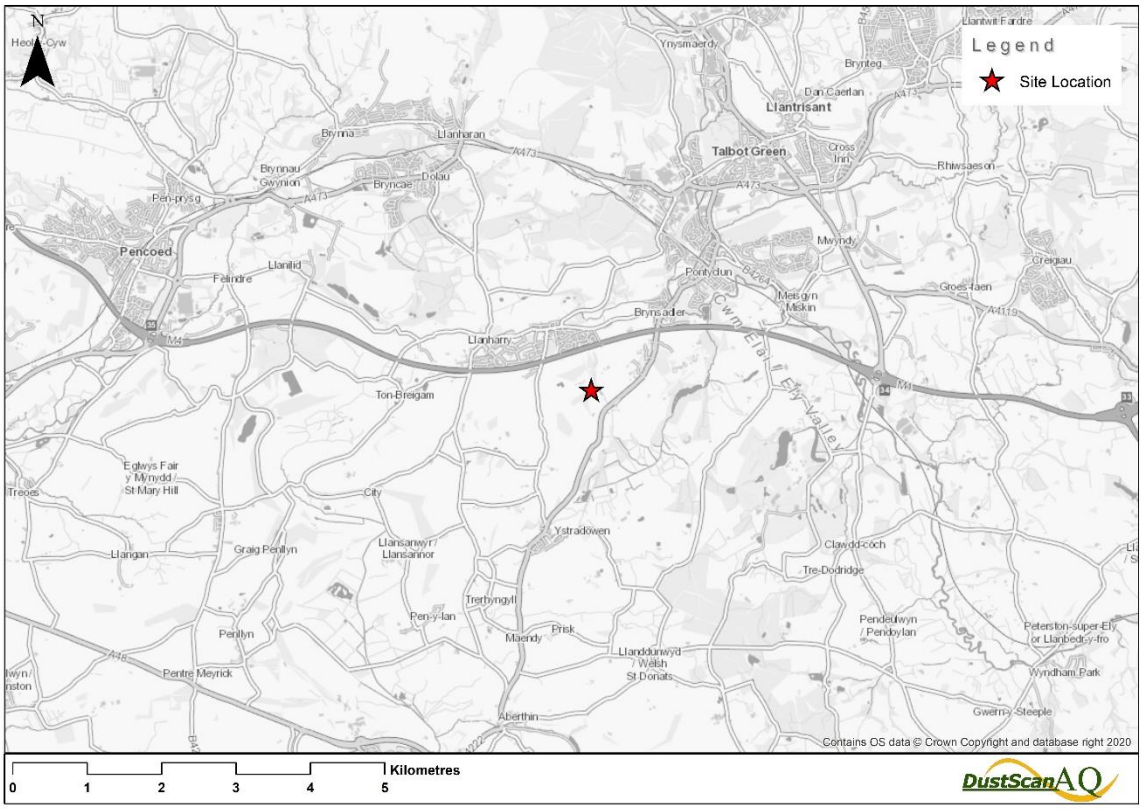

Figure 1.1: Site Location

1.3 Key Pollutants

The key pollutant associated with the construction phase of the project will be 'disamenity' or 'nuisance' dust. Nitrogen dioxide (NO_2) and particulate matter ($PM_{2.5}$ and PM_{10}) may also be associated with emissions from non-road mobile machinery (NRMM) and construction related traffic.

The key pollutants associated with the operational phase of the proposed development will be road traffic emissions including NO_2 and particulate matter ($PM_{2.5}$ and PM_{10}). These pollutants are therefore considered as part of this assessment.

Further details of the key pollutants are presented below.

1.3.1 Nitrogen Dioxide (NO_2)

NO_2 and nitric oxide (NO) are collectively referred to as oxides of nitrogen (NO_x). During fuel combustion, atmospheric nitrogen combines with oxygen to form NO, which is not considered harmful. Through a chemical reaction with ozone (O_3), NO further combines with oxygen to create NO_2 which is harmful to human health and vegetation. The foremost sources of NO_2 in the UK are combustion activities, mainly road transport and power generation.

1.3.2 Particulate Matter

Particulate matter as a term refers to a mixture of solid particles and liquid droplets suspended in the air. These particles come in many sizes and shapes and can be made up of hundreds of different chemicals. Some particles, such as dust, dirt, soot or smoke, are large or dark enough to be seen with the naked eye. Others can be so small that they can only be detected using an electron microscope. Fine dust, essentially particles up to 10 microns (µm), is commonly referred to as PM_{10}.

PM_{10} is known to arise from a number of sources such as construction sites, road traffic movement, industrial and agricultural activities. Very fine particles ($PM_{0.1}$ – $PM_{2.5}$) are known to be associated with pollutants such as NO_x and sulphur dioxide (SO_2) emitted from power plants, industrial installations and road transport sources.

$PM_{2.5}$ is generally associated with combustion and traffic sources and is more likely to be associated with the operational phase of the proposed development.

2 Legislation, Policy and Non-Statutory Guidance

This section summarises all legislation, policy, statutory and non-statutory guidelines relevant to the proposed development. Furthermore, the latest regional and local planning policy guidance specifically applicable to the proposed development has been reviewed.

2.1 Legislative Framework

2.1.1 International Legislation (European Union)

Whilst the UK has left the European Union (EU), it is relevant to understand the source of the current UK legislation. Following exit day on the 31st January 2020, the current framework of air quality legislation was converted into domestic law through the European Union (Withdrawal) Act 2018[3]. The EU sets legally binding limit values for outdoor air pollutants to be met by EU countries by a given date. These limit values are based on the World Health Organisation (WHO) guidelines on outdoor air pollutants. These are legally binding and set out to protect human health and the environment by avoiding, preventing or reducing harmful air pollution effects.

Directive 2008/50/EC[4] on ambient air quality and cleaner air for Europe entered into force in June 2008. This merged the existing 'Daughter' Directives[5] [6] [7] [8](apart from the fourth Daughter Directive), maintaining existing air quality objectives set out by 'Daughter' Directives for:

- Sulphur dioxide (SO_2);
- Nitrogen dioxide (NO_2);
- Oxides of nitrogen (NO_x);
- Particulate matter ($PM_{2.5}$ and PM_{10});
- Lead (Pb);
- Benzene(C_6H_6);
- Carbon monoxide (CO); and
- Ozone (O_3).

Directive 2008/50/EC also includes related objectives, exposure concentration obligations and exposure reduction targets for $PM_{2.5}$ (fine particles). The 'Daughter' Directives were based upon requirements set out in the first EU Ambient Air Quality Framework Directive 96/92/EEC[9].

[3] European Union. (2018): http://www.legislation.gov.uk/ukpga/2018/16/contents/enacted
[4] European Union. (2008), 'Ambient air quality assessment management', Framework Directive 2008/50/EC.
[5] European Union. (1999), 'Ambient air quality assessment management', Framework Directive 1999/30/EC.
[6] European Union. (2000), 'Ambient air quality assessment management', Framework Directive 2000/3/EC.
[7] European Union. (2002), 'Ambient air quality assessment management', Framework Directive 2002/3/EC.
[8] European Union. (2004), 'Ambient air quality assessment management', Framework Directive 2004/107/EC.
[9] European Union. (1996), 'Ambient air quality assessment management', Framework Directive 96/62/EC.

2.1.2 National Legislation (UK and Wales)

2.1.2.1 The Environment Act (1995)

The Environment Act 1995[10] established the system of 'local air quality management' (LAQM) and the designation of Air Quality Management Areas (AQMAs). Part IV of the 1995 Environmental Act and Part II of the Environment (Northern Ireland) Order 2002[11] requires local authorities to designate AQMAs where legal objectives are not being achieved or are not likely to be achieved within the relevant period. Where an AQMA is designated, local authorities are also required to produce an 'Air Quality Action Plan' (AQAP) detailing the pollution reduction measures that need to be adopted to achieve the relevant air quality objectives within an AQMA.

The Environment Act 1995 required the Government to produce a National Air Quality Strategy (NAQS) for the UK, outlining the air quality standards, objectives and measures for improving ambient air quality.

2.1.2.2 National Air Quality Strategy (UK)

Following the Environment Act 1995, the first Air Quality Strategy (AQS) was published in 1997[12]. The latest comprehensive review of the AQS, Air Quality Strategy for England, Scotland, Wales and Northern Ireland, was published in 2007[13], with a review yielding some minor changes in 2011. Each revision introduced strategies and regulations that consider measures for different pollutants by tightening existing objectives and also by introducing new ones to establish a common framework to protect human health and the environment by achieving ambient air quality improvements.

The AQS sets clear, measurable, outdoor air quality standards and target dates by which these must be achieved; the combined standard and target date is referred to as the Air Quality Objective (AQO) for that pollutant. Adopted national standards are based on the recommendations of the Expert Panel on Air Quality Standards (EPAQS) and have been translated into a set of Statutory Objectives within the Air Quality (Wales)Regulations (2000) No. 1940 (W.138), and subsequent amendments.

2.1.2.3 Air Quality Standards (Wales) Regulations (2010)

The Air Quality Standards (Wales) Regulations 2010[14] simplified air quality regulation, providing a new transposition of the 2008 EU ambient air quality directive, 2005/50/EC, also incorporated the fourth EU Daughter Directive (2004/107/EC). This placed Welsh Ministers responsible for assessment and management of ambient air quality and compliance with air quality limit values, target values and objectives. The Air Quality Objectives applicable

[10] Parliament of the United Kingdom. (1995), 'Environment Act'. King's Printer of Acts of Parliament
[11] Northern Ireland Orders in Council. (2002), 'The Environment (Northern Ireland) Order', No. 3153. King's Printer of Acts of Parliament
[12] Department for Environment Food and Rural Affairs. (1997), 'The United Kingdom National Air Quality Strategy', Cm 3587, Department for Environment Food and Rural Affairs.
[13] Department for Environment Food and Rural Affairs. (2007), 'The Air Quality Strategy for England, Scotland, Wales and Northern Ireland', Cm 7169, Department for Environment Food and Rural Affairs.
[14] Wales Statutory Instrument. (2010), 'The Air Quality Standards (Wales) Regulations 2010', No. 1433. King's Printer of Acts of Parliament.

to LAQM in Wales are set out in the Air Quality (Wales) Regulations 2000, No.1940 (Wales 138), Air Quality (Amendment) (Wales) Regulations 2002, No 3182 (Wales 298).

2.1.2.4 The Environment (Wales) Act 2016

The Environment (Wales) Act 2016[15], an Act of the National Assembly for Wales, promotes the sustainable management of natural resources (SMNR). The Act states that "natural resources" includes (but is not limited to):

"…

(b) air, water and soil;

…"

The Environment (Wales) Act 2016 provides an iterative framework to ensure sustainable management of natural resources is a core consideration in decision-making.

Natural Resources Wales (NRW) were required to give a State of Natural Resources report (SoNaRR), published in September 2016. The second SoNaRR assessment was published in 2020 (SoNaRR2020). SMNR is assessed against of number of cross-cutting themes', including Air Quality, published as SoNaRR2020 Assessment of the achievement of sustainable management of natural resources: Air Quality. NRW were also required to produce a local evidence base to help implement the Natural Resources Policy.

2.1.2.5 The Environment Act (2021) and the Environment (Air Quality and Soundscapes) (Wales) Bill 2023

Under the Environment Act 2021[16], a general UK act, the Secretary of State must by regulations set long-term targets in priority areas including air quality; however, the Secretary of State may not make any provision which, if contained in an Act of Senedd Cymru, would be within the legislative competence of the Senedd. The Environment (Air Quality and Soundscapes) (Wales) Bill introduced in 2023[17] will allow the Senedd to introduce a commitment to create a legally binding duty on government to reduce the concentration of fine particles ($PM_{2.5}$) in ambient air and to set a new long-term annual mean $PM_{2.5}$ target to supersede the target set out within the Environment (Miscellaneous Amendments) (EU Exit) regulations 2020. By way of reference, the Environmental Targets (Fine Particulate Matter) (England) Regulations 2023 set a target of 10 µg/m^3 to be met by 2040.

2.1.2.6 The Well-being of Future Generations Act (2015)

The Well-Being of Future Generations (Wales) Act 2015[18] ("the WFG Act") requires the public bodies of Wales to consider the long-term impact on their decisions in pursuit of the economic, social, environmental and cultural well-being of Wales that accords with

[15] Acts of the National Assembly for Wales. (2016), 'Environment (Wales) Act 2016'. King's Printer of Acts of Parliament
[16] Parliament of the United Kingdom. (2021), 'Environment Act'. King's Printer of Acts of Parliament
[17] Welsh Government. (2023), 'Environment (Air Quality and Soundscapes) (Wales) Bill' https://senedd.wales/media/raap2wmh/pri-ld15738-e.pdf
[18] Welsh Government. (2015), 'Well-being of Future Generations (Wales) Act 2015'

sustainable development. The Act is centred around seven well-being goals for national government, local government, local health boards and other specified public bodies.

All public bodies under this Act must adhere to the 'sustainable development principle' when making decisions. Considerations must be made to the following as part of the 'sustainable development principle':

- *"Collaboration: Acting in collaboration with any other person (or different parts of the body itself) that could help the body to meet its well-being objectives.*
- *Integration: Considering how the public body's well-being objectives may impact upon each of the well-being goals, on their other objectives, or on the objectives of other public bodies.*
- *Involvement: The importance of involving people with an interest in achieving the well-being goals, and ensuring that those people reflect the diversity of the area which the body serves.*
- *Long-term: The importance of balancing short-term needs with the need to safeguard the long-term needs.*
- *Prevention: How acting to prevent problems occurring or getting worse may help public bodies meet their objectives."*

The Welsh Government published statutory core guidance for public bodies to accompany the WFG Act in September 2016[19].

2.1.2.7 Relevant Air Quality Objectives

A summary of the relevant Air Quality Objectives (AQOs) is set out in Table 2.1.

The AQO listed in Table 2.1 are only applicable at locations where a member of the public could be reasonably expected to spend the relevant averaging period. Further examples of this are presented in Table 2.2.

Table 2.1: AQO relevant to the proposed development

Pollutant	Averaging Period	AQO (µg/m^3)	Exceedance Allowance	Percentile Equivalent
Nitrogen Dioxide (NO_2)	Annual	40	-	-
	1-hour	200	18 per annum	99.8th
Particulate Matter (as PM_{10})	Annual	40	-	-
	24-hour	50	35 per annum	90.4th
Particulate Matter (as $PM_{2.5}$)	Annual	20	-	-

[19] Welsh Government. (2016), 'Shared Purpose: Shared Future. Statutory guidance on the Well-being of Future Generations (Wales) Act 2015'

Table 2.2: Examples of where the AQO should apply

Averaging period	Objectives should apply at	Objectives should not apply at
Annual	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	All locations where the annual mean objective would apply, together with hotels and gardens of residential properties[(a)].	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	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 have expected to spend one hour or longer.	Kerbside sites where the public would not be expected to have regular access.

2.1.2.8 Statutory Nuisance

It is recognised that the planning system presents a way of protecting amenity. However, in cases where planning conditions are not applicable to a development/installation, the requirements of the Environmental Protection Act 1990 still apply. Under Part III of the Environmental Protection Act 1990, local authorities have a statutory duty to investigate any complaints of:

- *"any premises in such a state as to be prejudicial to health or a nuisance*
- *smoke emitted from premises so as to be prejudicial to health or a nuisance*
- *fumes or gases emitted from premises so as to be prejudicial to health or a nuisance*
- *any dust, steam, smell or other effluvia arising on industrial, trade or business premises and being prejudicial to health or a nuisance*

- *any accumulation or deposit which is prejudicial to health or a nuisance"*

Where the local authority establishes any one of these issues constitutes a statutory nuisance and believes it to be unreasonably interfering with the use or enjoyment of someone's premises and/or is prejudicial to health, an abatement notice will be served on the person responsible for the offence or the owner / occupier. Failure to comply with the notice could lead to a prosecution. However, it is considered as a defence if the best practicable means to prevent or to counteract the effects of the nuisance are employed.

2.2 Planning Policy

2.2.1 National Policy

2.2.1.1 National Planning Policy Wales (2021)

The Planning Policy Wales (PPW)[20] sets out relevant planning policy guidance in respect of the proposed development. Together with Technical Advice Notes, Welsh Government Circulars, and policy clarification letters it forms the national planning policy for Wales. The most recent update of the PPW was published in February 2021. For further details, please see the PPW.

2.2.1.2 Natural Resources Policy (2017)

Based on the findings of the first SoNaRR, the Environmental (Wales) Act 2016 required the Welsh Government to produce a national policy that sets out priorities, risks and opportunities for managing natural resources sustainably. The Natural Resources Policy[21] identifies improving air pollution as an opportunity for improving public health, with air filtration to remove pollutants listed as a key ecosystem service, as well as improving conditions of ecosystems. The Natural Resources Policy provides actions for local environmental quality. Relating to air quality, the Welsh government states it will:

> *"Take practical steps to improve air quality across Wales, not just in the most polluted hotspots but across Wales. This will require a mix of action to address pollution from traffic and other sources and to improve the ability of the natural environment to absorb pollutants through tree planting and green infrastructure."*

2.2.1.3 Clean Air Strategy (2019)

The Clean Air Strategy[22] was published by the Department of Environment Food and Rural Affairs (DEFRA) in 2019 as part of the 25 Year Environment Plan. It also complements the Industrial Strategy and the Clean Growth Strategy. The Strategy sets out the action that is required across governments and society to meet the AQOs. Action includes new legislation to create a more coherent framework for action to tackle air pollution, underpinned by 'England-wide powers' to control major sources of air pollution and 'local powers' to take actions in areas with an air pollution problem. These will supports the creation of Clean Air

[20] Planning Policy Wales, Edition 11 (2021)
[21] Welsh Government. (2017), 'Natural Resources Policy'
[22] Department of Environment Food and Rural Affairs. (2019) 'Clean Air Strategy 2019'

Zones (CAZs) to lower emissions from all sources of air pollution, back up with clear enforcement mechanisms.

2.2.1.4 The Clean Air Plan for Wales (2020)

The Clean Air Plan for Wales[23] was published in August 2020. It aims to reduce the impacts of air pollution on human health, biodiversity, the natural environment and Welsh economy. The plan sets out a strategy until 2031 to achieve cleaner air based on four key themes, People, Environment, Prosperity and Place, with consideration made to the approaches of the WFG Act. The Clean Air Plan also includes the commitment of introducing a Clean Air Bill for Wales; this legislation is referenced above as the Environment (Air Quality and Soundscapes) (Wales) Bill.

2.2.2 Local (Rhondda Cynon Taf County Borough Council)

2.2.2.1 RCTCBC Local Development Plan (LDP)

The Rhondda Cynon Taf Local Development Plan 2006 – 2021[24], was adopted in 2011 and formally reviewed in 2019. The LDP sets out the aims, vision and objectives for the future of RCTCBC, a spatial development strategy and a land use planning policy framework. Policy AW 10: Environmental Protection and Public Health within the LDP refers directly to air pollution.

Policy AW 10 states:

> *"Development proposals will not be permitted where they would cause or result in a risk of unacceptable harm to health and / or local amenity because of:-*
>
> *1. Air pollution;*
>
> *…*
>
> *unless it can be demonstrated that measures can be taken to overcome any significant adverse risk to public health, the environment and / or impact upon local amenity"*

Following the 2019 review, RCTCBC concluded a full revision of the LDP was required. The Revised LDP 2022 – 2037 is scheduled for adoption in 2025.

2.3 Guidance Documents

2.3.1 Local Air Quality Management in Wales Policy Guidance (2017)

The Welsh Government amended the local air quality management (LAQM) regime in Wales in 2017 by issuing new statutory policy guidance, PG(W)(17)[25], in order to bring the system into line with the WFG Act. The PG(W)(17) adopts the five ways of working as set out in the WFG Act and states LAQM in Wales should be carried out by:

- *"pursuing long-term, enduring solutions to any existing instances of noncompliance with the national air quality objectives;*

[23] Welsh Government (2020) 'The Clean Air Plan for Wales: Healthy Air, Healthy Wales'
[24] Rhondda Cynon Taf County Borough Council. (2011), 'Local Development Plan up to 2021 Adopted March 2011'
[25] Welsh Government. (2017), 'Local air quality management in Wales Policy guidance'.

- *seeking to manage air quality at the same time as achieving other, related outcomes;*
- *taking every opportunity to talk to the public about air quality challenges, listen to their concerns and seek their views on potential solutions and their involvement in delivering them;*
- *working actively with internal and external partners to mutual benefit in the delivery of desired outcomes; and*
- *keeping exposure to air pollution as low as reasonably practicable across the whole of the population, looking out in particular for areas where the national air quality objectives might be at risk of being breached at some point in the future and acting pre-emptively to prevent those breaches from occurring."*

2.3.2 Environmental Protection UK (EPUK) and Institute of Air Quality Management (IAQM) Planning Guidance

The Environmental Protection UK (EPUK) and Institute of Air Quality Management (IAQM) published guidance for the consideration of air quality within land-use planning and development control processes in January 2017[26]. In the absence of any statutory guidance on methodology, the IAQM/EPUK guidance is considered best practice and informs this assessment.

[26] The Environmental Protection UK (EPUK) and Institute of Air Quality Management (IAQM) (2017) 'Land-Use Planning & Development Control: Planning For Air Quality'. Accessible at: https://www.iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf

3 Methodology

This section sets out the approach taken to assess the potential impacts on air quality resulting from the proposed development.

3.1 Scope of the Assessment

The assessment is based on the following scope of work presented in Table 3.1:

Table 3.1: Scope of Work

Scope	Consideration
Spatial	The assessment considers the impact of NO_2, PM_{10} and $PM_{2.5}$ emissions from introduced traffic on existing sensitive receptors. Impacts on air quality arising from traffic related emissions are considered unnoticeable above background concentrations beyond 200 m from the source[27]. Hence, this assessment only considered receptors within 200 m from a road source.
Temporal	The impact of the proposed development has been considered for the earliest possible year of operation (2023).

[27] Highways England (2019), Design Manual for Roads and Bridges (DMRB), LA105 Air Quality. Available at: https://www.standardsforhighways.co.uk/dmrb/search/10191621-07df-44a3-892e-c1d5c7a28d90

3.2 Dispersion Model Selection

The assessment on identifying the impact of current traffic related emissions sources in the area of the proposed development has been carried out using the latest version of 'ADMS-Roads' Dispersion Modelling PC based software (version 5.0.0.1) developed by Cambridge Environmental Research Consultants Ltd (CERC). This model is commonly used in planning application and regulatory assessment of traffic related emissions.

3.3 Modelled Scenarios

As discussed in Section 1.1, this assessment focuses upon the potential impact on existing sensitive receptors from introduced traffic emissions associated with the proposed development.

The earliest possible opening year is 2023. Based on the above, the following scenarios have been considered with respect to traffic emissions:

- 2019 Model Verification Year;
- 2023 Without Proposed development
- 2023 With Proposed development.

According to the guidance provided by Defra in their Air Quality Strategy, vehicle emissions are expected to decrease in future years because of advancement in abatement technologies. It is also expected that more stringent emission limits will be imposed upon manufacturers.

3.4 Meteorological Data

The key meteorological parameters for dispersion modelling are wind speed and wind direction. Other meteorological parameters, such as cloud cover, surface temperature, precipitation rate and relative humidity are also taken into account.

For dispersion modelling, hourly-resolved data are required and often it is difficult to find a local site that can provide reliable data for all the meteorological parameters at this resolution.

Based on the above, meteorological data from St Athan was used, which is located approximately 12.1 km south of the proposed development.

In order to account for a variety of meteorological conditions, the qualitative assessment and dispersion modelling have been carried out with meteorological data from the period 2020 to 2022. Figure 3.3 below presents the wind rose for each modelling year.

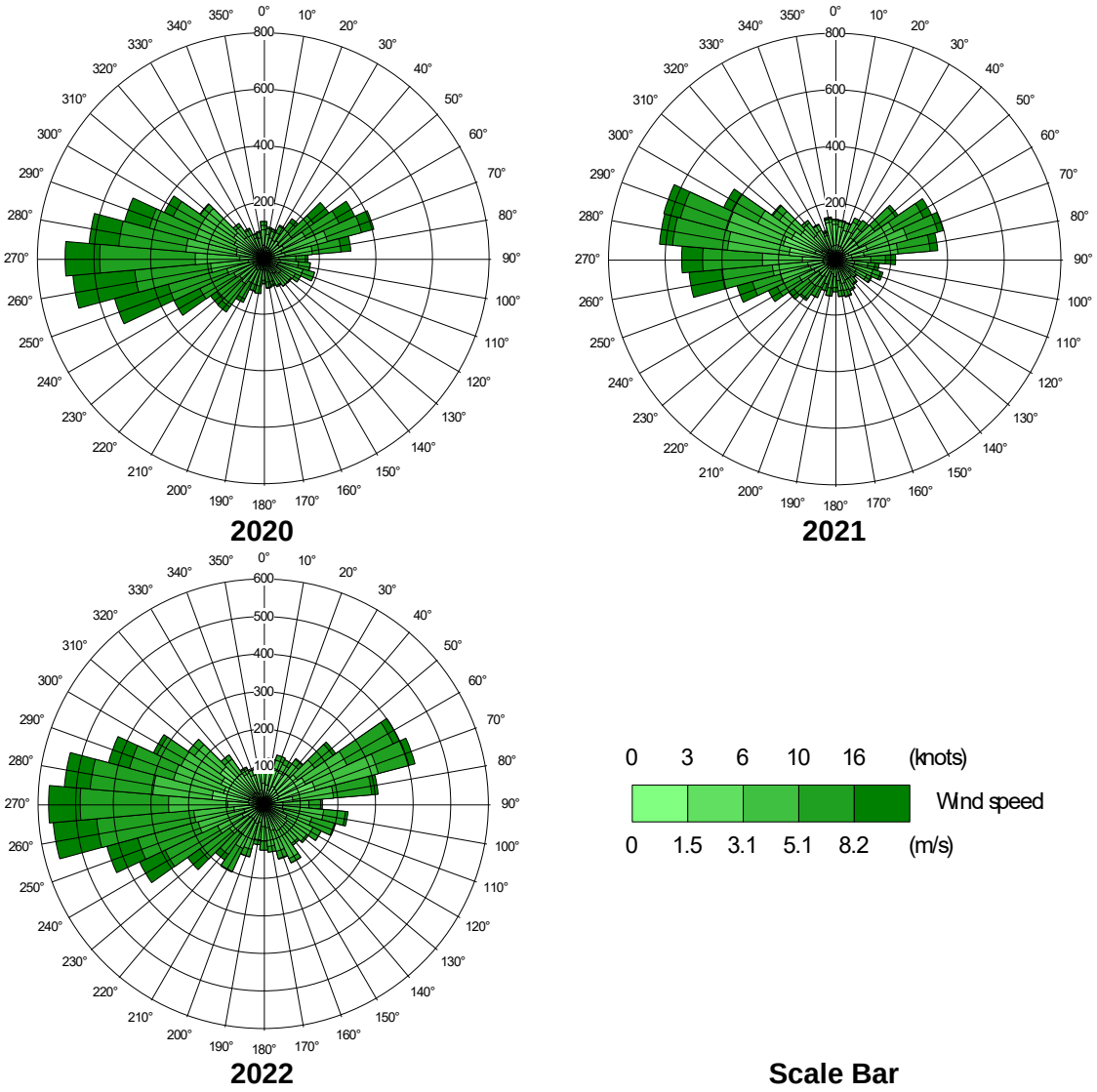

Figure 3.1: Wind roses for St Athan 2020-2022

3.5 Surface Roughness

The dispersion site surface roughness length (z0) was set to 0.5 m.

The meteorological site surface roughness length (z0) was set to 0.3 m.

3.6 Minimum Monin-Obukhov Length

The Minimum Monin-Obukhov Length (MMOL) provides a measure of the stability of the atmosphere.

An MMOL of 10 m (small towns) was used in the dispersion modelling study to describe the modelling area. An MMOL of 1 m was used to describe the meteorological site. These values are considered appropriate for the nature of the surrounding areas.

3.7 Road Traffic Data

Traffic data was obtained from TPS Transport Consultants Ltd, the appointed transport consultant. There is a net increase in traffic of 77 vehicles per day north through Brynsadler and Pontyclun.

The spatial scope of the traffic emissions model was informed by the distribution of development traffic and air quality concerns in Brynsadler and Pontyclun.

Road dimensions were determined from the interrogation of ordnance survey (OS) mapping sets and digital satellite images.

Vehicle speeds at 'busy' junctions were assumed to be 20 kph (defined by Defra as those with over 10,000 AADT) and vehicle speeds at minor junctions were assumed to be 10 kph below the road speed limit.

Table 3.2 shows the traffic data for the verification and Table 3.3 shows traffic data for 2023 Without Proposed development and With Proposed development scenarios. Table 3.4 described the links in the model.

Figure 3.2 shows the extent of the ADMS-Roads dispersion modelling network.

Table 3.2: Verification traffic data 2019

Link	Verification (2019)		
	AADT	HDV%	Speed (kph)
A	3936	3.07	96.56
B	4089	4.27	96.56
C	4089	4.27	64.37
D	4089	4.27	48.28
E	11976	2.77	48.28
F	11976	2.77	32.19
G	12232	2.25	32.19
H	12232	2.25	48.28
I	44183	8.12	112.65
J	45263	7.14	112.65

Table 3.3: With/Without Proposed development traffic data 2023

Link	Without (2023)			With (2023)		
	AADT	HDV%	Speed (kph)	AADT	HDV%	Speed (kph)
A	4076	3.07	96.56	4084	3.23	96.56
B	4235	4.27	96.56	4312	5.63	96.56
C	4235	4.27	64.37	4312	5.63	64.37
D	4235	4.27	48.28	4312	5.63	48.28
E	12401	2.77	48.28	12479	3.25	48.28
F	12401	2.77	32.19	12479	3.25	32.19
G	12666	2.25	32.19	12743	2.72	32.19
H	12666	2.25	48.28	12743	2.72	48.28
I	45751	8.12	112.65	45770	8.16	112.65
J	46870	7.14	112.65	46889	7.19	112.65

Table 3.4: Link Descriptions

Link	Description
A	A4222 south of site entrance
B	A4222 north of site entrance
C	Talygarn A4222 40 mph zone
D	Talygarn A4222 30 mph zone to Llanharry Road junction
E	Brynsadler A4222 to Pontyclun 20 mph zone
F	Pontyclun 20 mph zone to railway bridge
G	Railway bridge to 30 mph zone
H	Pontyclun 30 mph zone to A473 junction
I	M4 westbound
J	M4 eastbound

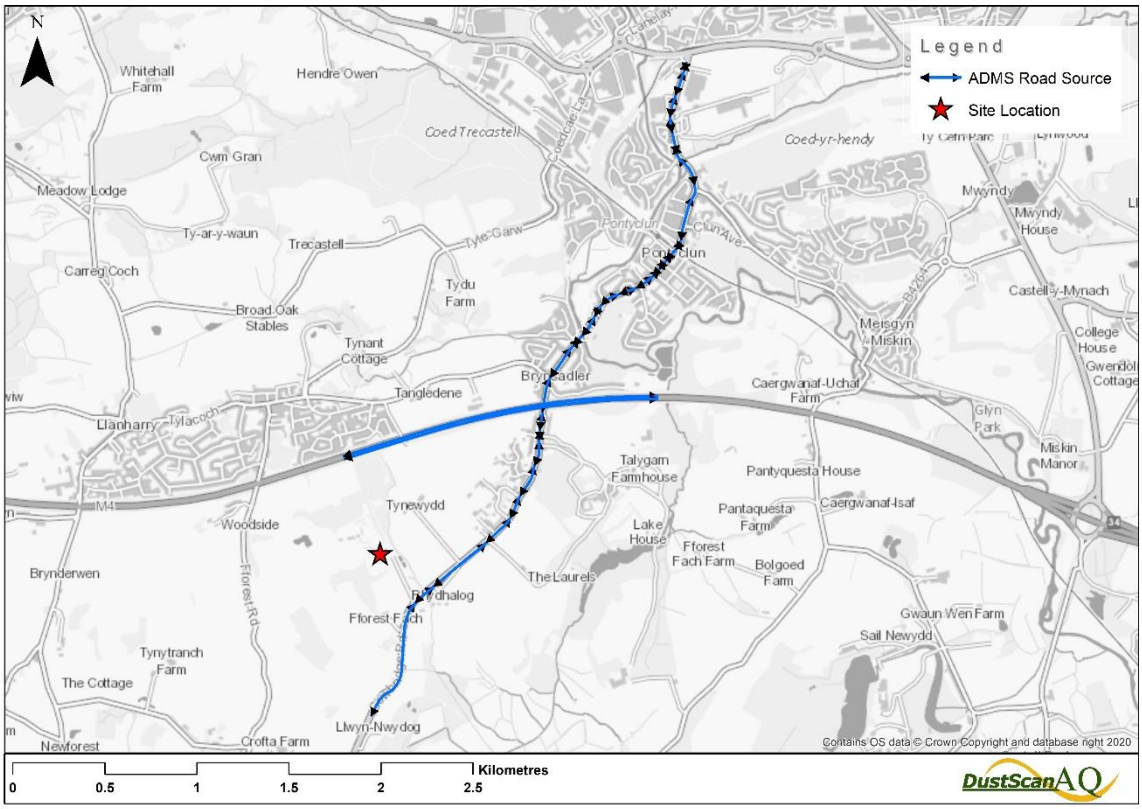

Figure 3.2: Modelled road network

3.8 Emission Factors

The NO_x, PM_{10} and $PM_{2.5}$ road source emissions are calculated from traffic flow data using the latest Defra Emission Factor Toolkit (EFT 11.0, November 2021)[28]. The EFT Version 11.0 has been developed for the UK by the National Atmospheric Emissions Inventory (NAEI) and Transport for London (TfL). The EFT is based on data collected from a number of sources including the European Environment Agency (EEA) COPERT (Computer Programme to calculate Emissions from Road Transport) emission calculator.

The earliest possible year of operation of the proposed development, 2023, has been used in the EFT.

A typical national 7-day diurnal profile derived from available DfT data has also been incorporated in the model, with the profile shown below in Figure 3.3.

[28] https://laqm.defra.gov.uk/air-quality/air-quality-assessment/emissions-factors-toolkit/

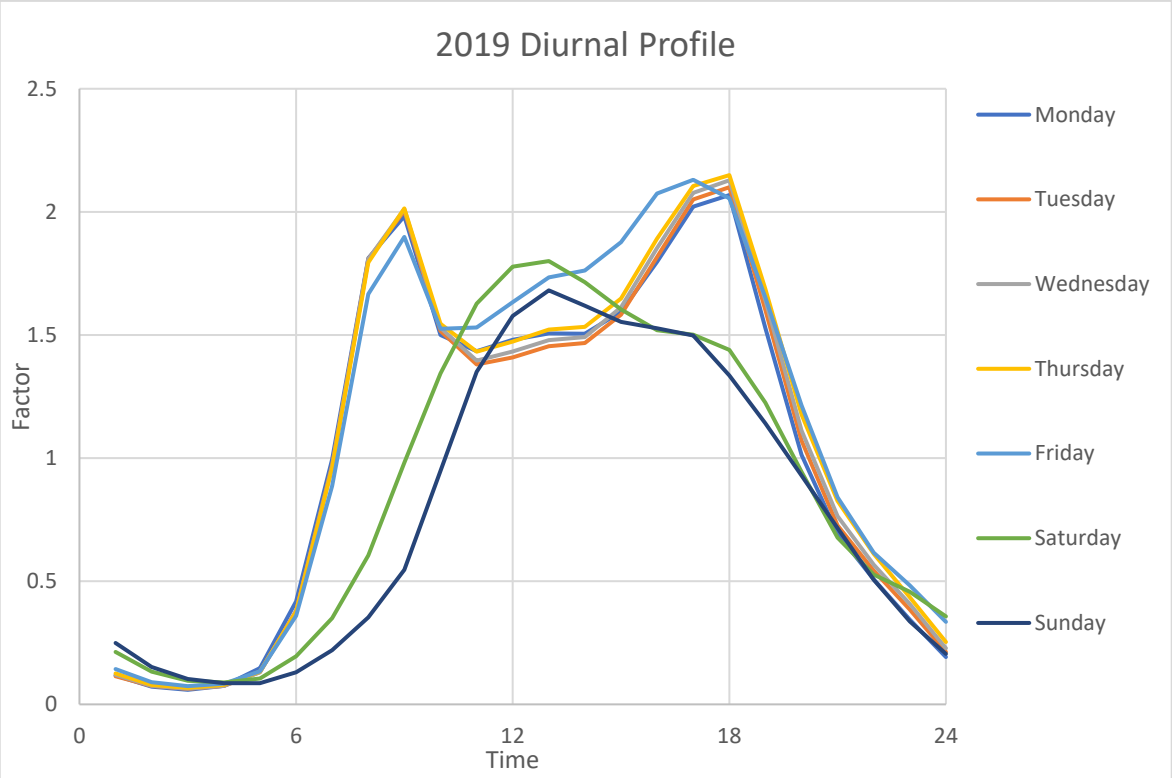

Figure 3.3: 7-Day Diurnal traffic profile based on DfT 2019 traffic data

3.9 NO_x to NO_2 Relationship

As discussed in Section 1.3.1, emissions of NO_x will comprise contributions from both NO and NO_2. This assessment uses the latest NO_x to NO_2 conversion factor toolkit (Version 8.1 released August 2020), provided by Defra as a Microsoft Excel based calculation tool which is available from Defra's website[29]. This method is considered the most appropriate technique of determining NO_2 concentrations from road NO_x contributions.

3.10 Modelled Receptors

Receptors have been chosen to assess the impact of the proposed development at worst-case human health receptors for comparison against the AQO. Receptor sites have been chosen using Google Earth satellite imagery and Google Street View.

Local Air Quality Management (LAQM) guidance clarifies where likely exceedances of the objectives should be assessed and states that Review and Assessment should focus on: *"Locations where members of the public are likely to be regularly present and are likely to be exposed for a period of time appropriate to the averaging period of the relevant air quality objective"* [30]. The receptors most likely to experience the greatest change in pollution

[29] Department for Environment Food and Rural Affairs. NO_x to NO_2 Calculator, available at: https://laqm.defra.gov.uk/air-quality/air-quality-assessment/nox-to-no2-calculator/
[30] Department for Environment, Food and Rural Affairs (2016), Local Air Quality Management – Technical Guidance (16)

concentrations from the proposed development were selected based on professional judgement.

Modelled receptors are detailed below in Table 3.5 and shown in Figure 3.4 - Figure 3.6.

Table 3.5: Modelled receptor details

ID	Receptor	X (m)	Y (m)	Z (m)
R1	Nant Rhydhalog, Cowbridge Road	302287.1	179528.2	1.5
R2	Ty-Lew, Cowbridge Road	302577.6	179837.6	1.5
R3	Plas Y Coed, Cowbridge Road	302795.9	180101.0	1.5
R4	St Annes Ct, Talygarn	302831.9	180231.5	2
R5	Talygarn Close	302837.5	180425.4	1.5
R6	Talygarn Close	302863.4	180505.3	1.5
R7	Tydraw, Cowbridge Road	302922.9	180503.3	1.5
R8	Cameron House, Cowbridge Road	302877.0	180596.5	1.5
R9	10, Paddocks Crescent	302886.1	180635.6	1.5
R10	38, Cowbridge Road	302954.4	180734.9	1.5
R11	51, Cowbridge Road	302937.8	180737.4	1.5
R12	37, Cowbridge Road	302964.8	180774.0	1.5
R13	20, Cowbridge Road	302996.6	180787.5	3
R14	17, Cowbridge Road	302999.6	180826.3	1.5
R15	14, Cowbridge Road	303016.8	180820.0	3
R16	13, Cowbridge Road	303013.4	180842.8	1.5
R17	10, Cowbridge Road	303029.6	180840.3	2.5
R18	5, Cowbridge Road	303031.5	180871.7	1.5
R19	Hennapyn, Cowbridge Road	303189.2	181108.5	1.5
R20	1, Heol-Y-Felin	303404.7	181185.3	1.5
R21	77, Cowbridge Road	303438.0	181209.3	1.5
R22	55, Cowbridge Road	303484.3	181246.8	1.5
R23	4, Cowbridge Road	303567.1	181370.7	1.5
R24	6, Rock Villa, Llantrisant Road	303652.2	181463.2	2
R25	1a, School Street	303638.6	181511.9	1.5
R26	37, Llantrisant Road	303651.5	181566.4	1.5

ID	Receptor	X (m)	Y (m)	Z (m)
R27	39 Llantrisant Road	303659.2	181594.6	1.5
R28	34, Llantrisant Road	303683.3	181610.9	1.5
R29	75a, Llantrisant Road	303703.0	181708.8	1.5
R30	Bute Cottage, Heol Miskin	303727.3	181730.1	1.5
R31	11, Maelog Close	303698.7	181738.6	0
R32	6, Pant Y Dderwen	303604.3	181909.7	1.5
R33	2, Pant Y Dderwen	303589.1	181947.2	1.5
R34	40, Pant Y Dderwen	303579.2	182025.3	1.5

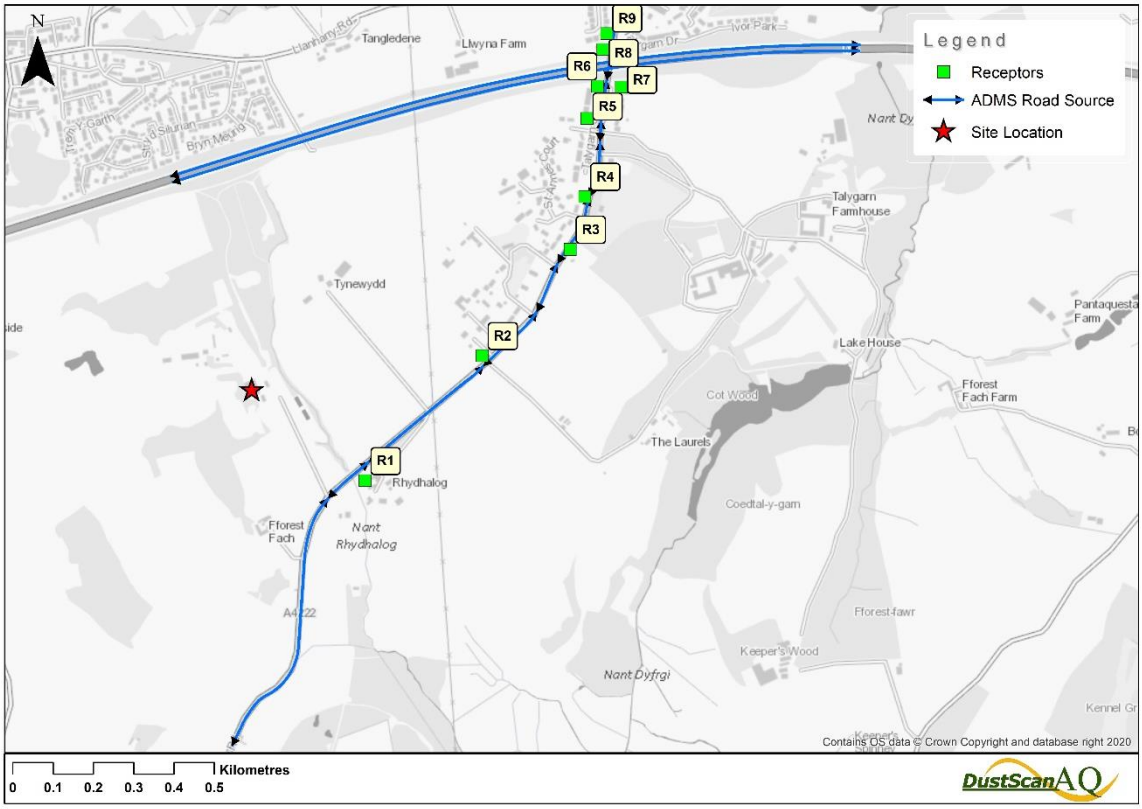

Figure 3.4: Modelled Receptors (Talygarn)

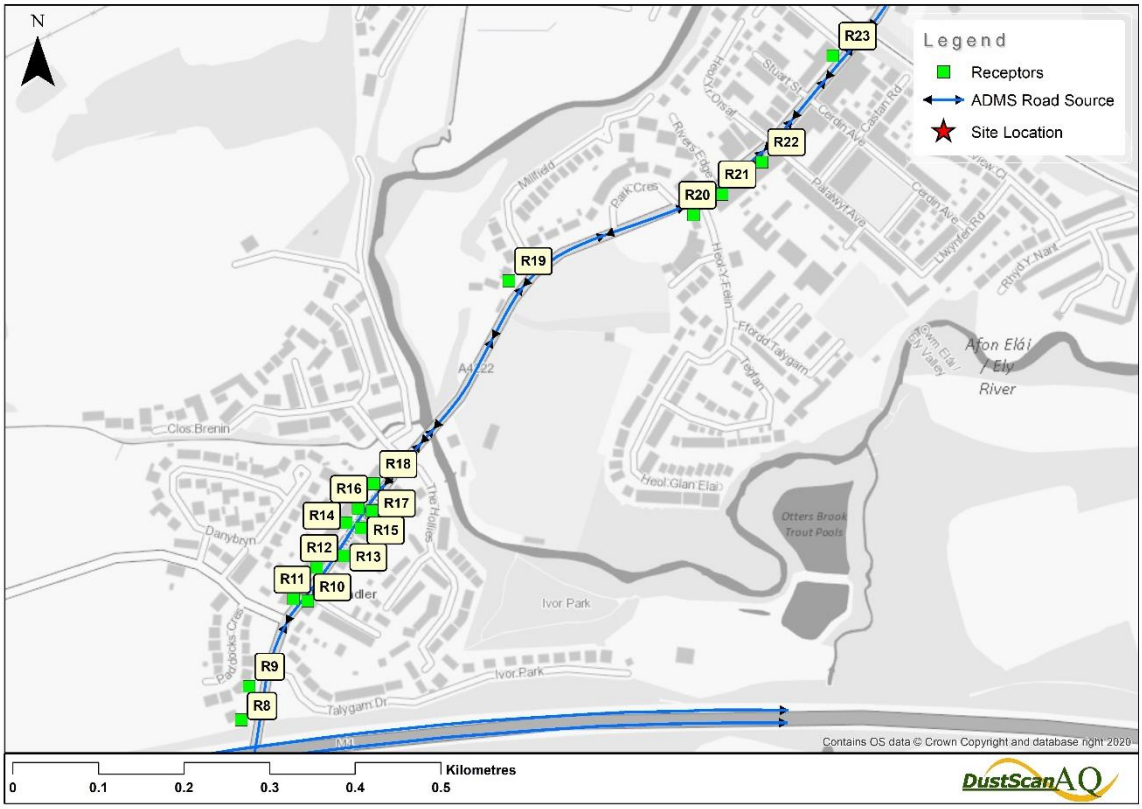

Figure 3.5: Modelled Receptors (Brynsadler)

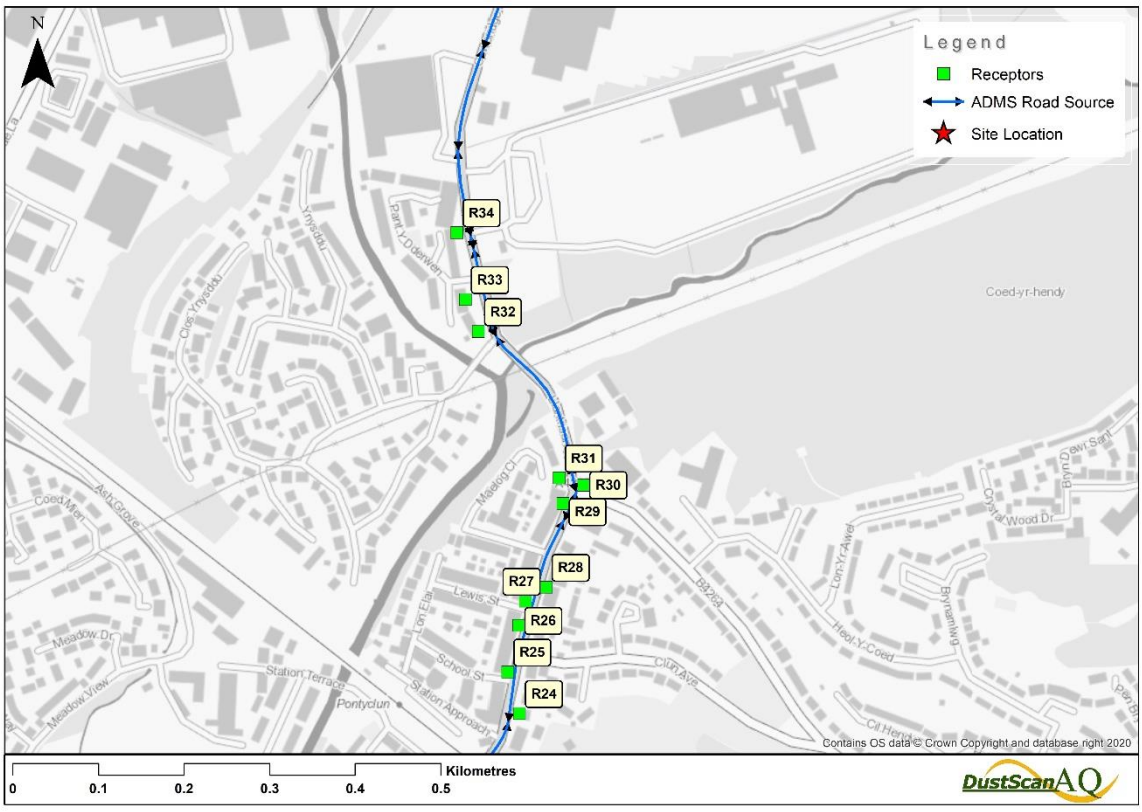

Figure 3.6: Modelled Receptors (Pontyclun)

3.11 Estimating Hourly and Daily Mean Concentrations

The latest Local Air Quality Management (LAQM) Technical Guidance TG (22) has been used for predicting 1 hourly and 24-hourly pollutant concentrations.

The guidance states that the one hour mean NO_2 AQO of 200 µg/m^3 is not likely to be exceeded at any roadside locations if the annual mean concentration is below 60 µg/m^3. Based on this guidance, the hourly mean NO_2 AQO is only considered when the annual mean NO_2 concentrations are over 60 µg/m^3.

In accordance with the guidance, the short term 24 hourly PM_{10} mean concentration can be calculated using the following equation as presented below:

$$Number\ \ of\ 24\ hour\ mean\ exceedences = 18.5 + 0.00145\ x\ annual\ mean^3 + (\frac{206}{annual\ mean})$$

As set out in the guidance, this calculation is only used where the annual mean PM_{10} concentration is 14.8 µg/m^3 or higher.

3.12 Significance Criteria

For the purposes of this assessment, the IAQM and EPUK (2017) criteria have been used for calculating the magnitude descriptors for predicted change in annual mean concentrations at individual receptors (Table 3.6). The IAQM recognise that professional judgement is required in the interpretation of air quality assessment significance. Table 3.6 is intended to be used as a tool to assist with interpretation of the air quality assessment.

Table 3.6: Impact descriptors for predicted change in annual mean concentrations at individual receptors (Reproduced from EPUK and IAQM Guidance)

Long term average concentration at receptor in assessment year	% Change in concentration relative to Air Quality Assessment Level (AQAL)			
	1	2-5	6-10	>10
75% or less of AQAL	Negligible	Negligible	Slight	Moderate
76-94% of AQAL	Negligible	Slight	Moderate	Moderate
95-102% of AQAL	Slight	Moderate	Moderate	Substantial
103-109% of AQAL	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Moderate	Substantial	Substantial	Substantial

Notes:

[1] AQAL = Air Quality Assessment Level, which may be an air quality objective, EU limit or target value, or an Environment Agency 'Environmental Assessment Level (EAL)'.

[2] The Table is intended to be used by rounding the change in percentage pollutant concentration to whole numbers, which then makes it clearer which cell the impact falls within. The numbers are treated with their likely accuracy in order to avoid assumption of false level of precision. For example, Changes of 0%, i.e. less than 0.5% will be described as Negligible.

[3] The Table is only designed to be used with annual mean concentrations.

[4] Descriptors are used for individual receptors only; the overall significance is determined using professional judgement. For example, a 'moderate' adverse impact at one receptor may not mean that the overall impact has a significant effect. Other factors need to be considered.

[5] When defining the concentration as a percentage of the AQAL, use the 'without scheme' concentration where there is a decrease in pollutant concentration and the 'with scheme;' concentration for an increase.

3.13 Modelling Assumptions and Uncertainties

In addition to the parameters outlined above, some assumptions have been made for the modelling, including:

- DS have made conservative assumptions where data hasn't been available.

Uncertainty in dispersion modelling predictions can be associated with a variety of factors, including:

- Uncertainties regarding vehicle emissions;
- Data uncertainty due to errors in input data, emission estimates, operational procedures, land use characteristics and meteorology;
- Uncertainties with recorded meteorological data; and
- Simplifications made in the model algorithms or post processing of the data that describe atmospheric dispersion or chemical reactions.

Model verification for transport emissions, a two-stage process, is therefore applied. First, modelled concentrations are compared with monitored concentrations to identify any disparity. Where disparity occurs, the model inputs are revisited to identify any potential errors or opportunity for improvement of the model. Second, where disparity remains following the first stage, model results can be adjusted to account for systematic bias. Further details of the second stage of the model verification carried out for this assessment are presented within Appendix C.

Potential uncertainties in the model results were minimised as far as practicable and worst-case inputs used in order to provide a robust assessment. This included the following:

- Choice of model - ADMS-Roads is a widely used atmospheric dispersion model and results have been verified through a number of studies to ensure predictions are as accurate as possible;
- Emission rates –For transport emissions, emissions have been calculated using Defra's Emission Factor Toolkit based upon traffic data from the DfT and an appointed transport consultant. A year of 2023 has been used in the EFT assuming that there is no improvement in fleet composition with respect to emissions;
- Receptor locations – Worst-case human health receptors along routes impacted by the proposed change in operational hours have been modelled;
- Defra background concentrations – 2023 Defra backgrounds have been used.

4 Baseline Conditions

The following section sets out the baseline conditions in relation to air quality at the proposed development site. For the purpose of this assessment, data has been obtained from the RCT 2022 Air Quality Progress Report[31] and the Defra air quality resource website[32].

4.1 Air Quality Management Areas (AQMAs)

RCT currently have 16 AQMAs declared all for exceedances of NO_2, the most recently being the Treforest AQMA declared on 29/01/2018. The proposed development itself does not lie within an AQMA and development traffic related to the proposed development does not travel through an AQMA.

4.2 RCT Automatic Monitoring

RCT undertook automatic monitoring across four sites during 2021 across its jurisdiction. There are no automatic monitoring sites located within the model extent. The closest monitor site is located approximately 11.5 km northeast of the proposed development.

4.3 RCT Non-Automatic (Diffusion Tube) Monitoring

RCT monitored NO_2 using diffusion tubes at 51 locations during 2021: two of these locations are at sites within the model extent (Figure 4.1). Monitor 132 is located approximately 1.2 km northeast of the proposed development. Monitor 110 is located approximately 2.2 km northeast of the proposed development along Cowbridge Road.

RCT monitoring has been used in this assessment to inform the 2019 verification model, details of which are presented in Appendix B. A verification year of 2019 was chosen because 2020 data, and to a lesser extent data from 2021, is compromised by measures relating to Covid-19.

[31] Rhonnda Cynon Taf County Borough Council (2022). '2022 Air Quality Progress Report'.
[32] Department for Environmental Food and Rural Affairs. Accessible at: https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018

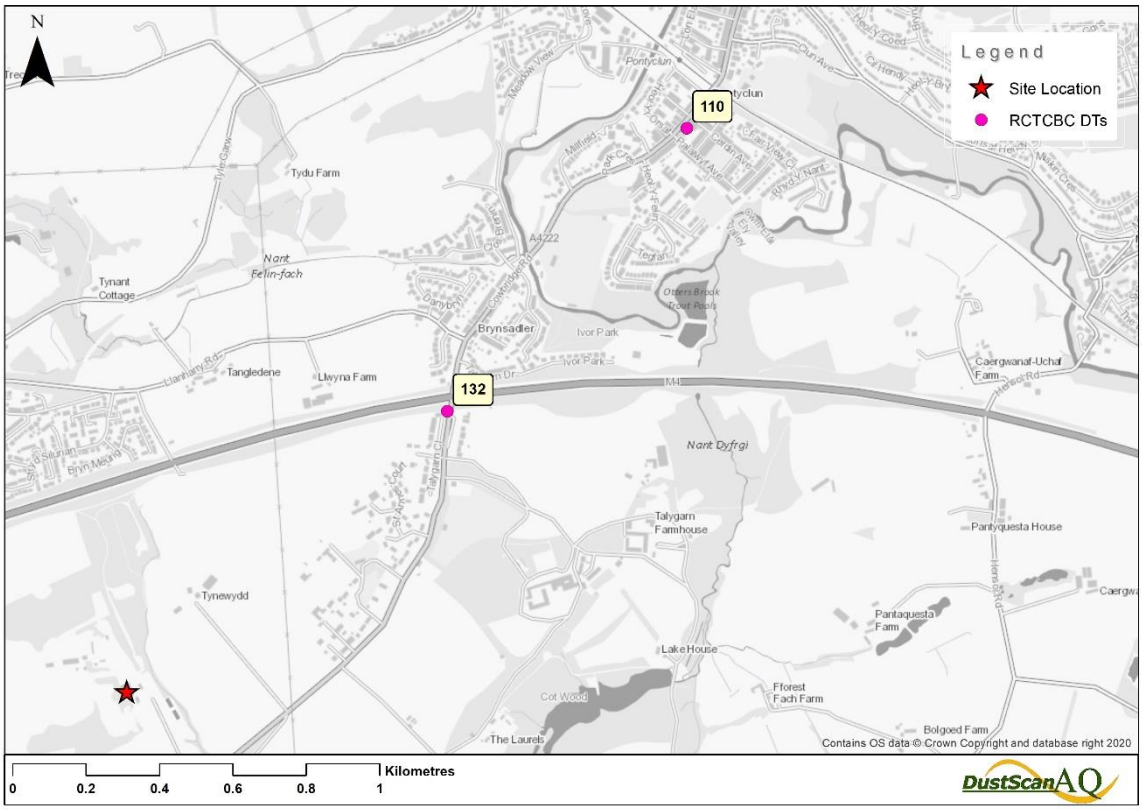

Figure 4.1: RCT Diffusion Tube Locations

4.4 Defra Modelled Background Pollution Concentrations

Defra provides background pollution concentration estimates to assist local authorities in undertaking their 'Review and Assessment' work. This data is available to download from the Defra air quality resource website for NO_x, NO_2, PM_{10} and $PM_{2.5}$ for every 1 km X 1 km grid square for all local authorities. The current dataset is based on 2018 background data and future year projections are available for 2018 to 2030. The background dataset provides breakdown of pollution concentrations by different sources (both road and non-road sources).

Table 4.1 presents the predicted background concentrations for 2023 for the location of each modelled receptor.

Table 4.1: Defra Projected Background Concentrations (for proposed development) (µg/m^3)

Year	Receptor	Annual Mean Concentration (µg/m^3)		
		NO_2	PM_{10}	$PM_{2.5}$
2023	R1	7.19	11.45	7.21
2023	R2	7.19	11.45	7.21
2023	R3	10.86	13.47	8.00
2023	R4	10.86	13.47	8.00
2023	R5	10.86	13.47	8.00

Year	Receptor	Annual Mean Concentration (µg/m^3)		
		NO_2	PM_{10}	$PM_{2.5}$
2023	R6	10.86	13.47	8.00
2023	R7	10.86	13.47	8.00
2023	R8	10.86	13.47	8.00
2023	R9	10.86	13.47	8.00
2023	R10	10.86	13.47	8.00
2023	R11	10.86	13.47	8.00
2023	R12	10.86	13.47	8.00
2023	R13	10.86	13.47	8.00
2023	R14	10.86	13.47	8.00
2023	R15	10.92	12.81	7.86
2023	R16	10.92	12.81	7.86
2023	R17	10.92	12.81	7.86
2023	R18	10.92	12.81	7.86
2023	R19	11.48	12.03	7.68
2023	R20	11.48	12.03	7.68
2023	R21	11.48	12.03	7.68
2023	R22	11.48	12.03	7.68
2023	R23	11.48	12.03	7.68
2023	R24	11.48	12.03	7.68
2023	R25	11.48	12.03	7.68
2023	R26	11.48	12.03	7.68
2023	R27	11.48	12.03	7.68
2023	R28	11.48	12.03	7.68
2023	R29	11.48	12.03	7.68
2023	R30	11.48	12.03	7.68
2023	R31	11.48	12.03	7.68
2023	R32	11.48	12.03	7.68
2023	R33	11.48	12.03	7.68
2023	R34	10.20	11.80	7.46

Note: Data presented within the table are derived from the following ordinance survey grid squares: 302500,179500; 302500,180500; 303500,180500; 303500,181500; 303500,182500.

4.5 Summary of Baseline Conditions

This assessment makes the conservative assumption that background air quality will not improve and therefore, 2023 background concentrations have been used throughout the assessment, representing a conservative case.

5 Potential Impacts

5.1 Operational Phase

The below sections detail the results of the modelling study.

Table 5.1 presents modelled NO_2, PM_{10} and $PM_{2.5}$ concentrations from both the 2023 Without Proposed development and With Proposed development scenarios for all modelled receptors.

Table 5.1: Modelled NO_2, PM_{10} and $PM_{2.5}$ Concentrations in 2023 without and with proposed development

Receptor ID	Without proposed development (2023)				With proposed development (2023)			
	Annual Mean (µg/m^3)			No. of exceedances of 24-hour mean PM_{10} AQO	Annual Mean (µg/m^3			No. of exceedances of 24-hour mean PM_{10} AQO
	NO_2	PM_{10}	$PM_{2.5}$		NO_2	PM_{10}	$PM_{2.5}$	
R1	9.2	11.8	7.4	0	9.2	11.8	7.4	0
R2	9.5	11.9	7.4	0	9.5	11.9	7.5	0
R3	16.3	14.6	8.6	0	16.4	14.6	8.7	0
R4	16.0	14.3	8.5	0	16.0	14.3	8.5	0
R5	17.9	14.4	8.6	0	17.9	14.4	8.6	0
R6	26.1	15.5	9.3	0	26.2	15.5	9.3	0
R7	23.9	15.2	9.1	0	23.9	15.2	9.1	0
R8	24.4	15.2	9.1	0	24.4	15.3	9.1	0
R9	18.9	14.6	8.7	0	19.0	14.6	8.7	0
R10	24.3	16.4	9.7	0	24.5	16.5	9.7	0
R11	20.1	15.2	9.0	0	20.2	15.3	9.1	0
R12	19.2	15.1	9.0	0	19.3	15.1	9.0	0

Receptor ID	Without proposed development (2023)				With proposed development (2023)			
	Annual Mean (µg/m^3)			No. of exceedances of 24-hour mean PM_{10} AQO	Annual Mean (µg/m^3			No. of exceedances of 24-hour mean PM_{10} AQO
	NO_2	PM_{10}	$PM_{2.5}$		NO_2	PM_{10}	$PM_{2.5}$	
R13	18.7	15.0	8.9	0	18.8	15.1	8.9	0
R14	18.5	15.1	8.9	0	18.6	15.1	8.9	0
R15	18.3	14.3	8.7	0	18.4	14.3	8.7	0
R16	19.2	14.6	8.9	0	19.3	14.6	8.9	0
R17	19.4	14.6	8.9	0	19.5	14.7	8.9	0
R18	18.4	14.3	8.7	0	18.5	14.3	8.7	0
R19	15.6	13.0	8.2	0	15.7	13.0	8.2	0
R20	18.3	13.6	8.6	0	18.4	13.7	8.6	0
R21	20.6	14.1	8.9	0	20.7	14.2	8.9	0
R22	19.8	13.9	8.8	0	20.0	13.9	8.8	0
R23	27.5	15.3	9.6	0	27.9	15.4	9.6	0
R24	17.5	13.5	8.5	0	17.6	13.5	8.5	0
R25	17.1	13.5	8.5	0	17.2	13.5	8.5	0
R26	17.0	13.5	8.5	0	17.1	13.5	8.5	0
R27	17.0	13.4	8.5	0	17.1	13.5	8.5	0
R28	18.4	13.8	8.7	0	18.5	13.8	8.7	0
R29	18.0	13.4	8.4	0	18.1	13.4	8.5	0

Receptor ID	Without proposed development (2023)				With proposed development (2023)			
	Annual Mean (µg/m³)			No. of exceedances of 24-hour mean PM_{10} AQO	Annual Mean (µg/m³			No. of exceedances of 24-hour mean PM_{10} AQO
	NO_2	PM_{10}	$PM_{2.5}$		NO_2	PM_{10}	$PM_{2.5}$	
R30	20.1	13.8	8.7	0	20.3	13.8	8.7	0
R31	16.9	13.2	8.3	0	17.1	13.2	8.3	0
R32	15.4	13.0	8.2	0	15.4	13.0	8.2	0
R33	15.1	12.8	8.1	0	15.2	12.8	8.1	0
R34	14.2	12.8	8.0	0	14.2	12.8	8.0	0
Corresponding AQO	**40**	**40**	**20**	**35**	**40**	**40**	**20**	**35**

Note: Exceedances of annual mean objective highlighted in Bold

From the above Table 5.1, it can be determined that at all modelled receptors, for all modelled pollutants, the modelled concentrations are below the relevant AQO.

According to Defra LAQM.TG (22) guidance, exceedance of the one-hour NO_2 mean objective is generally unlikely to occur where annual mean concentrations do not exceed 60 µg/m³. The annual mean NO_2 concentration at all receptors falls comfortably below 60 µg/m³ in the With Proposed Development scenario. Therefore, exceedances of the one-hour NO_2 mean are unlikely to occur at existing residential receptors.

It should be noted that results presented in this section are the maximum forecast over a three-year modelling period combined with 2023 ambient concentrations, thus representative of a conservative case.

Significance of impact has been determined for NO_2, PM_{10} and $PM_{2.5}$ using the impact descriptors matrix illustrated in Table 3.6. The significance of the impact of the proposed development on local air quality is presented below in Table 5.2, Table 5.3, and Table 5.4 respectively.

Table 5.2: NO_2 Annual Mean Concentration Changes and Associated Impact at Modelled Receptors in 2023

Receptor ID	Predicted Annual Mean NO_2 Concentration ($\mu g/m^3$)	Long Term Average Concentration at Receptor	Pollutant Concentration Change ($\mu g/m^3$)	% Change Relative to AQAL	Impact Descriptor
R1	9.2	75% or less of AQAL	0.03	<0.5	Negligible
R2	9.5	75% or less of AQAL	0.03	<0.5	Negligible
R3	16.4	75% or less of AQAL	0.16	<0.5	Negligible
R4	16.0	75% or less of AQAL	0.07	<0.5	Negligible
R5	17.9	75% or less of AQAL	0.02	<0.5	Negligible
R6	26.2	75% or less of AQAL	0.04	<0.5	Negligible
R7	23.9	75% or less of AQAL	0.03	<0.5	Negligible
R8	24.4	75% or less of AQAL	0.04	<0.5	Negligible
R9	19.0	75% or less of AQAL	0.04	<0.5	Negligible
R10	24.5	75% or less of AQAL	0.15	<0.5	Negligible
R11	20.2	75% or less of AQAL	0.09	<0.5	Negligible
R12	19.3	75% or less of AQAL	0.09	<0.5	Negligible
R13	18.8	75% or less of AQAL	0.08	<0.5	Negligible
R14	18.6	75% or less of AQAL	0.08	<0.5	Negligible
R15	18.4	75% or less of AQAL	0.09	<0.5	Negligible
R16	19.3	75% or less of AQAL	0.11	<0.5	Negligible
R17	19.5	75% or less of AQAL	0.11	<0.5	Negligible

Receptor ID	Predicted Annual Mean NO_2 Concentration ($\mu g/m^3$)	Long Term Average Concentration at Receptor	Pollutant Concentration Change ($\mu g/m^3$)	% Change Relative to AQAL	Impact Descriptor
R18	18.5	75% or less of AQAL	0.11	<0.5	Negligible
R19	15.7	75% or less of AQAL	0.05	<0.5	Negligible
R20	18.4	75% or less of AQAL	0.10	<0.5	Negligible
R21	20.7	75% or less of AQAL	0.15	<0.5	Negligible
R22	20.0	75% or less of AQAL	0.14	<0.5	Negligible
R23	27.9	75% or less of AQAL	0.36	1	Negligible
R24	17.6	75% or less of AQAL	0.10	<0.5	Negligible
R25	17.2	75% or less of AQAL	0.09	<0.5	Negligible
R26	17.1	75% or less of AQAL	0.10	<0.5	Negligible
R27	17.1	75% or less of AQAL	0.10	<0.5	Negligible
R28	18.5	75% or less of AQAL	0.12	<0.5	Negligible
R29	18.1	75% or less of AQAL	0.14	<0.5	Negligible
R30	20.3	75% or less of AQAL	0.20	<0.5	Negligible
R31	17.1	75% or less of AQAL	0.12	<0.5	Negligible
R32	15.4	75% or less of AQAL	0.07	<0.5	Negligible
R33	15.2	75% or less of AQAL	0.07	<0.5	Negligible
R34	14.2	75% or less of AQAL	0.06	<0.5	Negligible

Table 5.3: PM_{10} Annual Mean Concentration Changes and Associated Impact at Modelled Receptors in 2023

Receptor ID	Predicted Annual Mean PM_{10} Concentration ($\mu g/m^3$)	Long Term Average Concentration at Receptor	Pollutant Concentration Change ($\mu g/m^3$)	% Change Relative to AQAL	Impact Descriptor
R1	11.8	75% or less of AQAL	0.01	<0.5	Negligible
R2	11.9	75% or less of AQAL	0.01	<0.5	Negligible
R3	14.6	75% or less of AQAL	0.04	<0.5	Negligible
R4	14.3	75% or less of AQAL	0.02	<0.5	Negligible
R5	14.4	75% or less of AQAL	0.01	<0.5	Negligible
R6	15.5	75% or less of AQAL	0.01	<0.5	Negligible
R7	15.2	75% or less of AQAL	0.01	<0.5	Negligible
R8	15.3	75% or less of AQAL	0.01	<0.5	Negligible
R9	14.6	75% or less of AQAL	0.01	<0.5	Negligible
R10	16.5	75% or less of AQAL	0.05	<0.5	Negligible
R11	15.3	75% or less of AQAL	0.03	<0.5	Negligible
R12	15.1	75% or less of AQAL	0.02	<0.5	Negligible
R13	15.1	75% or less of AQAL	0.02	<0.5	Negligible
R14	15.1	75% or less of AQAL	0.02	<0.5	Negligible
R15	14.3	75% or less of AQAL	0.02	<0.5	Negligible
R16	14.6	75% or less of AQAL	0.03	<0.5	Negligible
R17	14.7	75% or less of AQAL	0.03	<0.5	Negligible

Receptor ID	Predicted Annual Mean PM_{10} Concentration ($\mu g/m^3$)	Long Term Average Concentration at Receptor	Pollutant Concentration Change ($\mu g/m^3$)	% Change Relative to AQAL	Impact Descriptor
R18	14.3	75% or less of AQAL	0.02	<0.5	Negligible
R19	13.0	75% or less of AQAL	0.02	<0.5	Negligible
R20	13.7	75% or less of AQAL	0.03	<0.5	Negligible
R21	14.2	75% or less of AQAL	0.04	<0.5	Negligible
R22	13.9	75% or less of AQAL	0.03	<0.5	Negligible
R23	15.4	75% or less of AQAL	0.06	<0.5	Negligible
R24	13.5	75% or less of AQAL	0.03	<0.5	Negligible
R25	13.5	75% or less of AQAL	0.03	<0.5	Negligible
R26	13.5	75% or less of AQAL	0.03	<0.5	Negligible
R27	13.5	75% or less of AQAL	0.03	<0.5	Negligible
R28	13.8	75% or less of AQAL	0.03	<0.5	Negligible
R29	13.4	75% or less of AQAL	0.02	<0.5	Negligible
R30	13.8	75% or less of AQAL	0.03	<0.5	Negligible
R31	13.2	75% or less of AQAL	0.02	<0.5	Negligible
R32	13.0	75% or less of AQAL	0.02	<0.5	Negligible
R33	12.8	75% or less of AQAL	0.01	<0.5	Negligible
R34	12.8	75% or less of AQAL	0.02	<0.5	Negligible

Table 5.4: $PM_{2.5}$ Annual Mean Concentration Changes and Associated Impact at Modelled Receptors in 2023

Receptor ID	Predicted Annual Mean $PM_{2.5}$ Concentration ($\mu g/m^3$)	Long Term Average Concentration at Receptor	Pollutant Concentration Change ($\mu g/m^3$)	% Change Relative to AQAL	Impact Descriptor
R1	7.4	75% or less of AQAL	0.01	<0.5	Negligible
R2	7.5	75% or less of AQAL	0.01	<0.5	Negligible
R3	8.7	75% or less of AQAL	0.02	<0.5	Negligible
R4	8.5	75% or less of AQAL	0.01	<0.5	Negligible
R5	8.6	75% or less of AQAL	0.00	<0.5	Negligible
R6	9.3	75% or less of AQAL	0.01	<0.5	Negligible
R7	9.1	75% or less of AQAL	0.01	<0.5	Negligible
R8	9.1	75% or less of AQAL	0.01	<0.5	Negligible
R9	8.7	75% or less of AQAL	0.01	<0.5	Negligible
R10	9.7	75% or less of AQAL	0.03	<0.5	Negligible
R11	9.1	75% or less of AQAL	0.01	<0.5	Negligible
R12	9.0	75% or less of AQAL	0.01	<0.5	Negligible
R13	8.9	75% or less of AQAL	0.01	<0.5	Negligible
R14	8.9	75% or less of AQAL	0.01	<0.5	Negligible
R15	8.7	75% or less of AQAL	0.01	<0.5	Negligible
R16	8.9	75% or less of AQAL	0.02	<0.5	Negligible
R17	8.9	75% or less of AQAL	0.02	<0.5	Negligible

Receptor ID	Predicted Annual Mean $PM_{2.5}$ Concentration ($\mu g/m^3$)	Long Term Average Concentration at Receptor	Pollutant Concentration Change ($\mu g/m^3$)	% Change Relative to AQAL	Impact Descriptor
R18	8.7	75% or less of AQAL	0.01	<0.5	Negligible
R19	8.2	75% or less of AQAL	0.01	<0.5	Negligible
R20	8.6	75% or less of AQAL	0.02	<0.5	Negligible
R21	8.9	75% or less of AQAL	0.02	<0.5	Negligible
R22	8.8	75% or less of AQAL	0.02	<0.5	Negligible
R23	9.6	75% or less of AQAL	0.04	<0.5	Negligible
R24	8.5	75% or less of AQAL	0.01	<0.5	Negligible
R25	8.5	75% or less of AQAL	0.01	<0.5	Negligible
R26	8.5	75% or less of AQAL	0.01	<0.5	Negligible
R27	8.5	75% or less of AQAL	0.01	<0.5	Negligible
R28	8.7	75% or less of AQAL	0.02	<0.5	Negligible
R29	8.5	75% or less of AQAL	0.01	<0.5	Negligible
R30	8.7	75% or less of AQAL	0.02	<0.5	Negligible
R31	8.3	75% or less of AQAL	0.01	<0.5	Negligible
R32	8.2	75% or less of AQAL	0.01	<0.5	Negligible
R33	8.1	75% or less of AQAL	0.01	<0.5	Negligible
R34	8.0	75% or less of AQAL	0.01	<0.5	Negligible

The above tables demonstrate that for all modelled pollutants and receptors, the impact of the proposed development will be 'Negligible'. Therefore, the proposed development is considered to have no significant adverse impact on local air quality.

With respect to the RCT comment (reproduced in section 1) regarding different times of the day, all modelled scenarios include a diurnal profile (section 3.8) which factors traffic differently depending on the time of day and day of the week. The model therefore accounts for peaks in scheme traffic both in the morning and the afternoon. Both NO_2 and PM_{10} have short-term AQO. The NO_2 short-term AQO have a one hour averaging period, whereas the PM_{10} short-term AQO has a 24 hour averaging period. At all receptors, the short-term AQO will be comfortably met.

6 Mitigation Measures

6.1 Operational Phase

The proposed development will have no significant adverse impact on local air quality and therefore no further mitigation is required.

7 Conclusion

This report provides an assessment of air quality impacts associated with the proposed development at Fforest Wood Quarry, Cowbridge Road, Talygarn, Pontyclun, CF72 9XD. The assessment includes:

- Characterisation of the baseline conditions along the modelled network using monitored pollutant data from RCT and background concentrations from Defra background maps;
- Assessment of the impact of the proposed development on existing sensitive receptors from transport emissions; and
- If required, make recommendations for mitigation measures.

An assessment of the operational air quality impact has been undertaken for the proposed development.

The modelling work undertaken as part of this assessment has assumed a conservative scenario with regard to ambient concentrations, in that there is no reduction in ambient concentrations from 2023 onwards. In reality, ambient concentrations are expected to improve.

This assessment considered transport emissions associated with the proposed development for the earliest year of operation (2023). The annual mean and one hour mean NO_2 objectives are forecast to be met at all modelled receptors. The PM_{10} concentration is also forecast to meet its respective long and short term AQO by a considerable margin at all modelled receptors. The $PM_{2.5}$ concentration is forecast to meets its AQO at all receptors.

The air quality impact is negligible for all pollutants at all modelled receptors, as would be expected given the relatively small increase in traffic. Therefore, the proposed development is not considered to have a significant effect on local air quality. No further mitigation measures are required.

It can therefore be concluded that the proposed development is not considered to conflict with national, regional and local air quality planning guidance because it does not result in significant negative impact on air quality.

Appendix A: Operational Impact Assessment

Methodology

The EPUK & IAQM guidance refers to the Town and Country Planning (Development Management Procedure) Order (England) 2010 [(Wales) 2012] for a definition of a 'major' development when scoping assessments required for the planning process. Based on the guidance, a 'major' development is such development where:

- The number of dwellings is 10 or above;
- The residential development is carried out of a site of more than 0.5ha where the number of dwellings is unknown;
- The provision of more than 1,000 m^2 commercial floorspace; or,
- Development carried out on land of 1ha or more.

It is recommended that consideration should be given to reduce impacts from any 'major' developments by considering:

- The impact of existing sources in the local area on the proposed development; and
- The impacts of the proposed development on the local area.

The assessment process involves two stages where:

Stage 1 scope out the need for an air quality assessment and **Stage 2** provide guidance of determining the level of assessment required for a project.

Table A 1 below sets out the Stage 1 criteria to determine the need to assess impacts arising from small developments and **Table A 2** provides more specific guidance as to when an air quality assessment is likely to be required to assess the impacts of the proposed development on the local area.

Table A 1: Stage 1 Criteria to Proceed to Stage 2

Criteria to Proceed to Stage 2	
A	If any of the following apply: • 10 or more residential units of a site area of more than 0.5ha • More than 1,000m^2 of floor space for all other uses or a site area greater than 1ha
B	Coupled with any of the following: • The development has more than 10 parking spaces • The development will have a centralised energy facility or other centralised combustion process

Table A 2: Indicative Criteria for Requiring an Air Quality Assessment

The development will	Indicative Criteria to Proceed to an Air Quality Assessment
1. Cause a significant change in Light Duty Vehicle (LDV) traffic flows on local roads with relevant receptors. (LDV = cars and small vans <3.5t gross vehicle weight).	A change of LDV flows of: - more than 100 AADT within or adjacent to an AQMA - more than 500 AADT elsewhere.
2. Cause a significant change in Heavy Duty Vehicle (HDV) flows on local roads with relevant receptors. (HDV = goods vehicles + buses >3.5t gross vehicle weight).	A change of HDV flows of: - more than 25 AADT within or adjacent to an AQMA - more than 100 AADT elsewhere.
3. Realign roads, i.e. changing the proximity of receptors to traffic lanes.	Where the change is 5m or more and the road is within an AQMA.
4. Introduce a new junction or remove an existing junction near to relevant receptors.	Applies to junctions that cause traffic to significantly change vehicle accelerate/decelerate, e.g. traffic lights, or roundabouts.
5. Introduce or change a bus station.	Where bus flows will change by: - more than 25 AADT within or adjacent to an AQMA - more than 100 AADT elsewhere.
6. Have an underground car park with extraction system.	The ventilation extract for the car park will be within 20 m of a relevant receptor. Coupled with the car park having more than 100 movements per day (total in and out).
7. Have one or more substantial combustion processes, where there is a risk of impacts at relevant receptors. NB. this includes combustion plant associated with standby emergency generators (typically associated with centralised energy centres) and shipping.	Typically, any combustion plant where the single or combined NO_x emission rate is less than 5 mg/sec is unlikely to give rise to impacts, provided that the emissions are released from a vent or stack in a location and at a height that provides adequate dispersion. In situations where the emissions are released close to buildings with relevant receptors, or where the dispersion of the plume may be adversely affected by the size and/or height of adjacent buildings (including situations where the stack height is lower than the receptor) then consideration will need to be given to potential impacts at much lower emission rates. Conversely, where existing nitrogen dioxide concentrations are low, and where the dispersion conditions are favourable, a much higher emission rate may be acceptable.

Appendix B: Verification

Overview

Model verification is a process by which checks are carried out to determine the performance of a dispersion model at a local level, primarily by comparison of modelled results with monitoring data. Differences between modelled and monitored data may occur as a result of uncertainties associated with a number of model inputs including:

- Traffic flows, speeds and vehicle splits;
- Emissions estimates;
- Background concentrations;
- Meteorological data; and
- Surface roughness length and terrain.

The verification process benefits an assessment by investigating uncertainties and minimising them either through informed refinement of model input parameters or adjustment of the model output if it is deemed necessary.

Verification of NO_2 concentrations has been carried out using 2019 monitored results from selected RCT roadside diffusion tube sites. 2019 data has been used as it's the most recent year for which there is data that was not impacted by Covid-19. Data from St Athan meteorological station in 2019 was used in the modelling, with all other inputs as per the main assessment.

Methodology

Guidance produced by Defra provides a methodology for model verification including calculation methods and directions on the suitability of monitoring data.

For the purpose of this verification only roadside monitoring sites have been used as verification against kerbside sites tends to result in over prediction at non-kerbside locations which are the primary focus of this assessment.

Verification of NO_2 concentrations has been carried out using 2019 results from two diffusion tube sites.

In accordance with guidance the model verification has been based on 2019 meteorological data. Background concentrations used in the model verification have been taken from Defra, consistent with the main model with individual background concentrations being obtained for each monitoring location. These are presented in Table B.1.

Table B.1: Background Concentrations used in Model Verification

Site Name	Annual Mean Concentration 2019 (µg/m³)	
	NO_x	NO_2
132	18.0	13.5
110	18.1	13.4

Figure B.1: Image of DT132 Cowbridge Road, Talygarn, taken from Google Street View – Height Estimated to be no more than 2.5m (not 3.5m as stated in ASR)

Table B.2 presents the monitored data used within the verification, the location of the monitoring sites and monitored pollutant concentrations. For both monitors, the diffusion tube height quoted within the ASR is 3.5 m. From the above Figure B.1 of site 132 it is evident that the diffusion tube height is no more than 2.5 m. This height has been used in the verification model for both monitoring locations.

Table B.2: Monitored Data used in Model Verification

Site Name	Type of Monitor	Annual Mean Concentration 2019 (µg/m³)	
		NO_x	NO_2
132	Diffusion Tube	52.2	31.0
110	Diffusion Tube	51.4	30.5

Verification Results

Table B.3 and Figure B.2 present the results of the model verification for NO_2. It can be seen that the modelled NO_2 concentrations at all locations are below the monitored values. On this basis it has been concluded that the model is under predicting annual mean NO_2 concentrations within the study area. Therefore, an adjustment factor has been calculated.

Table B.3: Model Verification Results for NO_2

Site Name	Monitored Total NO_2 ($\mu g/m^3$)	Modelled Total NO_2 ($\mu g/m^3$)	% Difference
132	31.0	28.89	-6.8
110	30.5	23.30	-23.6

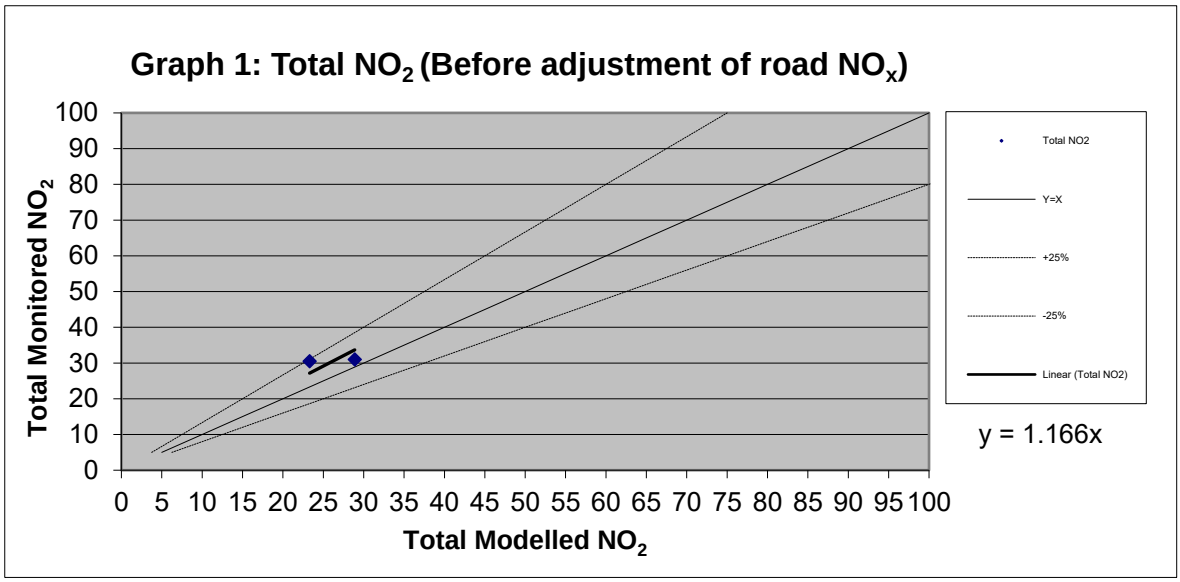

Figure B.2: Model Verification Results for NO_2

To derive adjustment factors for this assessment the modelled road NO_x contribution has been compared to monitored road NO_x contribution. Two adjustment factors were derived for this model: one for receptors affected by the impact of the M4 on the local air quality environment (R5 – R9), and one for the rest of the model. The two adjustment factors used were: 1.148 close to the M4, and 1.780 for all other links.

The adjustment factors have been applied to the modelled road NO_x contributions and added to background NO_x concentrations to give total corrected NO_x at each of the verification sites.

The final stage of the verification process involves applying the NO_x to NO_2 relationship presented in Section 3.9. Table B.4 presents the total adjusted modelled NO_2 and the monitored NO_2 after the adjustment factors have been applied. Figure B.3 presents the correlation between the total corrected NO_2 and the monitored NO_2. Following the application of the adjustment factors the site is within 10 % of monitored concentrations, with a good overall agreement. This indicates that overall, the model is performing acceptably.

Table B.4: Adjusted Modelled NO_2 Results

Site Name	Monitored Total NO_2 (µg/m³)	Modelled Total NO_2 (µg/m³)	% Difference
132	31.0	31.0	0.00
110	30.5	30.5	0.00

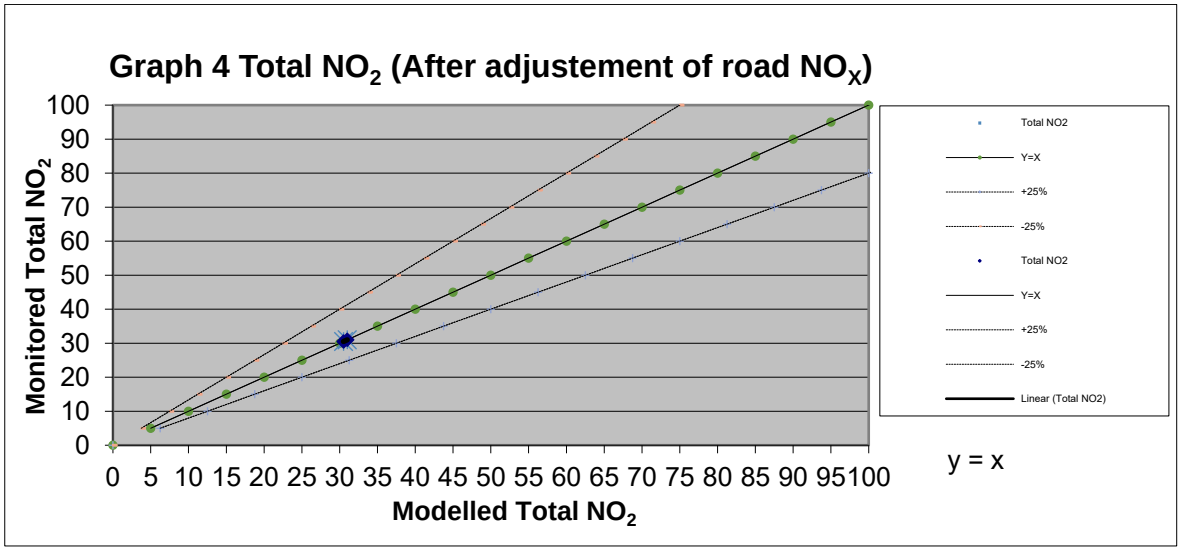

Figure B.3: Adjusted Model NO_2 Verification Results

Summary

Following the model verification it is considered that the model is performing acceptably with all modelled concentrations with + or – 10 % of monitored concentrations.

In accordance with Defra guidance, the road contributed NO_x adjustment factor was also applied to the road contributed PM concentration. The total PM_{10} and $PM_{2.5}$ concentrations are derived by adding the adjusted road contribution value to the Defra background concentrations.

An adjustment factor of 1.148 was used for receptors close to the M4 for NO_2, PM_{10} and $PM_{2.5}$. An adjustment factor of 1.780 was applied across the rest of the study area for NO_2, PM_{10} and $PM_{2.5}$.