Air Quality Assessment

Green Hydrogen Project, Bridgend

For Marubeni Europower

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Quality Management			
Prepared by	Georgie Coppin BSc(Hons)	Graduate Air Quality Consultant	
Reviewed & checked by	Fiona Prismall MSc, BSc (Hons), CEnv, FIAQM, MIEnvSc	Technical Director	
Authorised by	Fiona Prismall MSc, BSc (Hons), CEnv, FIAQM, MIEnvSc	Technical Director	
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Prepared by	Georgie Coppin BSc(Hons)	Graduate Air Quality Consultant
Checked by	Fiona Prismall MSc, BSc (Hons), CEnv, FIAQM, MIEnvSc	Technical Director

Executive Summary

The Green Hydrogen Project is located within the administrative area of Bridgend County Borough Council (BCBC). The development will include an array of ground mounted solar panels, ancillary infrastructure, switch gear, a substation and temporary construction compounds. BCBC has designated one Air Quality Management Area (AQMA) due to high levels of nitrogen dioxide (NO_2) pollution from road traffic. This AQAM is approximately 4.6 km to the south of the application site.

This Air Quality Assessment, undertaken to accompany the planning application, considers the air quality impacts from the construction phase and once the Proposed Development is fully operational.

The assessment has been undertaken based upon appropriate information on the Proposed Development provided by Marubeni Europower and its project team. In undertaking this assessment, RPS experts have exercised professional skills and judgement to the best of their abilities and have given professional opinions that are objective, reliable and backed with scientific rigour. These professional responsibilities are in accordance with the code of professional conduct set by the Institution of Environmental Sciences for members of the Institute of Air Quality Management (IAQM).

For the construction phase, the most important consideration is dust. Without appropriate mitigation, dust could cause temporary soiling of surfaces, particularly windows, cars and laundry. The mitigation measures provided within this report should ensure that the risk of adverse dust effects is reduced to a level categorised as ‘not significant’.

For the operational phase, arrivals at and departures from the Proposed Development may change the number, type and speed of vehicles using the local road network. Changes in road vehicle emissions are the most important consideration during this phase of the development.

Detailed atmospheric dispersion modelling has been undertaken for the first year in which the development is expected to be fully operational, 2025. Pollutant concentrations are predicted to be well within the relevant health-based air quality objectives at the façades of existing receptors. Using the criteria adopted for this assessment together with professional judgement, the operational air quality effects are considered to be ‘not significant’ overall.

The Green Hydrogen Project development does not, in air quality terms, conflict with national or local policies, or with measures set out in Bridgend County Borough Council’s Air Quality Action Plan. There are no constraints to the development in the context of air quality.

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1 Introduction

1.1 This report details the air quality assessment undertaken for the Proposed Development in Bridgend. The development will include an array of ground mounted solar panels, ancillary infrastructure, switch gear, a substation and temporary construction compounds. The local authority, Bridgend County Borough Council (BCBC), has currently designated one Air Quality Management Area (AQMA). The Application Site is approximately 4.6 km north of the designated AQMA.

1.2 This air quality assessment covers the:

- Construction phase - an evaluation of the temporary effects from fugitive construction dust and construction-vehicle exhaust emissions; and the
- Operational phase – an evaluation of the impacts of the development traffic on the local area including any effects on the AQMA

1.3 This report begins by setting out the policy and legislative context for the assessment. The methods and criteria used to assess potential air quality effects have then been described. The baseline air quality conditions have been established taking into account Defra estimates, local authority documents and the results of any local monitoring. The results of the assessment of air quality impacts have been presented. A conclusion has been drawn on the significance of the residual construction-phase effects and the residual operational-phase effects.

2 Policy and Legislative Context

Ambient Air Quality Legislation and National Policy

Air Quality Standards Regulations

2.1 The Air Quality Standards Regulations 2010 [1], amended by The Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020 [2], sets limit values for ambient air concentrations for the main air pollutants: particulate matter (PM_{10} and $PM_{2.5}$), nitrogen dioxide (NO_2), sulphur dioxide (SO_2), ozone (O_3), carbon monoxide (CO), lead (Pb) and benzene, certain toxic heavy metals (arsenic, cadmium and nickel) and polycyclic aromatic hydrocarbons (PAHs).

2.2 These limit values are legally binding on the Secretary of State. The Government and devolved administrations operate various national ambient air quality monitoring networks to measure compliance and develop plans to meet the limit values.

UK Air Quality Strategy

2.3 The Environment Act 1995 established the requirement for the Government and the devolved administrations to produce a National Air Quality Strategy (AQS) for improving ambient air quality, the first being published in 1997 and having been revised several times since, with the latest published in 2007 [3]. The Strategy sets UK air quality standards♦ and objectives# for the pollutants in the Air Quality Standards Regulations plus 1,3-butadiene and recognises that action at national, regional and local level may be needed, depending on the scale and nature of the air quality problem. There is no legal requirement to meet objectives set within the UK AQS except where equivalent limit values are set within the Air Quality Standards Regulations.

2.4 The 1995 Environment Act also established the UK system of Local Air Quality Management (LAQM), that requires local authorities to go through a process of review and assessment of air quality in their areas, identifying places where objectives are not likely to be met, then declaring Air Quality Management Areas (AQMAs) and putting in place Air Quality Action Plans to improve air quality. These plans also contribute, at local level, to the achievement of the limit values in the Air Quality Standards Regulations.

♦ Standards are concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. Standards, as the benchmarks for setting objectives, are set purely with regard to scientific evidence and medical evidence on the effects of the particular pollutant on health, or on the wider environment, as minimum or zero risk levels.

Objectives are policy targets expressed as a concentration that should be achieved, all the time or for a percentage of time, by a certain date.

2.5 The limit values and objectives relevant to this assessment are summarised in Table 2.1. Where the limit values and the AQS objectives differ, the more stringent has been used.

Table 2.1 Summary of Relevant Air Quality Limit Values and Objectives

Pollutant	Averaging Period	Objectives/ Limit Values	Not to be Exceeded More Than
Nitrogen Dioxide (NO_2)	1 hour	200 µg.m^{-3}	18 times per calendar year
	Annual	40 µg.m^{-3}	-
Particulate Matter (PM_{10})	24 Hour	50 µg.m^{-3}	35 times per calendar year
	Annual	40 µg.m^{-3}	-
Particulate Matter ($PM_{2.5}$)	Annual	20 µg.m^{-3}	-

2.6 On 14 January 2019, Defra published the *'Clean Air Strategy 2019'.* The report sets out actions that the Government intends to take to reduce emissions from transport, in the home, from farming and from industry.

National Planning Policy

2.7 Current land use policies for out the land use planning policies of the Welsh Government and is intended to provide a strategic policy framework to assist local authorities in the preparation of their development plans. Planning Policy Wales (PPW) is supported by twenty-four Technical Advice Notes (TANs) which give further guidance on specific topics. Procedural advice is also given in the National Assembly for Wales/Welsh Office topic. Procedural advice is also given in the National Assembly for Wales/Welsh Office Circulars. Planning authorities may use planning conditions or obligations to meet planning aims to protect the environment. PPW, the TANs and Circulars may be material to decisions made on individual planning applications and will be taken into account by the Secretary of State and his Inspectors in the determination of called-in planning applications and appeals.

2.8 Section 6.7 of PPW concerns Air Quality and Soundscape. Most relevant to this assessment, it states that: *"Planning authorities must consider the potential for temporary environmental risk, including airborne pollution and surface and subsurface risks, arising during the construction phases of development. Where appropriate planning authorities should require a construction* *management plan, covering pollution prevention, noisy plants, hours of operation, dust mitigation and details for keeping residents informed about temporary risks."*

2.9 PPW recognises that transport emissions contribute significantly to climate change and poor local air quality, which can in turn affect people's health. TAN 18 on Transport elaborates further on traffic growth and its implications on the UK's ability to meet objectives for greenhouse has emissions and for air quality. It advises that local planning authorities should therefore take into account statutory air quality objectives together with the outcomes of reviews and assessments any Air Quality Action Plans that may have been prepared.

Local Planning Policy

2.10 The Bridgend Local Development Plan, 2006-2021 outlines the key development policies set out by the borough. There are no policies relevant to air quality.

3 Assessment Methodology

3.1 BCBC sent a letter to RPS (dated 26 August 2022) setting out comments from consultees to the pre-application enquiry. In relation to air quality, the Shared Regulatory Services – Environment Team stated that:

"The operation of the facility itself does not include sources of combustion that release pollutants. I believe the only gas released from the process is oxygen. From an air quality perspective, I have no concerns regarding the hydrogen production process and the effect on nearby receptors in relation to compliance with national air quality objectives.

Due to the nature of the development, in terms of its size and proximity to residential roads and houses, via the submission of an appropriate air quality assessment (AQA) the applicant must consider the potential impacts on ambient air quality and the magnitude/ risk of these potential air quality impacts on local/current and future residents. Consideration of air quality impacts should be examined through the development stage and when the development is complete, focusing on dust emissions during the construction phase of the development and potential exposure of current/ future residents to traffic derived Nitrogen Dioxide (NO2) & Particulate Matter (PM10 & PM2.5) following completion of the development."

3.2 The approach to the air quality assessment is consistent with the EPUK & IAQM Land-Use Planning & Development Control: Planning For Air Quality document [4], the IAQM Guidance on the assessment of dust from demolition and construction [5], the Mayor of London's Local Air Quality Management Technical Guidance: LLAQM.TG19 [6] and, where relevant, Defra's Local Air Quality Management Technical Guidance: LAQM.TG22 [7]. It includes the key elements listed below:

- assessment of the existing air quality in the study area (existing baseline) and prediction of the future air quality without the development in place (future baseline), using official government estimates from Defra, publicly available air quality monitoring data for the area, and relevant Air Quality Review and Assessment (R&A) documents;
- a qualitative assessment of likely construction-phase impacts with mitigation and controls in place; and
- a quantitative prediction of the future operational-phase air quality impact with the development in place (with any necessary mitigation), encompassing the impacts of the development traffic on the local area.

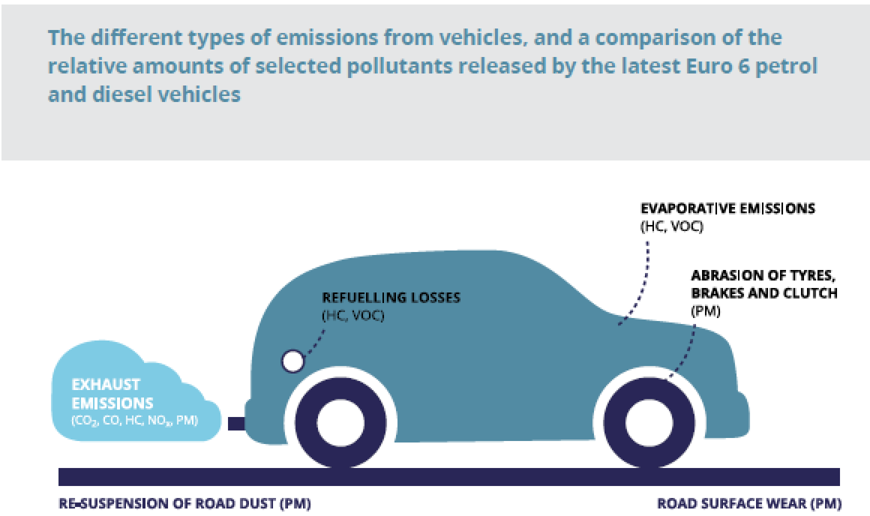
3.3 The Environmental Health Department at Bridgend County Borough Council was consulted and the scope and methodology for this assessment was agreed.

3.4 Air quality guidance advises that the organisation engaged in assessing the overall risks should hold relevant qualifications and/or extensive experience in undertaking air quality assessments. The RPS air quality team members involved at various stages of this assessment have professional affiliations that include Fellow and Member of the Institute of Air Quality Management and Chartered Environmentalist and have the required academic qualifications for these professional bodies. In addition, the Director responsible for authorising all deliverables has over 18 years' experience.

Summary of Key Pollutants Considered

3.5 For the operational phase of the Proposed Development, the main pollutants from road traffic with potential for local air quality impacts are nitrogen oxides (NO_x) and particulate matter (PM_{10}). Regarding the building emissions, the main pollutants from the with potential for local impacts are also NO_x . Emissions of total NO_x from combustion sources comprise nitric oxide (NO) and NO_2. The NO oxidises in the atmosphere to form NO_2. The assessment of operational impacts therefore focuses on changes in NO_2 and PM_{10} concentrations. The impact from fine particulate matter, known as $PM_{2.5}$ (a subset of PM_{10}) concentrations has also been considered.

Figure 3.1 Types of Vehicle Emissions



Source: European Environment Agency (2016) Explaining Road Transport Emissions: A Non-technical Guide

3.6 For the construction phase of the Proposed Development the key pollutant is dust, covering both the PM_{10} fraction that is suspended in the air that can be breathed, and the deposited dust that has fallen out of the air onto surfaces and which can potentially cause temporary annoyance effects.

3.7 Regarding exhaust emissions from construction-related vehicles (contractors' vehicles and Heavy Goods Vehicles (HGVs), diggers, and other diesel-powered vehicles), these are unlikely to have a significant impact on local air quality [5] except for large, long-term construction sites: the EPUK & IAQM Land-Use Planning & Development Control: Planning For Air Quality document [4] indicates that air quality assessments should include developments increasing annual average daily Heavy Duty Vehicle (HDV) traffic flows by more than 25 within or adjacent to an AQMA and more than 100 elsewhere. The results of the Highways and Access assessment indicates that the aforementioned EPUK & IAQM thresholds are not expected to be exceeded for any individual road during the construction phase of this project; therefore, construction-vehicle exhaust emissions have not been assessed specifically.

Construction Phase - Methodology

3.8 Dust is the generic term used to describe particulate matter in the size range 1-75 µm in diameter [8]. Particles greater than 75 µm in diameter are termed grit rather than dust. Dusts can contain a wide range of particles of different sizes. The normal fate of suspended (i.e. airborne) dust is deposition. The rate of deposition depends largely on the size of the particle and its density; together these influence the aerodynamic and gravitational effects that determine the distance it travels and how long it stays suspended in the air before it settles out onto a surface. In addition, some particles may agglomerate to become fewer, larger particles; whilst others react chemically.

3.9 The effects of dust are linked to particle size and two main categories are usually considered:

- PM_{10} particles, those up to 10 µm in diameter, remain suspended in the air for long periods and are small enough to be breathed in and so can potentially impact on health; and
- Dust, generally considered to be particles larger than 10 µm which fall out of the air quite quickly and can soil surfaces (e.g. a car, window sill, laundry). Additionally, dust can potentially have adverse effects on vegetation and fauna at sensitive habitat sites.

3.10 The IAQM Guidance on the assessment of dust from demolition and construction sets out 350 m as the distance from the site boundary and 50 m from the site traffic route(s) up to 500 m of the entrance, within which there could potentially be nuisance dust and PM_{10} effects on human receptors. In this particular application, there are no ecological receptors within the distances and ecological effects have been scoped out. These distances are set to be deliberately conservative.

3.11 Concentration-based limit values and objectives have been set for the PM_{10} suspended particle fraction, but no statutory or official numerical air quality criterion for dust annoyance has been set at a UK, European or World Health Organisation (WHO) level. Construction dust assessments have tended to be risk based, focusing on the appropriate measures to be used to keep dust impacts at an acceptable level.

3.12 The IAQM dust guidance aims to estimate the impacts of both PM_{10} and dust through a risk-based assessment procedure. The IAQM dust guidance document states: "*The impacts depend on the mitigation measures adopted. Therefore the emphasis in this document is on classifying the risk of dust impacts from a site, which will then allow mitigation measures commensurate with that risk to be identified.*"

3.13 The IAQM dust guidance provides a methodological framework, but notes that professional judgement is required to assess effects: *"This is necessary, because the diverse range of projects that are likely to be subject to dust impact assessment means that it is not possible to be prescriptive as to how to assess the impacts. Also a wide range of factors affect the amount of dust that may arise, and these are not readily quantified."*

3.14 Consistent with the recommendations in the IAQM dust guidance, a risk-based assessment has been undertaken for the development, using the well-established source-pathway-receptor approach:

- The dust impact (the change in dust levels attributable to the development activity) at a particular receptor will depend on the magnitude of the dust source and the effectiveness of the pathway (i.e. the route through the air) from source to receptor.
- The effects of the dust are the results of these changes in dust levels on the exposed receptors, for example annoyance or adverse health effects. The effect experienced for a given exposure depends on the sensitivity of the particular receptor to dust. An assessment of the overall dust effect for the area as a whole has been made using professional judgement taking into account both the change in dust levels (as indicated by the Dust Impact Risk for individual receptors) and the absolute dust levels, together with the sensitivities of local receptors and other relevant factors for the area.

3.15 The detail of the dust assessment methodology is provided in Appendix A.

3.16 The dust risk categories that have been determined for each of the four activities (demolition, earthworks, construction and trackout) have been used to define the appropriate site-specific mitigation measures based on those described in the IAQM dust guidance. The guidance states that provided the mitigation measures are successfully implemented, the resultant effects of the dust exposure will normally be 'not significant'.

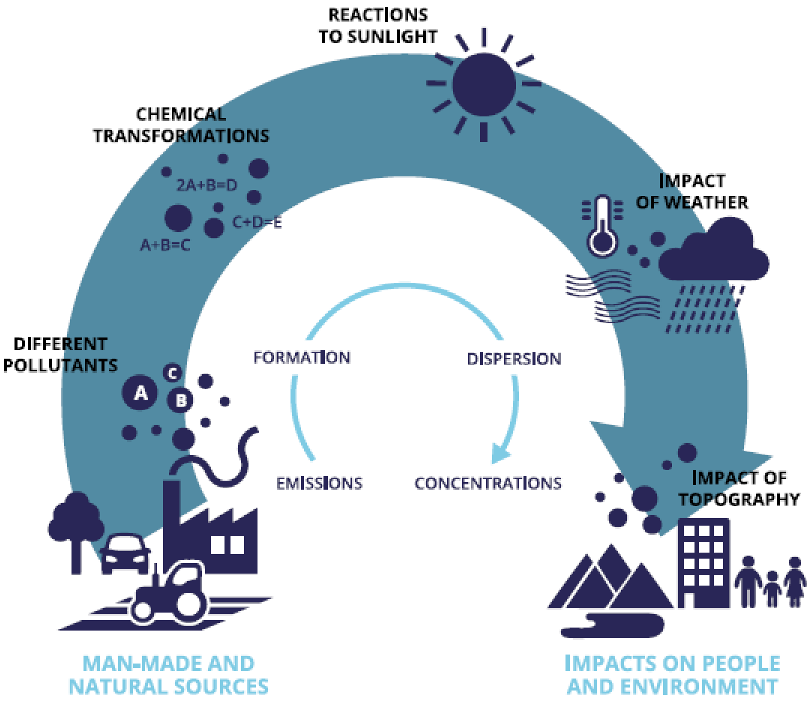
3.17 This assessment does not consider the air quality impacts of dust from any contaminated land or buildings. If contaminated land is identified on the Application Site, the impacts will be assessed in other technical discipline reports.

Operational Phase - Methodology

Atmospheric Dispersion Modelling of Pollutant Concentrations

3.18 In urban areas, pollutant concentrations are primarily determined by the balance between pollutant emissions that increase concentrations, and the ability of the atmosphere to reduce and remove pollutants by dispersion, advection, reaction and deposition. An atmospheric dispersion model is used as a practical way to simulate these complex processes; such a model requires a range of input data, which can include emissions rates, meteorological data and local topographical information. The model used and the input data relevant to this assessment are described in the following sub-sections.

Figure 3.2 Air Pollution: From Emissions to Exposure



Source: European Environment Agency (2016) Explaining Road Transport Emissions: A Non-technical Guide

3.19 The atmospheric pollutant concentrations in an urban area depend not only on local sources at a street scale, but also on the background pollutant level made up of the local urban-wide background, together with regional pollution and pollution from more remote sources brought in on the incoming air mass. This background contribution needs to be added to the fraction from the modelled sources, and is usually obtained from measurements or estimates of urban background concentrations for the area in locations that are not directly affected by local emissions sources. Background pollution levels are described in detail in Section 4.

3.20 The ADMS-Roads model has been used in this assessment to predict the air quality impacts from changes in traffic on the local road network. This is a version of the Atmospheric Dispersion Modelling System (ADMS), a formally validated model developed in the UK by Cambridge Environmental Research Consultants Ltd (CERC) and widely used in the UK and internationally for regulatory purposes.

Modelled Scenarios

3.21 The following scenarios were modelled:

- Without Development – without the Proposed Development in the first year that the development is expected to be fully operational, 2025; and
- With Development – with the Proposed Development in the first year that the development is expected to be fully operational, 2025.

Model Input Data

Traffic Flow Data

3.22 Traffic data used in the assessment have been provided by the project's transport consultants, Mott MacDonald. The traffic flow data provided for this assessment are summarised in Table 3.1. The modelled road links are illustrated in Figure 1.

Table 3.1 Traffic Data Used Within the Assessment

Road Link ID	Road Link Name	Speed ($km.hr^{-1}$)	Daily Two-Way Vehicle Flow			
			Without Development		With Development	
			Total Vehicles	%HDV	Total Vehicles	%HDV
1	Millers Avenue	30	40	100	68	85
2	Aneurin Bevan Avenue	30	40	100	52	100
3	A4065 North of Roundabout	80	11399	3	11399	3
4	A4065 South of Roundabout	80	11439	0.4	11467	3

Notes:
HDV = Heavy Duty Vehicle - vehicles greater than 3.5 t gross vehicle weight including buses
LDV = Light Duty Vehicle

3.23 The average speed on each road has been reduced by 10 $km.hr^{-1}$ (or to 20 $km.hr^{-1}$ for roads where the total vehicles exceed 10,000) to take into account the possibility of slow-moving traffic near junctions and at roundabouts in accordance with LAQM.TG22.

Vehicle Emission Factors

3.24 The modelling has been undertaken using Defra's 2021 emission factor toolkit (version 11) which draws on emissions generated by the European Environment Agency (EEA) COPERT 5.3 emission calculation tool.

Meteorological Data

3.25 ADMS-Roads requires detailed meteorological data as an input. The most representative observing station for the region of the study area that supplies all the data in the required format is St Athans, approximately 18 km southeast of the Application Site. Meteorological data from that station for 2021 have been used within the dispersion model. The wind rose is presented in Figure 2.

Receptors

3.26 The air quality assessment predicts the impacts at locations that could be sensitive to any changes. For assessing human-health impacts, such sensitive receptors should be selected where the public is regularly present and likely to be exposed over the averaging period of the objective. LAQM.TG22 [7] provides examples of exposure locations and these are summarised in Table 3.2.

Table 3.2 Examples of Where Air Quality Objectives Apply

Averaging Period	Objectives should apply at:	Objectives should generally not apply at:
Annual-mean	All locations where members of the public might be regularly exposed. Building façades of residential properties, schools, hospitals, care homes.	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's façades), or any other location where public exposure is expected to be short-term.
Daily-mean	All locations where the annual-mean objective would apply, together with hotels. Gardens of residential properties.	Kerbside sites (as opposed to locations at the building's façade), or any other location where public exposure is expected to be short-term.
Hourly-mean	All locations where the annual and 24 hour mean would apply. Kerbside sites (e.g. 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.	Kerbside sites where the public would not be expected to have regular access.

Averaging Period	Objectives should apply at:	Objectives should generally not apply at:
	Any outdoor locations to which the public might reasonably be expected to spend 1-hour or longer.	

3.27 Representative sensitive receptors for this assessment have been selected at properties where pollutant concentrations and/or changes in pollutant concentrations are anticipated to be greatest, as listed in Table 3.3.

Table 3.3 Modelled Sensitive Receptors

ID	Description	x	y
1	Hazel Mead – Residential	290468	184732
2	Abergarw Road – Residential	290688	184798
3	Gerddi'r Afon – Residential	291027	184682
4	Maes Brynach - Residential	29119	184692
5	Davis Avenue - Residential	291164	184566
6	Rowan's Lane - Residential	291128	184371

3.28 The annual, daily and hourly-mean AQS objectives apply at the front and rear façades of all residential properties. The approaches used to predict the concentrations for these different averaging periods are described below.

Long-Term Pollutant Predictions

3.29 Annual-mean NO_x and PM_{10} concentrations have been predicted at representative sensitive receptors using ADMS-Roads, then added to relevant background concentrations. Primary NO in the NO_X emissions is converted to NO_2 to a degree determined by the availability of atmospheric oxidants locally and the strength of sunlight. For road traffic sources, annual-mean NO_2 concentrations have been derived from the modelled road-related annual-mean NO_x concentration using Defra's calculator [9].

Short-Term Pollutant Predictions

3.30 In order to predict the likelihood of exceedances of the hourly-mean AQS objectives for NO_2 and the daily-mean AQS objective for PM_{10}, the following relationships between the short-term and the annual-mean values at each receptor have been considered.

Hourly-Mean AQS Objective for NO_2

3.31 Research undertaken in support of LAQM.TG22 has indicated that the hourly-mean limit value and objective for NO_2 is unlikely to be exceeded at a roadside location where the annual-mean

NO_2 concentration is less than 60 µg.m^{-3}. The threshold of 60 µg.m^{-3} NO_2 has been used as the guideline for considering a likely exceedance of the hourly-mean nitrogen dioxide objective.

Daily-Mean AQS Objective for PM_{10}

3.32 The number of exceedances of the daily-mean AQS objective for PM_{10} of 50 µg.m^{-3} may be estimated using the relationship set out in LAQM.TG22:

*Number of Exceedances of Daily Mean of 50 µg.m^{-3} = -18.5 + 0.00145 * (Predicted Annual-mean PM_{10})^3 + 206 / (Predicted Annual-mean PM_{10} Concentration)*

3.33 This relationship indicates that the daily-mean AQS objective for PM_{10} is likely to be met if the predicted annual-mean PM_{10} concentration is 31.8 µg.m^{-3} or less.

3.34 The daily mean objective is therefore not considered further within this assessment if the annual-mean PM_{10} concentration is predicted to be less than 31.5 µg.m^{-3}.

Fugitive PM_{10} Emissions

3.35 Transport PM_{10} emissions arise from both the tailpipe exhausts and from fugitive sources such as brake and tyre wear and re-suspended road dust. Improvements in vehicle technologies are reducing PM_{10} exhaust emissions; therefore, the relative importance of fugitive PM_{10} emissions is increasing. Current official vehicle emission factors for particulate matter include brake dust and tyre wear which studies suggest may account for approximately one-third of the total particulate emissions from road transport; but not re-suspended road dust (which remains unquantified.)

Significance Criteria for Development Impacts on the Local Area

3.36 The EPUK & IAQM Land-Use Planning & Development Control: Planning For Air Quality document [4] advises that:

"The significance of the effects arising from the impacts on air quality will depend on a number of factors and will need to be considered alongside the benefits of the development in question. Development under current planning policy is required to be sustainable and the definition of this includes social and economic dimensions, as well as environmental. Development brings opportunities for reducing emissions at a wider level through the use of more efficient technologies and better designed buildings, which could well displace emissions elsewhere, even if they increase at the development site. Conversely, development can also have adverse consequences for air quality at a wider level through its effects on trip generation."

3.37 When describing the air quality impact at a sensitive receptor, the change in magnitude of the concentration should be considered in the context of the absolute concentration at the sensitive receptor. Table 3.4 provides the EPUK & IAQM approach for describing the long-term air quality impacts at sensitive human-health receptors in the surrounding area.

Table 3.4 Impact Descriptors for Individual Sensitive Receptors

Long term average concentration at receptor in assessment year	% Change in concentration relative to Air Quality Assessment Level			
	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 than AQAL	Moderate	Substantial	Substantial	Substantial

1. AQAL = Air Quality Assessment Level, which may be an air quality objective, limit 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 user is encouraged to treat the numbers with recognition of their likely accuracy and not assume a false level of precision. 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 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.
6. The total concentration categories reflect the degree of potential harm by reference to the AQAL value. At exposure less than 75% of this value, i.e. well below, the degree of harm is likely to be small. As the exposure approaches and exceeds the AQAL, the degree of harm increases. This change naturally becomes more important when the result is an exposure that is approximately equal to, or greater than the AQAL.
7. It is unwise to ascribe too much accuracy to incremental changes or background concentrations, and this is especially important when total concentrations are close to the AQAL. For a given year in the future, it is impossible to define the new total concentration without recognising the inherent uncertainty, which is why there is a category that has a range around the AQAL, rather than being exactly equal to it.

3.38 The human-health impact descriptors above apply at individual receptors. The EPUK & IAQM guidance states that the impact descriptors *"are not, of themselves, a clear and unambiguous guide to reaching a conclusion on significance. These impact descriptors are intended for application at a series of individual receptors. Whilst it maybe that there are 'slight', 'moderate' or 'substantial' impacts at one or more receptors, the overall effect may not necessarily be judged as being significant in some circumstances."*

3.39 Professional judgement by a competent, suitably qualified professional is required to establish the significance associated with the consequence of the impacts. This judgement is likely to take into account the extent of the current and future population exposure to the impacts and the influence and/or validity of any assumptions adopted during the assessment process.

Uncertainty

3.40 All air quality assessment tools, whether models or monitoring measurements, have a degree of uncertainty associated with the results. The choices that the practitioner makes in setting-up the model, choosing the input data, and selecting the baseline monitoring data will decide whether the final predicted impact should be considered a central estimate, or an estimate tending towards the upper bounds of the uncertainty range (i.e. tending towards worst-case).

3.41 The atmospheric dispersion model itself contributes some of this uncertainty, due to it being a simplified version of the real situation: it uses a sophisticated set of mathematical equations to approximate the complex physical and chemical atmospheric processes taking place as a pollutant is released and as it travels to a receptor. The predictive ability of even the best model is limited by how well the turbulent nature of the atmosphere can be represented.

3.42 Each of the data inputs for the model, listed earlier, will also have some uncertainty associated with them. Where it has been necessary to make assumptions, these have mainly been made towards the upper end of the uncertainty range informed by an analysis of relevant, available data.

3.43 The atmospheric dispersion model used for this assessment, ADMS Roads, has been validated by its supplier and is widely used by professionals in the UK and overseas. A site-specific verification (calibration) provides additional certainty and is particularly important when air quality levels are close to exceeding the objectives/limit values.

3.44 LAQM.TG22 requires that local authorities verify the results of any detailed modelling undertaken for the purposes of fulfilling their R&A duties. Model verification refers to the checks that are carried out on model performance at a local level. Modelled concentrations are compared with the results of monitoring. Where there is a disparity between modelled and monitored concentrations, the first step is to review the appropriateness of the data inputs to determine whether the performance of the model can be improved. Once reasonable efforts have been made to reduce the uncertainties in the data inputs, an adjustment may be established and applied to reduce any remaining disparity between modelled and monitored concentrations. No adjustment factor is deemed necessary where the modelled concentrations are within 25% of the monitored concentrations.

3.45 For the verification and adjustment of NOx/NO_2 concentrations for R&A purposes, it is recommended that the comparison involves a combination of automatic and diffusion monitoring, rather than a single automatic monitor. This is to ensure any adjustment factor derived is representative of all locations modelled and not unduly weighted towards the characteristics at a single site. Where only diffusion tubes are used for the model verification, the study should consider a broad spread of monitoring locations across the study area to provide sufficient information relating to the spatial variation in pollutant concentrations.

3.46 Local Authorities generally implement a broad spread of monitoring, particularly in areas that are known to be sensitive to changes in air quality. Consequently, Local Authorities are usually able to verify the models they use for R&A purposes; however for individual developments, there is less likely to be a broad range of monitoring locations within the relevant study area. Notwithstanding this, a small number of monitoring locations have been identified within the study area and a model verification study has been undertaken for the proposed development and is included at Appendix B.

3.47 The main components of uncertainty in the total predicted concentrations, made up of the background concentration and the modelled fraction, include those summarised in Table 3.5.

Table 3.5 Approaches to Dealing with Uncertainty used Within the Assessment

Concentration	Source of Uncertainty	Approach to Dealing with Uncertainty	Comments
Background Concentration	Characterisation of current baseline air quality conditions	The background concentration used within the assessment is the most conservative value from a comparison of measured and Defra mapped concentration estimate.	The background concentration is the major proportion of the total predicted concentration.
	Characterisation of future baseline air quality (i.e. the air quality conditions in the future assuming that the development does not proceed)	The future background concentration used in the assessment is the same as the current background concentration and no reduction has been assumed. This is a conservative assumption as, in reality, background concentrations are likely to reduce over time as cleaner vehicle technologies form an increasing proportion of the fleet.	The conservative assumptions adopted ensure that the background concentration used within the model contributes to the result being towards the top of the uncertainty range, rather than a central estimate.
Fraction from Modelled Sources	Traffic flow estimates	Traffic flows provided have all been based on traffic counts, rather than flows derived from a traffic model. High growth assumptions have been used to develop the traffic dataset used within the model.	The modelled fraction is a minor proportion of the total predicted concentration.
	Traffic speed estimates	Measured average traffic speeds have been used within the model. The average speed has been reduced in congested areas to take account of slow-moving and queuing traffic.	The modelled fraction is likely to contribute to the result being between a central estimate and the top of the uncertainty range.

Concentration	Source of Uncertainty	Approach to Dealing with Uncertainty	Comments
	Road-related emission factors – projection to future years	The most recently published emission factors have been used within the modelling and these are based on the current and best understanding of the variation in emission factors in future years.	
	Meteorological Data	Uncertainties arise from any differences between the conditions at the met station and the development site, and between the historical met years and the future years. These have been minimised by using meteorological data collated at a representative measuring site. The model has been run for a full year of meteorological conditions. This means that the conditions in 8,760 hours have been considered in the assessment.	
	Receptors	Receptor locations have been identified where concentrations are highest or where the greatest changes are expected.	
	Dispersion Modelling	The model predictions have been compared with monitored concentrations. The model outputs have been adjusted accordingly. The fractional bias indicates that the model is systematically over-predicting.	

3.48 The analysis of the component uncertainties indicates that, overall, the predicted total concentration is likely to be towards the top of the uncertainty range rather than being a central estimate. The actual concentrations that will be found when the development is operational are unlikely to be higher than those presented within this report and are more likely to be lower.

4 Baseline Air Quality Conditions

Overview

4.1 The background concentration often represents a large proportion of the total pollution concentration, so it is important that the background concentration selected for the assessment is realistic. National Planning Practice Guidance and EPUK & IAQM guidance highlight public information from Defra and local monitoring studies as potential sources of information on background air quality. LAQM.TG22 recommends that Defra mapped concentration estimates are used to inform background concentrations in air quality modelling and states that: "*Where appropriate these data can be supplemented by and compared with local measurements of background, although care should be exercised to ensure that the monitoring site is representative of background air quality*".

4.2 For this assessment, the background air quality has been characterised by drawing on information from the following public sources:

- Defra maps [10], which show estimated pollutant concentrations across the UK in 1 km grid squares; and
- published results of local authority Review and Assessment (R&A) studies of air quality, including local monitoring and modelling studies.

4.3 A detailed description of how the baseline air quality has been derived for this Proposed Development site is summarised in the following paragraphs.

Review and Assessment Process

4.4 Bridgend County Borough Council has one designated AQMA, due to high levels of NO_2 associated with road traffic emissions. This AQMA is approximately 4.6 km south of the application site.

4.5 There is no continuous automatic monitoring undertaken in a background location in the county. There is a single passive diffusion tube monitoring site located approximately 5 km to the east of the application site. This is diffusion tube is unlikely to measure concentrations that would be indicative of the application site.

4.6 Bridgend County Borough Council are currently in the process of producing an Air Quality Action Plan to reduce the high levels of NO_2 within the AQMA. Consultation on the draft plan began in September 2022 and will end in late November 2022.

Appropriate Background Concentrations for the Development Site

4.7 In the absence of NO_2, PM_{10} and $PM_{2.5}$ monitoring at this site, the background annual-mean concentration at the Application Site has been derived from the Defra mapped background concentration estimate.

4.8 Historically the view has been that background traffic-related NO_2 concentrations in the UK would reduce over time, due to the progressive introduction of improved vehicle technologies and increasingly stringent limits on emissions. After a prolonged period through the last decade where background annual-mean NO_2 concentrations did not generally decrease in line with expectations, the most recent monitoring studies indicate ambient traffic-related NO_2 concentrations are now falling. To ensure that the assessment presents conservative results, no reduction in the background has been applied for future years.

4.9 Table 4.1 summarises the annual-mean background concentrations for NO_2, PM_{10} and $PM_{2.5}$ used in this assessment.

Table 4.1 Summary of Background Annual-Mean (Long-term) Concentrations used in the Assessment

Pollutant	Data Source	Concentration ($\mu g.m^{-3}$)
NO_2	Defra Mapped	9.03
PM_{10}		11.70
$PM_{2.5}$		7.51

5 Assessment of Construction-Phase Air Quality Impacts

Construction Dust

5.1 Whilst no detailed construction phase information is currently available, the type of activities that could cause fugitive dust emissions are: demolition; earthworks; handling and disposal of spoil; wind-blown particulate material from stockpiles; handling of loose construction materials; and movement of vehicles, both on and off site.

5.2 The level and distribution of construction dust emissions will vary according to factors such as the type of dust, duration and location of dust-generating activity, weather conditions and the effectiveness of suppression methods.

5.3 The main effect of any dust emissions, if not mitigated, could be annoyance due to soiling of surfaces, particularly windows, cars and laundry. However, it is normally possible, by implementation of proper control, to ensure that dust deposition does not give rise to significant adverse effects, although short-term events may occur (for example, due to technical failure or exceptional weather conditions). The following assessment, using the IAQM methodology, predicts the risk of dust impacts and the level of mitigation that is required to control the residual effects to a level that is “not significant”.

Risk of Dust Impacts – Hydrogen Production Facility

Source

5.4 There are no buildings to be demolished on site and so demolition has not been considered further in this assessment.

5.5 The site area is between 2,500 and 10,000 m^2. Therefore, the dust emission magnitude for the earthworks phase is classified as medium.

5.6 The total volume of the buildings to be constructed would be less than 25,000 m^3 so the dust emission magnitude for the construction phase is classified as small.

5.7 As the maximum number of outwards movements in any one day is between 10 and 50 HDVs, the dust emission magnitude for trackout is classified as medium.

Table 5.1 Dust Emission Magnitude for Earthworks, Construction and Trackout

Earthworks	Construction	Trackout
Medium	Small	Medium

Pathway and Receptor - Sensitivity of the Area

5.8 All earthworks and construction activities are assumed to occur within the site boundary. As such, receptors at distances within 20 m, 50 m, 100 m, 200 m and 350 m of the site boundary have been identified and are illustrated in Figure 3. The sensitivity of the area has been classified and the results are provided in Table 5.2 below.

Table 5.2 Sensitivity of the Surrounding Area for Earthworks and Construction

Potential Impact	Sensitivity of the Surrounding Area	Reason for Sensitivity Classification
Dust Soiling	Medium	Approx. 25 residential properties on Rowan's Lane and Denis Place. 10 – 100 high sensitivity receptors located within 50 m of the site boundary (Table A.4)
Human Health	Low	Approx. 25 residential properties on Rowan's Lane and Denis Place. Background PM_{10} concentrations for the assessment = 11.7 $\mu g.m^{-3}$ 10 – 100 high sensitivity receptors located within 50 m of the site boundary and PM_{10} concentrations below 24 $\mu g.m^{-3}$ (Table A.5)

5.9 The Dust Emission Magnitude for trackout is classified as medium and trackout may occur on roads up to 200 m from the site. The major routes within 200 m of the site are Blackmill Road and the A4065. The sensitivity of the area has been classified and the results are provided in Table 5.3

Table 5.3 Sensitivity of the Surrounding Area for Trackout

Potential Impact	Sensitivity of the Surrounding Area	Reason for Sensitivity Classification
Dust Soiling	High	Approx. 45 residential properties aligning Blackmill Lane and the A4065. 10 – 100 high sensitivity receptors located within 50 m of the roads (Table A.5)
Human Health	Low	Approx. 25 residential properties on Rowan's Lane and the A4065. Background PM_{10} concentrations for the assessment = 11.7 µg.m^{-3} 10 – 100 high sensitivity receptors located within 50 m of the roads and PM_{10} concentrations below 24 µg.m^{-3} (Table A.6)

Overall Dust Risk – Hydrogen Production Facility

5.10 The Dust Emission Magnitude has been considered in the context of the Sensitivity of the Area (Tables A.5 and A.6) to give the Dust Impact Risk. Table 5.4 summarises the Dust Impact Risk for the three activities.

Table 5.4 Dust Impact Risk for Earthworks, Construction and Trackout

Source	Earthworks	Construction	Trackout
Dust Soiling	Medium	Low	Medium
Human Health	Low	Negligible	Low
Risk	Medium	Low	Medium

5.11 Taking the hydrogen production facility site as a whole, the overall risk is deemed to be medium.

Risk of Dust Impacts – Solar Facility

Source

5.12 There are no buildings to be demolished on site and so demolition has not been considered further in this assessment.

5.13 The site area is over 10,000 m^2. Therefore, the dust emission magnitude for the earthworks phase is classified as large.

5.14 The total volume of the buildings to be constructed would be less than 25,000 m^3 so the dust emission magnitude for the construction phase is classified as small.

5.15 As the maximum number of outwards movements in any one day is less than 10 HDVs. Therefore, the dust emission magnitude for trackout is classified as small.

Table 5.5 Dust Emission Magnitude for Earthworks, Construction and Trackout

Earthworks	Construction	Trackout
Large	Small	Small

Pathway and Receptor - Sensitivity of the Area

5.16 All earthworks and construction activities are assumed to occur within the site boundary. As such, receptors at distances within 20 m, 50 m, 100 m, 200 m and 350 m of the site boundary have been identified and are illustrated in Figure 3. The sensitivity of the area has been classified and the results are provided in Table 5.2 below.

Table 5.6 Sensitivity of the Surrounding Area for Earthworks and Construction

Potential Impact	Sensitivity of the Surrounding Area	Reason for Sensitivity Classification
Dust Soiling	Medium	Approx. 25 residential properties on Rowan's Lane and Denis Place. 10 – 100 high sensitivity receptors located within 50 m of the site boundary (Table A.4)
Human Health	Low	Approx. 25 residential properties on Rowan's Lane and Denis Place. Background PM_{10} concentrations for the assessment = 11.7 $\mu g.m^{-3}$ 10 – 100 high sensitivity receptors located within 50 m of the site boundary and PM_{10} concentrations below 24 $\mu g.m^{-3}$ (Table A.5)

5.17 The Dust Emission Magnitude for trackout is classified as medium and trackout may occur on roads up to 200 m from the site. The major routes within 200 m of the site are Blackmill Road and the A4065. The sensitivity of the area has been classified and the results are provided in Table 5.3

Table 5.7 Sensitivity of the Surrounding Area for Trackout

Potential Impact	Sensitivity of the Surrounding Area	Reason for Sensitivity Classification
Dust Soiling	High	Approx. 45 residential properties aligning Blackmill Road and the A4065. 10 – 100 high sensitivity receptors located within 50 m of the roads (Table A.5)
Human Health	Low	Approx. 25 residential properties on Rowan's Lane and Denis Place. Background PM_{10} concentrations for the assessment = 11.7 $\mu g.m^{-3}$ 10 – 100 high sensitivity receptors located within 50 m of the roads and PM_{10} concentrations below 24 $\mu g.m^{-3}$ (Table A.6)

Overall Dust Risk – Solar Facility

5.18 The Dust Emission Magnitude has been considered in the context of the Sensitivity of the Area (Tables A.5 and A.6) to give the Dust Impact Risk. Table 5.4 summarises the Dust Impact Risk for the three activities.

Table 5.8 Dust Impact Risk for Earthworks, Construction and Trackout

Source	Earthworks	Construction	Trackout
Dust Soiling	Medium	Low	Negligible
Human Health	Low	Negligible	Negligible
Risk	Medium	Low	Negligible

5.19 Taking the solar facility site as a whole, the overall risk is deemed to be medium.

Risk of Dust Impacts

5.20 The risk for both sites is considered to be medium.

5.21 The mitigation measures appropriate to a level of risk for the sites as a whole and for each of the phases are set out in Section 7.

5.22 Provided this package of mitigation measures is implemented, the residual construction dust effects will not be significant. The IAQM dust guidance states that "For almost all construction activity, the aim should be to prevent significant effects on receptors through the use of effective mitigation. Experience shows that this is normally possible. Hence the residual effect will normally be 'not significant'." The IAQM dust guidance recommends that significance is only assigned to the effect after the activities are considered with mitigation in place

6 Assessment of Operational-Phase Air Quality Impacts

Assessment of Air Quality Impacts on Surrounding Area

6.1 This section of the report summarises the future operational-phase air quality impacts of the key pollutants associated with the development traffic of the proposed scheme.

Nitrogen Dioxide (NO_2)

6.2 Table 6.1 presents the annual-mean NO_2 concentrations predicted at the façades of existing receptors.

Table 6.1 Predicted Annual-Mean NO_2 Impacts at Existing Receptors

Receptor ID	Concentration (µg.m^{-3})		With - Without Dev as % of the AQS Objective	Impact Descriptor
	Without Development	With Development		
1	9.1	9.1	0	Negligible
2	9.1	9.1	0	Negligible
3	9.3	9.3	0	Negligible
4	10.2	10.2	0	Negligible
5	10.9	10.9	0	Negligible
6	11.7	11.7	0	Negligible
Maximum	**11.7**	**11.7**	**-**	-
Minimum	**9.1**	**9.1**	**-**	-

6.3 Predicted annual-mean NO_2 concentrations in the opening year at the façades of the existing receptors are below the AQS objective for NO_2. When the magnitude of change is considered in the context of the absolute concentrations, the impact descriptor is categorised as 'negligible' at all receptors.

6.4 As all predicted annual-mean NO_2 concentrations are below 60 µg.m^{-3}, the hourly-mean objective for NO_2 is likely to be met at all receptors. The short-term NO_2 impact can be considered 'negligible' and is not considered further within this assessment.

6.5 Overall, the impact on the surrounding area from NO_2 is considered to be 'negligible', using the criteria adopted for this assessment and based on professional judgement.

Particulate Matter (PM_{10})

6.6 Table 6.2 presents the annual-mean PM_{10} concentrations predicted at the façades of existing receptors.

Table 6.2 Predicted Annual-Mean PM_{10} Impacts at Existing Receptors

Receptor ID	Concentration (µg.m^{-3})		With - Without Dev as % of the AQS Objective	Impact Descriptor
	Without Development	With Development		
1	11.7	11.7	0	Negligible
2	11.7	11.7	0	Negligible
3	11.8	11.8	0	Negligible
4	12.0	12.0	0	Negligible
5	12.3	12.3	0	Negligible
6	12.6	12.7	0	Negligible
Maximum	**12.6**	**12.7**	-	-
Minimum	**11.7**	**11.7**	-	-

6.7 Predicted annual-mean PM_{10} concentrations in the opening year at the façades of the existing receptors are well below the AQS objective for PM_{10}. When the magnitude of change is considered in the context of the absolute concentrations, the impact descriptor is categorised as 'negligible' at all receptors.

6.8 As all predicted annual mean PM_{10} concentrations are below 31.5 µg.m^{-3}, the daily-mean PM_{10} objective is expected to be met at all receptors and the short-term PM_{10} impact is not considered further within this assessment.

6.9 Overall, the impact on the surrounding area from PM_{10} is considered to be 'negligible', using the criteria adopted for this assessment and based on professional judgement.

Fine Particulate Matter ($PM_{2.5}$)

6.10 Table 6.3 presents the annual-mean $PM_{2.5}$ concentrations predicted at the façades of existing receptors.

Table 6.3 Predicted Annual-Mean $PM_{2.5}$ Impacts at Existing Receptors

Receptor ID	Concentration (µg.m^{-3})		With - Without Dev as % of the AQS Objective	Impact Descriptor
	Without Development	With Development		
1	7.5	7.5	0	Negligible
2	7.5	7.5	0	Negligible
3	7.6	7.6	0	Negligible
4	7.7	7.7	0	Negligible
5	7.8	7.9	0	Negligible
6	8.0	8.0	0	Negligible
Maximum	**8.0**	**8.0**	-	-
Minimum	**7.5**	**7.5**	-	-

AQS objective = 20µg.m^{-3}

6.11 Predicted annual-mean $PM_{2.5}$ concentrations in the opening year at the façades of the existing receptors are below the AQS objective for $PM_{2.5}$ at all receptors. When the magnitude of change is considered in the context of the absolute concentrations, the impact descriptor is categorised as 'negligible' at all receptors.

6.12 Overall, the impact on the surrounding area from $PM_{2.5}$ is considered to be 'negligible', using the criteria adopted for this assessment and based on professional judgement.

Significance of Effects

6.13 It is generally considered good practice that, where possible, an assessment should communicate effects both numerically and descriptively. Professional judgement by a competent, suitably qualified professional is required to establish the significance associated with the consequence of the impacts.

6.14 The impacts predicted at individual receptors and the geographical extent over which such impacts occur, can be used to inform the judgement on the impact on the surrounding area as a whole, and whether the resulting overall effect is significant or not. The IAQM guidance states, *"Whilst it may be that there are 'slight', 'moderate', or 'substantial' impacts at one or more receptors, the overall effect may not necessarily be judged as being significant in some circumstances."* and *"…a 'moderate' or 'substantial' impact may not have a significant effect if it is confined to a very small area and where it is not obviously the cause of harm to human health."*

6.15 The results of the modelling indicate that with the development, the predicted NO_2, PM_{10} and $PM_{2.5}$ concentrations at existing receptors are below the relevant long and short-term AQS objectives. When the magnitude of change in annual-mean NO_2, PM_{10} and $PM_{2.5}$ concentrations is considered in the context of the absolute predictions, the air quality impacts of the development on existing receptors are categorised as ‘negligible’. Taking into account the geographical extent of the impacts predicted in this study, the overall impact of the development on the surrounding area as a whole is considered to be ‘negligible’, using the descriptors adopted for this assessment.

6.16 Using professional judgement, the resulting air quality effect is considered to be ‘not significant’ overall.

Sensitivity and Uncertainty

6.17 Section 3 provided an analysis of the sources of uncertainty in the results of the assessment. The conclusion of that analysis was that, overall, the predicted total concentration is likely to be towards the top of the uncertainty range rather than being a central estimate. The actual concentrations that will be found when the development is operational are unlikely to be higher than those presented within this report and are more likely to be lower.

6.18 The impacts at existing receptors are shown to be not significant even for this conservative scenario. Consequently, further sensitivity analysis has not been undertaken and, in practice, the impacts at sensitive receptors are likely to be lower than those reported in this conservative assessment.

7 Mitigation

Mitigation During Construction

7.1 The IAQM dust guidance lists mitigation measures for low, medium and high dust risks.

7.2 As summarised in Section 5, the predicted Dust Impact Risk is classified as low for Construction and medium for Earthworks and Trackout. The general site measures described as 'highly recommended' for medium risks are listed below. The 'highly recommended' measures for low risk construction sites and medium risk medium risk trackout are also listed. There are no 'highly recommended' measures for medium risk earthworks or low risk construction.

Communications

- Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.
- Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.
- Display the head or regional office contact information

Dust Management Plan

- Develop and implement a Dust Management Plan (DMP) (which may include measures to control other emissions), approved by the Local Authority. The level of detail will depend on the risk, and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the site. The DMP may include monitoring of dust.

Site Management

- Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
- Make the complaints log available to the local authority when asked.
- Record any exceptional incidents that cause dust and/or air emissions, either on- or off- site, and the action taken to resolve the situation in the log book.

Monitoring

- Carry out regular dust soiling checks of surfaces such as street furniture, cars and window-sills within 100 m of site boundary.

- Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.
- Agree dust deposition, dust flux, or real-time PM_{10} continuous monitoring locations with the Local Authority. Commence baseline monitoring at least three months before work commences on site or, if it a large site, before work on a phase commences. A shorter monitoring period or concurrent upwind and downwind monitoring may be agreed by the local authority. Further guidance is provided by IAQM on monitoring during earthworks and construction [11].

Preparing and Maintaining the Site

- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible. Use screening intelligently where possible – e.g. locating site offices between potentially dusty activities and the receptors.
- Erect solid screens or barriers around the site boundary.
- Avoid site runoff of water or mud.
- Keep site fencing, barriers and scaffolding clean.
- Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.
- Depending on the duration that stockpiles will be present and their size - cover, seed, fence or water to prevent wind whipping.

Operating Vehicle/machinery and Sustainable Travel

- Ensure all vehicles switch off engines when stationary – no idling vehicles.
- Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.
- Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on un-surfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate)
- Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.

Operations

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible.
- Use enclosed chutes, conveyors and covered skips, where practicable.
- Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

Waste Management

- Avoid bonfires and burning of waste materials.

Medium Risk Measures Specific to Trackout

- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as soon as practicable any material tracked out of the site. This may require the sweeper being continuously in use.
- Avoid dry sweeping of large areas.
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
- Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as practicable.
- Record all inspections of haul routes and any subsequent action in a site log book.
- Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site).
- Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.
- Access gates to be located at least 10 m from receptors where possible.

7.3 The IAQM dust guidance states that with the recommended dust mitigation measures in place the residual effect will normally be "*not significant*", and recommends the mitigation is secured by for example planning conditions, a legal obligation, or by legislation.

Mitigation for the Operational Impact of the Development on the Surrounding Area

7.4 When the change in concentration at existing sensitive receptors is considered in the context of the absolute concentration, the overall air quality impact on the surrounding area as a whole is categorised as "negligible" and the resulting effect is considered to be "not significant". On that basis, no mitigation measures are considered necessary.

8 Conclusions

8.1 This assessment has considered dust effects during the construction phase and the air quality impacts during the operational phase of the Green Hydrogen Project development.

8.2 Impacts during construction, such as dust generation and plant vehicle emissions, are predicted to be of short duration and only relevant during the construction phase. The results of the risk assessment of construction dust impacts undertaken using the IAQM dust guidance, indicates that before the implementation of mitigation and controls, the risk of dust impacts will be medium. Implementation of the highly-recommended mitigation measures described in the IAQM construction dust guidance should reduce the residual dust effects to a level categorised as "*not significant*".

8.3 Regarding the operational impact of the Green Hydrogen Project development on the surrounding area, detailed atmospheric dispersion modelling has been undertaken for the first year in which the development is expected to be fully operational, 2025. The operational impact of the Green Hydrogen Project development on existing receptors in the local area is predicted to be 'negligible' taking into account the changes in pollutant concentrations and absolute levels. Using the criteria adopted for this assessment together with professional judgement, the overall impact on the area as a whole is described as 'negligible'.

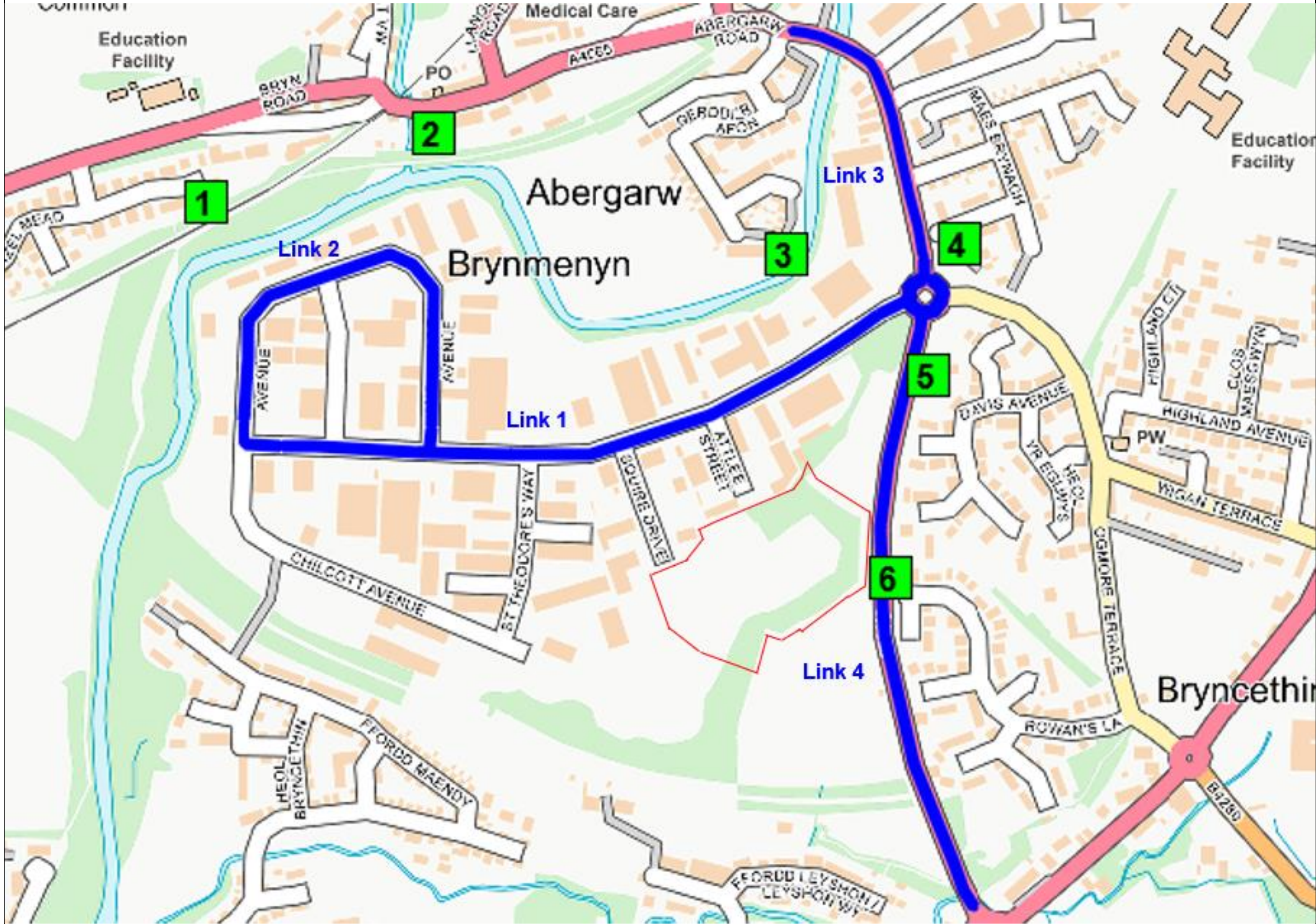
8.4 Using professional judgement, the resulting air quality effect of the Green Hydrogen Project development is considered to be 'not significant' overall.

8.5 The Green Hydrogen Project development does not, in air quality terms, conflict with national or local policies, or with measures set out in Bridgend County Borough Council's Air Quality Action Plan. There are no constraints to the development in the context of air quality.

Glossary

AADT	Annual Average Daily Traffic Flow
ADMS	Atmospheric Dispersion Modelling System
AQMA	Air Quality Management Area
AQS	Air Quality Strategy
Deposited Dust	Dust that has settled out onto a surface after having been suspended in air
DMP	Dust Management Plan
Dust	Solid particles suspended in air or settled out onto a surface after having been suspended in air
Effect	The consequences of an impact, experienced by a receptor
EPUK	Environmental Protection UK
HDV	Heavy Duty Vehicle
HGV	Heavy Goods Vehicle
IAQM	Institute of Air Quality Management
Impact	The change in atmospheric pollutant concentration and/or dust deposition. A scheme can have an ‘impact’ on atmospheric pollutant concentration but no effect, for instance if there are no receptors to experience the impact
PPW	Planning Policy Wales
R&A	Review and Assessment
Receptor	A person, their land or property and ecologically sensitive sites that may be affected by air quality
Risk	The likelihood of an adverse event occurring
Trackout	The transport of dust and dirt from the construction site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network

Figures



Site Boundary

Road Links

Receptors

Notes

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6-7 Lovers Walk
Brighton East Sussex BN1 6AH

T 01273 546800 F 01273 546801
E rpsbn@rpsgroup.com W rpsgroup.com

Client: For Marubeni Europower

Project: Green Hydrogen Project, Bridgend

Job Ref: JAR3294

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Figure 1: Road Links and Receptors

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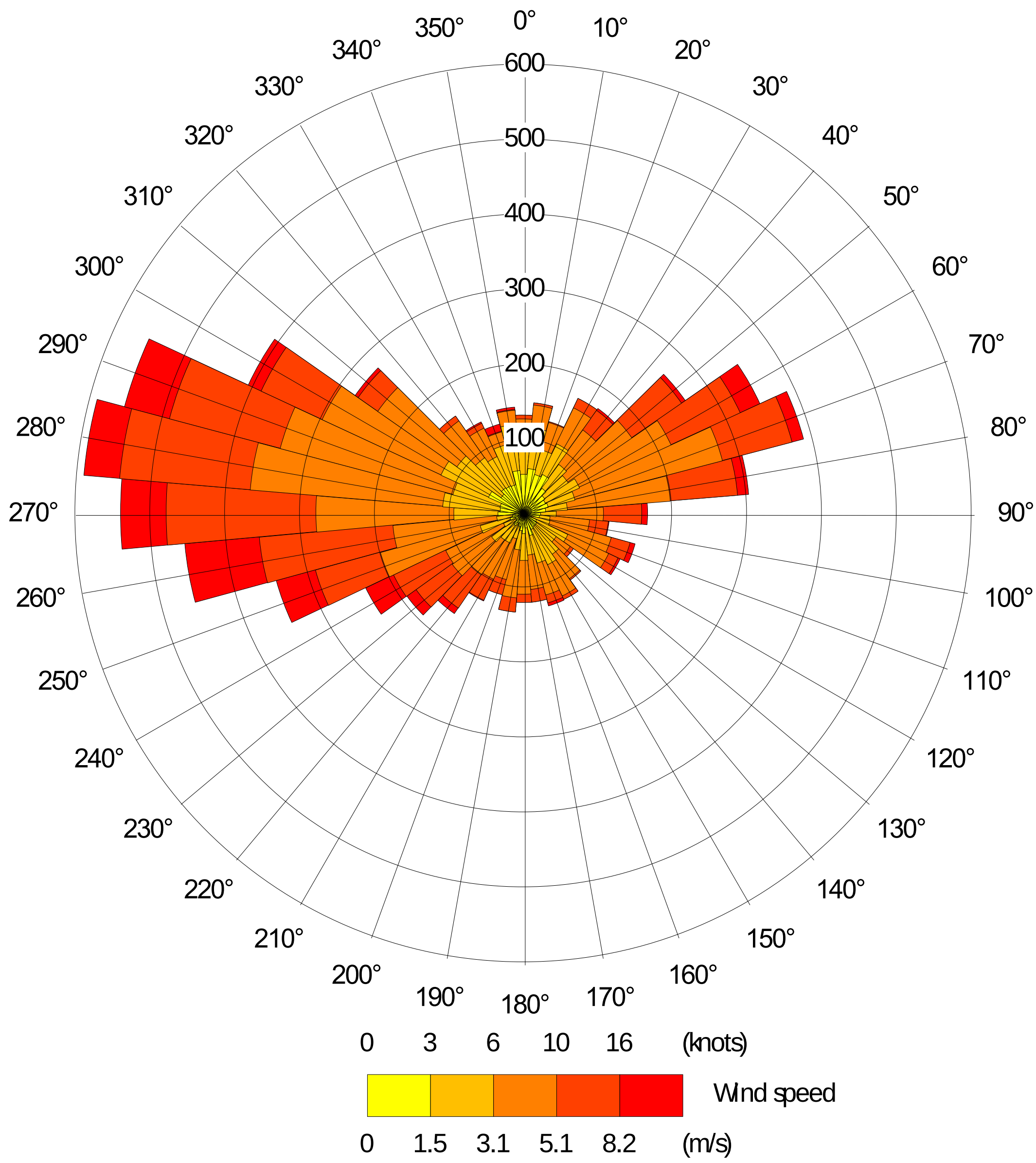

Figure 2: Wind Rose – St Athan 2021

Project Number	JAR3294	Project Title	Green Hydrogen Project, Bridgend		
Client:	For Marubeni Europower	Rev :	0	Drawn By:	GC
		Date:	15/11/2022	Checked By:	
File location:					

Notes
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6-7 Lovers Walk
Brighton East Sussex BN1 6AH
T 01273 546800 F 01273 546801
E rpsbn@rpsgroup.com W rpsgroup.com
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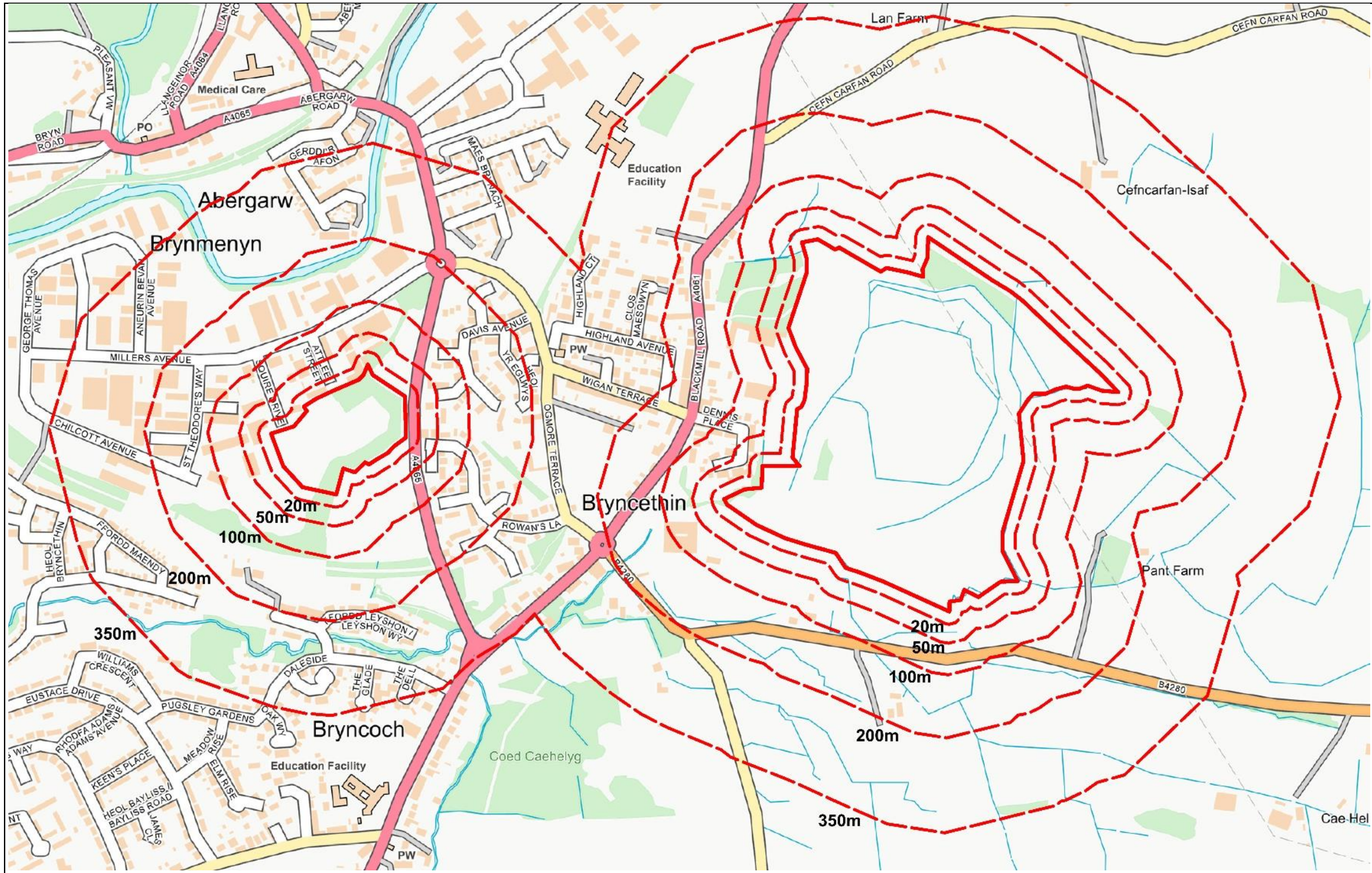

Site Boundary

Construction Dust Buffers

Notes

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6-7 Lovers Walk
Brighton East Sussex BN1 6AH

T 01273 546800 F 01273 546801
E rpsbn@rpsgroup.com W rpsgroup.com

Client: For Marubeni Europower	
Project: Green Hydrogen Project, Bridgend	
Job Ref: JAR3294	
Date: 15/11/2022	Rev: 0
Drawn: GC	Checked:

Figure 3: Construction Dust Buffers

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Appendices

Appendix A: Detailed Construction Dust Assessment Methodology

Source

A.1 The IAQM dust guidance gives examples of the dust emission magnitudes for demolition, earthworks and construction activities and trackout. These example dust emission magnitudes are based on the site area, building volume, number of HDV movements generated by the activities and the materials used. These example magnitudes have been combined with details of the period of construction activities to provide the ranking for the source magnitude that is set out in Table A.1.

Table A.1 Risk Allocation – Source (Dust Emission Magnitude)

Features of the Source of Dust Emissions	Dust Emission Magnitude
Demolition - building over 50,000 m^3, potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities > 20 m above ground level. **Earthworks** – total site area over 10,000 m^2, potentially dusty soil type (e.g. clay), >10 heavy earth moving vehicles active at any one time, formation of bunds > 8 m in height, total material moved > 100,000 tonnes. **Construction** - total building volume over 100,000 m^3, activities include piling, on-site concrete batching, sand blasting. Period of activities more than two years. **Trackout** – 50 HDV outwards movements in any one day, potentially dusty surface material (e.g. High clay content), unpaved road length > 100 m.	Large
Demolition - building between 20,000 to 50,000 m^3, potentially dusty construction material and demolition activities 10 - 20 m above ground level. **Earthworks** – total site area between 2,500 to 10,000 m^2, moderately dusty soil type (e.g. silt), 5 – 10 heavy earth moving vehicles active at any one time, formation of bunds 4 - 8 m in height, total material moved 20,000 to 100,000 tonnes. **Construction** - total building volume between 25,000 and 100,000 m^3, use of construction materials with high potential for dust release (e.g. concrete), activities include piling, on-site concrete batching. Period of construction activities between one and two years. **Trackout** – 10 - 50 HDV outwards movements in any one day, moderately dusty surface material (e.g. High clay content), unpaved road length 50 – 100 m.	Medium
Demolition - building less than 20,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities < 10 m above ground, demolition during winter months. **Earthworks** – total site area less than 2,500 m^2. Soil type with large grain size (e.g. sand), < 5 heavy earth moving vehicles active at any one time, formation of bunds < 4 m in height, total material moved < 20,000 tonnes earthworks during winter months. **Construction** - total building volume below 25,000 m^3, use of construction materials with low potential for dust release (e.g. metal cladding or timber). Period of construction activities less than one year.	Small

Features of the Source of Dust Emissions	Dust Emission Magnitude
Trackout – < 10 HDV outwards movements in any one day, surface material with low potential for dust release, unpaved road length < 50 m.	

Pathway and Receptor - Sensitivity of the Area

A.2 Pathway means the route by which dust and particulate matter may be carried from the source to a receptor. The main factor affecting the pathway effectiveness is the distance from the receptor to the source. The orientation of the receptors to the source compared to the prevailing wind direction is a relevant risk factor for long-duration construction projects; however, short-term construction projects may be limited to a few months when the most frequent wind direction might be quite different, so adverse effects can potentially occur in any direction from the site.

A.3 As set out in the IAQM dust guidance, a number of attempts have been made to categorise receptors into high, medium and low sensitivity categories; however there is no unified sensitivity classification scheme that covers the quite different potential effects on property, human health and ecological receptors.

A.4 Table A.2 and Table A.3 sets out the IAQM basis for categorising the sensitivity of people and property to dust and PM_{10} respectively.

Table A.2 Sensitivities of People and Property Receptors to Dust

Receptor	Sensitivity
Principles:- • Users can reasonably expect enjoyment of a high level of amenity; or • the appearance, aesthetics or value of their property would be diminished by soiling; and the people or property would reasonably be expected to be present continuously, or at least regularly for extended periods as part of the normal pattern of use of the land. Indicative Examples:- • Dwellings. • Museums and other culturally important collections. • Medium and long-term car parks and car showrooms.	High
Principles:- • Users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; or • the appearance, aesthetics or value of their property could be diminished by soiling; or • the people or property wouldn’t reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land. Indicative Examples:- • Parks. • Places of work.	Medium

Receptor	Sensitivity
Principles:- • the enjoyment of amenity would not reasonably be expected; or • there is property that would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling; or • there is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land. Indicative Examples:- • Playing fields, farmland (unless commercially-sensitive horticultural). • Footpaths and roads. • Short-term car parks.	Low

Table A.3 Sensitivities of People and Property Receptors to PM_{10}

Receptor	Sensitivity
Principles:- • Locations where members of the public are exposed over a time period relevant to the air quality objective (in the case of the 24-hour objective for PM_{10}, a relevant location would be one where individuals may be exposed for eight hours or more in a day). Indicative Examples:- ▪ Residential properties. ▪ Schools, hospitals and residential care homes.	High
Principles:- • Locations where the people exposed are workers and exposure is over a time period relevant to the air quality objective (in the case of the 24-hour objective for PM_{10}, a relevant location would be one where individuals may be exposed for eight hours or more in a day). Indicative Examples:- ▪ Office and shop workers (but generally excludes workers occupationally exposed to PM_{10} as protection is covered by Health and Safety at Work legislation).	Medium
Principles:- • Locations where human exposure is transient exposure. Indicative Examples:- • Public footpaths. • Playing fields, parks. • Shopping streets.	Low

A.5 The IAQM methodology combines consideration of the pathway and receptor to derive the ‘sensitivity of the area’. Table A.4 and Table A.5 show how the sensitivity of the area has been derived for this assessment.

Table A.4 Sensitivity of the Area to Dust Soiling Effects on People and Property

Receptor Sensitivity	Number of Receptors [a]	Distance from the Source (m) [b] <20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

The sensitivity of the area has been derived for demolition, construction, earthworks and trackout.

a The total number of receptors within the stated distance has been estimated. Only the highest level of area sensitivity from the table has been recorded.

b For trackout, the distances have been measured from the side of the roads used by construction traffic. Without site-specific mitigation, trackout may occur from roads up to 500 m from large sites, 200 m from medium sites and 50 m from small sites, as measured from the site exit. The impact declines with distance from the site, and trackout impacts have only been considered up to 50 m from the edge of the road.

Table A.5 Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM_{10} Concentration [a]	Number of Receptors [b, c]	Distance from the Source (m) [d] <20	<50	<100	<200	<350
High	> 32 μg.m^{-3}	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28 - 32 μg.m^{-3}	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24 - 28 μg.m^{-3}	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	< 24 μg.m^{-3}	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	> 32 μg.m^{-3}	>10	High	Medium	Low	Low	Low

Receptor Sensitivity	Annual Mean PM_{10} Concentration [a]	Number of Receptors [b, c]	Distance from the Source (m) [d]				
			<20	<50	<100	<200	<350
		1 – 10	Medium	Low	Low	Low	Low
	28 – 32 $\mu g.m^{-3}$	> 10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	< 28 $\mu g.m^{-3}$	>1	Low	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

The sensitivity of the area has been derived for demolition, construction, earthworks and trackout.

a This refers to the background concentration derived from the assessment of baseline conditions later in this report. The concentration categories listed in this column apply to England, Wales and Northern Ireland but not to Scotland.

b The total number of receptors within the stated distance has been estimated. Only the highest level of area sensitivity from the table has been recorded.

c For high sensitivity receptors with high occupancy (such as schools or hospitals), the approximate number of occupants has been used to derive an equivalent number of receptors.

d For trackout, the distances have been measured from the side of the roads used by construction traffic. Without site-specific mitigation, trackout may occur from roads up to 500 m from large sites, 200 m from medium sites and 50 m from small sites, as measured from the site exit. The impact declines with distance from the site, and trackout impacts have only been considered up to 50 m from the edge of the road.

A.6 The IAQM dust guidance lists the following additional factors that can potentially affect the sensitivity of the area and, where necessary, professional judgement has been used to adjust the sensitivity allocated to a particular area:

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

A.7 The matrices in Table A.6, Table A.7, Table A.8 and Table A.9 have been used to assign the risk for each activity to determine the level of mitigation that should be applied. For those cases where the risk category is ‘negligible’, no mitigation measures are required beyond those mandated by legislation.

Table A.6 Risk of Dust Impacts – Demolition

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible

Table A.7 Risk of Dust Impacts – Earthworks

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table A.8 Risk of Dust Impacts – Construction

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table A.9 Risk of Dust Impacts – Trackout

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible

Appendix B: Model Verification

B.1 The approach to model verification that LAQM.TG22 recommends for local authorities when they carry out their LAQM duties is summarised in Section 3. For the verification and adjustment of NO_x /NO_2 concentrations, the guidance recommends that the comparison considers a broad spread of automatic and diffusion-tube monitoring. Bridgend County Borough Council monitors roadside NO_2 concentrations passively using diffusion tubes at multiple locations in the vicinity of the Application Site.

B.2 The concentrations monitored over recent years up to 2019 (i.e. pre-pandemic) are provided in Table B.1.

B.3 Two new non-automatic diffusion tube sites were commissioned in 2021 near the area of the proposed development. The 2021 data for OBC130 and OBC132 were used alongside the 2019 data for the long running monitoring sites.

Table B.1 Measured Annual-mean NO_2 Concentrations ($\mu g.m^{-3}$)

Monitoring Site	Measured Annual-mean NO_2 Concentrations ($\mu g.m^{-3}$)				
	2016	2017	2018	2019	2021
OBC90	21	19.5	20.9	20.3	-
OBC89	23	21.8	21	20.3	-
OBC88	21	20.3	21.5	19.6	-
OBC121	-	-	-	18.5	-
OBC124	-	-	-	16.6	-
OBC130	-	-	-	-	31.1
OBC132	-	-	-	-	25.1

B.4 The monitored annual-mean NO_x road contributions have been derived from the monitored annual-mean NO_2 concentrations using the LAQM.TG22 calculator. The monitored annual-mean NO_X road contributions have then been compared with the modelled annual-mean NO_x road contributions. This comparison is provided in Table B.2 below.

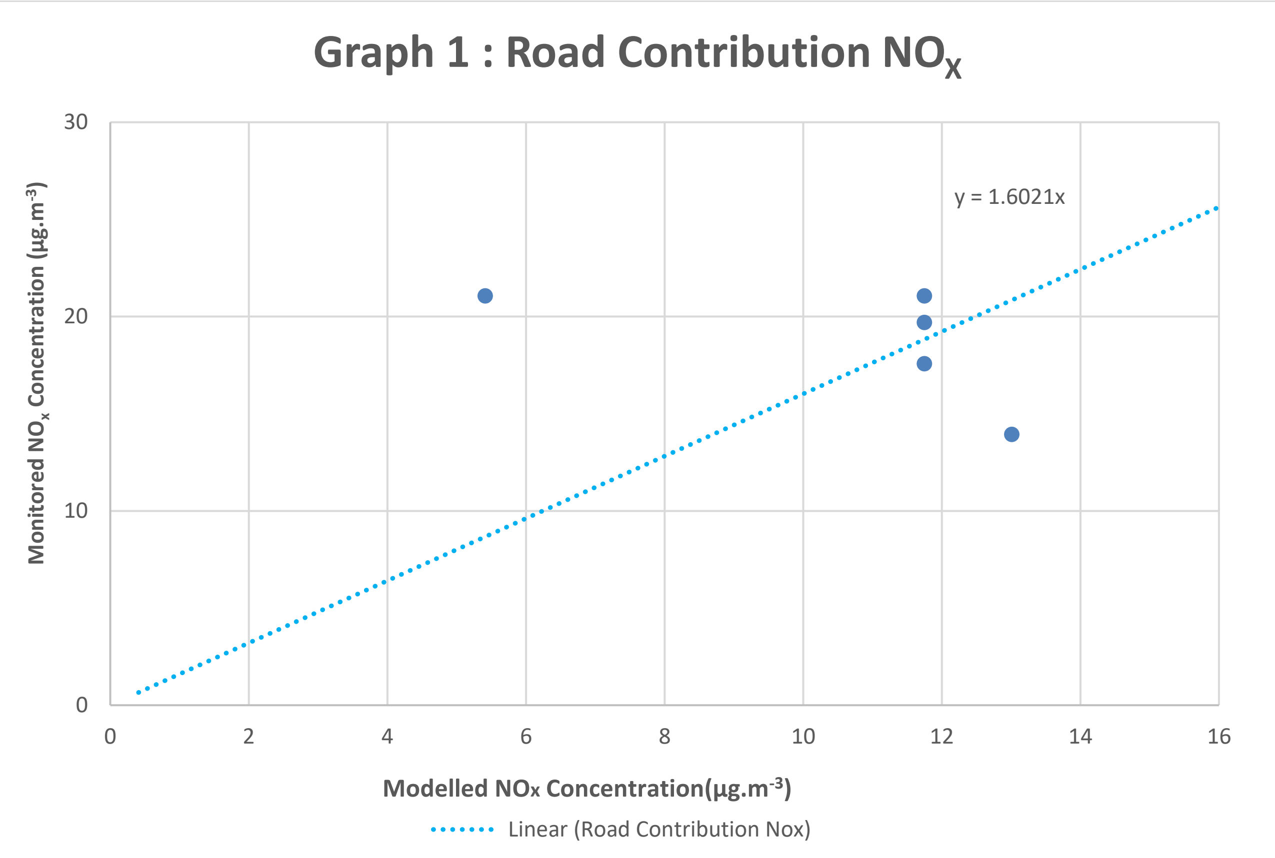
Table B.2 Comparison of Monitored and Modelled Annual-mean Road NO_x Contribution ($\mu g.m^{-3}$)

Monitoring Site	Annual-mean Road NO_X Contribution ($\mu g.m^{-3}$)	
	Monitored	Modelled
OBC90	21.08	5.41
OBC89	21.08	11.75

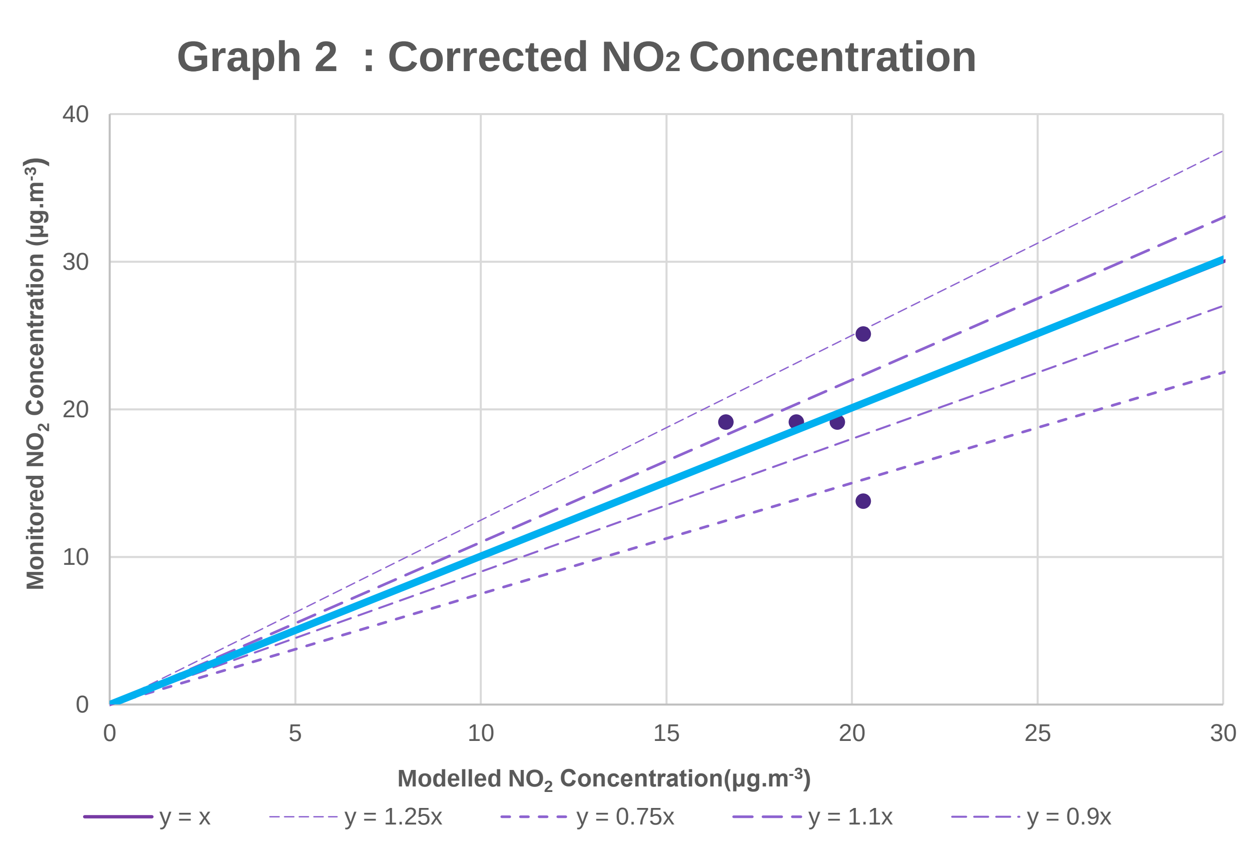
Monitoring Site	Annual-mean Road NO_X Contribution ($\mu g.m^{-3}$)	
	Monitored	Modelled
OBC88	19.71	11.75
OBC121	17.58	11.75
OBC124	13.95	13.01
OBC130	43.26	14.39
OBC132	30.67	3.14

B.5 It should be borne in mind that the monitored concentrations are themselves only estimates to the true concentrations at each point; the EU Directive on air quality [12] designates passive NO_2 samplers indicative measures with a potential uncertainty of +/-30 %. Ignoring any uncertainty errors in the monitoring results, Table A1.2 above indicates that the model is under-predicting.

B.6 The modelled annual-mean NO_x road contributions have been plotted against the monitored annual-mean NO_x road contributions in Graph 1.



B.7 The modelled NO_x contributions have been multiplied by the gradient of the trend line (1.6) to determine the corrected NO_x contributions. Modelled annual-mean NO_2 concentrations have been derived from the corrected modelled annual-mean NO_x road contributions. The corrected modelled annual-mean NO_2 concentrations have been plotted against the monitored annual-mean NO_2 concentrations in Graph 2.



B.8 The corrected modelled annual-mean NO_2 concentrations are all within 25% of the monitored annual-mean NO_2 concentrations. The correction factor therefore improves the modelled concentrations and has been applied to all predictions used within the assessment.

B.9 The fractional bias can also be used to determine whether the corrected model has a tendency to over or under-predict. The fractional bias is calculated as:

(Average Monitored NO_X Concentration – Average Predicted NO_x Concentration) / 0.5 x (Average Monitored NO_X + Average Predicted NOx Concentration)

B.10 Fractional bias values vary between +2 and -2 and has an ideal value of zero. A negative value suggests a model over-prediction and a positive value suggests a model under-prediction.

B.11 Table B.3 sets out the average monitored concentration and the average predicted concentration.

Table B.3 Comparison of Monitored and Adjusted Modelled Annual-mean Road NO_X Contribution (µg.m^{-3})

Monitoring Site	Annual-mean Road NO_X Contribution (µg.m^{-3})	
	Monitored	Corrected Modelled
OBC90	21.08	8.65
OBC89	21.08	18.79
OBC99	19.71	18.79
OBC121	17.58	18.79
OBC124	13.95	20.81
OBC130	43.26	23.02
OBC132	30.67	5.02
Average	**18.68**	**17.17**

B.12 The fractional bias for this study is therefore (18.68 – 17.17) / (0.5 x (18.68 +17.17)) = 0.08. As the fractional bias is near zero, the adjusted model is working well.

References

1 Defra, 2010, The Air Quality Standards Regulations.

2 The Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020

3 Defra, 2007, The Air Quality Strategy for England, Scotland, Wales and Northern Ireland. Volume 2.

4 EPUK & IAQM, January 2017, Land-Use Planning & Development Control: Planning For Air Quality

5 IAQM, 2014, Guidance on the assessment of dust from demolition and construction

6 Mayor of London, 2019 London Local Air Quality Management Technical Guidance, 2019 (LLAQM.TG19)

7 Defra, 2022, Local Air Quality Management Technical Guidance, 2022 (LAQM.TG22)

8 British Standard Institute, 1983, BS 6069:Part 2:1983, ISO 4225-1980 Characterization of air quality. Glossary

9 http://laqm.defra.gov.uk/review-and-assessment/tools/tools.html

10 Drawn from Defra Maps at http://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018

11 IAQM, 2012, Air Quality Monitoring in the Vicinity of Demolition and Construction Sites

12 Council Directive 2008/50/EC of 21 May 2008 on ambient air quality and cleaner air for Europe