RESIDENTIAL DEVELOPMENT AT DANESCOURT

Air Quality Assessment

Prepared for: Taff Housing Limited

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1.0 INTRODUCTION

SLR Consulting Ltd has been commissioned by Taff Housing Limited to undertake an Air Quality Assessment in support of their planning application for the development of the Site in Danescourt, Cardiff which lies to the south west of the River Taff. The Proposed Development comprises 45No. residential units and associated car parking.

The assessment describes the scope, relevant legislation, assessment methodology and the baseline conditions currently existing in the area. It then presents the potential impacts of the scheme and an evaluation of the significance of the effects.

1.1 Summary of Proposed Development

The Proposed Development comprises 45No. residential units across 15 blocks; 39No. houses and 6No. walk-up flats. Construction of a new access road is proposed and would join to the existing residential road De Braose Close.

A detailed description of the Proposed Development is included within the Planning Application documentation.

1.2 Scope of Assessment

The scope of the assessment has been agreed in pre-application discussions with Cardiff Council (CC), which covers Bridgend, Cardiff and the Vale of Glamorgan. The following aspects of the development have been agreed with the Specialist Service Officer[1].

- determination of baseline scenario, using council monitoring data;
- assessment of potential air quality impacts during the construction phase;
- assessment of potential air quality impacts during the operational phase; and
- identification of required mitigation measures.

[1] Email communication with Craig Lewis, Specialist Service Officer at Bridgend, Cardiff and the Vale of Glamorgan and SLR Consulting on 20th September 2019.

2.0 AIR QUALITY LEGISLATION, POLICY AND GUIDANCE

2.1 Air Quality Standards Regulations

The Air Quality Standards (Wales) Regulations 2010 (the regulations) transpose the Ambient Air Quality Directive (2008/50/EC), and transpose the Fourth Daughter Directive (2004/107/EC) within UK legislation. The regulations include Limit Values, Target Values, Objectives, Critical Levels and Exposure Reduction Targets for the protection of human health and the environment (collectively termed Air Quality Assessment Levels (AQAL) throughout this report). Those relevant to this Air Quality Assessment are presented within Table 2-1.

Table 2-1
Relevant Air Quality Assessment Levels

Pollutant	Standard (µg/m^3)	Measured as	
Nitrogen dioxide (NO_2)	40	Annual mean	-
	200	1 hour mean	Not to be exceeded more than 18 times a calendar year
Particulate matter with an aerodynamic diameter of less than 10µm (PM_{10}) (gravimetric)	40	Annual mean	-
	50	24 hour mean	Not to be exceeded more than 35 times a calendar year

2.2 Air Quality Strategy

The United Kingdom Air Quality Strategy (UK AQS) for England, Scotland, Wales and Northern Ireland[2], last updated in 2007, sets out the Government's policies aimed at delivering cleaner air in the United Kingdom (UK). It sets out a strategic framework within which air quality policy will be taken forward in the short to medium term, and the roles that Government, industry, the Environment Agency (EA), local government, business, individuals and transport have in protecting and improving air quality.

2.3 Local Air Quality Management

Section 82 of the Environment Act 1995 (Part IV) requires local authorities to periodically review and assess the quality of air within their administrative area. The reviews have to consider the present and future air quality and whether any AQALs prescribed in regulations are being achieved or are likely to be achieved in the future.

Where any of the prescribed AQALs are not likely to be achieved the authority concerned must designate an Air Quality Management Area (AQMA). For each AQMA the local authority has a duty to draw up an Air Quality Action Plan (AQAP) setting out the measures the authority intends to introduce to deliver improvements in local air quality in pursuit of the AQAL. As such, Local Authorities (LAs), have formal powers to control air quality through a combination of LAQM and by use of their wider planning policies.

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

2.4 General Nuisance Legislation

Part III of the Environmental Protection Act (EPA) 1990 (as amended) contains the main legislation on Statutory Nuisance and allows local authorities and individuals to take action to prevent a statutory nuisance. Section 79 of the EPA defines, amongst other things, smoke, fumes, dust and smells emitted from industrial, trade or business premises so as to be prejudicial to health or a nuisance, as a potential Statutory Nuisance.

Fractions of dust greater than 10µm (i.e. greater than PM_{10}) in diameter typically relate to nuisance effects as opposed to potential health effects and therefore are not covered within the UK AQS. In legislation there are currently no numerical limits in terms of what level of dust deposition constitutes a nuisance.

2.5 Planning Policy

2.5.1 National Policy

Planning Policy Wales (10th Edition)[3] sets out the land use planning policies in Wales. Section 6.7 'Air Quality and Soundscape' includes air quality specific policies, including:

> *"Paragraph 6.7.6 – In proposing new development, planning authorities and developers must, therefore:*
>
> - *address any implication arising as a result of its association with, or location within, air quality management areas, noise action planning priority areas or areas where there are sensitive receptors;*
> - *not create areas of poor air quality or inappropriate soundscape; and seek to incorporate measures which reduce overall exposure to air and noise pollution and create appropriate soundscape […]"*
>
> *"Paragraph 6.7.10 – […] It will be important to identify wider mitigation solutions to reduce air and noise pollution and to avoid exacerbating problems in existing air quality management areas or noise hotspots through the provision of green infrastructure identified as part of Green Infrastructure Assessments, by the provision of electric vehicle charging infrastructure or through promoting the need to consider effective design solutions. Planning authorities should work closely with bodies such as the Public Service Boards in the preparation of their well-being plans and seek input from their own Environmental Health departments."*
>
> *"Paragraph 6.7.16 – Relevant considerations in making planning decisions for potentially polluting development are likely to include:*
>
> - *location, including the reasons for selecting the chosen site itself;*
> - *impact on health and amenity;*
> - *effect of pollution on the natural and built environment and the enjoyment of areas of landscape and historic and cultural value; […]*
> - *effect on biodiversity and ecosystem resilience, including where there may be cumulative impacts on air or water quality which may have adverse consequences for biodiversity and ecosystem resilience;*

[3] Welsh Government (2018). Planning Policy Wales, Edition 10, December 2018

- *the risk and impact of potential pollution from the development, insofar as this might lead to the creation of, or worsen the situation in, an air quality management area, a noise action planning priority area or an area where there are sensitive receptors; […]"*

2.5.2 Local Policy

In January 2016, Cardiff Council (CC) adopted The Cardiff Local Development Plan (LDP) 2006 – 2026 which sets out the planning framework across the area up until 2026. The Plan sets out the key and detailed policies that are used to assess and reach conclusions on planning applications submitted across the area.

Key Policy KP18 and Detailed Policy EN13 of the LDP are relevant to air quality and are stated below:

"KP18: Natural Resources

In the interests of the long-term sustainable development of Cardiff, development proposals must take full account of the need to minimise impacts on the city's natural resources and minimise pollution, in particular the following elements:

i. Protecting the best and most versatile agricultural land;
ii. Protecting the quality and quantity of water resources, including underground surface and coastal waters;
iii. Minimising air pollution from industrial, domestic and road transportation sources and managing air quality; and
iv. Remediating land contamination through the redevelopment of contaminated sites.

[…]

4.188 Poor air quality can affect people's health, quality of life and amenity and can impact on nature conservation and built heritage interests. Development has the potential to cause air pollution, or sensitive developments can be affected by existing air quality problems in an area. In Cardiff, transport emissions are one of the main contributors to poor air quality. Development will not be permitted if it would cause or result in unacceptable harm due to air pollution. Implementation of this Policy will also help to counteract any increase in atmospheric pollution as a result of the Plan, thereby helping to avoid the likelihood that this LDP will have a significant effect upon internationally designated sites."

"EN13: Air, Noise, Light Pollution and Land Contamination

Development will not be permitted where it would cause or result in unacceptable harm to health, local amenity, the character and quality of the countryside, or interests of nature conservation, landscape or built heritage importance because of air, noise, light pollution or the presence of unacceptable levels of land contamination.

[…]

5.180 Where a development is likely to affect air quality significantly (i.e. where air quality standards are, or are likely to be breached or a new residential development gives rise to the need for a new Air Quality Management Area to be declared by introducing residents to areas where air quality standards are already being breached) then an application may be approved subject to conditions mitigating its impact on air quality, or refused where appropriate."

2.6 Assessment Guidance

The primary guidance documents consulted in undertaking this assessment are detailed below.

2.6.1 Defra 'LAQM.TG(16)'

Defra Local Air Quality Management Technical Guidance[4] (LAQM.TG(16)) was published for use by local authorities in their LAQM review and assessment work. The document provides key guidance in aspects of air quality assessment, including screening, use of monitoring data, and use of background data that are applicable to all air quality assessments.

2.6.2 Welsh Government, 'Local Air Quality Management in Wales', Policy Guidance, June 2017

The Welsh Government's LAQM in Wales Policy Guidance details the approach that Local Authorities should follow in carrying out their functions under Part IV of the Environment Act 1995. It states that they should adopt the five ways of working set out in the Well-being for Future Generations (Wales) Act 2015.

2.6.3 EPUK-IAQM 'Air Quality Guidance for Planning'

Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) have together published guidance[5] to help ensure that air quality is properly accounted for in the development control process. It clarifies when an air quality assessment should be undertaken, what it should contain, and how impacts should be described and assessed including guidelines for assessing the significance of impacts.

2.6.4 IAQM 'Construction and Demolition Dust Guidance'

Guidance on the assessment of dust from demolition and construction has been published by the IAQM [6]. The guidance provides a series of matrices to determine the risk magnitude of potential dust sources associated with construction activities in order to identify appropriate mitigation measures that are defined within further IAQM guidance.

[4] Defra Local Air Quality Management Technical Guidance (2016).
[5] Environmental Protection UK and Institute of Air Quality Management, 'Land-Use Planning and Development Control: Planning for Air Quality', 2017.
[6] Institute of Air Quality Management (IAQM), Guidance on the assessment dust from demolition and construction (2016).

3.0 METHODOLOGY

3.1 Construction Dust Assessment

The assessment has been undertaken with reference to IAQM '*Guidance on the assessment of dust from construction and demolition*'. The assessment of risk is determined by considering the risk of dust effects arising from four activities in the absence of mitigation:

- demolition;
- earthworks;
- construction; and
- track-out.

The assessment methodology considers three separate dust impacts with account being taken of the sensitivity of the area that may experience these effects:

- annoyance due to dust soiling;
- the risk of health effects due to an increase in exposure to PM_{10}; and
- harm to ecological receptors.

The first stage of the assessment involves a screening to determine if there are sensitive receptors within threshold distances of the site activities associated with the construction phase of the scheme. No further assessment is required if there are no receptors within a certain distance of the works; 350m for human receptors and 50m for designated ecological receptors.

The dust emission class (or magnitude) for each activity is determined on the basis of the guidance, indicative thresholds and expert judgement. The risk of dust effects arising is based upon the relationship between the dust emission magnitude and the sensitivity of the area. The risk of impact is then used to determine the mitigation requirements

Descriptors for magnitude of impact and impact significance used in this assessment of construction phase dust are freely available in the guidance from the IAQM website and not reproduced in this report.

3.2 Traffic Emissions Assessment

3.2.1 Screening Assessment

The traffic emissions screening assessment has been undertaken on the basis of the EPUK-IAQM guidance[7]. The guidance includes indicative criteria to define what constitutes a significant increase in traffic movements to determine when a quantitative assessment of traffic emissions may be required. They are intended to function as a sensitive 'trigger' for initiating an assessment in cases where there is a possibility of significant effects arising on local air quality.

The indicative criteria are:

- a change in Light Duty Vehicle (LDV) (LDV - <3.5 tonnes) flows of more than 500 Annual Average Daily Traffic (AADT) outside of an AQMA;
- a change in LDV (LDV - <3.5 tonnes) flows of more than 100 AADT within or adjacent to an AQMA;
- a change in Heavy Duty Vehicle (HDV) (HDV - >3.5 tonnes) flows of more than 100 AADT outside of an AQMA; and/or

[7] Environmental Protection UK and Institute of Air Quality Management, 'Land-Use Planning and Development Control: Planning for Air Quality', 2017.

- a change in HDV (HDV - >3.5 tonnes) flows of more than 25 AADT within or adjacent to an AQMA.

3.2.2 Dispersion Modelling

The screening assessment has identified that the predicted trip generation exceeds the EPUK-IAQM indicative criteria within the Llandaff AQMA; as such dispersion modelling has been undertaken to assess impacts on air quality on the affected roads of the Llandaff AQMA.

Detailed air dispersion modelling has been undertaken using the Cambridge Environmental Research Consultants (CERC) ADMS-Roads air dispersion model, following guidance provided in LAQM.TG(16) to predict concentrations of NO_2 and PM_{10} for the various scenarios. The model requires various input data, including emissions from each section of road (based upon vehicle flows and vehicle type), and the road characteristic (including road width and street canyon height, where applicable).

The earliest year of potential occupation is 2026 and therefore, the following scenarios have been modelled:

- 'Do Minimum' scenario (DM): situation if the scheme is not taken forward (opening year 2026);
- 'Do Something' scenario (DS): situation if the scheme is taken forward (opening year 2026).

Descriptors for marginal change and predicted impact used in this assessment will be based on both the EPUK and IAQM Guidance.

3.2.3 Traffic Emission Factors and Sensitivity Assessment

Defra provides an Emission Factor Toolkit (EfT) in order to calculate emissions from a given length of road based on the traffic composition (number of vehicles of each type) and speed data. Emission factors improve with time as new vehicles registered in the UK have to meet progressively tighter European type approval emissions categories, referred to as "Euro" standards. As the proportion of vehicles in the fleet meeting a particular Euro standard increases, the vehicle emissions from the fleet theoretically improve. In order to reflect this, the EfT provides projected emission factors for future years.

Emission factors were determined for each scenario using the latest EfT (v9.0).

Reference should be made to Appendix B for presentation of the traffic data entered into the assessment. Speeds used in the model were based on posted limits and adjusted for junctions following guidance in LAQM.TG(16).

Modelled traffic exhaust concentrations of NO_x have been subject to verification in accordance with LAQM.TG(16) and annual mean NO_2 concentrations calculated using the latest DEFRA 'NO_x-NO_2 Calculator' (v7.1). The traffic mix within the calculator has been set to "All other UK traffic" for a 2026 year (i.e. the predicted development opening year). 'Cardiff' was selected as the local authority.

In summary, the assessment has utilised the following inputs:

- 2026 emission factors from v9.0 of the EFT; and
- 2026 mapped background concentrations sourced from the DEFRA mapping study.

Recent evidence indicates a disparity between the emission factors and ambient monitoring data. To address this uncertainty, an additional modelling scenario has been assessed in which it has been assumed there is no improvement in vehicle emissions from a precautionary 2018 baseline year and no improvement in backgrounds from the 2018 DEFRA mapping study base year. Reference should be made to Appendix C for presentation of the sensitivity modelling scenario. These modelling assumptions and sensitivity on the dispersion modelling inputs are in accordance with principles of the IAQM's Position Statement on Dealing with Uncertainty in Vehicle NO_x Emissions within Air Quality Assessments.

3.2.4 Meteorological Data

To calculate pollutant concentrations at identified sensitive receptor locations the dispersion model uses sequential hourly meteorological data, including wind direction, wind speed, temperature, cloud cover and stability, which exert significant influence over atmospheric dispersion.

The dispersion modelling has been undertaken using 2018 data from Cardiff Airport. This site is located approximately 14km south-west of the Proposed Development. It is also the closest and most relevant meteorological station that records all of the parameters necessary for dispersion modelling.

The meteorological dataset used in this assessment was provided by ADM Ltd. A windrose is presented in Figure 4-2.

3.2.5 Background Concentrations

Defra provide modelled background pollutant concentration data on a 1km x 1km spatial resolution across the UK that is routinely used to support LAQM and Air Quality Assessments. Background pollutant concentrations are based upon the 2017 base year Defra update and projected forward. Mapped background concentrations for NO_2 and PM_{10} were obtained for the grid squares containing the Proposed Development and surrounding study area for the assessment scenario years.

3.2.6 Sensitive Receptors

LAQM.TG(16) provides guidance on assessing air quality against the regulations, stating that the AQALs should be assessed at 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 standard.

Human receptor locations have been characterised with reference to LAQM.TG(16) Box 1.1. According to LAQM.TG(16) exceedences of the AQALs should be assessed in relation to:

> *"the quality of the air at locations which are situated outside of buildings or other natural or man-made structure, above or below ground, and where members of the public are regularly present".*

The receptor locations considered representative of potential exposure within the Air Quality Assessment of road traffic emissions are shown in Table 4-2 and on Drawing AQ1, based upon relevant exposure locations outlined in Table 2-1

Annual mean NO_2 concentrations were calculated at relevant receptor locations. The risk of exceeding the 1-hour mean AQAL was assessed according to the guidance in LAQM.TG(16). This Guidance states that:

> *"exceedances of the NO_2 1-hour mean are unlikely to occur where the annual mean is below 60µg/m^3".*

Annual mean PM_{10} concentrations for PM_{10} were calculated for these receptor locations. The risk of exceeding the 24-hour mean AQAL was assessed according to the guidance in LAQM.TG(16). This Guidance provides the calculation below to determine compliance:

> *No. 24-hour mean exceedances = -18.5 + 0.00145 × annual mean3 + (206/annual mean)*

3.2.7 Assessing Significance

The EPUK-IAQM guidance requires a judgment on the significance of the 'effect', this is based upon consideration, as necessary, of the following factors:

- the existing and future air quality in the absence of the development;
- the extent of current and future population exposure to the impacts;
- the worst case assumptions adopted when undertaking the prediction of impacts; and

- the extent to which the Proposed Development has adopted best practice to eliminate and minimise emissions.

4.0 BASELINE ENVIRONMENT

4.1 Location

The Site is situated in the Danescourt area of Cardiff approximately 5 kilometres north west of Cardiff City Centre. The Site comprises an area of approximately 2.6 hectares of woodland through which a public footpath runs.

The Site is bound to the north and east by a railway line beyond which is the River Taff. In accordance with the LAQM.TG(16) guidance no further assessment of the railway is required. The south and west of the Site is bound by the residential area of Danescourt, Cardiff, and there are several properties in close proximity to the Site including those on Nicholson Webb Close and Blethin Close. Danescourt Primary School is located approximately 170 metres to the south west of the Site.

Access to the Site, during the construction and operational phases, is proposed along the residential road De Braose Close from which a new access road will be constructed. The Site and surrounds, including Llandaff AQMA are illustrated in Figure 4-1.

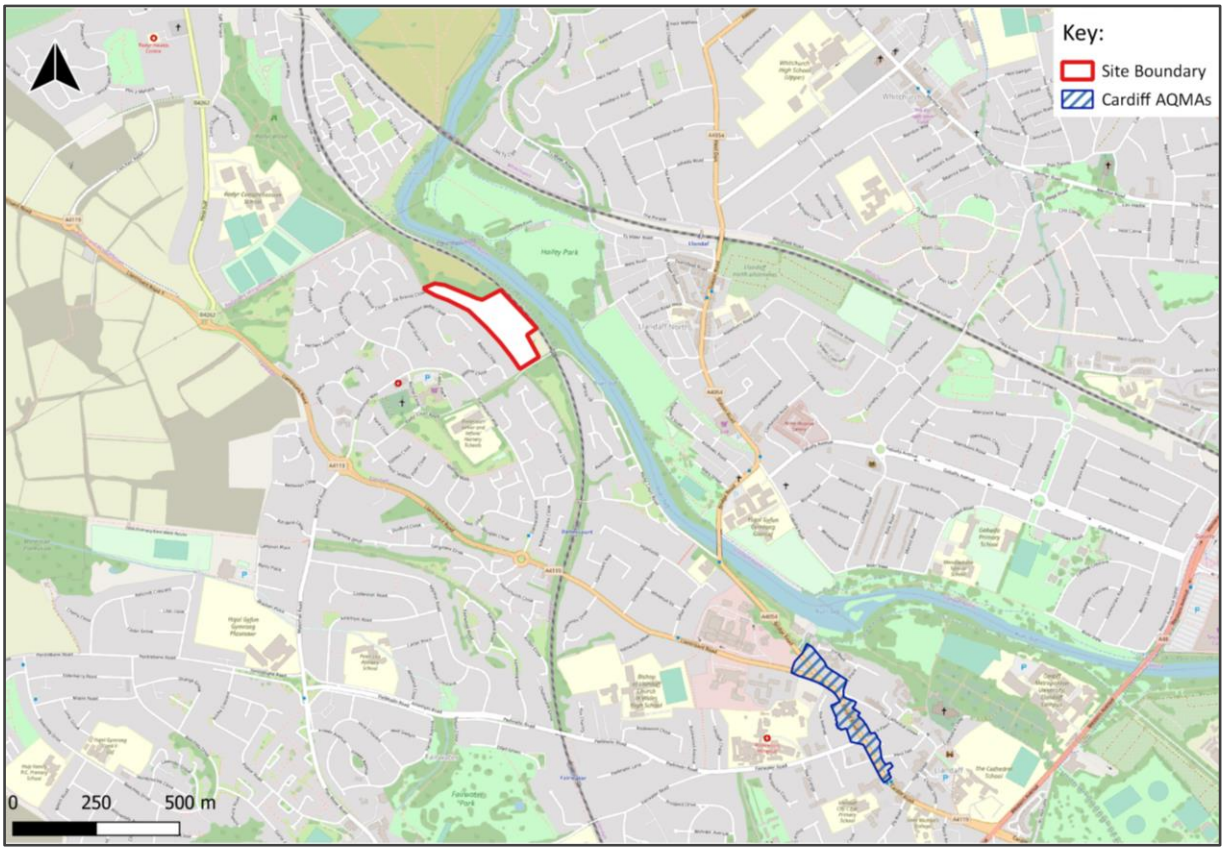

Figure 4-1
Site Setting

4.2 Sensitive Receptors

4.2.1 Construction Dust Receptors

The main receptors likely to be affected by the generation of construction dust are those existing receptors within approximately 350m of the development site boundary and/or within 50m of the route(s) used by vehicles on the

public highway, up to 500m from the site entrance(s)[8]. However, for those receptors sited in a downwind location from the development site boundary, potential dust impacts may be witnessed at a distance of greater than 350m on occasion under worst case conditions.

Reference should be made to Drawing AQ1 for an illustration of buffer zones of all sensitive receptors with the potential to be impacted upon by construction phase dust in accordance with the stated IAQM assessment methodology.

4.2.2 Traffic Emissions – Human Sensitive Receptors

The sensitive receptor locations considered representative of potential exposure for the Air Quality Assessment are shown in Table 4-2. Where these are referenced within the report text, they are referred to as R1 – R8. Reference should be made to Drawing AQ2 for an illustration of the location of these receptors relative to the development.

Table 4-1
Operational Phase Human Sensitive Receptors

Receptor		NGR (m)		Height (m)
		X	Y	
R1	Residential - 2 Llantrisant Road	315147	178244	1.5
R2	Residential - 62 Cardiff Road	315204	178216	1.5
R3	Residential - Flats on Cardiff Road	315253	178154	1.5
R4	Residential - 2 Fairwater Road	315288	178058	1.5
R5	Residential - 43 Cardiff Road	315372	177951	1.5
R6	Residential - Plas Gwyn Halls of Residence	315088	178220	1.5
R7	Residential - 22 Llantrisant Road	314781	178357	1.5
R8	Residential - 4 Bridge Street	315171	178262	1.5

4.2.3 Ecological Receptors

A review using the Magic web-based mapping service[9] was undertaken to identify any designated sites of ecological or nature conservation importance required for consideration within the assessment, as follows:

- construction phase assessment – any ecological designation within 50m of the development boundary, or 50m of any road projected to witness construction phase road traffic movements, that could potentially be affected by dust from the construction phases of the Proposed Development; and
- operational phase assessment – any Ramsar, Special Areas of Conservation (SAC), Special Protection Areas (SPA) or Sites of Special Scientific Interest (SSSI) within 200m of any 'affected road' as part of the scheme, that could be affected by any change in vehicle emissions associated with the Proposed development.

[8] IAQM, Guidance on the assessment dust from demolition and construction v1.1, 2016.
[9] Natural England, www.magic.gov.uk, accessed October 2019.

The closest ecological designation to the Proposed Development is the Glamorgan Canal Long Wood SSSI, located approximately 1km to the north. Located approximately 8km south-east is the Ramsar, SAC, SPA & SSSI site which runs the length of the Severn Estuary coast line down to Cardiff Bay.

4.3 Baseline Air Quality

4.3.1 Local Air Quality Management

As required under Section 82 of the Environment Act (1995) (Part IV), CC has conducted an on-going exercise to review and assess air quality within their administrative area.

This process has indicated that CC have declared four AQMAs as detailed in Table 4-1, the closest of which is the Llandaff AQMA approximately 1.5km south-east of the Site. The location of this AQMA is shown in Figure 4.1. The latest LAQM report[10] has been reviewed and the latest available data (2018) indicates exceedances of the annual mean AQAL for NO_2 at locations across the City. However, no exceedances for other monitored pollutants (PM_{10}, $PM_{2.5}$, SO_2, CO and O_3) were recorded. The four AQMAs are declared for exceedences of the annual mean AQAL for NO_2.

Table 4-2
Cardiff Council AQMAs

AQMA Name	Description	Designated for:	Approximate location relative to the Site
Cardiff City Centre AQMA	Encompasses residential and commercial properties situated on the main routes through Cardiff City Centre: High Street, Womanby Street, Westgate Street and St Mary Street.	NO_2 – Annual Mean	5km SE
Ely Bridge AQMA	Residential properties along the A48 Cowbridge Road West.	NO_2 – Annual Mean	2.5km S
Stephenson Court AQMA	Residential properties along the A4161 Newport Road.	NO_2 – Annual Mean	6km SE
Llandaff AQMA	Residential properties along Cardiff Road through Llandaff village.	NO_2 – Annual Mean	1.5km SE

4.4 Baseline Air Quality

4.4.1 Automatic Air Quality Monitoring

The UK Automatic Urban and Rural Network (AURN) is a countrywide network of air quality monitoring stations operated on behalf of the DEFRA. Monitoring data for AURN sites is available from the UK Air Information Resource website (UK AIR)[11].

[10] https://cardiff.moderngov.co.uk/documents/s24642/Cabinet%2011%20October%202018%20Annual%20Air%20Quality%20App.pdf
[11] DEFRA, UK Air Information Resource (UK-AIR) website, http://uk-air.defra.gov.uk/, accessed October 2019.

The closest AURN monitor to the Proposed Development is the Cardiff Centre AURN (NGR: x318416, y176526), located approximately 5km south-east of the Proposed Development. The Cardiff Centre AURN is of an '*urban background*' classification, defined as "*an urban location distanced from sources and therefore broadly representative of city-wide background conditions, e.g. urban residential areas*".

Recent NO_2 and PM_{10} monitoring data from the Cardiff Centre AURN is presented within Table 4-3 and Table 4-4.

Table 4-3
Cardiff Centre AURN: NO_2 Monitoring Results

Year	Annual Mean NO_2 Concentration (µg/m^3)	Number of Hours >200µg/m^3	Data Capture (%)
2016	23.3	0	98.0
2017	20.2	0	99.0
2018 (A)	18.2	0	71.1

Note:
(A) No monitoring data is present from 3rd October 2018 and therefore data capture is below the LAQM.TG(16) recommended 75% and results should be treated with caution.

Table 4-3 indicates that NO_2 concentrations monitored at the Cardiff Centre AURN are in compliance with the annual mean AQAL during all considered years. 1-hour mean concentrations further illustrate compliance with the number of permitted hourly exceedences (18 1-hour concentrations in excess of 200µg/m^3 are permitted).

Table 4-4
Cardiff Centre AURN: PM_{10} Monitoring Results

Year	Annual Mean NO_2 Concentration (µg/m^3)	Number of Days >50µg/m^3	Data Capture (%)
2016	18.7	1	47.0
2017	15.9	2	91.4
2018	17.4	4	88.6

Note:
(A) data capture is below the LAQM.TG(16) recommended 75% and results should be treated with caution.

Table 4-4 indicates that PM_{10} concentrations monitored at the Cardiff Centre AURN are in compliance with the annual mean AQAL during all considered years. 24-hour mean concentrations further illustrate compliance with the number of permitted hourly exceedences (35 24-hour concentrations in excess of 50µg/m^3 are permitted).

CC undertakes automatic monitoring at two locations within the City. The closest automatic monitor to the Proposed Development is situated at 'Cardiff Frederick Street' (NGR: x318416, y176526), which is co-located with the Cardiff Centre AURN at an 'urban background' location. As such, results are the same as those presented above.

4.4.2 Passive Diffusion Tube Monitoring

Passive diffusion tube monitoring is undertaken by CC at 75 non-automatic (passive) diffusion tube sites throughout the City (for NO_2). The nearest monitoring sites are located within the Llandaff AQMA to the south-east of Site.

The annualised results from the diffusion tubes within the Llandaff AQMA are presented in Table 4-5.

Table 4-5
Diffusion Tube Monitoring Results (Llandaff AQMA)

Ref.	Description	NGR (m)		Within AQMA?	Site Classification	Annual Mean NO_2 Concentration ($\mu g/m^3$) (A)		
		X	Y			2016	2017	2018
DT33	Mitre Place	315248	178165	Y	Kerbside	47.6	33.0	32.5
DT99	Cardiff Road Llandaff	315275	178117	Y	Roadside	34.8	31.0	31.7
DT161	52 Bridge Road	315230	178205	Y	Roadside	35.0	33.4	- (C)
DT208	2 Llantrisant Road	315146 (F)	178241 (F)	Y	- (E)	-	-	25.4 (B)
DT212	62 Bridge Road	315196 (F)	178222 (F)	Y	- (E)	-	-	47.2 (B)(D)

Notes:
(A) Bias Adjusted
(B) Monitoring began in 2018
(C) Monitoring ceased in 2017
(D) Only 50% data capture and therefore results should be treated with caution
(E) Unknown
(F) Estimated based on aerial photography

As shown in Table 4-5, there is one exceedance of the NO_2 AQAL at DT212. However, it should be noted that the data capture at this site was only 50% and therefore in line with LAQM.TG(16) the data should be treated with caution.

4.4.3 Defra Modelled Background and Projections

Background pollutant concentration data on a 1km x 1km spatial resolution is provided by DEFRA through the UK Air Information Resource (AIR) website and is routinely used to support LAQM and Air Quality Assessments.

Mapped background concentrations of NOx, NO_2 and PM_{10} were downloaded for the grid squares containing the Proposed Development and the operational phase receptor locations, based upon the 2017 base year DEFRA update[12]. In accordance with the methodology presented within LAQM.TG(16), the NOx and PM_{10} proportions from the 'primary A-road road in' sector of the grid square were removed from the 'total' background concentrations

[12] Background mapping data for local authorities – http://uk-air.defra.gov.uk/data/laqm-background-home, accessed June 2019.

downloaded for each respective pollutant from the Air Quality Information Resource where relevant (i.e. for grid squares in which A-roads were modelled).

Background NO_2 concentrations were updated and revised according to the methodology prescribed within LAQM.TG(16), in light of the source apportioned background NOx concentration, where relevant. This 'calculated' background concentration was then input into the Air Quality Assessment avoiding double counting of potential source contributions (i.e. existing baseline traffic flows included within the detailed dispersion modelling assessment).

Background pollutant concentrations for 2018 (to represent worst-case background concentrations and verification year) and 2026 (the Proposed Development opening year) are displayed in Table 4-6 and Table 4-7 respectively.

Table 4-6
2018 Adjusted Background Concentrations

Pollutant	Mapped Background Concentration (µg/m³)	Sector Total to be Removed (µg/m³)	Adjusted Background (µg/m³)
Grid Square: x314500, y179500 (Proposed Development)			
NO_2	13.2	-	12.9
NO_x	18.2	0.41	17.8
PM_{10}	11.5	<0.01	11.5
Grid Square: x315500, y178500 (Receptors R1 – R4, R6, R8)			
NO_2	14.6	-	14.1
NO_x	20.4	0.88	19.5
PM_{10}	11.8	<0.01	11.8
Grid Square: x315500, y177500 (Receptor R5)			
NO_2	17.6	-	15.4
NO_x	25.1	3.53	21.6
PM_{10}	12.5	0.02	12.5
Grid Square: x314500, y178500 (Receptor R7)			
NO_2	14.2	-	13.4
NO_x	19.7	1.25	18.4
PM_{10}	11.9	<0.01	11.9

Table 4-7
2026 Adjusted Background Concentrations

Pollutant	Mapped Background Concentration (µg/m^3)	Sector Total to be Removed (µg/m^3)	Adjusted Background (µg/m^3)
Grid Square: x314500, y179500 (Proposed Development)			
NO_2	9.16	-	9.00
NO_x	12.2	0.22	12.0
PM_{10}	10.8	<0.01	10.8
Grid Square: x315500, y178500 (Receptors R1 – R4, R6, R8)			
NO_2	10.3	-	9.96
NO_x	13.8	0.50	13.3
PM_{10}	11.0	<0.01	11.0
Grid Square: x315500, y177500 (Receptor R5)			
NO_2	12.3	-	11.0
NO_x	16.9	2.01	14.9
PM_{10}	11.7	0.01	11.7
Grid Square: x314500, y178500 (Receptor R7)			
NO_2	9.93	-	9.45
NO_x	13.3	0.70	12.6
PM_{10}	11.1	<0.01	11.1

4.5 Meteorology

In relation to construction dust the generation, release and dispersion of fugitive dust are particularly dependent upon weather conditions and the nature of the handled material. The prevailing meteorological conditions at any site would be dependent upon many factors including its location in relation to macroclimatic conditions as well as more site specific, microclimatic conditions. The most important climatic parameters governing the emission and magnitude of impact of dust are:

- wind direction which determines the broad transport of the emission and the direction in which it is dispersed; and
- wind speed will affect ground level emissions by increasing the initial dilution of pollutants in the emission; it will also affect the potential for dust entrainment.

4.5.1 Wind Speed and Direction Data

The most comparable observation station to the Proposed Development site is Cardiff, located approximately14km to the south-west.. A wind rose for the 2018 base year is presented in Figure 4-2.

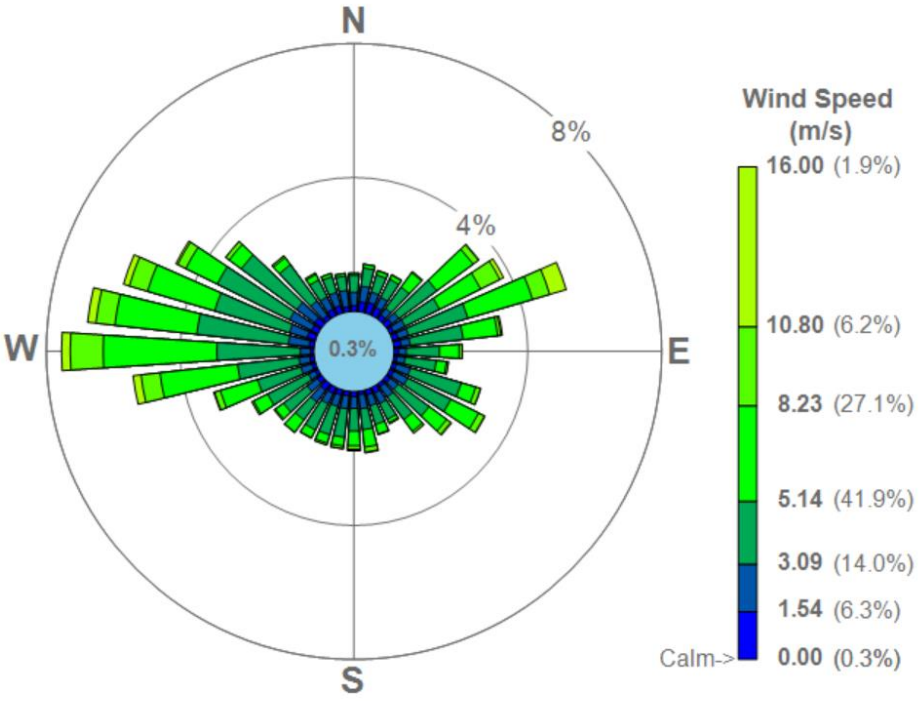

Figure 4-2
Wind Rose for Cardiff Meteorological Station (2018)

5.0 CONSTRUCTION PHASE ASSESSMENT

This section presents the potential air quality impacts and effects associated with the construction of the development in terms of dust and vehicle emissions.

5.1 Construction Dust Assessment

Construction activities will include:

- material export and import;
- temporary stockpiling of materials;
- groundwork for foundations and services;
- construction of buildings;
- landscaping works;
- vehicle movements (with the potential to track-out material from site).

The following subsections provide a consideration of potential construction dust and conclude with a determined emission class and risk category, from each of the categories identified by the IAQM Guidance.

5.1.1 Assessment Screening

There are 'human receptors' within 350m of the Site but no designated habitat sites within 50m of the Site boundary or within 50m of the Site entrance. Therefore, an assessment of construction dust on ecological receptors can be screened out from this assessment but an assessment of construction dust at human receptors is required.

5.1.2 Potential Dust Emission Magnitude

The most significant potential source of dust emissions during construction would be the earthworks and trackout activities. Dust is potentially generated by the action of heavy vehicles (bulldozer, front-end loader, hydraulic excavator, and dump trucks), as well as by the movement of the vehicles on potentially dusty surfaces. Dust and dirt from the construction site can be transported onto the road network by HDVs leaving the construction site. The potential dust emission magnitude for each activity is described in Table 5-1.

Table 5-1
Potential Dust Emission Magnitude

Activity	Comments	Dust Emission Magnitude
Demolition	The Proposed Development does not include the demolition of any buildings and therefore this part of the assessment is 'not applicable'. An area of woodland needs to be cleared for the development.	Not applicable
Earthworks	The total site area is classified as 'large' (being in excess of 10,000m^2) and it has been assumed that the soil is potentially dusty.	Large
Construction	The building volume requiring construction can be classified as small (<25,000m^3). It has been assumed that typical construction methods will be employed and potentially dust construction (e.g. concrete) will be used.	Medium

Activity	Comments	Dust Emission Magnitude
Trackout	The length of unpaved road is not expected to exceed 100m and there are expected to be less than 50 outward HDV movements in any one day. Therefore, the dust emission magnitude has been classified as 'medium'.	Medium

5.1.3 Sensitivity of the Area

The sensitivity of the area takes account of a number of factors:

- the specific sensitivities of receptors in the area;
- the proximity and number of those receptors;
- in the case of PM_{10}, the local background concentration; and
- site-specific factors, such as whether there are natural shelters, such as trees, to reduce the risk of wind-blown dust.

The sensitivity of the area and the factors considered are presented in Table 5-2. The number of receptors and their sensitivity were assessed at 20, 50, 100 and 350 metres from the site boundary in line with the IAQM guidance. This assessment is visually displayed in Drawing AQ1.

Table 5-2
Sensitivity of the Area

Sensitivity to:	Activity:	Comments	Sensitivity
Dust Soiling Impacts	Earthworks Construction Trackout	The surroundings comprise residential properties that are classified as of high sensitivity to dust soiling. There are more than 10 high sensitivity receptors within 20m of the site boundary. In addition, there are more than 10 high sensitivity receptors within 20m of the assumed access route along De Braose Close, Timothy Rees Close and Danescourt Road.	High
Human Health Impacts	Earthworks Construction	The Defra 2019 PM_{10} background is 11.3µg/m^3 (i.e. falls into the <24µg/m^3 class) and there are less than 100 receptors within 20m.	Low
	Trackout	There are less than 100 high sensitivity receptors within 20m of any construction routes up to 500m from site.	Low

5.1.4 Risk of Impacts (Unmitigated)

The outcome of the assessment of the potential 'magnitude of dust emissions', and the 'sensitivity of the area' are combined in the table below to determine the risk of impact which is used to inform the selection of appropriate mitigation.

Table 5-3
Risk of Dust Impacts

Potential Impact	Demolition	Earthworks	Construction	Trackout
Dust Soiling Impacts	Not applicable	High Risk	Medium Risk	Medium Risk
Human Health Impacts	Not applicable	Low Risk	Low Risk	Low Risk

5.1.5 Construction Phase Mitigation

In order to control potential impacts, the mitigation measures from the IAQM guidance[13] and presented within Table 5-4 are recommended. With the effective application of the dust mitigation measures it is considered that the impacts at all receptors will be 'not significant'.

Table 5-4
Construction Dust Mitigation Measures

Site Application	Mitigation Measure
General dust management	Incorporate dust management measures into the Construction Management Plan
	Record all dust and air quality complaints and take appropriate measures to reduce emissions
	Record any exceptional; incidents that cause dust off site
	Carry out regular site inspections, record inspection results, and make an inspection log available to the local authority when asked
	Ensure an adequate supply of water is available onsite for effective dust suppression
	Minimise drop heights from loading shovels and other material handling equipment
	Impose a site speed limit
	Ensure all vehicles engines are switched off when stationary and not in use
	Plan site layout so machinery is located away from receptors as far as possible
	Avoid site runoff of water or mud
	Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site
	In close proximity to sensitive receptors cover or fence stockpiles to prevent wind whipping
Earthworks	Re-vegetate earthworks and soil stockpiles to stabilise surfaces as soon as practicable
	Cover stockpiles if not vegetated and only remove in small areas during work
	Avoid Double Handling of material
	Cease operations during high winds in the direction of sensitive receptors

[13] Institute of Air Quality Management (IAQM), Guidance on the assessment dust from demolition and construction (2016).

Site Application	Mitigation Measure
Construction	Avoid scabbling (roughing of concrete surfaces) if possible
	Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out
	Ensure bulk cement and other fine powder materials are delivered in enclosed tankers
Trackout	Use water assisted dust sweepers on the access and local roads to removed tracked out material is necessary
	Use hard surfaced haul routes on site, which are damped down as necessary
	Avoid dry sweeping large areas
	Ensure vehicles entering and leaving sire are covered to prevent escape of materials during transport
	Provide means to wheel wash for vehicles tracking over unsurfaced areas and hard surfaced area between facilities and site exit

5.2 Construction Phase Plant Emissions

During the construction phase Non-road Mobile Machinery (NRMM) and plant shall be well maintained; if any emissions of dark smoke occur then the relevant machinery should stop immediately, and any problem rectified. In addition, the following controls should apply to NRMM:

- all NRMM should use fuel equivalent to ultralow sulphur diesel;
- all NRMM should comply with either the current or previous EU Directive Staged Emission Standards;
- all NRMM should be fitted with Diesel Particulate Filters (DPF) conforming to defined and demonstrated filtration efficiency (load/duty cycle permitting);
- the on-going conformity of plant retrofitted with DPF, to a defined performance standard; and
- implementation of fuel conservation measures including instructions to throttle down or switch off idle construction equipment; switch off the engines of trucks while they are waiting to access the site and while they are being loaded or unloaded, ensure equipment is properly maintained to ensure efficient fuel consumption.

Successful implementation of the above mitigation measures would ensure that emissions from the construction phase and NRMM used during construction phase result in a ‘not significant’ effect on air quality.

5.3 Construction Phase – Vehicular Pollutants

The closest AQMA to the Proposed Development is ‘Llandaff AQMA’ approximately 1.5km south-east. Construction phase traffic is unlikely to travel through the AQMA and therefore the higher screening criterion (i.e. 500 LDV and 100 HDV) would apply to the roads within this area.

Information on traffic movements anticipated during construction works was unavailable for the completion of the Air Quality Assessment. However, the development quantum is not anticipated to result in a significant increase in movements above the EPUK and IAQM criterion. The duration of movements will be short-term in nature and are not considered further within the context of this assessment. Therefore, in accordance with the criterion presented

within EPUK and IAQM guidance, additional road vehicle trips during the construction phase of the scheme '*can be considered to have insignificant effects*' on air quality.

6.0 ASSESSMENT OF EFFECTS AND SIGNIFICANCE: OPERATIONAL PHASE TRAFFIC

This section presents the potential air quality impacts associated with traffic associated with the operational phase of the development.

In summary, this assessment has utilised the following inputs:

- 2026 emission factors from v9.0 of the EFT; and
- 2026 mapped background concentrations the DEFRA mapping study.

6.1 Modelling Outputs

Paragraph 7.508 of LAQM.TG(16) states that: '*The model used should have some form of published validation assessment available and/or should be recognised as being fit for purpose by the regulatory authorities*'. An adjustment factor has been calculated for the assessment scenarios in line with this guidance. The verification factor calculated was **3.4485**. Reference should be made to Appendix B for the details of the verification process.

EPUK and IAQM guidance states that *'Most particulate matter from combustion processes (including road traffic) occurs in the $PM_{2.5}$ fraction. The AQAL for $PM_{2.5}$ is lower than that for PM_{10} and this therefore represents a more conservative approach for these sources. The application of Table 6.3 for $PM_{2.5}$ is straightforward, given that the AQAL is expressed as an annual mean. In assessing road traffic sources, however, regard must also be given to emission from brake / tyre wear and road abrasion, which are predominantly in the 2.5 - 10µm fraction. Consequently, PM_{10} is the more appropriate pollutant to assess in these circumstances.'* As such, while PM_{10} concentrations have been modelled, the operational phase results predicted have been assessed against the AQAL for PM_{10} and $PM_{2.5}$ in order to provide a worst-case assessment.

6.2 Operational Phase Impact Assessment

6.2.1 Nitrogen Dioxide Annual Mean Modelling Results

Predicted annual mean NO_2 concentrations were assessed against the AQAL of 40µg/m^3, based upon the modelled receptor locations outlined in Table 4-1 and Drawing AQ2.

Table 6-1
Summary of Predicted Annual Mean NO_2 Concentrations: Road Vehicle Emissions

Receptor	Predicted 2026 NO_2 Concentration (µg/m^3) [A]		Change (µg/m^3)	Change as a Percentage of the AQAL (%)
	'Do-minimum'	'Do-something'		
R1 [B]	20.8	20.8	+0.07	0.17
R2 [B]	21.9	22.0	+0.07	0.18
R3 [B]	19.9	20.0	+0.07	0.18
R4 [B]	17.3	17.3	+0.05	0.12
R5 [C]	18.6	18.7	+0.06	0.15
R6 [B]	13.8	13.8	+0.03	0.08

Receptor	Predicted 2026 NO_2 Concentration (µg/m^3) (A)		Change (µg/m^3)	Change as a Percentage of the AQAL (%)
	'Do-minimum'	'Do-something'		
R7 (D)	12.9	13.0	+0.03	0.08
R8 (B)	16.3	16.3	+0.03	0.08

Note:

(A) Scenario modelled as an assumed 2026 development opening year, with 2026 emission factors and 2026 mapped background pollutant concentrations.
(B) Annual mean concentrations inclusive of 2026 background concentration of 9.96µg/m^3.
(C) Annual mean concentrations inclusive of 2026 background concentration of 11.0µg/m^3.
(D) Annual mean concentrations inclusive of 2026 background concentration of 9.45µg/m^3.

As shown in Table 6-1, there are not predicted to be any exceedences of the annual mean NO_2 AQAL at any identified sensitive receptor in either scenario. The maximum predicted change in annual mean NO_2 concentrations associated with additional development trips is +0.07µg/m^3, representing 0.18% of the AQAL, as predicted at R2 and R3 (Residential – 62 Cardiff Road and Residential – Flats on Cardiff Road, respectively).

Predicted impacts on annual mean NO_2 concentrations are summarised in Table 6-2, based upon the descriptors presented within EPUK and IAQM guidance[14].

Table 6-2
Summary of Predicted Annual Mean NO_2 Impacts: Road Vehicle Emissions

Receptor	Concentration with the Development	Percentage Change Relative to AQAL (%)	Impact
R1	<75% of the AQAL	<1%	Negligible
R2	<75% of the AQAL	<1%	Negligible
R3	<75% of the AQAL	<1%	Negligible
R4	<75% of the AQAL	<1%	Negligible
R5	<75% of the AQAL	<1%	Negligible
R6	<75% of the AQAL	<1%	Negligible
R7	<75% of the AQAL	<1%	Negligible
R8	<75% of the AQAL	<1%	Negligible

As indicated in Table 6-2, the predicted percentage change of annual mean NO_2 concentrations is '<1% of the AQAL' at all considered receptors. The predicted concentration with the development is '<75% of the AQAL' at all considered sensitive receptors. An unmitigated negligible impact is predicted at all sensitive receptors in accordance with the assessment methodology.

[14] EPUK and IAQM, 'Land-Use Planning and Development Control: Planning for Air Quality', v1.2 2017.

6.2.2 Nitrogen Dioxide 1-hour Mean Modelling Results

The maximum annual mean NO_2 'do-something' concentration is 22.0µg/m^3 (receptor location R2, Residential – 62 Cardiff Road). Therefore, predicted concentrations are well below the 60µg/m^3 indicative criteria and, in accordance with DEFRA guidance, exceedences of the 1-hour mean NO_2 AQAL are considered unlikely.

6.2.3 Particulate Matter Annual Mean Modelling Results

Predicted annual mean ground level PM_{10} concentrations were assessed against the $PM_{2.5}$ AQAL of 25µg/m^3, in accordance with EPUK and IAQM guidance.

Table 6-3
Summary of Predicted Annual Mean PM_{10} Concentrations: Road Vehicle Emissions

Receptor	Predicted 2024 PM_{10} Concentration (µg/m^3) (A)		Change (µg/m^3)	Change as a Percentage of the $PM_{2.5}$ AQAL (%)
	'Do-minimum'	'Do-something'		
R1 (B)	13.8	13.9	+0.02	0.08
R2 (B)	14.1	14.2	+0.02	0.09
R3 (B)	14.6	14.6	+0.03	0.10
R4 (B)	13.0	13.0	+0.01	0.06
R5 (C)	13.7	13.7	+0.02	0.08
R6 (B)	12.2	12.2	+0.01	0.04
R7 (D)	12.1	12.1	+0.01	0.04
R8 (B)	12.7	12.7	+0.01	0.03

Note:
(A) Scenario modelled as an assumed 2026 development opening year, with 2026 emission factors and 2026 mapped background pollutant concentrations.
(B) Annual mean PM_{10} concentrations inclusive of 2026 apportioned background concentration of 11.0µg/m^3.
(C) Annual mean PM_{10} concentrations inclusive of 2026 apportioned background concentration of 11.7µg/m^3
(D) Annual mean PM_{10} concentrations inclusive of 2026 apportioned background concentration of 11.1µg/m^3

As shown in Table 6-3, there are not predicted to be any exceedences of the annual mean PM_{10} AQAL, or the more stringent $PM_{2.5}$ AQAL, at any identified receptor in either scenario. The maximum predicted change in annual mean PM_{10} concentrations associated with additional development trips is +0.03µg/m^3, representing 0.10% of the $PM_{2.5}$ AQAL, as predicted at receptor location R3 (Residential - Flats on Cardiff Road).

Predicted impacts assessed against the annual mean $PM_{2.5}$ AQAL are summarised in Table 6-4, based upon the descriptors presented within EPUK and IAQM guidance[15].

[15] EPUK and IAQM, 'Land-Use Planning and Development Control: Planning for Air Quality', v1.2 2017.

Table 6-4
Summary of Predicted Annual Mean $PM_{2.5}$ Impacts: Road Vehicle Emissions

Receptor	Concentration with Development	Percentage Change Relative to the $PM_{2.5}$ AQAL (%)	Impact
R1	<75% of the AQAL	<1%	Negligible
R2	<75% of the AQAL	<1%	Negligible
R3	<75% of the AQAL	<1%	Negligible
R4	<75% of the AQAL	<1%	Negligible
R5	<75% of the AQAL	<1%	Negligible
R6	<75% of the AQAL	<1%	Negligible
R7	<75% of the AQAL	<1%	Negligible
R8	<75% of the AQAL	<1%	Negligible

As indicated in Table 6-4, the predicted percentage change of annual mean PM_{10} concentrations at sensitive receptor is '<1% of the AQAL' at all sensitive receptors, based upon the $PM_{2.5}$ AQAL. The predicted concentration with the development is '<75% of the AQAL' at all sensitive receptors based upon the $PM_{2.5}$ AQAL. The unmitigated impact is predicted to be negligible at all sensitive receptors in accordance with the stated assessment methodology.

6.2.4 Particulate Matter 24-hour Mean Modelling Results

Based upon the maximum predicted annual mean PM_{10} concentration of 14.6µg/m^3 (receptor location R3) this equates to zero days where 24-hour mean PM_{10} concentrations are greater than 50µg/m^3. 35-days where 24-hour mean concentrations are in excess of 50µg/m^3 are permitted and, therefore, the number of maximum exceedences is in compliance with the 24-hour mean AQAL.

6.2.5 Modelling Sensitivity

Assessment sensitivity to the dispersion modelling inputs is considered and presented within Appendix C.

6.2.6 Significance of Air Quality Impacts

The EPUK and IAQM guidance[16] considers a number of factors for the determination of significance of predicted air quality impacts. Such factors include:

- the existing and future air quality in the absence of the development;
- the extent of current and future population exposure to the impacts;
- the worst-case assumptions adopted when undertaking the prediction of impacts; and
- the extent to which the development has adopted best practice to eliminate and minimise emissions.

[16] EPUK and IAQM, 'Land-Use Planning and Development Control: Planning for Air Quality', v1.2 2017.

The unmitigated impact associated with the scheme has been predicted in accordance with the stated assessment methodology. The following factors have been taken into account:

- there are no predicted exceedences of the annual mean NO_2 or PM_{10} (or $PM_{2.5}$) AQALs as a result of the development;
- a negligible impact on annual mean NO_2 concentrations has been predicted at all considered sensitive receptor locations;
- a negligible impact on annual mean PM_{10} concentrations has been predicted at all considered sensitive receptor locations, even with change in concentrations as a result of the development assessed against the more exacting $PM_{2.5}$ AQAL;
- exceedences of the 1-hour mean NO_2 and 24-hour mean PM_{10} AQALs are considered unlikely, based upon the marginal change in concentrations and absolute concentrations predicted through the dispersion modelling study; and
- modelling has been verified using 2018 monitoring data from CC's monitoring network.

A sensitivity assessment of the model input variables (emission factors and background concentrations) has been considered and is presented in Appendix C. However, the overall conclusion over the significance of the effect has been based upon the main body of the assessment and the impact assessment based upon a 2026 development opening year.

Therefore, on the basis of the above, the overall effect on air quality as a result of the additional development trips on sensitive receptors is considered to be 'not significant'.

7.0 MITIGATION MEASURES

This section presents any mitigation measures required during the construction and operational phases of the development in order to reduce the potential impact of the predicted effect.

7.1 Construction Dust Phase

Construction Phase mitigation measures are detailed within Section 5.1.5 and Table 5-4. With the effective application of the dust mitigation measures it is considered that the overall effect at all receptors will be 'not significant'.

7.2 Construction Phase Road Traffic Emissions

Potential air quality impacts associated with construction phase road traffic emissions (principally HDV movements) have been screened out for further assessment with associated impacts on air quality predicted to result in an 'insignificant' effect. Therefore, mitigation measures are not considered to be required.

7.3 Construction Phase NRMM Emissions

NRMM and plant should be well maintained. If any emissions of dark smoke occur then the relevant machinery should stop immediately and any problem rectified. In addition, the controls detailed in Section 5.2 should apply to NRMM.

Successful implementation of these mitigation measures would ensure that emissions from the construction phase and NRMM used during construction are 'not significant'.

7.4 Operational Phase Road Traffic Emissions

An assessment of vehicle emissions associated with the operation of the scheme predicted the unmitigated impact to be negligible at all considered receptors resulting in an overall 'not significant' effect on air quality.

The transport consultants for the Proposed Development have proposed a Travel Plan for the development which includes a number of mitigation measures would help to improve air quality in the locale. Reference should be made to the Travel Plan for these measures.

8.0 CONCLUSIONS

SLR has undertaken an assessment of potential air quality impacts associated with a proposed residential development at a site in Danescourt, Cardiff.

A qualitative assessment of the potential dust impacts during the construction of the development has been undertaken. Through good practice and implementation of appropriate mitigation measures, it is expected that the release of dust would be effectively controlled and mitigated, with resulting impacts considered to be 'not significant'. All dust impacts are considered to be temporary and short-term in nature.

Due to the low additional number of HDV trips anticipated during the construction phase of the development, there is predicted to be a neutral impact / insignificant effect on air quality from road vehicle emissions.

Additional development trips arising during the operational phase of the scheme are predicted to result in a negligible impact on annual mean NO_2 and PM_{10} concentrations at all considered sensitive receptors, with a maximum absolute predicted change in annual mean concentrations of +0.07µg/m^3 and +0.03µg/m^3, respectively. There is no predicted risk of exceedence of the 1-hour mean NO_2 or 24-hour mean PM_{10} AQALs as a result of the development proposals. As such, the overall effect is considered to be 'not significant'.

As such, it is not considered that air quality represents a material constraint to the development proposals, which conform to the principles of National Planning Policy Framework or Planning Practice Guidance, and the saved policies of the Cardiff Council's Local Plan Policy.

DRAWINGS


313400
313600
313800
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314200
314400
314600
314800
179800
179600
179400
179200
350m
100m
50m
20m
N
LEGEND
INDICATIVE SITE BOUNDARY
INDICATIVE SITE BOUNDARY BUFFERS
TRACKOUTS
TRACKOUT 50m BUFFER
Cardiff
0
100
200
300
400
500
Meters
Taff Housing Association
Cymdeithas Tai Taf
SLR
DE BRAOSE, DANESCOURT
AIR QUALTIY ASSESSMENT
SITE SETTING AND CONSTUCTION PHASE BUFFER ZONES
AQ1
Scale 1:5,000 @ A3
Date OCTOBER 2019
402.09803.00001.23.1.0 Site Setting and Construction Phase Buffer Zones
Service Layer Credits: (c) OpenStreetMap and contributors, Creative Commons-Share Alike License (CC-BY-SA)
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
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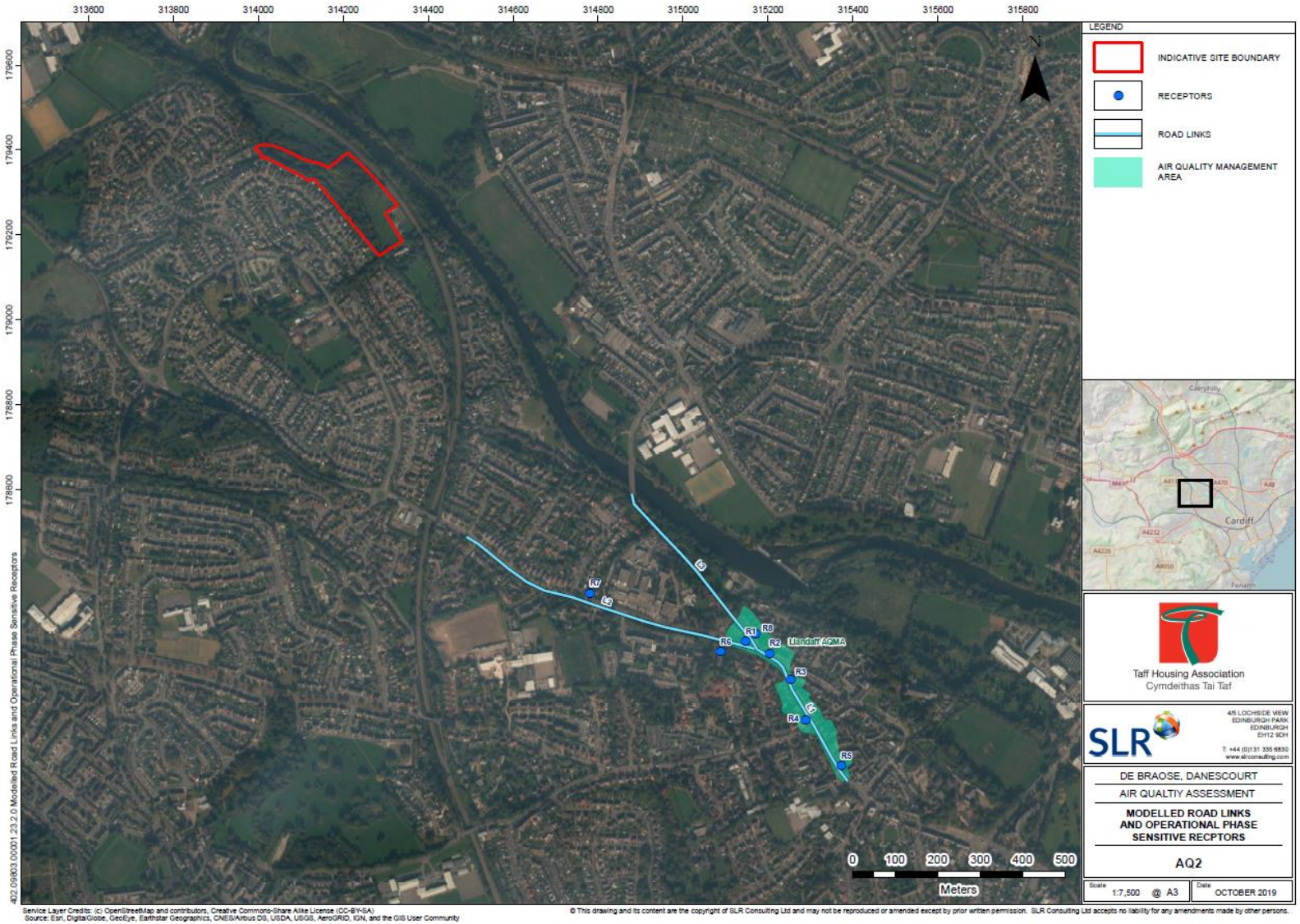

Appendix A – Construction Dust Assessment Methodology

Predicting Risk

The assessment of risk is determined by considering the predicted change in conditions as a result of the development. The risk category for potential dust effects arising from site works is defined into 4No. potential activities:

- demolition;
- earthworks;
- construction; and
- trackout.

The determination of risk categories presented above are based upon the descriptors presented within IAQM: Guidance on the assessment of dust from demolition and construction.

Sensitivity of Receptor

To determine the significance of dust effects associated with the construction phase of the development, an evaluation of the sensitivity of the surrounding area is required. Receptors can demonstrate different sensitivities to changes in their environment, and are classified as detailed within Table A-1.

Quoted distances to the nearest receptor are from the dust emission sources. Where this is not known, receptor distances are determined from the site boundary. The risk category is based upon the distance of site works to the nearest receptor.

Table A-1
Methodology for Defining Sensitivity to Dust Effects

Sensitivity of Area	Examples		
	Human Receptors		Ecological Receptors [A]
	Dust Soiling Effects	Health Effects of PM_{10}	
High	• users can reasonably expect an 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 include dwellings, museums and other culturally important collections, medium and long term car parks and car showrooms.	• locations where members of the public are exposed over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day). • Indicative examples include residential properties. Hospitals, schools and residential care homes should also be considered as having equal sensitivity to residential areas for the purposes of this assessment.	• locations with an international or national designation and the designated features may be affected by dust soiling; or • locations where there is a community of a particularly dust sensitive species such as vascular species included in the Red Data List For Great Britain. • indicative examples include a Special Area of Conservation (SAC) designated for acid heathlands or a local site designated for lichens adjacent to the demolition of a large site containing concrete (alkali) buildings.
Medium	• users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level	• locations where the people exposed are workers, and exposure is over a time period relevant to the air quality	• locations where there is a particularly important plant species, where its dust

Sensitivity of Area	Examples		
	Human Receptors		Ecological Receptors [A]
	Dust Soiling Effects	Health Effects of PM_{10}	
	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 include parks and places of work.	objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day). • indicative examples include office and shop workers, but will generally not include workers occupationally exposed to PM_{10}, as protection is covered by Health • and Safety at Work legislation.	sensitivity is uncertain or unknown; or • locations with a national designation where the features may be affected by dust deposition. • indicative example is a Site of Special Scientific Interest (SSSI) with dust sensitive features.
Low	• the enjoyment of amenity would not reasonably be expected; or • property 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	• locations where human exposure is transient. • indicative examples include public footpaths, playing fields, parks and shopping streets.	• locations with a local designation where the features may be affected by dust deposition. • indicative example is a local Nature Reserve with dust sensitive features.

Sensitivity of Area	Examples		
	Human Receptors		Ecological Receptors (A)
	Dust Soiling Effects	Health Effects of PM_{10}	
	to be present only for limited periods of time as part of the normal • pattern of use of the land. • indicative examples include playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks and roads.		
Notes: (A) Only applicable if ecological habitats are present which may be sensitive to dust effects.			

Assessment of Impact Significance – Dust Effects

Table A-2 to Table A-4 illustrate how the sensitivity of the area may be determined for dust soiling, human health and ecosystem impacts, respectively. The highest level of sensitivity from each table should be recorded.

Table A-2
Sensitivity of Area to Dust Soiling Effects on People and Property

Receptor Sensitivity	Number of Receptors	Distance from Source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10 – 100	Medium	Medium	Low	Low
	1 – 10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	<1	Low	Low	Low	Low

Table A-3
Sensitivity of Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM_{10} Concentration	Number of Receptors	Distance from the Source (m)				
			<20	<50	<100	<200	<350
High	>32µg/m^3	>100	High	High	High	Medium	Low
		10 – 100	High	High	Medium	Low	Low
		1 – 10	High	Medium	Low	Low	Low
	28 – 32µg/m^3	>100	High	High	Medium	Low	Low
		10 – 100	High	Medium	Low	Low	Low
		1 – 10	High	Medium	Low	Low	Low
	24 – 28µg/m^3	>100	High	Medium	Low	Low	Low
		10 – 100	High	Medium	Low	Low	Low
		1 – 10	Medium	Low	Low	Low	Low
	<24µg/m^3	>100	Medium	Low	Low	Low	Low
		10 – 100	Low	Low	Low	Low	Low
		1 – 10	Low	Low	Low	Low	Low
Medium	>32µg/m^3	>10	High	Medium	Low	Low	Low
		1 – 10	Medium	Low	Low	Low	Low

	28 – 32µg/m^3	>10	Medium	Low	Low	Low	Low
		1 – 10	Low	Low	Low	Low	Low
	24 – 28µg/m^3	>10	Low	Low	Low	Low	Low
		1 – 10	Low	Low	Low	Low	Low
	<24µg/m^3	>10	Low	Low	Low	Low	Low
		1 – 10	Low	Low	Low	Low	Low
Low	-	1	Low	Low	Low	Low	Low

Table A-4
Sensitivity of Area to Ecological Impacts

Receptor Sensitivity	Distance from the Source (m) (A)	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low
Note: (A) For trackout, the stand-offs should be measured from the side of the roads used by construction traffic.		

Defining the Risk of Impact

Table A-5 to Table A-8 illustrates how the dust emission magnitude should be combined with the sensitivity of the area to determine the risk of impacts with no mitigation measures applied.

Table A-5
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-6
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-7
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-8
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 Input, Verification and Performance

Model Input Summary

The modelling parameters are summarised in Table B-1.

Table B-1
Summary of Modelling Inputs

Parameter	Description	Input Variable
Surface Roughness	Surface roughness of the modelling domain as a function of land use	A roughness length z0 of 0.5m was used within the assessment area of this dispersion modelling study. This value is for 'parkland, open suburbia' and therefore considered appropriate for the surface roughness of the dispersion modelling assessment area.
Road Source Emissions	Source of the emission factors used	EFT v.9.0
Emission Year	Modelling year used to factor the traffic emissions	2026 opening year 2018 verification year
Road Type	Road type within the EFT emission database	Urban (not London)
Elevation of Road	Height of the road link above ground level	None
Road Width	Width of the road link	Road width obtained from OS map
Road Speed	Road speed in km/h	Variable based on posted limit and adjustment for road geometry in line with LAQM.TG(16)
Time Varied Emissions	Daily, weekly or monthly variations in emissions applied to road sources	None – AADT modelled to determine annual mean impacts.
Meteorology	Representative hourly sequential meteorological data	Cardiff Airport 2018
Background	Background pollutant concentration considered during the modelling	Defra Mapped backgrounds (2017 base year) projected to 2026 for assessment. The 'in-grid square' contribution from 'primary 'A' road' have been removed, where relevant, from the background annual mean NOx concentration estimates, and background annual mean NO_2 estimates have been corrected using Defra's Background Sector Removal Tool

Output	Output as gridded or specified points	At specified points as detailed.
Pollutant Output	Pollutants modelled and averaging time	NO_2 and PM_{10} annual mean.

Traffic Data

The traffic flow data was provided by Vectos and applied in the assessment as detailed in Table B-2 below.

The following committed developments have been included within both the 'do-minimum' and 'do-something' scenarios:

- 14/02188/MJR – Land South of Pentrebane Rd – approved 13/12/16
  Up to 290 residential dwellings (C3), open space (including childrens play space), landscaping, sustainable urban drainage, vehicular access, pedestrian and cycle accesses and related infrastructure and engineering works;
- 14/02157/MJR – Land North and South of Llantrisant Rd – outline application approved 09/08/2016.
  The development of up to 630 residential dwellings (use class c3, including affordable homes), primary school (use class d1), visitor centre/community centre (use class d1), community centre (use class d1), open space (including children's play spaces), landscaping, sustainable urban drainage, vehicular accesses, bus lanes, pedestrian and cycle accesses and related infrastructure and engineering works;
- 14/02733/MJR – North West Cardiff – approved 20/03/2017
  Outline planning application with all matters reserved apart from strategic access junctions for residential-led mixed use development, to be developed in phases, including preparatory works as necessary including demolition and re-grading of site levels; up to 5,970 residential units (use class c3, including affordable homes); 3 no. Local centres providing residential units, convenience shops and facilities/services (including up to 7,900 sq m in use classes a1-a3) and 1no. District centre providing residential units, up to 12,000 sq m in use classes a1-a3 including up to two food stores (up to 5,000 sq m gross) with associated parking, up to 15,500 sq m of use class b1(a), b1(b) and b1(c); provision of up to 5,100 sq m of community and healthcare facilities across the district and local centres (use classes d1 and d2); provision for 3no. Primary schools and 1no. Secondary school; open space including allotments; parks; natural and semi natural green space; amenity green spaces; facilities for children and young people; outdoor sports provision including playing pitches; associated infrastructure and engineering works including new vehicular accesses, improvement works to the existing highway network, new roads, footpaths/cycleways, a reserved strategic transport corridor; up to 1 no. Electricity primary-substation and landscaping works (including suds);
- 16/00106/MJR – Goitre Fach Farm, Llantrisant Rd – approved 27/04/17
  Outline planning application (all matters reserved apart from strategic vehicular, cycle and pedestrian access into the site) for the demolition of existing buildings and residential development of up to 300 dwellings on site to include open space (including children's play space), landscaping. Sustainable urban drainage, vehicular access, pedestrian and cycle accesses and related infrastructure and engineering works; and
- 14/00852/DCO – Land to the North of M4 Junction 33 – approved 07/09/2017
  Comprehensive development of 'Land to the North of Junction 33 of the m4' to create a new community containing: A range of new homes, including houses, apartments and some sheltered accommodation for the elderly (Use Classes C2 and C3), a park and ride facility and transport interchange or hub, community facilities including a new primary school and community centre (Use Class D1), a local centre including shops (Use Class A1), financial and professional (Use Class A2), food and drink (Use Class A3)

and a clinic or surgery (Use Class D1), new offices, workshops and research and development facilities (Use Classes B1 with ancillary B2 and B8), a network of open spaces including parkland, footpaths, sports pitches and areas for informal recreation, new roads, parking areas, accesses and paths, other ancillary uses and activities, and requiring; site preparation, the installation or improvement of services and infrastructure; the creation of drainage channels; improvements/works to the highway network and other ancillary works and activities.

Table B-2
Traffic Flow (AADT)

Ref	Description	2026 Opening Year			Speed (km/h) (A)
		AADT 'Do-minimum'	AADT 'Do-something'	% (>3.5t)	
L1	A4119 Cardiff Road - East of Bridge Road	15,750	15,894	9.04	48
L2	A4119 Llantrisant Road - West of Bridge Road	14,841	15,018	9.04	48
L3	A4054 Bridge Road – north of A4119	9,849	9,883	9.04	48
Note: (A) Where relevant, links have been modelled with an additional slow down link modelled at 20kmph.					

Model Verification

Appropriate traffic data for the 2018 verification year was sourced from the Department for Transport (DfT) Matrix[17] which presents estimated and monitored traffic flows on every link of the 'A' road and motorway network in Great Britain. Traffic data was obtained from the DfT Matrix for a count point located on A4119 Cardiff Road - East of Bridge Road (count point number 10655) and A4119 Llantrisant Road - West of Bridge Road (count point 30659).

The traffic flow data applied in the 2018 verification assessment is detailed in Table B-3 below.

Table B-3
2018 Traffic Flow (AADT)

Ref	Description	2018 Verification Year		Speed (A)
		AADT	% (>3.5t)	(km/h)
L1	A4119 Cardiff Road - East of Bridge Road	17,503	2.42	48
L2	4119 Llantrisant Road - West of Bridge Road	15,929	1.99	48
Note:				

[17] http://www.dft.gov.uk/matrix/

Ref	Description	2018 Verification Year		Speed (A)
		AADT	% (>3.5t)	(km/h)
(A) Where relevant, links have been modelled with an additional slow down link modelled at 20kmph.				

Calculation of Correction Factors

The model output of road-NO_x (i.e. the component of total NO_x coming from road traffic exhaust emissions) has been compared with the 'measured' road-NO_x.

For this calculation, the following assessment inputs were used, which are considered to be representative of the development locale:

- DEFRA's NOx to NO_2 calculator version 7.1;
- 'Cardiff' was selected as the 'Local Authority';
- 2018 NO_2 monitoring locations 33, 99 and 208 from the CC monitoring network; and
- 2018 DEFRA mapped background for the grid square containing the above monitoring locations (NGR: x315500, y178500).

Monitoring data versus modelling data is shown in Table B-4 below with the applied primary adjustment factors. The final verification results are graphed in Figure B-1.

Table B-4
Verification Data 2018

Monitoring Location	Modelled NO_X Road Contribution ($\mu g/m^3$)	Calculated NO_X Road Contribution ($\mu g/m^3$)	Adjusted Modelled NO_X Road Contribution ($\mu g/m^3$)	Monitored NO_2 Concentration ($\mu g/m^3$)	Adjusted Modelled NO_2 Concentration ($\mu g/m^3$)	Difference (%)
33	6.5	36.2	22.4	32.5	26.0	-19.88
99	9.6	34.4	33.1	31.7	31.1	-1.89
208	9.3	21.1	32.0	25.4	30.6	20.43
Adjustment Factor			**3.4485**			

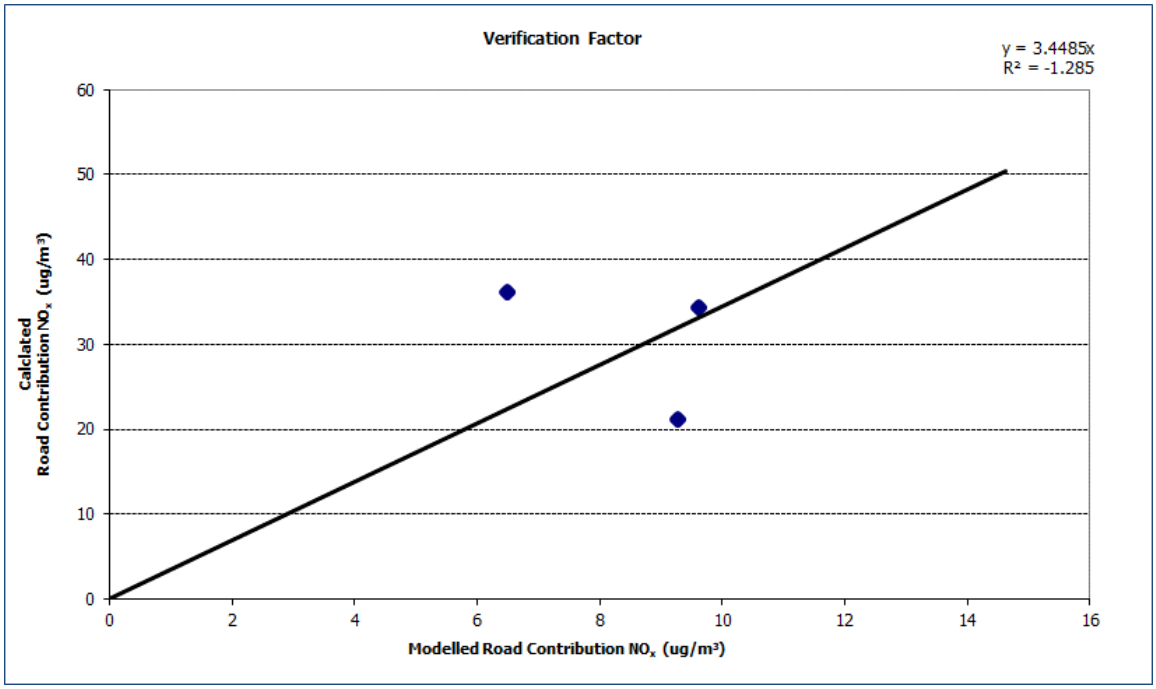

Figure B-1
Final Verification and Adjustment

As stated in Table B-4 and Figure B-1, the verification process calculated a factor from an average of all considered monitoring results of **3.4485**.

Model Performance

An evaluation of model performance has been undertaken to establish confidence levels in model results, based upon the calculated average factor of 2.7638 and the precautionary factor of 1. LAQM.TG(16) identifies a number of statistical procedures that are appropriate to evaluate model performance and assess uncertainty. The statistical parameters used in this assessment are:

- Root mean square error (RMSE); and
- Fractional bias (FB).

A brief for explanation of each statistic is provided in Table B-5, and further details can be found in LAQM.TG(16).

Table B-5
Model Performance

Parameter	Comments	Value
Root Mean Square Error	RMSE is used to define the average error or uncertainty of the model. The units of RMSE are the same as the quantities compared If the RMSE values are higher than ±25% of the objective being assessed, it is recommended that the model inputs and verification should be revisited in order to make improvements. For example, if the model predictions are for the annual mean NO_2 objective of 40µg/m^3, if an RMSE of 10µg/m^3 or above is determined for a model, the local authority would be advised to revisit the model parameters and model verification. Ideally an RMSE within 10% of the	4.79µg/m^3 (i.e. 11.9% of the AQAL)

	air quality objective would be derived, which equates to 4µg/m^3 for the annual average NO_2 AQAL.	
Fractional Bias	It is used to identify if the model shows a systematic tendency to over or under predict. FB values vary between +2 and -2 and has an ideal value of zero. Negative values suggest a model over-prediction and positive values suggest a model under-prediction.	0.0210906

As indicated in Table B-5, for the factor of 3.4485, the RMSE value is calculated to be 4.79g/m^3/11.9% and therefore within ±25% of the annual mean AQAL for all monitoring locations considered within the verification assessment. Furthermore, the FB is calculated to be 0.0210906 and within the required +2 and -2 range.

Therefore, model performance and uncertainty is considered to be satisfactory and all monitoring locations have been retained within the verification study.

APPENDIX C – Sensitivity Assessment Results

Table C-1 below presents the maximum modelled annual mean NO_2 concentrations at each of the sensitive receptors detailed in Table 4-1 and displayed in Drawing AQ2.

In summary, the sensitivity assessment has utilised the following inputs as a precautionary approach:

- 2018 emission factors from v9.0 of the EFT (to represent the base year); and
- 2018 mapped background concentrations the DEFRA mapping study.

Predicted annual mean NO_2 concentrations were assessed against the AQAL of 40µg/m^3.

Table C-1
Summary of Predicted Annual Mean NO_2 Concentrations: Road Vehicle Emissions

Receptor	Predicted 2018 NO_2 Concentration (µg/m^3) (A)		Change (µg/m^3)	Change as a Percentage of the AQAL (%)
	'Do-minimum'	'Do-something'		
R1 (B)	38.2	38.3	+0.12	0.30
R2 (B)	40.6	40.8	+0.13	0.32
R3 (B)	35.7	35.8	+0.12	0.30
R4 (B)	30.7	30.8	+0.09	0.23
R5 (C)	32.1	32.2	+0.10	0.25
R6 (B)	22.8	22.8	+0.06	0.15
R7 (D)	21.3	21.3	+0.07	0.18
R8 (B)	28.5	28.6	+0.05	0.13

Note:
(A) Scenario modelled as an assumed 2026 development opening year, with 2018 emission factors and 2018 mapped background pollutant concentrations.
(B) Annual mean concentrations inclusive of 2018 apportioned background concentration of 14.1µg/m^3.
(C) Annual mean concentrations inclusive of 2018 apportioned background concentration of 15.4µg/m^3.
(D) Annual mean concentrations inclusive of 2018 apportioned background concentration of 13.4µg/m^3

As shown in Table C-1, there are exceedences of the annual mean NO_2 AQAL predicted at receptor location R2 in both the 'do-minimum' and 'do-something' scenario. No other sensitive receptors predict exceedences of the annual mean NO_2 AQAL, in either scenario. The maximum predicted change in annual mean NO_2 concentrations associated with additional development trips is +0.13µg/m^3, representing 0.32% of the AQAL, as predicted at sensitive receptor location R2.

Predicted impacts on annual mean NO_2 concentrations are summarised in Table C-2, based upon the descriptors presented within EPUK and IAQM guidance[18].

[18] EPUK and IAQM, 'Land-Use Planning and Development Control: Planning for Air Quality', v1.2 2017.

Table C-2
Summary of Predicted Annual Mean NO_2 Impacts: Road Vehicle Emissions

Receptor	Concentration with the Development	Percentage Change Relative to AQAL (%)	Impact
R1	95 – 102% of the AQAL	<1%	Slight, adverse
R2	95 – 102% of the AQAL	<1%	Slight, adverse
R3	76 – 94% of the AQAL	<1%	Negligible
R4	76 – 94% of the AQAL	<1%	Negligible
R5	76 – 94% of the AQAL	<1%	Negligible
R6	<75% of the AQAL	<1%	Negligible
R7	<75% of the AQAL	<1%	Negligible
R8	<75% of the AQAL	<1%	Negligible

As indicated in Table C-2, the predicted percentage change of annual mean NO_2 concentrations remains to be '<1% of the AQAL' at all considered receptors. The predicted concentration with the development is '95 – 102% of the AQAL' at R1 and R2, '76 – 94% of the AQAL' at R3, R4 and R5 and '<75% of the AQAL' at all other considered sensitive receptors. An unmitigated 'slight, adverse' impact is predicted at R1 and R2 and a 'negligible' impact is predicted all other sensitive receptors in accordance with the assessment methodology.

Analysis of Assessment Sensitivities

Sensitivity modelling has been undertaken which utilises 2018 emission factors (EFT v9.0) and 2018 background concentrations (May 2019 DEFRA release, mapping base year) to reflect the 2026 development opening year. This scenario does not predict any exceedances of the annual mean NO_2.

The unmitigated impact is predicted to be 'negligible' at all receptor locations in accordance with the assessment methodology.

It is noted that this precautionary assessment assumes that road traffic emission factors and background concentrations in the 2026 development opening year will remain at the 2018 base year level. Furthermore, the precautionary assessment assumes that road traffic flows predicted in the 2026 development opening year will occur in 2018.

DEFRA projections and the basis for future year road traffic emission factor reductions are based upon a number of assumptions, including the following:

- improvements in the fleet composition based on European emission factor standards from pre-Euro I/1 to Euro VI/6, resulting in lower exhaust emissions, particularly from September 2014 when all new vehicles are required to be Euro VI compliant;
- improvements in the quality of fuel and some degree of retrofitting, resulting in lower exhaust emissions; and
- improvements and conversions in the technology of National fleet vehicles, resulting in lower exhaust emissions.

It is considered that the 2018 modelling predictions presented within this sensitivity modelling are worst-case reflections to provide confidence in the modelling predictions, and do not reflect likely impacts from additional development trips in the development opening year. Actual impacts in the development opening year are likely to be lower than those predicted given the projected road traffic exhaust emission factor improvements, as

indicated by the impact assessment scenario and modelled concentrations in the main body of the reporting text.

DEFRA mapped background concentrations and their future year projections are based on a number of assumptions which include the following:

- all assumptions underlying the latest (2017) NOx emission projections for road transport, as detailed above;
- updated road transport forecasts for Great Britain from the DfT;
- updated assumptions on diesel car penetration rates provided by the DfT; and
- updated vehicle sales projections for cars and LGVs based on information provided by the DfT.

In relation to trends in air pollutant concentrations within CC's area, including those of NO_2, a review of the CC 2018 Air Quality Annual Status Report states, with reference to Figure 2.4, *'The graph represents annual average bias corrected NO_2 data since 2002 at long-term standing diffusion tube monitoring locations. The displayed average datasets indicate compliant NO_2 results for 2017. The results are somewhat stable with a slightly decreasing trend evident.'*

On this basis, and given the witnessed reduction trend in annual mean NO_2 concentration within the CC network, the precautionary approach of using 2018 mapped background concentrations to reflect the 2026 development opening year is considered likely to overestimate background concentrations in 2026, given the 8-year difference. On this basis, compliance with the annual mean AQAL is considered to be indicated by the impact assessment scenario and modelled concentrations in the main body of the reporting text.

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313400 313600 313800 314000 314200 314400 314600 314800

179800 179600 179400 179200

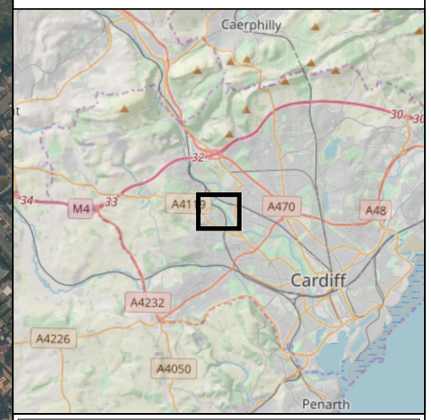
350m
100m
50m
20m

N

0 100 200 300 400 500
Meters

LEGEND

- INDICATIVE SITE BOUNDARY
- INDICATIVE SITE BOUNDARY BUFFERS
- TRACKOUTS
- TRACKOUT 50m BUFFER



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DE BRAOSE, DANESCOURT

AIR QUALTIY ASSESSMENT

SITE SETTING AND CONSTUCTION PHASE BUFFER ZONES

AQ1

Scale 1:5,000 @ A3

Date OCTOBER 2019

402.09803.00001.23.1.0 Site Setting and Construction Phase Buffer Zones

313600 313800 314000 314200 314400 314600 314800 315000 315200 315400 315600 315800

179600 179400 179200 179000 178800 178600

N

L5 L4 L2

R7 R6 R1 R8 R2 R3 R4 R5

Llandaff AQMA

0 100 200 300 400 500

Meters

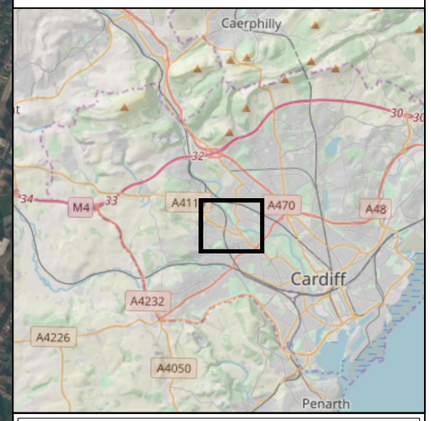
LEGEND

INDICATIVE SITE BOUNDARY

RECEPTORS

ROAD LINKS

AIR QUALITY MANAGEMENT AREA



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DE BRAOSE, DANESCOURT

AIR QUALTIY ASSESSMENT

MODELLED ROAD LINKS AND OPERATIONAL PHASE SENSITIVE RECPTORS

AQ2

Scale 1:7,500 @ A3

Date OCTOBER 2019

402.09803.00001.23.2.0 Modelled Road Links and Operational Phase Sensitive Receptors