



Lidl, King's Meadow, Brecon

Air Quality Assessment

Lidl Great Britain Ltd

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Appendices

- Appendix A Legislation and Planning Policy**
- Appendix B Construction Dust Mitigation Measures**
- Appendix C Model Inputs and Verification**



1.0 Introduction

SLR Consulting Ltd (SLR) has been commissioned by Lidl Great Britain Ltd (Lidl) to undertake an air quality assessment to support a planning application for a food store and associated infrastructure (the 'Proposed Development') at King's Meadow, Brecon (the 'Site').

The Site is located at the approximate National Grid Reference (NGR): x303190, y228270, within the administrative areas of Bannau Brycheiniog National Park Authority (BBNPA) and Powys County Council (PCC). BBNPA is the Local Planning Authority (LPA) for the Site, while PCC is responsible for Local Air Quality Management (LAQM).

The Site is bound by:

- The Tarell Roundabout immediately to the north with the Brecon Golf Course and River Usk beyond;
- The A40 and Afon Tarell immediately to the east with residential premises associated with Brecon beyond;
- The Afon Tarell immediately to the south with existing commercial land beyond; and
- The A470 immediately to the west with existing commercial land beyond.

Vehicular access to the Site is proposed via the A470 to the west.

1.1 Scope of Assessment

Pre-assessment consultation with the Environmental Health Officer (EHO) at PCC¹ was undertaken to agree the scope and methodology of the air quality assessment. The following scope of works has been undertaken as agreed with PCC and in accordance with national and local planning policies, guidance and established best practice:

- Baseline Evaluation;
- Construction Phase Assessment;
- Operational Phase Assessment; and
- Mitigation Measures.

¹ Email to SLR from Ella Flanagan Jones, PCC Environmental Protection Officer, dated 18/08/2026.



2.0 Environmental Standards

2.1 Air Quality

The relevant environmental standards for the protection of human health are presented below. Further detail and context are outlined in Appendix A.

The ambient air quality standards of relevance to this assessment (collectively termed Air Quality Assessment Levels (AQALs) throughout this report) are provided in Table 2-1. These are primarily based upon the Air Quality Objectives Local Authorities are responsible for achieving. The PM_{2.5} AQSR AQAL has also been included for completeness recognising that PM_{2.5} is not currently a statutory Air Quality Objective within the Welsh LAQM framework.

Table 2-1: Relevant Ambient AQALs (Wales)

Pollutant	AQAL (µg/m ³)	Averaging Period
Nitrogen dioxide (NO ₂)	40	Annual mean
	200	1-hour mean (not to be exceeded on more than 18 occasions per annum)
Particles (as PM ₁₀)	40	Annual mean
	50	24-hour mean (not to be exceeded on more than 35 occasions per annum)
Particles (as PM _{2.5})	20 (10 proposed in 2035)	Annual mean

In accordance with Department for Environment, Food & Rural Affairs (Defra's) technical guidance on Local Air Quality Management (LAQM.TG(22))², the AQALs in Table 2-1 should only be assessed at locations of relevant public exposure, where people may be present for the duration of the specified averaging period. The AQALs do not apply to exposure at the workplace.

A summary of the typical relevant locations associated with each applicable AQAL assessed is detailed below in Table 2-2.

Table 2-2: Human Health Relevant Exposure

AQAL Averaging Period	AQALs Should Apply At	AQALs Should Not Apply At
Annual mean	Building facades of residential properties, schools, hospitals etc.	Facades of offices Hotels Gardens of residences Kerbside sites
24-hour mean	As above together with hotels and gardens of residential properties	Kerbside sites where public exposure is expected to be short term
1-hour mean	As above together with kerbside sites of regular access, car parks, bus stations etc.	Kerbside sites where the public would not be expected to have regular access

² Defra in partnership with the Scottish Government, Welsh Government and Department of Agriculture, Environment and Rural Affairs Northern Ireland, Local Air Quality Management Technical Guidance 22, May 2025.



2.2 Ecosystems and Vegetation

In the UK, sites of ecological importance are provided environmental protection from activities through the application of standards known as Critical Levels (CL_e) and Critical Loads (CL_o).

2.2.1 Critical Levels

CL_e are a quantitative estimate of exposure to one or more airborne pollutants in gaseous form, below which significant harmful effects on sensitive elements of the environment do not occur, according to present knowledge.

CL_e for the protection of vegetation and ecosystems apply irrespective of habitat type and are based on the concentration of the relevant pollutants in ambient air. The CL_e of relevance to this assessment are provided in Table 2-3.

Table 2-3: Critical Levels for the Protection of Vegetation and Ecosystems

Pollutant	Concentration (µg/m ³)	Averaging Period	Habitat
Nitrogen Oxides (NO _x)	30	Annual Mean	All
	75	Daily Mean	
Ammonia (NH ₃)	1	Annual Mean	Habitat dependant: where lichens or bryophytes are present.
	3		All other

2.2.2 Critical Loads

CL_o are a quantitative estimate of exposure to deposition of one or more pollutants, below which significant harmful effects on sensitive elements of the environment do not occur, according to present knowledge.

Nutrient nitrogen and acidification CL_o are site specific. CL_o for the habitats and species of relevance to this assessment have been obtained from the Air Pollution Information System (APIS) website³.

To ensure a worst-case approach, the most sensitive qualifying habitat at each designated site has been selected where applicable. These values are presented in Section 4.4.

³ Air Pollution Information System <http://www.apis.ac.uk/>



3.0 Assessment Methodology

3.1 Construction Phase

A Construction Dust Assessment has been undertaken in accordance with Institute of Air Quality Management (IAQM) Guidance on the Assessment Dust from Demolition and Construction (the 'IAQM Construction Dust guidance')⁴.

Initially, proposed construction activities are reviewed to inform the dust emission magnitude potential, without considering mitigation. This is performed for the full life cycle of construction, targeting four discrete activities:

- **Demolition:** Removal of existing structures;
- **Earthworks:** Soil-stripping, levelling, excavation, and landscaping;
- **Construction:** Activities involved in creating or modifying structures; and
- **Trackout:** Dust resuspension by Heavy-Duty Vehicles (HDVs) on public and haul roads.

Separately, the sensitivity of the surrounding area is characterised with reference to three discrete impacts. These include:

- Dust soiling effects on people and property;
- The risk of health effects due to an increase in exposure to PM₁₀; and
- Harm to ecological receptors.

Once identified, the likely dust emission magnitude is considered in conjunction with the sensitivity of the surrounding area to determine the risk of impact iteratively for each activity (as activity and receptor context can vary). The maximum risk level is then used as a benchmark to inform mitigation measures (Appendix B).

The overall aim is to determine the proportionate level of mitigation necessary to prevent significant effects on receptors from construction activities. Upon successful implementation of these controls, residual effects associated with construction dust are expected to be 'not significant'. To confirm this, the controls are supplemented by a communication and monitoring framework to evaluate effectiveness and determine whether any additional measures are required.

Given the short-term nature of the construction phase and the low volume of vehicle movements that will likely arise, it is unlikely that significant air quality effects from development related road traffic emissions during the construction phase will arise. Such potential effects have therefore been scoped out from requiring detailed assessment based on their assumed 'insignificant' effect as per the Environmental Policy Implementation Community (EPIC) & IAQM guidance⁵.

3.2 Operational Phase

A dispersion modelling assessment of road traffic emissions has been undertaken to identify operational phase road traffic impacts. This has utilised the Cambridge Environmental Research Consultants (CERC) ADMS-Roads v5.1 dispersion model. This has focussed on concentrations of NO_x, NO₂, PM₁₀, PM_{2.5} and NH₃ for the following scenarios:

⁴ IAQM, Guidance on the Assessment Dust from Demolition and Construction, v2.2 January 2024.

⁵ EPIC & IAQM, Land-Use Planning & Development Control: Planning for Air Quality, January 2017.



- 2024 Baseline (2024 BS) – Base flows for the model verification exercise; and
- 2028 Do Minimum (2028 DM) – Future baseline flows (inclusive of any relevant committed development flows) corresponding to the earliest potential opening year of the Proposed Development; and
- 2028 Do Something (2028 DS) – 2028 DM scenario plus additional traffic generated by the Proposed Development once operational (including the proposed car park).

To disaggregate in-combination impacts on designated ecological sites, an additional modelled scenario was included for 2028; comprising future baseline flows without the addition of committed developments (i.e. 2028 DM minus committed development flows).

For the above scenarios, concurrent emissions factors and background pollutant concentrations have been applied.

The dispersion modelling exercise has been undertaken in accordance with Defra's LAQM.TG(22). Details of model inputs are discussed in turn below and traffic data inputs are presented in Appendix C.

3.2.1 Traffic Data

Traffic data inputs have been provided by SCP Transport, the appointed transport consultant.

To initially inform the spatial extent of the model, changes in traffic volumes on public roads as a result of the Proposed Development were compared to ecological and human screening thresholds. These are discussed in turn below. Where the screening thresholds are exceeded, the 'affected road network' has been included within the dispersion model.

Two road traffic domains have been modelled. The first represents the study area and includes the modelled road network used for the assessment of human and ecological receptors. The second represents an additional model verification area, developed to support verification of the modelled results through comparison with available monitoring data within Brecon. The model verification area does not form part of the assessment study area.

Traffic speeds were modelled at the relevant speed limit for each road. However, where appropriate, the speeds have been reduced to simulate queues at junctions, traffic lights and other locations where queues or slower traffic are known to be an issue, in accordance with LAQM.TG(22). Traffic speeds have been assumed to be consistent across all the modelled scenarios.

For NO_x, PM₁₀ and PM_{2.5}, the Emissions Factors Toolkit (EFT) version 14.1 developed by Defra⁶ has been used to determine vehicle emission factors for input into the ADMS-Roads dispersion model. For NH₃, the Calculator for Road Emissions of Ammonia (CREAM) version 2a⁷ has been used to determine vehicle emission factors for input into the ADMS-Roads dispersion model.

Details of the traffic flows and advanced model inputs used in the assessment are provided in Appendix C, whilst the modelled roads in relation to the Site are presented in Figure 3-2.

3.2.1.1 Human Receptor Initial Screening Criteria

The screening criteria provided in the EPIC & IAQM guidance document has initially been used to determine whether further assessment of operational traffic on sensitive human

⁶ Defra, EFT v14.1 (2026).

⁷ Air Quality Consultants, CREAM v2a (2025).



receptor locations is required. Specific to roads located outside of an Air Quality Management Area (AQMA):

- A change of light duty vehicle (LDV) flows of more than 500 24-hour Annual Average Daily Traffic (AADT); and/ or
- A change of HDV flows of more than 100 AADT.

3.2.1.2 Ecological Receptor Initial Screening Criteria

The screening criteria provided in the Natural Resource Wales (NRW) guidance⁸ document has initially been used to determine whether further assessment of operational traffic on sensitive ecological designations is required.

Further consideration is required where any ecological designations with sensitive qualifying features are located within 200m of a road link projected to experience the following developmental-generated vehicle movements:

- >1,000 LDV; and/or
- >200 HDVs.

For the purposes of assessing impacts on internationally and nationally designated ecological sites, screening of development-generated trips has been undertaken in-combination with other projects and plans. Whilst assessing impacts on local ecological designations, it is appropriate to assess developmental trips in isolation. This is reflective of the level of protection afforded to these sites.

If the above conditions are not met, then impacts on ecological designations are likely to be imperceptible, whereby resultant effects are considered to be not significant.

As per the Joint Nature Conservation Committee (JNCC) guidance⁹, road links associated with strategic 'trunk roads' (i.e. the Strategic Road Network (SRN)) have been excluded. The SRN forms the national transport system, central to long distance travel and connectivity as a consequence of predicted growth across the UK and does not need to be considered within assessments concerning individual developments. The effects of development on traffic flows on the SRN are more appropriately taken into account as part of national and regional strategic plan level assessments. However, they have been included within the dispersion modelling exercise (where relevant) to facilitate a cumulative assessment; omission may underpredict modelled concentrations.

3.2.2 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.

From a review of local meteorological observation sites, Sennybridge No. 2 was identified as the observation site closest to the Site, located approximately 20 km to the northeast. The Sennybridge No. 2 observation site is approximately 110m higher in elevation than the Site. Given the separation distance and difference in elevation, the dispersion modelling has instead been undertaken using 2024 Numerical Weather Prediction (NWP) data centred on the Site.

⁸ NRW, Assessing air quality impacts as part of your planning application. Dated 24th Jul 2026.

⁹ JNCC Report No. 696. Main Report Guidance on Decision-making Thresholds for Air Pollution. Dated December 2021.



LAQM.TG(22) recommends that meteorological data should have a percentage of usable hours greater than 85%. The 2024 NWP dataset includes 8,783 lines of usable hourly data for the year, i.e. 100% usable data. This is therefore suitable for the dispersion modelling exercise.

A wind rose for the 2024 NWP dataset is presented in Figure 3-1.

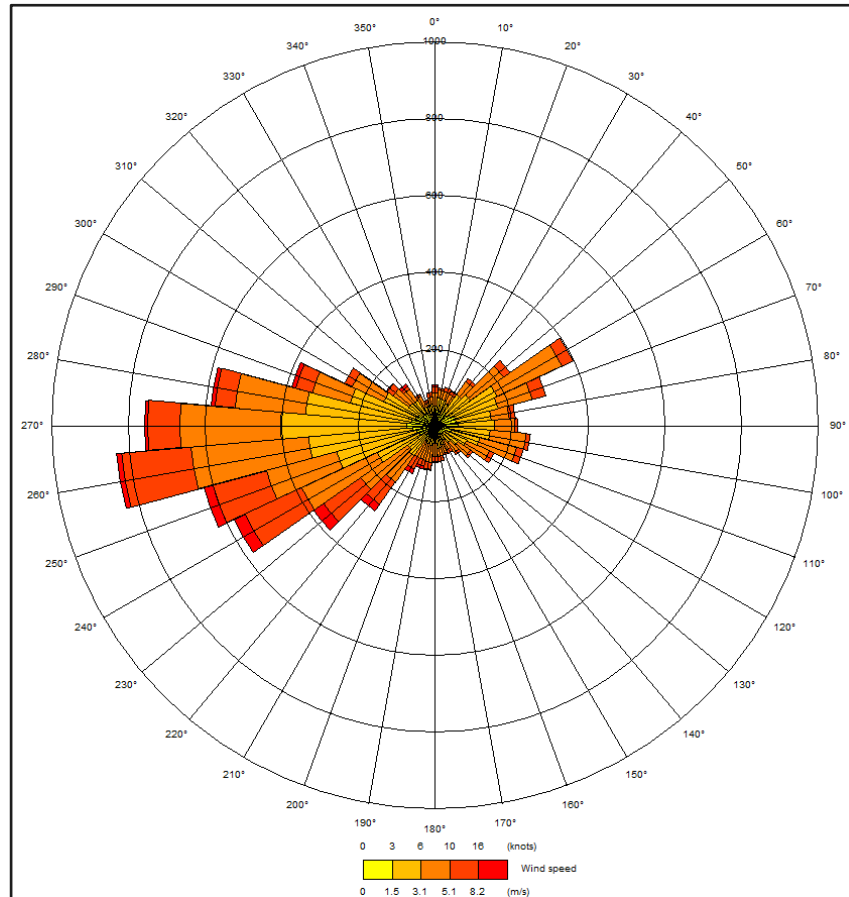


Figure 3-1: Wind Rose for 2024 NWP Dataset Centred on the Site

3.2.3 Sensitive Receptors

3.2.3.1 Human Receptors

Human receptors considered in the assessment of road traffic emissions are provided within Table 3-1, whilst their locations are illustrated in Figure 3-2.

Existing human receptors HR1 – HR6 are representative of worst-case exposure locations at existing locations relative to the affected road network discussed.

All receptors have been modelled at adult breathing height relative to the adjacent modelled road network, i.e. 1.5m at ground level.

Table 3-1: Human Receptor Locations

Receptor	X	Y	Height (m)
HR1	303263	228336	1.5
HR2	303234	228384	1.5
HR3	303275	228352	1.5
HR4	303295	228403	1.5



Receptor	X	Y	Height (m)
HR5	303329	228275	1.5
HR6	303396	228224	1.5

3.2.3.2 Ecological Receptors

The NRW guidance states that the following protected sites should be considered: Special Areas of Conservation (SACs), Special Protection Areas (SPAs), Ramsar, Sites of Special Scientific Interest (SSSIs), National Nature Reserves (NNRs) and Marine Conservation Zones (MCZs).

Two protected sites are located within 200m of the affected road network as detailed in Table 3-2. Their locations relative to the modelled road network are illustrated in Figure 3-2.

Table 3-2: Identified Ecological Designations

Site ID	Site Name	Designation
ER1	River Usk/ Afon Wysg	SAC
ER2	River Usk/ Afon Wysg	SSSI

All receptors have assumed a height of 0m and are represented in the model using gridded and polygon boundary receptors at two distinct resolutions to identify the maximum modelled impact:

- 2m resolution within 200m of the Site; and
- 20m resolution between 200m and 1km of the Site.

3.2.4 Background Datasets

3.2.4.1 Background Concentrations

In the absence of locally representative background monitoring sites, annual mean background concentrations used for the purposes of the assessment have been obtained from the Defra supplied background maps (2021 reference year)¹⁰, based on the 1km grid squares which cover the modelled area. Further detail on these datasets can be found in Section 4.3.

To avoid double counting potential background sources already contained within the ADMS-Roads dispersion model, relevant sources were removed from the appropriate background grid squares. This was limited to the removal of 'Primary A Road in' and 'Trunk A Road in' sectors.

As the relationship between NO₂ and NO_x is not linear, the NO₂ Adjustment for NO_x Sector Removal Tool v9.0¹¹ has been used, in accordance with LAQM.TG(22).

3.2.4.2 Deposition Fluxes

Habitat specific background deposition rates have been obtained from the APIS website, based on the 1km grid squares which cover the modelled area. Further detail on these datasets can be found in Section 4.4.

¹⁰ Defra Background Maps (2021-Reference). Available at: <http://uk-air.defra.gov.uk/data/laqm-background-home>.

¹¹ NO₂ Adjustment for NO_x Sector Removal Tool v9.0. Available at: <https://laqm.defra.gov.uk/air-quality/air-quality-assessment/no2-adjustment-for-nox-sector-removal-tool>.



3.2.5 Model Outputs

3.2.5.1 Ambient Concentrations

The background pollutant concentrations discussed in Section 4.3 have been used in conjunction with the concentrations predicted by the ADMS-Roads model to calculate predicted total annual mean concentrations of NO₂, PM₁₀ and PM_{2.5} for each respective scenario.

For the prediction of annual mean NO₂ concentrations for all modelled receptor locations, the road-NO_x contributions (adjusted as per Appendix C) have been converted to total NO₂ following the methodology in LAQM.TG(22) using the latest version of Defra's NO_x to NO₂ conversion tool (v9.1)¹². The modelled road-NO₂ contribution was then added to the appropriate NO₂ background concentration value to obtain an overall total annual mean NO₂ concentration.

For the prediction of short-term NO₂ impacts, LAQM.TG(22) advises that it is valid to assume that exceedances of the 1-hour mean AQAL for NO₂ are unlikely to occur where the annual mean NO₂ concentration is <60µg/m³. This approach has thus been adopted for the purposes of this assessment.

For the prediction of short-term PM₁₀, LAQM.TG(22) provides an empirical relationship between the annual mean and the number of exceedances of the 24-hour mean AQAL for PM₁₀ that can be calculated as follows:

$$\text{No. 24-hour mean exceedances} = -18.5 + 0.00145 \times \text{annual mean}^3 + (206/\text{annual mean})$$

This relationship has thus been adopted to determine whether exceedances of the short-term PM₁₀ AQAL are likely.

Verification of the ADMS-Roads assessment has been undertaken as per Appendix C.

3.2.5.2 Deposition Fluxes

Road dry deposition fluxes were calculated for NO₂ and NH₃ using empirical methods provided within the Environment Agency's AQTAG06¹³, which are subsequently recommended within the IAQM's ecological guidance¹⁴.

While NH₃ is not explicitly identified within the NRW guidance as a pollutant requiring assessment from road traffic sources, it has nevertheless been included in accordance with air quality best practice¹⁵, providing a robust assessment.

In recognition of the NO_x to NO₂ non-linear relationship (facilitated by the NO_x to NO₂ conversion tool), the road NO₂ contribution from the development alone and in-combination for screening was derived through subtraction of the total NO₂ modelled concentration from the scenarios discussed in Section 3.2, as it is not considered appropriate to process individual contributions of NO₂ from different development aspects.

The modelled road-NH₃ contribution was added to the appropriate NH₃ background concentration value to obtain an overall total annual mean NH₃ concentration.

¹² Defra NO_x to NO₂ Calculator v9.1 (2024). Available at: <https://laqm.defra.gov.uk/air-quality/air-quality-assessment/nox-to-no2-calculator/>.

¹³ AQTAG06 – Technical Guidance on detailed modelling approach for an appropriate assessment for emissions to air. Environment Agency, March 2014 version.

¹⁴ A guide to the assessment of air quality impacts on designated nature conservation sites. Version 1.1. Dated May 2020.

¹⁵ Defra, FAQ 143 – Assessment of Ammonia.



Road dry deposition fluxes were calculated using the following equation:

$$\text{Dry deposition flux } (\mu\text{g}/\text{m}^2/\text{s}) = \text{ground level concentration } (\mu\text{g}/\text{m}^3) \times \text{deposition velocity } (\text{m}/\text{s})$$

The applied deposition velocities for the relevant chemical species are provided in Table 3-3. These velocities vary, dependant on land use. As such, where present, both habitats should be given due consideration to ensure maximum impacts from deposition are calculated. This is particularly important where both features exist however grassland habitats are found to be the most sensitive (based upon CLo), as whilst woodland habitats may have higher CLo, resultant deposition fluxes can be higher in comparison.

Table 3-3: Applied Deposition Velocities

Chemical Species	Recommended Deposition Velocity (m/s)	
NO ₂	Grassland	0.0015
	Woodland	0.0030
NH ₃	Grassland	0.02
	Woodland	0.03

3.2.5.2.1 Critical Loads – Nutrient Nitrogen

For the assessment of nutrient nitrogen, the predicted road deposition rates were converted from $\mu\text{g}/\text{m}^2/\text{s}$ to units of $\text{kgN}/\text{ha}/\text{year}$ using a standard conversion factor of 95.9 for NO_x and 260 for NH₃.

3.2.5.2.2 Critical Loads – Acidification

For the assessment of acidification, the predicted road deposition rates were converted to units of equivalents ($\text{keq}/\text{ha}/\text{year}$), which is a measure of how acidifying the chemical species can be, by multiplying the dry deposition flux ($\mu\text{g}/\text{m}^2/\text{s}$) by the standard conversion factor of 6.84 for NO_x and 18.5 for NH₃.

Acidification can arise from nitrogen and/or sulphur deposition and is assessed using the Critical Load Function¹⁶. This considers the combined acidifying effects of nitrogen and sulphur deposition to determine the levels below which harmful effects do not occur. The Critical Load Function comprises three parameters:

- **CLminN:** Minimum nitrogen Critical Load for acidification; nitrogen deposition below this level will not contribute to acidification;
- **CLmaxN:** Maximum nitrogen Critical Load for acidification, representing the threshold above which harmful acidification effects may occur ; and
- **CLmaxS:** Maximum sulphur Critical Load for acidification, representing the threshold above which harmful acidification effects may occur.

The selection of the appropriate Critical Load and associated PC is determined by the nitrogen deposition PEC relative to CLminN. Where the nitrogen deposition PEC is below CLminN, sulphur deposition alone is considered and assessed against CLmaxS. Where nitrogen deposition PEC exceeds CLminN, both nitrogen and sulphur contribute to acidification, and the combined deposition is assessed against CLmaxN. This approach has been applied for each receptor to identify the appropriate PC and the relevant Critical Load to be assessed.

¹⁶ <https://www.cara.ceh.ac.uk/clf-guidance>.



3.2.6 Assessing Significance

3.2.6.1 Human Receptors

Guidance for determining operational phase effects associated with air quality is provided by EPIC & IAQM. When describing the developmental impact at a specific existing receptor, the resultant total concentration as well as the magnitude of change in relation to respective AQALs are both considered, using the approach detailed in Table 3-4.

Table 3-4: Impact Descriptors for Individual Receptors

Long Term Average Concentration at Receptor in Assessment Year	Change in Concentration relative to AQAL			
	1% (A)	2-5%	6-10%	>10%
75% or less of AQAL	Negligible	Negligible	Slight	Moderate
76-94% of AQAL	Negligible	Slight	Moderate	Moderate
95-102% of AQAL	Slight	Moderate	Moderate	Substantial
103-109% of AQAL	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Moderate	Substantial	Substantial	Substantial
Note: (A) Changes <0.5% will be described as Negligible.				

Following derivation of impacts at all receptor locations assessed, the overall significance of the developmental 'effect' is determined based upon consideration, as necessary, of the following factors:

- The existing and future air quality in the absence of the Proposed 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.

3.2.6.2 Ecological Receptors

With respect to ecological receptors, consideration has been given to the relevant CLe and CLo. The assessment procedure outlined within the NRW guidance document has been used to determine significance.

Vehicle movements generated by the operational phase of the Proposed Development can be classed as insignificant where they result in:

- <1% of the CLe and/or CLo.

In-combination screening has been conducted for international and national ecological designations. This comprises the consideration of vehicle movements associated with live project and plans in combination with Proposed Development trips.

If modelled changes are below these thresholds, then impacts on ecological designations can be screened out as insignificant.

Where impacts cannot be screened out on this basis, an initial further assessment is undertaken to calculate the Predicted Environmental Concentration (PEC) at the affected site(s) and determine whether the CLe / CLo will be exceeded, above which significant harmful effects are known to occur (i.e. a Likely Significant Effect). Where the PEC exceeds



the relevant CLe/CLo, the assessment information is then referred to the Project Ecologist for further assessment and determination of significance.

It should be reinforced that exceedance of this 1% threshold does not, of itself, imply damage to a habitat, rather implies further assessment is required as the impacts cannot be described as imperceptible.

3.2.7 Uncertainty

Dispersion modelling is inherently uncertain and is principally reliant on the accuracy and representativity of its inputs. In acknowledgement of this, the ADMS-Roads dispersion model has been verified with publicly available local monitoring data, as collected by PCC. Details of the verification exercise are shown in Appendix C. Following verification, all model output statistical parameters (used to evaluate model performance and uncertainty) are within LAQM.TG22 prescribed tolerances.

Historically, there has been a widely acknowledged disparity between projected improvements in vehicle emission factors and observed ambient pollutant concentrations¹⁷, principally NO₂. To minimise any associated uncertainty when forming conclusions from the results, this assessment has utilised the latest EFT version 14.1 utilising COPERT v5.9.1 emission factors, and associated tools/datasets published by Defra.

¹⁷ Carslaw, et al. (2011). Trends in NO_x and NO₂ emissions and ambient measurements in the UK.



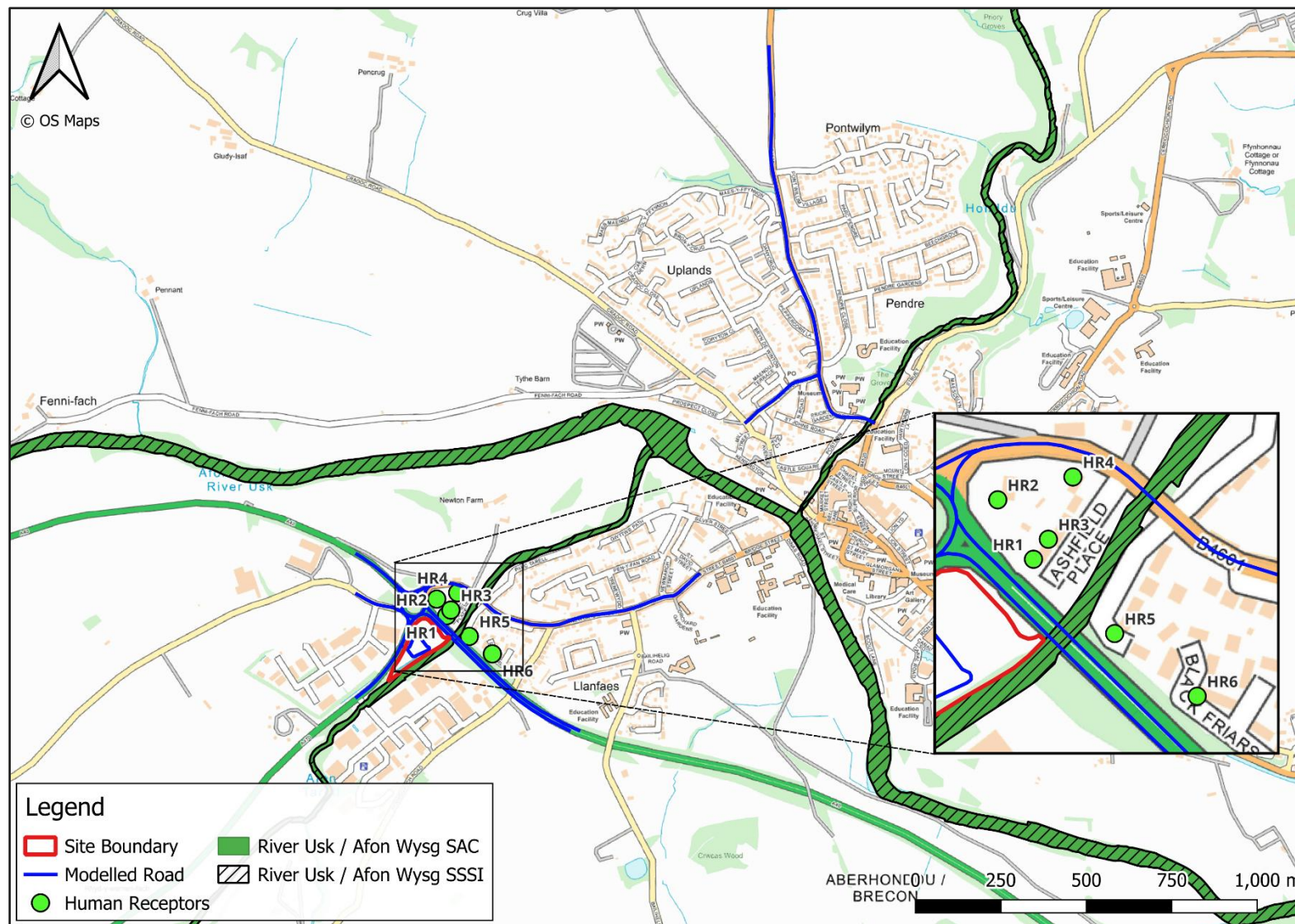


Figure 3-2: Modelled Road Links and Receptors



4.0 Baseline Environment

PCC, in fulfilment of statutory requirements, have conducted on-going exercises to review and assess air quality within their administrative areas. The latest publicly available Annual Status Report (ASR)¹⁸ at the time of writing has been reviewed.

Pollutant concentrations monitored during 2020 and 2021 (i.e. affected by the COVID-19 pandemic) are expected to be atypical and have not been used to determine baseline conditions although have been presented for completeness.

4.1 Air Quality Management Areas

PCC do not currently have any declared AQMAs within their administrative area. AQMAs are there therefore not considered further in this assessment.

4.2 Air Quality Monitoring

A review of national and local monitoring regimes has been conducted.

4.2.1 Automatic Monitoring

PCC do not currently undertake relevant automatic monitoring within their administrative areas. The closest Automatic Urban and Rural Network (AURN) monitor is located approximately 45km south of the Site and has therefore not been considered on the basis of proximity.

4.2.2 Diffusion Tube Monitoring

Passive NO₂ diffusion tube monitoring is currently undertaken by PCC at numerous locations. The details and results of those monitoring locations local to the Site are presented in Table 4-1 and Table 4-2 respectively, whilst their locations are illustrated in Figure 4-1. All monitoring data presented has been ratified by PCC.

PCC undertake reactive monitoring in response to public notification of potential local air quality impacts, rather than operate a permanent monitoring network across the district. Consequently, no consistent, longer-term monitoring dataset is available to establish a comparable baseline for earlier years. The latest year of monitoring data, 2024, has therefore been presented as the baseline dataset.

Table 4-1: Diffusion Tube Monitoring Sites: Details

Site ID	Site Type	NGR (m)		Distance to Site (m)
		X	Y	
Powys/24A/NAS1	Kerbside	303190	228398	80
Powys/24A/NAS2	Suburban	303271	228331	70
Powys/24A/NAS4	Suburban	303547	228113	330
Powys/24B/NDS1	Kerbside	304349	229026	1,300
Powys/24B/NDS2	Roadside	304350	229070	1,350
Powys/24B/NDS4	Roadside	304352	229145	1,400

¹⁸ PCC, 2025 Air Quality Annual Status Report, (September 2025).



Table 4-2: Diffusion Tube Monitoring Sites: Results

Site ID	2024 Data Capture %	Annual Mean NO ₂ Concentration (µg/m ³)				
		2020	2021	2022	2023	2024
Powys/24A/NAS1	100	-	-	-	-	15.7
Powys/24A/NAS2	92.3	-	-	-	-	10.5
Powys/24A/NAS4	100	-	-	-	-	6.6
Powys/24B/NDS1	92.3	-	-	-	-	12.1
Powys/24B/NDS2	67.9	-	-	-	-	12.6
Powys/24B/NDS4	67.9	-	-	-	-	9.2

Annual mean NO₂ concentrations were 'well below' (<75%) the annual mean AQAL (40 µg/m³) at all considered monitors in 2024.

Using the empirical relationship given in LAQM.TG(22), an exceedance of the 1-hour mean AQAL was unlikely to have occurred at the above monitoring locations during the presented period.

4.3 Defra Mapped Background Concentrations

Defra maintains a nationwide model of existing and future background air quality concentrations at a 1km grid square resolution. The latest dataset includes annual average concentration estimates for NO_x, NO₂, PM₁₀ and PM_{2.5} using a reference year of 2021 (the year in which comparisons between modelled and monitored concentrations are made)¹⁹.

The Defra mapped annual mean background concentrations covering the modelled area (human receptors) for the base year (2024) and future likely completion year of the Proposed Development (2028) are presented in Table 4-3. The AQALs expected to be operable at that time are also presented.

Table 4-3: Defra Mapped Background Pollutant Concentrations

Grid Square (X, Y)	Year	Annual Mean Concentration (µg/m ³)			
		NO _x	NO ₂	PM ₁₀	PM _{2.5}
303500, 228500	2024	3.7	3.0	8.6	5.3
	2028	3.2	2.6	8.3	5.0
Relevant AQAL		-	40	40	20

All values are well below the relevant annual mean AQALs and show a reduction in future years.

4.4 Sensitive Ecosystems

APIS has been used to provide details of baseline conditions at the assessed ecological designations requiring detailed assessment. This includes:

- Critical Loads / Levels;
- Baseline deposition rates (presently 2022 - 2024); and
- Habitat type and sensitivity to atmospheric emissions (where available).

¹⁹ Defra Mapped Background Concentrations (2021 Reference Year). <https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2021>



APIS provides assessment information for SACs and SSSIs. The most sensitive habitat listed on APIS has been used to provide a worst-case assessment. Woodland and grassland habitats have both been assessed where present at the same designations, as are subject to different deposition velocities / CLo and therefore impacts which may otherwise be overlooked.

For the purposes of initial screening, worst-case input parameters were used i.e. maximum reported baseline conditions and minimum Critical Level / Load. This approach assumes that impacts occur at the location of greatest sensitivity to facilitate a conservative assessment. Further detail is provided below. Where impacts could not be screened out, receptor specific inputs were then used.

As the APIS deposition rates relate to a three-year rolling mean average (presently 2022 – 2024), use of these for the future year scenarios (2028) is considered pessimistic (for assessment of NO_x / NO₂ specifically); as it does not take into account forecast local reductions, either through policy interventions or the penetration of cleaner vehicles within the fleet.

Background NH₃ concentrations and nitrogen deposition rates for the 2028 future year scenarios were adjusted with reference to the JNCC Nitrogen Futures report (2020)²⁰. In reference to this report, the national projections of NH₃ and NO_x emissions between 2017 and 2030 under a relatively conservative 'business as usual' scenario have been applied in this assessment. NH₃ emissions are expected to increase by approximately 1%. In contrast, overall nitrogen deposition rates are projected to decrease by approximately 13% over the same period, driven largely by the greater anticipated reductions in NO_x emissions. Acid deposition rates have not been adjusted.

This forecasting has been embedded into the assessment to ensure that likely projections are reflected and accounted for whilst predicting future total deposition rates for comparison with the CLo and CLe – consistent with the prediction of ambient concentrations applied elsewhere.

4.4.1 Critical Levels

Information used in the assessment of potential NO_x and NH₃ CLe impacts is provided in Table 4-4.

Table 4-4: Baseline NO_x and NH₃ Critical Level Conditions

Site ID	Critical Level (µg/m ³)		Background Range Applied (µg/m ³)	
	NO _x	NH ₃	NO _x	NH ₃
ER1	30	1	2.88 – 3.86	0.93 – 0.98
ER2	No sensitive features present on APIS			

No CLe information is available for ER2; it has been excluded from assessment. For ER1, the background range for the ecological study area is presented above.

4.4.2 Critical Loads

4.4.2.1 Nutrient Nitrogen

Information used in the assessment of potential nutrient nitrogen CLo impacts is provided in Table 4-5.

²⁰ Joint Nature Conservation Committee (2020) Nitrogen Futures. JNCC Report No. 665.



Table 4-5: Baseline Nutrient Nitrogen Critical Load Conditions

Site ID	Nitrogen Class	Length	CLo Range	CLo Applied	Baseline Deposition Rate
			(kg N/ha/yr)		
ER1	Raised and blanket bogs	Grassland	5 – 10	5	12.13 – 12.59
	Fagus forest on non-acid and acid soils	Woodland	10 – 15	10	18.6 – 19.26
ER2	No comparable habitat with established critical load estimate available				

No nutrient nitrogen CLo information is available for ER2; it has been excluded from assessment. For ER1, the baseline deposition flux already exceeds the CLo.

4.4.2.2 Acidification

Information used in the assessment of potential acid CLo impacts are provided in Table 4-6.

Table 4-6: Baseline Acidification Critical Load Conditions

Site ID	Acidity Class	Length	CLo Range			Baseline Deposition	N/S Sensitive?
			CLminN	CLmaxS	CLmaxN	N	
			(keq/ha/yr)				
ER1	Bogs	Grassland	0.321	0.280	0.601	0.90 – 0.93	N
	Unmanaged Broadleaved/Coniferous Woodland	Woodland	0.142	1.171	1.313	1.38 – 1.42	N
ER2	N/A: No Data on APIS						

No acidification Critical Load information is available for ER2; it has been excluded from assessment. For ER1, the baseline deposition fluxes already exceed the CLo.



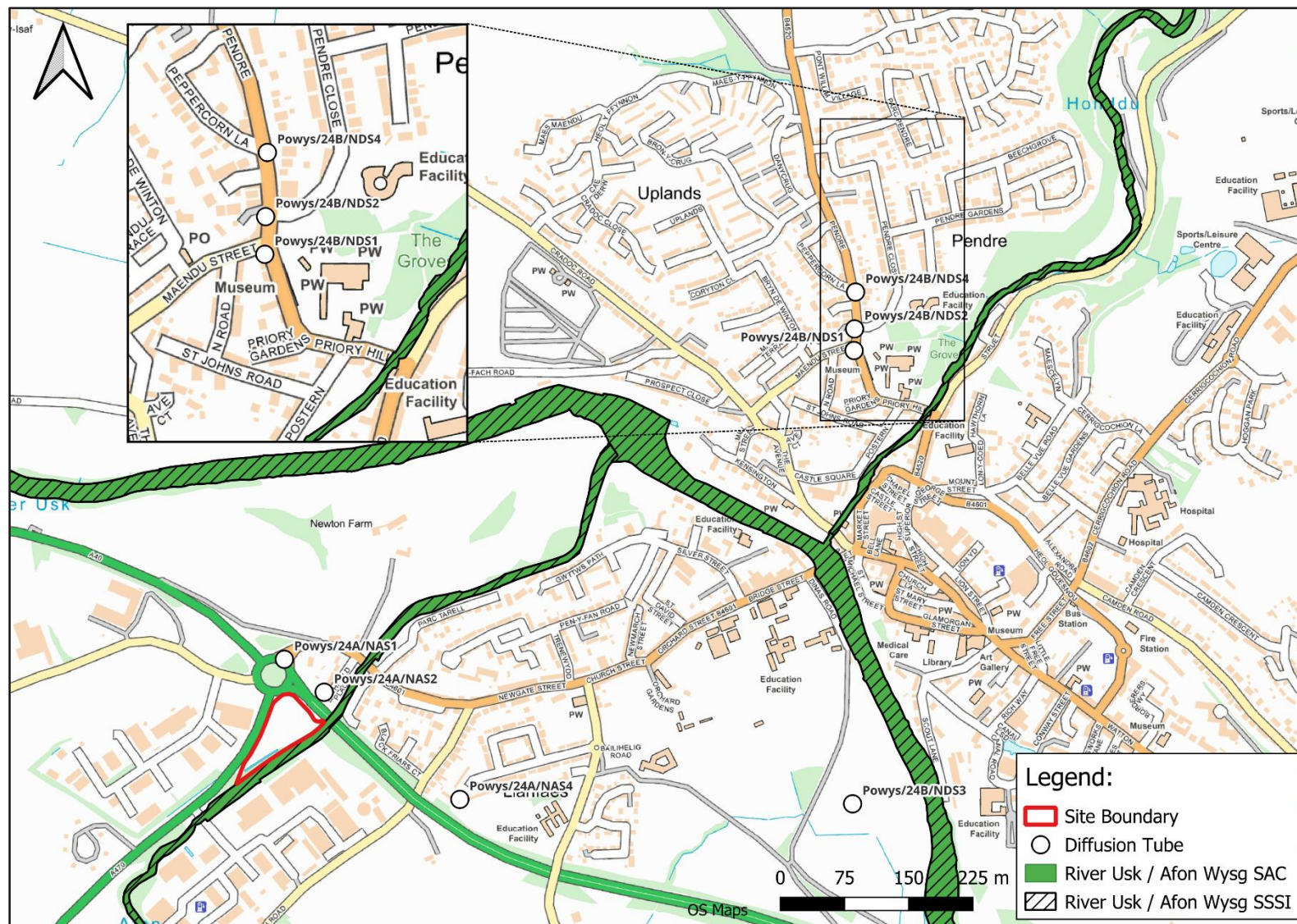


Figure 4-1: Baseline Air Quality Context



5.0 Construction Dust Assessment

Where figures relating to area and volume of the Site, approximate number of construction vehicles or distances to receptors are given, these relate to thresholds as defined in the IAQM Construction Dust guidance to guide the assessor to define the dust emissions magnitude and sensitivity of the area.

5.1 Assessment Screening

There are human receptors within 250m of the Site and within 50m of the identified trackout routes. The River Usk/ Afon Wysg SAC and SSSI are located within 50m of the Site and within 20m of the identified trackout routes. Therefore, a construction dust assessment is required for both human and ecological receptors.

5.2 Potential Dust Emission Magnitude

5.2.1 Demolition

The Site currently comprises unused, open greenfield land. There are no structures or buildings which require demolition. As such, consideration of impacts associated with demolition activities have been scoped out of the assessment.

5.2.2 Earthworks

The total Site area is approximately 11,000m² (i.e. <18,000m²). Furthermore, given the scale of the development, <5 heavy earth moving vehicles are considered likely to be active on Site at any one time. The dust emission magnitude for earthworks is therefore considered to be 'small'.

5.2.3 Construction

The total building volume associated with the Proposed Development is predicted to be 12,000 - 75,000m³. However, the building methods and materials are expected to comprise material with low potential for dust release (e.g. pre-fabricated steel frame and metal cladding). The dust emission magnitude for construction is therefore considered to be 'small'.

5.2.4 Trackout

Construction vehicles are expected to access the Site from the A470, to the west of the Site. No details are available at the time of assessment regarding the number of HDV movements associated with construction works. However, given the scale of the development, the peak number of outward HDV movements per day is likely to be <20. In addition, due to the size of the site, any unpaved road length is likely to be <50m. The dust emission magnitude for trackout is therefore considered to be 'small'.

5.2.5 Summary

A summary of the dust emission magnitude for each activity is detailed in Table 5-1.



Table 5-1: Potential Dust Emission Magnitude

Activity	Dust Emission Magnitude
Earthworks	Small
Construction	Small
Trackout	Small

5.3 Sensitivity of the Area

5.3.1 Dust Soiling Impacts

There are predicted to be between 10-100 long term car park/showroom spaces ('high' sensitivity' receptors) long term car park associated with 'Spa Motors' car dealership within 50m of the Site boundary and within 20m of the relevant trackout routes.

The sensitivity of the area to dust soiling effects on people and property is therefore considered to be 'medium' in relation to earthworks and construction and 'high' in relation to trackout.

5.3.2 Human Health Impacts

The maximum 2024 mapped background PM₁₀ concentration for the 1km² grid squares covering the Site is estimated to be 8.6µg/m³ (i.e. falls into the <24µg/m³ class).

There are between 1-10 'high' sensitivity receptors (i.e. residential dwellings) within 100m of the Site boundary and >1 'medium' sensitivity receptors within 20m of relevant trackout routes. Given the above, the sensitivity of the area with respect to human health impacts in relation to earthworks, construction, and trackout is considered to be 'low'.

5.3.3 Ecological Impacts

The River Usk/ Afon Wysg SAC and SSSI are located within 20m of the Site and within 20m of the identified trackout routes. To facilitate a robust assessment in the absence of further information, it has been assumed that both designated sites are sensitive to dust deposition and therefore, in accordance with the IAQM Construction Dust guidance, the SAC has been considered a high ecological sensitivity receptor, while the SSSI has been considered a medium sensitivity ecological receptor. Given the proximity of the higher sensitivity SAC to the Site and the identified trackout routes, the total sensitivity of the area with respect to ecological impacts from earthworks, construction and trackout is therefore considered to be 'high'.

5.3.4 Summary

The sensitivity of the area is summarised in Table 5-2.

Table 5-2: Sensitivity of the Area

Potential Impact	Earthworks	Construction	Trackout
Dust Soiling	Medium	Medium	High
Human Health	Low	Low	Low
Ecological	High	High	High



5.4 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 Table 5-3 below to determine the risk of impact (unmitigated) which is used to inform the selection of appropriate mitigation.

Table 5-3: Risk of Dust Impacts (Unmitigated)

Potential Impact	Earthworks	Construction	Trackout
Dust Soiling	Low Risk	Low Risk	Low Risk
Human Health	Negligible	Negligible	Negligible
Ecological	Low Risk	Low Risk	Low Risk

Following the construction dust assessment, the Site is found to be at worst:

- 'Low risk' in relation to dust soiling effects on people and property;
- 'Negligible risk' in relation to human health impacts; and
- 'Low risk' in relation to ecological impacts.

However, potential dust effects during the construction phase are considered to be temporary in nature and may only arise at particular times (i.e. certain activities and/or meteorological conditions).

Best practice mitigation measures are required to minimise or eliminate potential impacts. Provided effective measures (as outlined in Table 8-1) are implemented, residual effects from construction dust are considered 'not significant'.



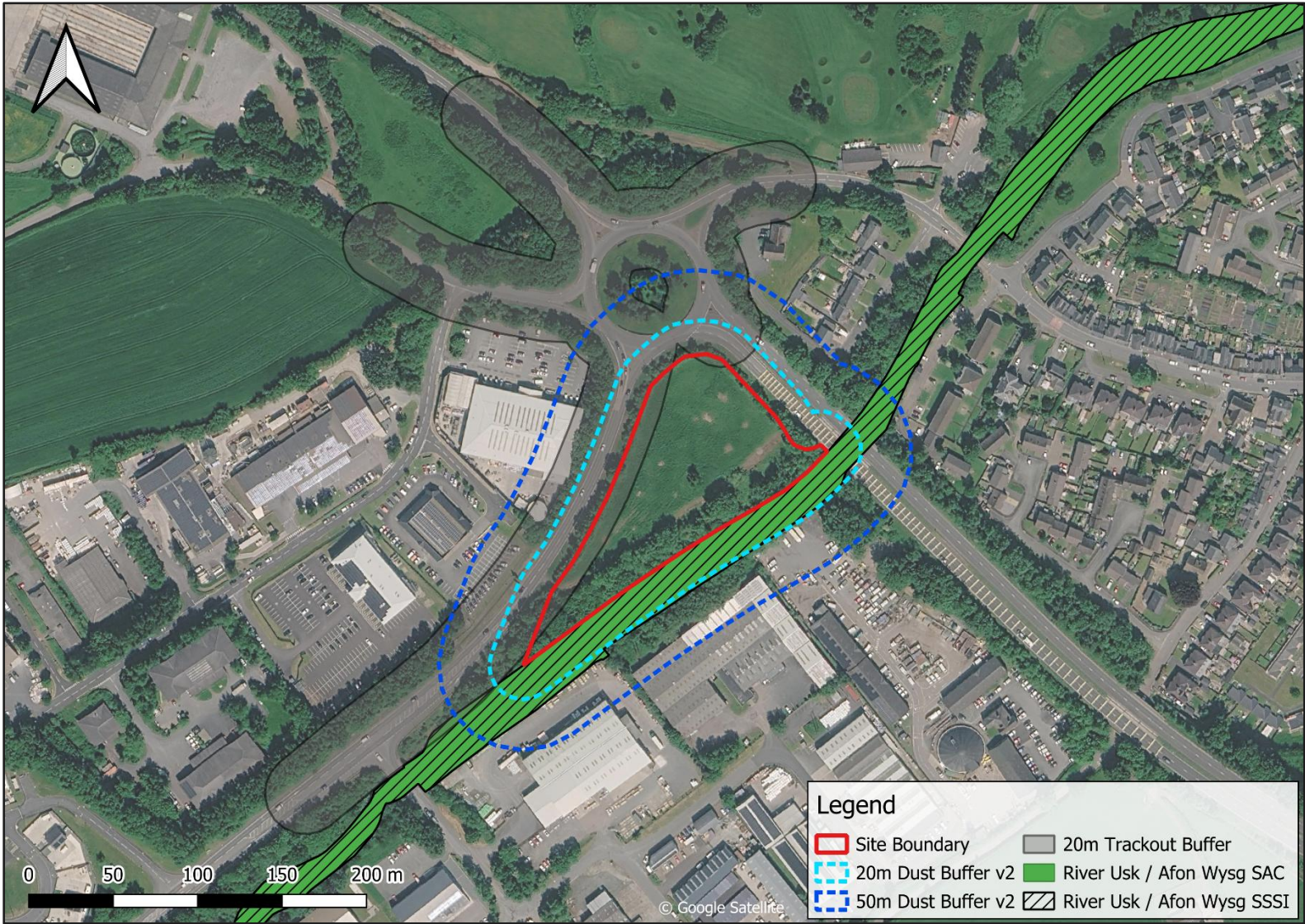


Figure 5-1: Construction Dust Assessment Buffers



6.0 Operational Phase Assessment

This section presents the potential air quality impacts and effects associated with the operation of the Proposed Development.

6.1 Human Receptors

6.1.1 NO₂ Modelling Results

Table 6-1 presents the annual mean NO₂ concentrations predicted at all existing receptor locations for the 2028 DS scenario.

Table 6-1: Predicted Annual Mean NO₂ Concentrations

Receptor	Predicted Annual Mean NO ₂ Concentration (µg/m ³)			% Change of AQAL	% of 2028 DS Relative to AQAL	EPIC & IAQM Impact Descriptor
	2024 BS	2028 DM	2028 DS			
HR1	7.5	5.5	5.7	0.4	14.3	Negligible
HR2	8.7	6.3	6.5	0.4	16.3	Negligible
HR3	6.7	5.0	5.1	0.3	12.8	Negligible
HR4	6.9	5.1	5.3	0.4	13.3	Negligible
HR5	6.5	4.8	5.0	0.4	12.5	Negligible
HR6	5.6	4.3	4.4	0.2	11.0	Negligible

The outcomes are as follows:

- The impacts of the Proposed Development on annual mean NO₂ concentrations at all receptors are considered to be 'negligible';
- There are no exceedances of the annual mean NO₂ AQAL at any receptor; and
- Exceedances of the 1-hour mean NO₂ AQAL are unlikely to occur.

Based on the above, effects associated with NO₂ concentrations at all assessed receptor locations are considered to be 'not significant'.

6.1.2 PM₁₀ Modelling Results

Table 6-2 presents the annual mean PM₁₀ concentrations predicted at all existing receptor locations for the 2028 DS scenario.

Table 6-2: Predicted Annual Mean PM₁₀ Concentrations

Receptor	Predicted Annual Mean PM ₁₀ Concentration (µg/m ³)			% Change of AQAL	% of 2028 DS Relative to AQAL	EPIC & IAQM Impact Descriptor
	2024 BS	2028 DM	2028 DS			
HR1	9.6	9.3	9.3	0.1	23.3	Negligible
HR2	10.0	9.6	9.7	0.1	24.3	Negligible
HR3	9.4	9.1	9.1	0.1	22.8	Negligible
HR4	9.5	9.2	9.2	0.1	23.0	Negligible
HR5	9.2	8.9	8.9	0.1	22.3	Negligible



Receptor	Predicted Annual Mean PM ₁₀ Concentration (µg/m ³)			% Change of AQAL	% of 2028 DS Relative to AQAL	EPIC & IAQM Impact Descriptor
	2024 BS	2028 DM	2028 DS			
HR6	9.0	8.7	8.7	<0.1	21.8	Negligible

The outcomes are as follows:

- The impacts of the Proposed Development on annual mean PM₁₀ concentrations at all receptors are considered to be 'negligible';
- There are no exceedances of the annual mean PM₁₀ AQAL at any receptor; and
- The maximum predicted annual mean PM₁₀ concentration (HR2) equates to <1 day where 24-hour mean PM₁₀ concentrations are predicted to be >50µg/m³. This is below the 35 permitted number of exceedances. Based on the above, effects associated with PM₁₀ concentrations at all assessed receptor locations are considered to be 'not significant'.

6.1.3 PM_{2.5} Modelling Results

Table 6-3 presents the annual mean PM_{2.5} concentrations predicted at all existing receptor locations for the 2028 DS scenario.

Table 6-3: Predicted Annual Mean PM_{2.5} Concentrations

Receptor	Predicted Annual Mean PM _{2.5} Concentration (µg/m ³)			% Change of AQAL	% of 2028 DS Relative to AQAL	EPIC & IAQM Impact Descriptor
	2024 BS	2028 DM	2028 DS			
HR1	6.0	5.7	5.7	0.2	28.5	Negligible
HR2	6.2	5.9	5.9	0.2	29.5	Negligible
HR3	5.9	5.6	5.6	0.1	28.0	Negligible
HR4	5.9	5.6	5.6	0.2	28.0	Negligible
HR5	5.7	5.4	5.4	0.1	27.0	Negligible
HR6	5.6	5.3	5.3	<0.1	26.5	Negligible

The outcomes are as follows:

- The impacts of the Proposed Development on annual mean PM_{2.5} concentrations at all receptors are considered to be 'negligible'; and
- There are no exceedances of the annual mean PM_{2.5} AQAL at any receptor.

Based on the above, effects associated with PM_{2.5} concentrations at all assessed receptor locations are considered to be 'not significant'.

6.2 Ecological Receptors

Only impacts on the River Usk / Afon Wysg SAC (ER1) require further assessment through the use of dispersion modelling to quantify the effect on concentrations and deposition rates. Results presented herein relate to the maximum modelled impact and as such, represents a conservative outlook.



6.2.1 NO_x Critical Level

Table 6-4 presents the Proposed Development's maximum contribution in 2028 (project alone and in-combination) to annual mean NO_x concentrations relative to the CLe (30µg/m³). Exceedances of the 1% CLe screening criteria are displayed in bold.

Table 6-4: Maximum Predicted Annual Mean NO_x Impacts

Site ID	Project Alone		In-Combination		Further Assessment?
	µg/m ³	% of CLe	µg/m ³	% of CLe	
ER1	1.9	6.3	2.3	7.6	Yes

The maximum increases in annual mean NO_x concentrations as a result of the Proposed Development alone and in-combination are predicted to be >1% of the CLe at ER1 and therefore cannot be screened out as insignificant. Further assessment has therefore been undertaken to establish the maximum resultant predicted pollutant level (2028 DS, i.e. the PEC). The outcomes are detailed in Table 6-5.

Table 6-5: Maximum Predicted Annual Mean NO_x Concentrations: 2028 DS

Site ID	2028 DS PEC		Further Assessment?
	µg/m ³	% of CLe	
ER1	20.7	68.8	No

The maximum annual mean NO_x concentration modelled at ER1 is below the CLe within the 2028 DS scenario. There are no Likely Significant Effects and further consideration is therefore not required.

6.2.2 Ammonia Critical Level

Table 6-6 presents the Proposed Development's maximum contribution in 2028 (project alone and in-combination) to annual mean NH₃ concentrations relative to the applicable CLe (1µg/m³) for screening. Exceedances of the 1% CLe screening criteria are displayed in bold.

Table 6-6: Maximum Predicted Annual Mean NH₃ Impacts

Site ID	Project Alone		In-Combination		Further Assessment?
	µg/m ³	% of CLe	µg/m ³	% of CLe	
ER1	0.35	35.5	0.36	35.9	Yes

The maximum increases in annual mean NH₃ concentrations as a result of the Proposed Development alone and in-combination are predicted to be >1% of the CLe at ER1 and therefore cannot be screened out as insignificant. Further assessment has therefore been undertaken to establish the maximum resultant predicted pollutant level (2028 DS, i.e. the PEC). The outcomes are detailed in Table 6-7.

Table 6-7: Maximum Predicted Annual Mean NH₃ Concentrations: 2028 DS

Site ID	2028 DS PEC		Further Assessment?
	µg/m ³	% of CLe	
ER1	2.0	202.9	Yes

The maximum annual mean NH₃ concentration modelled at ER1 exceeds the CLe within the 2028 DS scenario. Further information is explored below.



ER1: River Usk/ Afon Wysg SAC

The spatial extent of the affected area (i.e. where total modelled concentrations are >1% of the CLe and therefore cannot be considered insignificant) is approximately 10,261m² as illustrated in Figure 6-1. However, for context, the background NH₃ concentrations approach / exceed the NH₃ CLe and the spatial extent of impact is confined to 0.10% of the total designated area.

This has been referred to the Project Ecologist (Biodiverse) for further consideration and conclusion on significance within the Shadow Habitats Regulations Assessment (sHRA) document.

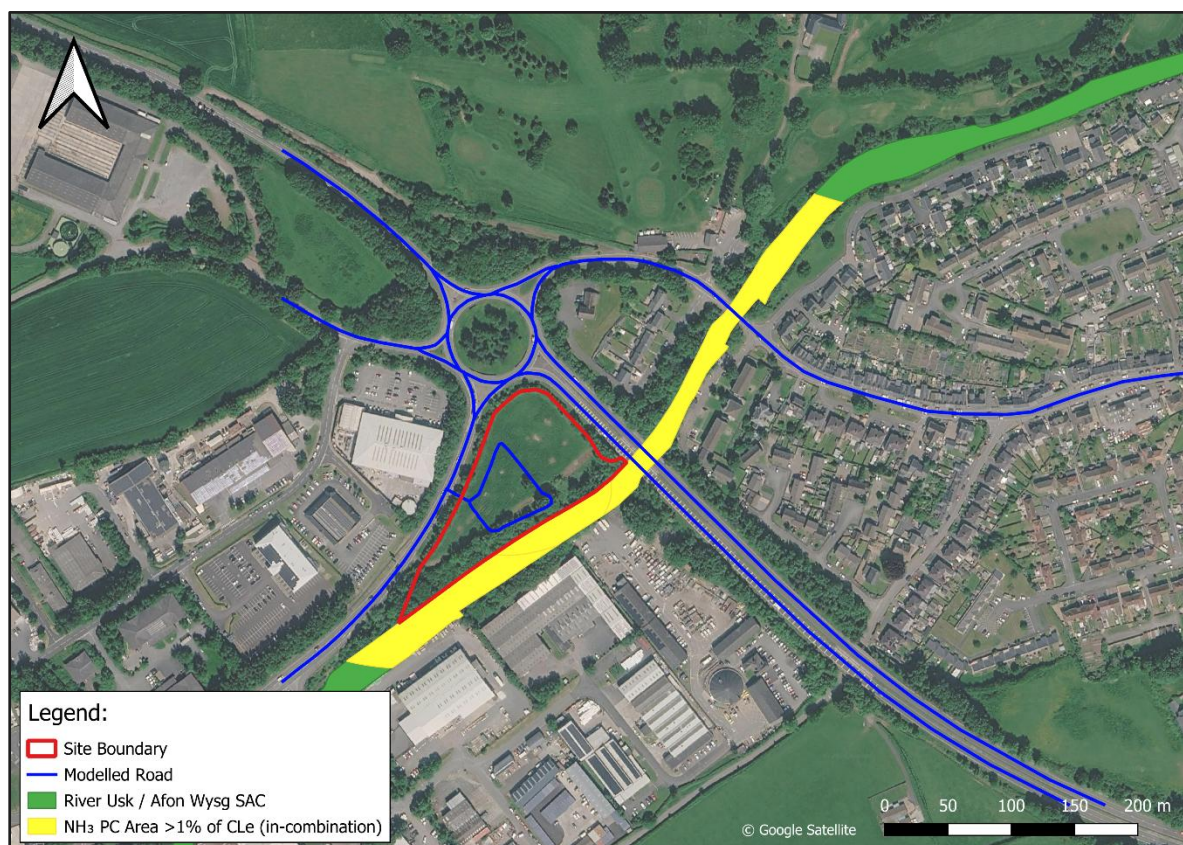


Figure 6-1: Spatial Extent of Modelled NH₃ Impacts (PC >1% of Critical Level)

6.2.3 Nutrient Nitrogen Critical Load Modelling Results

In the absence of any site-specific habitat data, the nutrient nitrogen assessment has considered the most sensitive short vegetation and woodland vegetations features potentially present within the SAC (as listed on APIS) and the lowest associated CLo. This is therefore not an exhaustive list of qualifying features but instead identifies those most sensitive to air pollution (there are a number of additional woodland features that may also be present).

Table 6-8 presents the maximum modelled 2028 Critical Load impacts (project alone and in-combination) as a result of the Proposed Development for initial screening. Exceedances of the 1% CLo screening criteria are displayed in bold.



Table 6-8: Maximum Predicted Nutrient Nitrogen Impacts

Site ID	Qualifying Feature	Min CLo Adopted (kg N/ha/yr)	Project Alone		In-Combination		Further Assessment?
			kg N/ha/yr	% of CLo	kg N/ha/yr	% of CLo	
ER1	Raised and blanket bogs	5	1.98	39.7	2.03	40.6	Yes
	Fagus forest on non-acid and acid soils	10	3.04	30.4	3.12	31.2	Yes

The maximum increases in nutrient N deposition as a result of the Proposed Development alone and in-combination are predicted to be >1% of the minimum CLo at ER1 for both considered features and therefore cannot be screened out as insignificant. Further assessment has therefore been undertaken to establish the maximum resultant predicted pollutant level (2028 DS, i.e. the PEC). The outcomes are detailed in Table 6-9.

Table 6-9: Maximum Predicted Nutrient Nitrogen Deposition: 2028 DS

Site ID	Qualifying Feature	2028 DS		Further Assessment?
		kg N/ha/yr	% of CLo	
ER1	Raised and blanket bogs	17.13	342.7	Yes
	Fagus forest on non-acid and acid soils	25.62	256.2	Yes

The maximum annual mean nutrient N deposition rate modelled at ER1 exceeds the minimum Critical Load within the 2028 DS scenario. Further information is explored below.

ER1: River Usk/ Afon Wysg SAC

The background nitrogen deposition already exceeds the CLo (including the upper limit).

The spatial extent of the affected area (i.e. where total modelled concentrations are >1% of the CLo and therefore cannot be considered insignificant) is approximately 11,028m² (Raised and blanket bogs) and 9,762m² (Fagus forest on non-acid and acid soils) as illustrated in Figure 6-2. This equates to 0.11% and 0.10% of the total designated area only.

This has been referred to the Project Ecologist (Biodiverse) for further consideration and conclusion on significance within the Shadow Habitats Regulations Assessment (sHRA) document.

6.2.4 Acid Deposition Modelling Results

Similarly to the nutrient nitrogen assessment, the acid deposition assessment has considered the most sensitive short vegetation and woodland vegetations features potentially present within the SAC (as listed on APIS) and the lowest associated CLo. This is therefore not an exhaustive list of qualifying features but instead identifies those most sensitive to air pollution (there are a number of additional woodland features that may also be present).

Table 6-10 presents the Proposed Development's maximum contribution in 2028 (project alone and in-combination) to acidic N deposition rates relative to the receptor specific CLmaxN for screening.



Table 6-10: Maximum Predicted Change in Acidic N Deposition

Site ID	Qualifying Feature	CL _{max} N (k _{eq} /ha/yr)	Project Alone		Screened Out?	In-Combination		Screened Out?
			k _{eq} /ha/yr	% of CLo		k _{eq} /ha/yr	% of CLo	
ER1	Bogs	0.755 – 0.809	0.14	23.49	No	0.14	24.02	No
	Unmanaged Broadleafed/Coniferous Woodland	2.269 – 2.311	0.22	16.50	No	0.22	16.93	No

The maximum increases in nutrient N deposition as a result of the Proposed Development alone and in-combination are predicted to be >1% of the minimum CLo at ER1 for both considered features and therefore cannot be screened out as insignificant. Further assessment has therefore been undertaken to establish the maximum resultant predicted pollutant level (2028 DS, i.e. the PEC). The outcomes are detailed in Table 6-11.

Table 6-11: Maximum Predicted Acidic N Deposition Rates

Site ID	Qualifying Feature	2028 DS		Further assessment?
		kg N/ha/yr	% of CLo	
ER1	Bogs	1.33	175.6	Yes
	Unmanaged Broadleafed/Coniferous Woodland	2.11	93.0	No

As shown in Table 6-11, no exceedances of the 'Unmanaged Broadleafed/Coniferous Woodland' minimum CLo_{max}N is predicted at ER1 during the DS scenario. As such, it can be concluded that there is no 'likely significant effect' on Unmanaged Broadleafed/Coniferous Woodland. No Further assessment is required.

For 'Bogs', the maximum annual mean acidic N deposition rate modelled at ER1 exceeds the minimum CLo within the 2028 DS scenario. Further information is explored below.

ER1: River Usk/ Afon Wysg SAC

The spatial extent of the affected area (i.e. where total modelled concentrations are >1% of the CLo and therefore cannot be considered insignificant) is approximately 7,739m² as illustrated in Figure 6-2. However, for context, the background acidic N deposition rate exceeds the CL_{max}N and the spatial extent of impact is confined to 0.08% of the total designation area only.

This has been referred to the Project Ecologist (Biodiverse) for further consideration and conclusion on significance within the Shadow Habitats Regulations Assessment (sHRA) document.





Figure 6-2: Spatial Extent of Modelled Nutrient N and Acidification Impacts (PC >1% of Critical Level)



7.0 Mitigation Measures

This section presents any proportionate mitigation measures required during the construction and operational phases of the Proposed Development.

7.1 Construction Dust

As discussed in Section 5.0, construction impacts associated with the Proposed Development would result in the generation of dust and PM₁₀.

In order to control potential impacts, a range of mitigation measures which could be applied and align with the IAQM Construction Dust guidance are presented in Table 8-1. With the effective application of the dust mitigation measures, residual effects will be 'not significant'.

7.2 Operational Phase

7.2.1 Human Receptors

In accordance with EPUK & IAQM guidance, the overall effect of the development on NO₂, PM₁₀ and PM_{2.5} concentrations at assessed existing receptor locations is considered to be 'not significant'. Therefore, no mitigation is required.

Notwithstanding, the Proposed Development will include electric vehicle (EV) charging infrastructure, in line with the Lidl's commitment to support the use of electric vehicles.

7.2.2 Ecological Receptors

A detailed ecological assessment has been undertaken in accordance with NRW and IAQM guidance. The results have been provided to Biodiverse, the appointed Project Ecologist, for further consideration as part of the sHRA. The significance of any potential effects will be assessed within the sHRA and any associated mitigation measures identified as necessary will be set out within the sHRA.



8.0 Conclusion

SLR has been commissioned by Lidl to undertake an air quality assessment to support a planning application for a food store and associated infrastructure at King's Meadow, Brecon.

8.1 Construction Phase

A qualitative assessment of the potential dust impacts during the construction of the Proposed Development has been undertaken following the IAQM Construction Dust guidance.

Following the construction dust assessment, the Site is found to be at worst 'low risk' in relation to dust soiling effects on people and property, 'Negligible' in relation to human health impacts and 'low risk' in relation to ecological impacts. Providing effective mitigation measures are implemented, such as those outlined in Table 8-1 of this report, residual effects from dust emissions during the construction phase would be 'not significant'.

8.2 Operational Phase

The assessment of operational phase effects considered impacts from road traffic emissions associated with the Proposed Development. The ADMS-Roads dispersion model was used to determine the likely NO_x, NO₂, PM₁₀ and PM_{2.5} and NH₃ concentrations at relevant receptor locations for a series of scenarios, in accordance with LAQM.TG(22).

8.2.1 Human Receptors

Applying EPIC & IAQM guidance, the impacts of the Proposed Development on NO₂, PM₁₀ and PM_{2.5} concentrations at all existing receptor locations are considered to be 'negligible', effects at all assessed receptor locations are considered 'not significant'.

8.2.2 Ecological Receptors

Following NRW and IAQM guidance, the impacts on the River Usk / Afon Wysg SAC can be summarised as follows:

- **NO_x concentrations:** The PEC is less than the CLe and therefore there are no Likely Significant Effects and no further assessment is required.
- **NH₃ concentrations:** The maximum change predicted at any receptor as a result of the Proposed Development alone and in-combination is >1% of the CLe and the PEC exceeds the CLe. However, for context, the background NH₃ concentrations approach / exceed the NH₃ CLe and the spatial extent of impact is confined to 0.10% of the total designated area.
- **Nutrient N deposition:**
 - Bog Woodland: The maximum change predicted at any receptor as a result of the Proposed Development alone and in-combination is >1% of the CLo. Furthermore, the PEC is greater than the CLo. However, for context, the background nutrient N deposition exceeds the CLo and the spatial extent of impact is confined to 0.11% of the total designated area.
 - Asperulo-Fagetum beech forests: The maximum change predicted at any receptor as a result of the Proposed Development alone and in-combination is >1% of the critical load. Furthermore, the PEC is greater than the CLo. However, for context, the background nutrient N deposition exceeds the CLo and the spatial extent of impact is confined to 0.10% of the total designated area.



- **Acidification:**

- Bogs: The maximum change predicted at any receptor as a result of the Proposed Development alone and in-combination is >1% of the critical load. Furthermore, the PEC is greater than the critical load. However, for context, the background acid deposition exceeds the Clo and the spatial extent of impact is confined to 0.10% of the total designated area.
- Unmanaged Broadleaved/Coniferous Woodland: The PEC does not exceed the Clo and therefore there are no Likely Significant Effects and no further assessment is required.

Where a conclusion of No Likely Significant Effects could not be reached, the results have been referred to the Project Ecologist (Biodiverse) for further consideration as part of the sHRA, where the significance of effects will be determined.





Appendix A Legislation and Planning Policy

Lidl, King's Meadow, Brecon

Air Quality Assessment

Lidl Great Britain Ltd

SLR Project No.: 425.068000.00001

6 October 2026

A.1 Legislation

A dual set of regulations, separately applicable to National and Local Government, are currently operable within the UK.

A.1.1 National Obligations

The Air Quality Standards (Wales) Regulations 2010²¹ (AQSR) transpose both the EU Ambient Air Quality Directive (2008/50/EC), and the Fourth Daughter Directive (2004/107/EC) within Welsh legislation. The AQSR includes Limit Values which are legally binding ambient concentration thresholds which, however, are only applicable at specific locations (Schedule 1: AQSR)²².

Following the UK's withdrawal from the EU, the Environment (Miscellaneous Amendments) (Wales) (EU Exit) Regulations 2020²³ was introduced to mirror revisions to supporting EU legislation. As a result, the PM_{2.5} Limit Value was reduced to 20µg/m³ (to be met by 2020).

The responsibility of achieving the AQSR is a national obligation for the Welsh Government who undertake assessments on an annual basis. Local Authorities have no statutory obligation to achieve the AQSR or the European equivalent Directives.

On 14 February 2024, the Environment (Air Quality and Soundscapes) (Wales) Act²⁴ became law in Wales. The Act supports delivery of the measures set out in The Clean Air Plan for Wales²⁵ to improve air quality. The Act also imposes a duty on Welsh Ministers to set at least one target, in regulations, in respect of annual mean fine particulate matter (PM_{2.5}) levels. The Welsh Government consulted on these targets in early 2026. The draft legislation²⁶ proposes a PM_{2.5} target of 10µg/m³ to be met by 31 December 2035.

A.1.2 Local Obligations

Part IV of the Environment Act 1995²⁷ (as amended by the Environment Act 2021²⁸) requires the Welsh Ministers to review the national Air Quality Strategy (AQS) every five years and modify this if required. It also established the system of Local Air Quality Management (LAQM) for Local Authorities to regularly review and assess air quality within their respective administrative areas.

The Air Quality (Wales) Regulations 2000 (as amended by the Air Quality (Wales) (Amendment) Regulations 2002) provide the statutory basis for the Air Quality Objectives. Local Authorities must adhere to under LAQM in Wales. PM_{2.5} is not currently part of the LAQM framework; however, as per the national AQS, Local Authorities are expected to work towards reducing PM_{2.5}.

In 2020, the Welsh Government published The Clean Air Plan for Wales²⁹ which sets out the over-arching strategic framework for air quality management in Wales. In 2023, following a

²¹ The Air Quality Standards (Wales) Regulations 2010, Wales Statutory Instrument No. 1433 (W. 126).

²² [Schedule 1 of the 2010 AQSR](#) provides the locations of the sampling points where the AQSR Limits Values can be assessed.

²³ The Environment (Miscellaneous Amendments) (Wales) (EU Exit) Regulations 2020, Wales Statutory Instrument No. 1215 (W. 274).

²⁴ Environment (Air Quality and Soundscapes) (Wales) Act 2024, Acts of Senedd Cymru, 2024 asc 2.

²⁵ Clean Air Plan for Wales: Healthy Air, Healthy Wales. Welsh Government, August 2020. WG40794.

²⁶ The Air Quality Targets (Fine Particulate Matter) (Wales) Regulations 2026, Draft Welsh Statutory Instruments 2026 No. (W.).

²⁷ Environment Act 1995, 1995 chapter 25.

²⁸ Environment Act 2021, 2021 chapter 30.

²⁹ Welsh Government, The Clean Air Plan for Wales: Healthy Air, Healthy Wales, 2020.



review of the AQS for England, Scotland, Wales and Northern Ireland, which was published in 2007³⁰, the Welsh Government formerly adopted The Clean Air Plan for Wales as the National AQS for Wales, to replace the 2007 document. However, the objectives of the former 2007 strategy were retained.

The Air Quality Objectives apply at locations where members of the public are regularly present and might reasonably be expected to be exposed to pollutant concentrations over the relevant averaging period (referred to as 'relevant exposure'). Table 2-2 provides an indication of those locations. Where any of the prescribed Air Quality Objectives are not likely to be achieved, the authority must designate an AQMA. For each AQMA, the local authority is required to prepare an Air Quality Action Plan (AQAP), which details measures the authority intends to introduce to deliver improvements in local air quality and achieve compliance.

A.1.3 Environmental Protection Act 1990

The Environmental Protection Act 1990³¹ sets out provisions for the regulation of statutory nuisances. Section 79 sets out this statutory nuisance as "*any dust, steam, smell or other effluvia arising on industrial, trade or business premises and being prejudicial to health or a nuisance*".

Fractions of dust greater than 10µm (i.e. greater than PM₁₀) 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.

A.1.4 Ecological Habitats

Ecological habitats vary in terms of their sensitivity, perceived ecological value, geographic importance, and level of protection. Within the UK, there are three types of nature conservation designations: international, national, and local designations, which are all provided environmental protection from developments, including from atmospheric emissions, with a greater level of protection afforded to the former, relative to the latter.

The Conservation of Habitats and Species Regulations 2017 (as amended) (the 'Habitats Regulations')³² introduces the precautionary principle for protected European sites, i.e. that projects can only be permitted to proceed having ascertained that there will be no adverse effect on the integrity of the designated site. It requires an assessment to determine if significant effects (alone or in-combination) are likely, followed by an 'appropriate assessment' by the competent authority, if necessary. European sites include SAC and SPA. These regulations were subsequently amended in 2019 to make them operable from 1 January 2021 despite the UK's withdrawal from the EU³³.

The Wildlife and Countryside Act 1981 (as amended, primarily by The Countryside and Rights of Way Act 2000) provides protection to Sites of Special Scientific Interest (SSSI) to ensure that developments are not likely to cause damage. Other designations (e.g. Ancient Woodland) are afforded protection under national planning policy; including the Planning Policy Wales (PPW).

³⁰ Defra, The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, July 2007.

³¹ The Environmental Protection Act 1990. Available at <http://www.legislation.gov.uk/ukpga/1990/43/contents>.

³² The Conservation of Habitats and Species Regulations 2017 (as amended) Statutory Instrument 490.

³³ The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019.



Sites of ecological importance are provided environmental protection with respect to air quality, through the application of standards known as Critical Levels and Critical Loads (Section 2.2).

A.2 Planning Policy

A.2.1 National Planning Policy

The Planning Policy Wales (PPW)³⁴ document sets out the Welsh Government's land use planning policies for development across Wales.

The document states the following in relation to air quality and planning:

"6.1.32 When considering a scheme of enabling development, planning permission should be granted only where all of the following can be applied:

[...] the enabling development does not give rise to significant risks, for example residential development in the floodplain or significantly impact on air quality or soundscape."

Furthermore, in relation to addressing air quality in the planning system:

"6.7.4 The planning system should maximise its contribution to achieving the well-being goals, and in particular a healthier Wales, by aiming to reduce average population exposure to air and noise pollution alongside action to tackle high pollution hotspots. In doing so, it should consider the long-term effects of current and predicted levels of air and noise pollution on individuals, society and the environment and identify and pursue any opportunities to reduce, or at least, minimise population exposure to air and noise pollution, and improve soundscapes, where it is practical and feasible to do so.

6.7.5 In taking forward these broad objectives the key planning policy principle is to consider the effects which proposed developments may have on air or soundscape quality and the effects which existing air or soundscape quality may have on proposed developments. Air Quality and soundscape influence choice of location and distribution of development and it will be important to consider the relationship of proposed development to existing development and its surrounding area and its potential to exacerbate or create poor air quality or inappropriate soundscapes. The agent of change principle says that a business or person responsible for introducing a change is responsible for managing that change. In practice, for example, this means a developer would have to ensure that solutions to address air quality or noise from nearby pre-existing infrastructure, businesses or venues can be found and implemented as part of ensuring development is acceptable."

PPW is supported by Future Wales: The National Plan 2040³⁵ which is the national development framework for Wales. Air quality is a key theme throughout the framework.

A.2.2 Local Planning Policy

BBNPA's current Local Development Plan (LDP)³⁶ was adopted in December 2013 and covers the period 2007 – 2022.

It contains the following policies of relevance to air quality:

³⁴ Welsh Government, Planning Policy Wales, Edition 12, February 2024.

³⁵ Welsh Government, Future Wales: The National Plan 2040, February 2021.

³⁶ Brecon Beacons National Park Local Development Plan (2007 – 2022). Adopted 17th December 2013.



“Policy 14 Air Quality

Proposals for development will only be permitted where it is proven that no detrimental impact, individually or cumulatively will be had on air quality. Proposals for development which are likely to impact negatively on air quality or are potentially polluting will not be permitted unless mitigation measures to avoid the impact are provided.”

BBNPA have commenced the preparation of a revised LDP (National Park Local Development Plan 2025 – 2045). On review of the adoption timetable, the revised LDP is currently at stage one of its development (*Participation and involvement: strategy and evidence*) and has a proposed adoption year of 2029.





Appendix B Construction Dust Mitigation Measures

Lidl, King's Meadow, Brecon

Air Quality Assessment

Lidl Great Britain Ltd

SLR Project No.: 425.068000.00001

6 October 2026

B.1 Construction Dust Mitigation Measures

Table 8-1: Construction Dust Mitigation Measures

Site Application	Mitigation Measures
Highly Recommended	
Communications	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.
Monitoring	Display the head or regional office contact information.
	Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked.
	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.
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.
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 and appropriate.
	Use enclosed chutes and conveyors and covered skips.
	Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
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.
	Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
	Avoid site runoff of water or mud.
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 offsite, and the action taken to resolve the situation in the log book.
Waste Management	Avoid bonfires and burning of waste materials.
Desirable	
Communications	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.
Construction	Avoid scabbling (roughening of concrete surfaces) if possible.
	Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
Monitoring	Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and windowsills within 100m of site boundary, with cleaning to be provided if necessary.
Operating Vehicle/Machinery and Sustainable Travel	Impose and signpost a maximum-speed-limit of 15mph on surfaced and 10mph on unsurfaced 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



Site Application	Mitigation Measures
	approval of the nominated undertaker and with the agreement of the local authority, where appropriate).
Operations	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.
Preparing and Maintaining the Site	Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period.
	Keep site fencing, barriers and scaffolding clean using wet methods.
	Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.
	Cover, seed or fence stockpiles to prevent wind whipping.
Trackout	Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, 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.
	Record all inspections of haul routes and any subsequent action in a site logbook.
	Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).





Appendix C Model Inputs and Verification

Lidl, King's Meadow, Brecon

Air Quality Assessment

Lidl Great Britain Ltd

SLR Project No.: 425.068000.00001

6 October 2026

C.1 Traffic Data

Table 8-2 provides an overview of the traffic data used within the assessment.

Table 8-2: Traffic Data Used Within the Assessment

Link ID	Road Name	Details	Speed (kph)	2024 BS		2028 DM-C		2028 DM		2028 DS	
				AADT	HDV %	AADT	HDV %	AADT	HDV %	AADT	HDV %
1	Site Access	New site access	10	-	-	-	-	-	-	2,583	0.2
2	A470 (north of site)	Between site access and roundabout	64	9,745	3.0	9,745	3.0	10,212	3.0	10,987	0.5
3	A470 (south of site)	Immediately south of site access	64	9,745	3.0	9,745	3.0	10,212	3.0	10,212	0.0
4	Unnamed Road	Section approaching roundabout	96	3,628	1.4	3,628	1.4	3,801	1.4	3,801	0.0
5	A40 (West)	Section approaching roundabout	96	5,165	4.6	5,165	4.6	5,412	4.6	5,412	0.0
6	B4601	Section approaching roundabout	64	8,526	1.7	8,526	1.7	8,935	1.7	9,193	1.5
7	A40 (East) westbound	Section approaching roundabout	96	5,085	4.4	5,085	4.4	5,328	4.4	5,328	0.0
7.1	A40 (East) eastbound		96	5,085	4.4	5,085	4.4	5,328	4.4	5,328	0.0
8	B4520 Pendre Close	B4520 Pendre Close, 5m south of Peppercorn Lane	32	3,983	7.7	3,983	7.7	4,174	7.7		
9	B4520 Priory Hill	B4520 Priory Hill, 15m north of Priory Gardens	32	5,253	6.0	5,253	6.0	5,505	6.0		
10	Maendu Street	Between Maendu Terrace	32	2,253	0.3	2,253	0.3	2,361	0.0		
Table Note: Link ID's 8-10 are used for modelled verification only and do not form part of the affected study area for human or ecological receptors.											



C.2 Advanced Model Inputs

Advanced model inputs used are detailed below.

C.2.1 Surface Roughness

A surface roughness value of 0.5m was used to represent the dispersion site. This represents 'Parkland and open Suburbia' and is therefore considered appropriate. Given the use of NWP meteorological data, the applied surface roughness value for the dispersion site is reflective of the met site.

C.2.2 Opening Hours / Diurnal Profile

The Proposed Development will operate from 08:00 to 22:00 Monday to Saturday, with reduced opening hours of 10:00 to 16:00 on Sundays and Bank Holidays. The opening hours have been taken into account when assessing the development trip generation, with trips distributed across the relevant weekday, Saturday and Sunday periods to reflect the anticipated operational profile.

C.3 Model Verification

The ADMS-Roads dispersion model has been widely validated for this type of assessment and is specifically listed in Defra's LAQM.TG(22) as an accepted dispersion model.

Model validation undertaken by the software developer (CERC) will not have included validation in the vicinity of the Site. It is therefore necessary to perform a comparison of modelled results with local monitoring data at relevant locations. This process of verification attempts to minimise modelling uncertainty and systematic error by correcting modelled results by an adjustment factor to gain greater confidence in the final results.

Prior to undertaking model verification, model setup parameters and input data were reviewed to maximise the performance of the dispersion model in relation to the real-world conditions.

C.3.1 NO_x / NO₂ Verification

NO_x / NO₂ verification relates to the comparison and adjustment of modelled road-NO_x (as output from the ADMS-Roads dispersion model), relative to monitored road-NO_x.

For NO_x / NO₂ model verification, 2024 PCC monitoring data has been used for those roadside locations situated adjacent to a modelled link, i.e. where traffic data exists. Table 8-3 presents all relevant local monitoring data available for model verification.

Table 8-3: Local Monitoring Data Available for Model Verification

Site ID	NGR X (m)	NGR Y (m)	2024 Monitored Annual Mean NO ₂ (µg/m ³)	2024 Data Capture (%)
Powys/24A/NAS1	303190	228398	15.7	100
Powys/24B/NDS1	304349	229026	12.1	100
Powys/24B/NDS2	304350	229070	12.6	68
Powys/24B/NDS4	304352	229145	9.2	68

NO_x was back calculated using the latest version of Defra's NO_x to NO₂ Calculator (v9.1) for all diffusion tube monitors. The NO_x to NO₂ Calculator was also used to facilitate the



conversion of modelled road-NO_x (as output from the ADMS-Roads dispersion model) into road-NO₂.

Initial Verification

Verification was completed using the 2024 Defra background mapped concentrations (2021 reference year) for the relevant 1km² grid squares (i.e. those which contain verification locations). To avoid double counting of potential background sources already contained within the ADMS-Roads dispersion model, relevant sources were removed from the appropriate background grid square. This was limited to the removal of the 'Primary A Roads in' and 'Trunk A Road in' sectors.

Comparison of the modelled vs. monitored road-NO_x is provided in Table 8-4. An adjustment factor of 1.579 has been derived, based on a linear regression forced through zero, as shown Figure C-1.

Table 8-4: NO_x / NO₂ Model Verification (1.579)

Site ID	Monitored Road-NO _x (µg/m ³)	Modelled Road-NO _x (µg/m ³)	Ratio (Monitored vs. Modelled Road-NO _x)	Adjustment Factor	Adjusted Modelled Total NO ₂ (µg/m ³)	Monitored Total NO ₂ (µg/m ³)	% Difference (Adjusted Modelled NO ₂ vs Monitored NO ₂)
Powys/24A/NAS1	27.2	20.6	1.3	1.579	17.9	15.7	14.1
Powys/24B/NDS1	19.3	10.3	1.9		10.7	12.1	-11.4
Powys/24B/NDS2	20.5	9.6	2.1		10.2	12.6	-19.1
Powys/24B/NDS4	13.0	4.5	2.9		6.3	9.2	-31.1



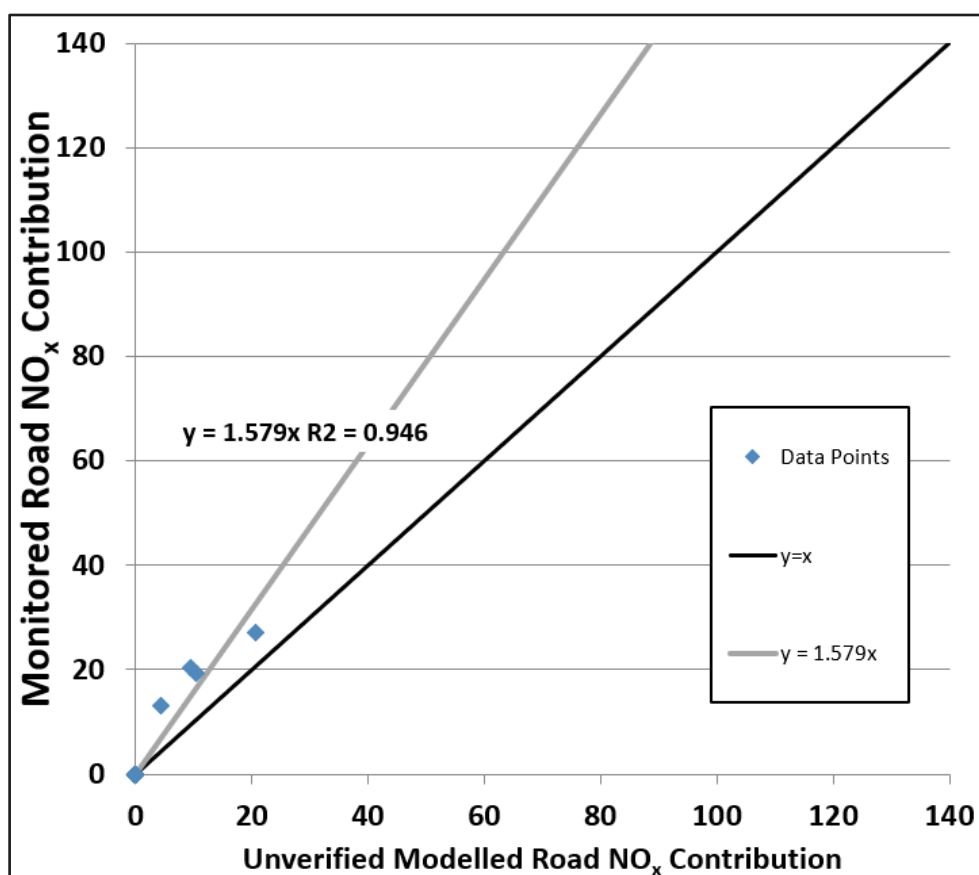


Figure C-1: Comparison of Modelled vs. Monitored Road-NO_x Contribution (1.579)

LAQM.TG(22) states that:

"In order to provide more confidence in the model predictions and the decisions based on these, the majority of results should be within 25% of the monitored concentrations as a minimum, preferably within 10%".

As shown in Table 8-4, the difference between the adjusted modelled NO₂ and monitored NO₂ is $\pm 25\%$ at all locations with the exception of Powys/24B/NDS4. Therefore, this tube was reviewed further in more detail.

Powys/24B/NDS4 was underperforming the most. Following closer inspection, Powys/24B/NDS4 is located directly opposite 'Peppercorn Lane' which is not represented within the model due to absence of appropriate traffic data. Furthermore, there are a significant number of vehicles parked on the roadside near the monitor and associated emissions such as vehicle idling are not reflected within the model. As such, associated traffic emissions may not be appropriately represented by the model and would result in an underprediction of modelled concentrations at these locations.

The verification exercise was repeated with this monitor removed to refine the dispersion model.

Final Verification

Further comparison of the modelled vs. monitored road-NO_x is provided in Table 8-4. An adjustment factor of 1.536 has been derived, based on a linear regression forced through zero, as shown Figure C-1.



Table 8-5: NO_x / NO₂ Model Verification (1.536)

Site ID	Monitored Road-NO _x (µg/m ³)	Modelled Road-NO _x (µg/m ³)	Ratio (Monitored vs. Modelled Road-NO _x)	Adjustment Factor	Adjusted Modelled Total NO ₂ (µg/m ³)	Monitored Total NO ₂ (µg/m ³)	% Difference (Adjusted Modelled NO ₂ vs Monitored NO ₂)
Powys/24A/NAS1	27.2	20.6	1.3	1.536	17.6	15.7	11.8
Powys/24B/NDS1	19.3	10.3	1.9		10.5	12.1	-13.1
Powys/24B/NDS2	20.5	9.6	2.1		10.0	12.6	-20.6

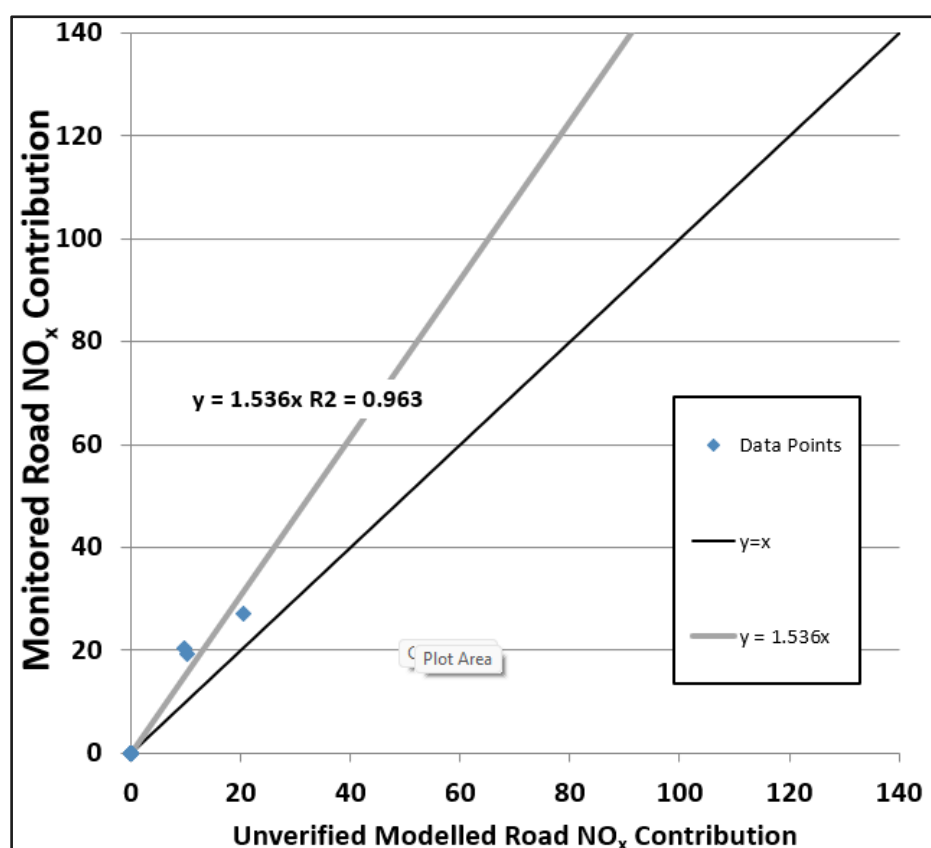


Figure C-2: Comparison of Modelled vs. Monitored Road-NO_x Contribution (1.536)

As shown in Table 8-4, the difference between the adjusted modelled NO₂ and monitored NO₂ is $\pm 25\%$ at all locations. In addition, a verification factor of 1.536 reduces the Root Mean Square Error (RMSE) from a value of 4.1 µg/m³ to 2.0 µg/m³, within the ideal LAQM.TG(22) prescribed limit (10% of the annual mean AQAL).

On this basis, the derived verification factor (1.536) was considered acceptable and was subsequently applied to all road-NO_x concentrations predicted (as output of the ADMS Roads dispersion model).

C.3.2 PM₁₀ / PM_{2.5} Verification

The adjustment factor of 1.536 was also applied to road-PM₁₀ and PM_{2.5} concentrations (as output of the ADMS Roads dispersion model), following the recommendations of LAQM.TG(22) in the absence of local particulate monitoring.



C.3.3 Ammonia Verification

In accordance with guidance provided by AQC³⁷ on the CREAM Emissions Model Version 2, local verification of CREAM has not been undertaken and therefore no verification factor has been applied to the road-NH₃ model outputs.

³⁷ Air Quality Consultants, Development of CREAM Emissions Model Version 2, Revision 01, 07/02/2025.





Making Sustainability Happen