Ashdown Forest SAC & Lewes Downs SAC - Air Quality Modelling Methodology

Habitats Regulations Assessment of the planned Local Plan of Wealden District Council

Wealden District Council

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Quality information

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Revision History

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1. Introduction

1.1 Wealden District Council (WDC)'s Local Development Scheme (LDS) was adopted on 29 January 2026 by Full Council. A new Local Plan is in preparation, which will provide policies to manage growth in the district and guide development over a 15 year period from its adoption. The Local Plan will become the key planning document against which planning applications are assessed in accordance with the timetable set out in the adopted LDS (Wealden District Council, 2026).

1.2 In March 2024, WDC published a draft Local Plan outlining the Council's proposed policies and growth strategies. The Local Plan is likely to affect traffic flows on the roads operating through the Ashdown Forest Special Area of Conservation (SAC) located within Wealden District, and adjacent to the Lewes Downs SAC, which lies outside the district boundary within Lewes District. These SACs were identified as part of the Regulation 18 Wealden Local Plan (March 2024) Habitats Regulations Assessment (HRA) as being at risk of air quality impacts. In accordance with the Habitats Regulations, potential effects of the Local Plan must be assessed for all designated sites that could be affected by plan-related changes, regardless of whether those sites fall within the Local Authority boundary. The Council has therefore commissioned AECOM Limited to conduct an air quality assessment to inform this Regulation 19 Wealden Local Plan HRA. This report presents an interim air quality assessment based on traffic data provided by the project team on 11 August 2026. When provided, these represented the latest available traffic forecasts. Updated traffic data are expected to become available at a later stage and may be considered in future iterations of the assessment.

1.3 The assessment focuses on the impact of traffic related nitrogen-based emissions due to the planned development in the Wealden Local Plan on sensitive ecosystems within the Ashdown Forest SAC and the Lewes Downs SAC. The Ashdown Forest SAC is designated for heathland, which is sensitive to nitrogen and ammonia (NH_3) deposition and includes lichens and bryophytes that can be particularly sensitive. The Lewes Downs SAC is designated for semi-natural dry calcareous grassland, which is sensitive to nitrogen and NH_3 deposition and includes rare orchid species.

1.4 This assessment considers the following key pollutants shown to affect sensitive ecosystems: NH_3, oxides of nitrogen[1] (NO_X), total nitrogen deposition and nitrogen acid deposition. All pollutants are considered at receptor locations within transects up to a distance of 200m from the roadside of affected road links - within the SACs.

1.5 WDC undertook monitoring of nitrogen dioxide (NO_2) and NH_3 between 2022 and 2025 within the Ashdown Forest SAC. Monitoring data has been used to verify the model performance with regards to NOx and NH_3 concentrations.

1.6 The following scenarios have been modelled:

- Baseline year (2023): represents air quality conditions in the selected base year using verified traffic data and background pollutant concentrations for the same year;
- Future Baseline (2042): represents the future assessment year using baseline traffic flows but applying projected vehicle emission factors and background pollutant concentrations from the future assessment year to account for anticipated improvements in the vehicle fleet;
- 2042 Option1: future assessment year including forecast traffic growth and committed development, but excluding development allocations proposed within the Local Plan commonly also referred to as Do Minimum scenario (DM); and
- 2042 Option 2: future assessment year including forecast traffic growth, committed development and the development allocations proposed within the Local Plan commonly also referred to as Do Something (DS) scenario.

1.7 The results of the modelling of the above scenarios are assessed to compare against NO_x and NH_3 critical levels, and nitrogen and acid deposition critical loads within the Ashdown Forest SAC and Lewes Downs SAC. The results are presented in the accompanying report 'Habitats Regulations Assessment of the Local Plan of Wealden District Council'.

[1] Nitrogen oxides emitted from combustion processes are collectively known as NOx and primarily include nitric oxide (NO) which is quickly oxidised in the atmosphere to nitrogen dioxide (NO_2).

2. Policy Context

Clean Air Strategy

2.1 In 2019, the UK government released its Clean Air Strategy 2019 (Defra, 2019) as part of its 25 Year Environment Plan (Defra, 2018). These documents include targets to reduce emissions of NH_3 from farming activities, and nitrogen oxides from combustion processes, and thus reduce the deposition of nitrogen to sensitive ecosystems.

Environment Act

2.2 The Environment Act 2021 (HM Government, 2021) amends the Environment Act 1995 (HM Government, 1995). On 9 November 2021, the Act received Royal Assent after being first introduced to Parliament in January 2020 to address environmental protection and the delivery of the Government's 25 Year Environment Plan. It includes provisions to establish a post-Brexit set of statutory environmental principles to ensure environmental governance through an environmental watchdog, the Office for Environmental Protection (OEP).

2.3 The Secretary of State must publish a review report every five years (as a minimum and with yearly updates to Parliament). The 25 Year Environment Plan was adopted as the first Environmental Improvement Plan (EIP) of the Environment Act 2021. The first statutory Environmental Improvement Plan, EIP 23 (DEFRA, 2023), sets out long-term legally binding targets and outlines the Governments environmental priorities and actions.

Habitats Regulations Assessment (HRA)

2.4 While the UK is no longer a member of the EU, a requirement for HRA will continue as set out in the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019.

2.5 The HRA process applies the 'Precautionary Principle'[2] to European sites. Plans and projects can only be permitted having ascertained that there will be no adverse effect on the integrity of the European site(s) in question. To ascertain whether or not site integrity will be affected, an Appropriate Assessment should be undertaken of the Plan or project in question.

2.6 Following evidence gathering, the first stage of any HRA is the screening for Likely Significant Effects (LSEs), a high-level assessment to decide whether the Appropriate Assessment is required. Where it is determined that a conclusion of 'no Likely Significant Effects' cannot be drawn, the analysis proceeds to the Appropriate Assessment.

2.7 The Local Plan will significantly increase the population and employment opportunities within the District, which may result in more journeys being undertaken within 200m of sensitive features. Therefore, LSEs cannot be excluded, and the Ashdown Forest SAC and Lewes Downs SAC have been screened in for Appropriate Assessment regarding this impact pathway. This is in accordance with Natural England's approach to advising competent authorities on the assessment of road traffic emissions under the Habitats Regulations (Natural England, 2018).

2.8 As such, the air quality modelling methodology and analyses presented in this report have been undertaken to inform the HRA for the Ashdown Forest SAC and Lewes Downs SAC.

Regional Policy

2.9 WDC currently does not have an Air Quality Action Plan (AQAP) in place, as the district has not identified any designated Air Quality Management Areas (AQMAs) or exceedances of air quality objectives.

[2] The Precautionary Principle, which is referenced in Article 191 of the Treaty on the Functioning of the European Union, has been defined by the United Nations Educational, Scientific and Cultural Organisation (UNESCO, 2005) as: *"When human activities may lead to morally unacceptable harm* [to the environment] *that is scientifically plausible but uncertain, actions shall be taken to avoid or diminish that harm. The judgement of plausibility should be grounded in scientific analysis".*

Lewes District Council Air Quality Action Plan (2025)

2.10 Lewes District Council (LDC) currently has two AQMAs within their jurisdiction, both of which have been declared for exceedances of the annual mean NO_2 objective. These are:

- Lewes Town Centre (approximately 16km from Ashdown Forest SAC, and 1km from Lewes Downs SAC); and
- A259 Newhaven Ring Road (approximately 24km from Ashdown Forest SAC, and 7.5km from Lewes Downs SAC).

2.11 LDC's Air Quality Action Plan (AQAP) (Lewes District Council, 2025), was published in 2025 and includes actions to improve air quality across their two AQMAs. The plan outlines a total of 32 measures, which are based around the following priorities:

- Priority 1: Transport – aims to reduce pollutant emissions from transport, which contributes a significant portion of emissions across the district;
- Priority 2: Planning and Infrastructure – ensures that new development will not cause adverse effects on air quality;
- Priority 3: Public Information and Behavioural Change – focuses on improving air quality to ensure good health across the District, and aims to ensure that health of the public is communicated effectively;
- Priority 4: Strategies and Policy Guidance – ensures that any relevant policies or strategies relating to air quality are considered; and
- Priority 5: Air Quality Monitoring – ensures air quality is effectively and closely monitored across the District.

2.12 These measures to reduce road traffic emissions, are expected to improve air quality within Ashdown Forest SAC and Lewes Downs SAC. Progress on the measures outlined in the AQAP will be discussed annually within LDC's Annual Status Reports (ASR).

East Sussex Local Transport Plan (2024-2050)

2.13 East Sussex County Council (ESCC) have developed a Local Transport Plan (LTP) (East Sussex County Council, 2024) which includes ambitions and objectives for towns across East Sussex, including Wealden and Lewes. The plan recognises the negative impact of congestion on air quality and aims to improve air quality by encouraging modal shift and decarbonisation.

2.14 The LTP includes a number of objectives that align with air quality considerations including: objective 2 which focuses on healthier lifestyles and communities, including considerations around active travel and reducing emissions to air, objective 3, which aims to decarbonise transport across ESCC and objective 4, which includes considerations around conservation of natural habitats.

2.15 Policies A1 and A2 aim to reduce vehicle emissions, to improve air quality. These policies focus on reducing the need for travel, encouraging modal shifts for shorter journeys, and fleet decarbonisation.

Air Quality and Emissions Mitigation Guidance for Sussex (2021)

2.16 The Air Quality and Emissions Mitigation Guidance for Sussex (Sussex Air, 2021) provides a framework for addressing air quality and emissions issues across the Sussex region. This guidance was developed collaboratively by local authorities within Sussex to ensure a consistent and effective approach to mitigating air quality impacts from development and transport activities.

2.17 The guidance outlines a series of principles and measures aimed at reducing emissions and improving air quality. These measures are structured around key themes, which include:

- Planning and Development Control: Ensures that new developments incorporate air quality mitigation measures to prevent adverse impacts on local air quality. This includes the use of air quality assessments, low-emission strategies, and the integration of green infrastructure.
- Transport Emissions Reduction: Focuses on reducing emissions from transport sources, which are a major contributor to air pollution in Sussex. This includes promoting active travel (walking and cycling), enhancing public transport options, and encouraging the adoption of low-emission vehicles.

- Public Health and Awareness: Aims to raise awareness of air quality issues among residents and stakeholders, promoting behavioural changes that contribute to emission reductions and improved public health outcomes.
- Monitoring and Evidence-Based Action: Emphasises the importance of robust air quality monitoring to inform decision-making and track progress on mitigation measures. This includes the use of air quality data to guide local policies and interventions.

2.18 The implementation of the Air Quality and Emissions Mitigation Guidance for Sussex is expected to contribute significantly to improving air quality across the region, including areas such as the Ashdown Forest SAC and Lewes Downs SAC. By addressing emissions at the source and promoting sustainable practices, the guidance supports the conservation of natural habitats and aligns with broader regional and national air quality strategies.

Other Guidance documents

2.19 Best practice and advice / guidance contained within documents from Natural England (Natural England, 2018), the Institute of Air Quality Management (IAQM) (IAQM, 2020), the Chartered Institute of Ecology and Environmental Management (CIEEM) (CIEEM, 2021), National Highways (Design Manual for Roads and Bridges DMRB LA105) (DMRB, 2024), and Local Air Quality Management Technical Guidance (Defra, 2025) have been used to determine the methodology presented in this report, and in the accompanying ecological interpretation of the results.

Critical Levels

2.20 Annual mean critical levels of NO_x and NH_3 are summarised in Table 1. These are concentrations above which adverse effects on ecosystems may occur based on present knowledge. The critical level for NO_x is taken from the EU Ambient Air Quality Directive 2008/50/EU (EU Directives, 2008) which has also been set as the Air Quality Strategy objective for the protection of vegetation and ecosystems and has been incorporated into English legislation.

2.21 The EU Directive (EU Directives, 2008) states that the sampling point to determine compliance should be sited more than 20 km away from agglomerations or more than 5 km away from other built-up areas, industrial installations or motorways or major roads with traffic counts of more than 50,000 vehicles per day, which means that a sampling point must be sited in such a way that is representative of an area of at least 1,000 km^2. Applying the critical level for NO_x to designated nature conservation sites that are located close to busy roads is therefore precautionary.

2.22 The critical levels for NH_3 have not been incorporated into legislation and are a recommendation made by the United Nations Economic Commission for Europe (UNECE) Executive Body for the Convention on Long-Range Transboundary Air Pollution (CLRTAP) (UNECE, 2013).

Table 1: Annual Mean Critical Levels (NO_x and NH_3)

Pollutant	Critical Level
NOx	30 µg/m^3
NH_3	3 µg/m^3 for higher plants 1 µg/m^3 for lichens and bryophytes

3. Methodology

3.1 This section presents the methodology used to model air quality within the Ashdown Forest SAC and Lewes Downs SAC. The assessment is based on the latest interim traffic data available at the time of reporting. The following sources of information and data have been used to form the basis of the interim air quality assessment:

- Department for Environment, Food and Rural Affairs (Defra)'s Air Quality Background Concentration Maps based on a 2021 base year (Defra, 2024);
- Defra's Emissions Factor Toolkit (EFT) v14.1 (Defra, 2026);
- Driver Vehicle Licencing Agency (DVLA) statistics on licensed road-using cars and light goods vehicles dataset for 2024 (DVLA, 2025);
- Department for Transport (DfT)'s Transport Decarbonisation Plan of future vehicle fleet projections (DfT, 2024);
- Emission rates as published in the Calculator for Road Emissions of Ammonia (CREAM v2A) tool (Air Quality Consultants, 2025);
- 1x1 km modelled nitrogen and acid deposition data and NH_3 background concentrations from the Air Pollution Information System (APIS, 2026);
- Air quality monitoring data for 2022-2025 undertaken by WDC; and
- Interim traffic flow and speed data analysed by East Sussex County Council, WSP and Jacobs, representing the latest available information at the time of assessment.

Pollutants of Interest

3.2 The pollutants of interest with regards to sensitive ecosystems for which critical levels and critical loads exist, and which are included in the air quality modelling and assessment of impacts on the Ashdown Forest SAC and Lewes Downs SAC, are NO_x, NH_3, and nitrogen and acid deposition. Modelling of these pollutants is undertaken to assess the air quality impacts of planned development in the draft Local Plan, both alone and 'in combination' with that which is in the jurisdiction of surrounding authorities.

3.3 Whilst emissions of NO_x from road vehicles are regulated according to Euro standards, emissions of NH_3 are generally not regulated. This means that emissions of NH_3 from individual vehicle types are highly uncertain, particularly as measurements are rarely made (as this is not required for regulatory purposes). The uncertainty associated with the predicted nitrogen deposition rates from NH_3 is also greater than for NO_2, with the NH_3-derived nitrogen deposition rates representing an upper estimate.

3.4 There is currently no tool publicly available for the assessment of road traffic emissions of NH_3 from National Highways, Defra, Natural England, or other nature conservation bodies. However, there is evidence that exclusion of NH_3 from assessments leads to an underestimate of deposited nitrogen (Air Quality Consultants, 2025).

3.5 The methodology used to model NH_3 concentrations from road traffic, using ADMS Roads, and the subsequent contribution to nitrogen deposition within the SACs (described below), is considered the most appropriate that is publicly available at this time. The methodology has been applied by AECOM in several Appropriate Assessments to inform HRAs in neighbouring authorities and further afield including that for Tunbridge Wells Borough Council, the South Downs National Park Authority and Epping Forest District Council.

Nitrogen Oxides

3.6 Detailed dispersion modelling of road traffic emissions of NO_x has been undertaken using the latest version of ADMS Roads (currently v5.1), combined with the latest version – at the time of assessment – of Defra's EFT v14.1. The subsequent contribution of emitted NO_x to nitrogen and acid deposition within the SAC has also been assessed, as well as concentrations of NO_x.

3.7 Future fleet predictions were updated in EFT v14.1 for the fleet operating outside of London. However, the UK government's policy to ban the sale of new petrol and diesel cars and vans by 2035 (recently postponed from 2030) are not accounted for in the fleet information within the current version of the EFT. As such, a more up-to-date fleet projection for the future year fleet has been used, in line with recent DfT policy, which is discussed in more detail below in the "Modelled Vehicle Fleet" subsection. This takes account of the fact that a significant shift in the constitution of the UK vehicle fleet is forecast to arise during the 2030s.

3.8 Associated LAQM tools to the EFT v14.1 currently only support assessment years 2021-2040. AECOM has therefore used 2040 emission and concentration information for any later modelled years (2042). This offers a precautionary approach for Local Plan modelling as it would not account for any improvements in vehicle emission factors in the latter part of the plan period.

Ammonia

3.9 In February 2020, Air Quality Consultants developed and published the Calculator for Road Emissions of Ammonia (CREAM) tool, "*in order to allow tentative predictions regarding trends in traffic-related ammonia emissions over time"*. The tool is based upon remotely sensed pollutant measurements, published real-world fuel consumption data, and ambient measurements of NH_3 recorded in Ashdown Forest (2014-2016).

3.10 The report that was published alongside the CREAM tool states that:

"*It should be recognised that these emissions factors remain uncertain. Using them to make future year predictions will clearly be an improvement on any assessment which omits ammonia. They are also considered to be more robust than the emissions factors contained in the EEA Guidebook, which risk significantly under-predicting ammonia emissions. The emissions factors contained in the CREAM model can be considered to provide the most robust estimate of traffic-related ammonia possible at the present time, but they may be updated in the future as more information becomes available"*.

3.11 The CREAM v2A tool was updated in February 2025 and currently uses vehicle fleet information from Defra's EFT v12.0 which has now been superseded. This reliance on outdated data introduces a degree of uncertainty in the emissions estimates produced by the tool.

3.12 The latest version of ADMS Roads has been employed to model the dispersion of emissions of NH_3 from road traffic, consistent with the approach for modelling emissions of NOx, and the subsequent contribution of emitted NH_3 to nitrogen deposition within the SAC has also been assessed.

Traffic Data

3.13 Traffic flows used within this assessment have been provided to AECOM by Jacobs and WSP in the form of Interim Annual Average Daily Traffic (AADT) flows, and percentage of heavy duty vehicles (HDV). The assessment presented in this report is based on these interim traffic forecasts, issued on 11 August 2026.

3.14 The Ashdown Forest SAC modelled road links are shown in Figure 1, and Lewes Downs SAC road links presented in Figure 2.

3.15 Traffic data were provided for four scenarios:

- Baseline traffic (2023) flows - from traffic counts;
- Future year (2042) Option 1 - from the baseline traffic counts with a growth factor applied;
- Future year (2042) Option 2 - from baseline traffic counts with the Local Plan and accounting for growth from the Local Plan.

A summary of the traffic data used in the air quality assessment is provided in A.1.

Modelled Vehicle Fleet

3.16 For the baseline modelling of the SAC, the nominal EFT v14.1 "Basic Split" rural fleet for the 2023 year was used, as this aligns well with the 2023 base year traffic data, 2023 meteorological data, and 2023 Ashdown Forest SAC monitoring data.

3.17 Vehicle emission factors were derived using Defra's EFT v14.1. The EFT provides emission factors for different vehicle types, fuel types and Euro emission standards and is widely applied in LAQM, Environmental Impact Assessments (EIAs) and Habitats Regulations Assessments (HRAs).

3.18 To ensure the vehicle fleet composition used within the EFT reflects current vehicle characteristics, the most recent Driver and Vehicle Licensing Agency (DVLA) statistics on licensed road-using vehicles were reviewed (DVLA, 2025). This data provides an up-to-date representation of the distribution of vehicle fuel types and technologies within the vehicle fleet.

3.19 For the future assessment year (2040), vehicle emissions were derived using the EFT fleet projection functionality, which accounts for anticipated changes in vehicle technology and fleet turnover over time.

3.20 The current (2024) fleet composition, from which the 2040 fleet projection is based, is derived from the most up-to-date available full-year dataset (2024) of registered light-duty vehicles (LDV) from DVLA (DVLA, 2025). A high-level review of the fleet characteristics for WDC, neighbouring districts, and West and East Sussex counties, revealed a high level of similarity at local and county levels. Given this similarity, and to incorporate a dataset with a greater number of overall vehicles, it was decided to use the fleet characteristics at the combined East Sussex, West Sussex, and Hampshire County level as the starting point for the fleet projections.

3.21 DfT's Decarbonising Transport Plan (TDP) (DfT, 2024), provides projections for the UK's intended decarbonisation of the transport fleet, aligned with achieving Net Zero by 2050. These projections include both high and low ambition scenarios, detailing annual rates of decarbonisation up to 2050. To inform the future vehicle fleet composition, these projections were adjusted and applied within the EFT v14.1 to determine the breakdown of individual fuel types.

3.22 A precautionary approach was adopted by selecting the lower ambition "Decarbonising Transport Upper" scenario. This scenario was used to project the baseline (2023) fleet composition to the future assessment year (2040), providing a conservative estimate of future emissions by assuming a slower rate of fleet decarbonisation.

Receptors

3.23 Pollutant concentrations and deposition rates have been predicted along defined transects within the SAC within 200m of affected roads, in accordance with National Highways guidance for ecological assessments (LA105) (DMRB, 2024), Natural England guidance (Natural England, 2018), and is consistent with the approach taken to modelling impacts on Ashdown Forest for the South Downs National Park, Lewes and Mid Sussex Local Plans. The greatest impacts from changes in road traffic emissions will be observed and modelled closest to the roadside. Consideration of the road network within 200m of the SACs is therefore deemed robust and background concentrations utilised in the assessment account for all other sources that are not defined explicitly in the model.

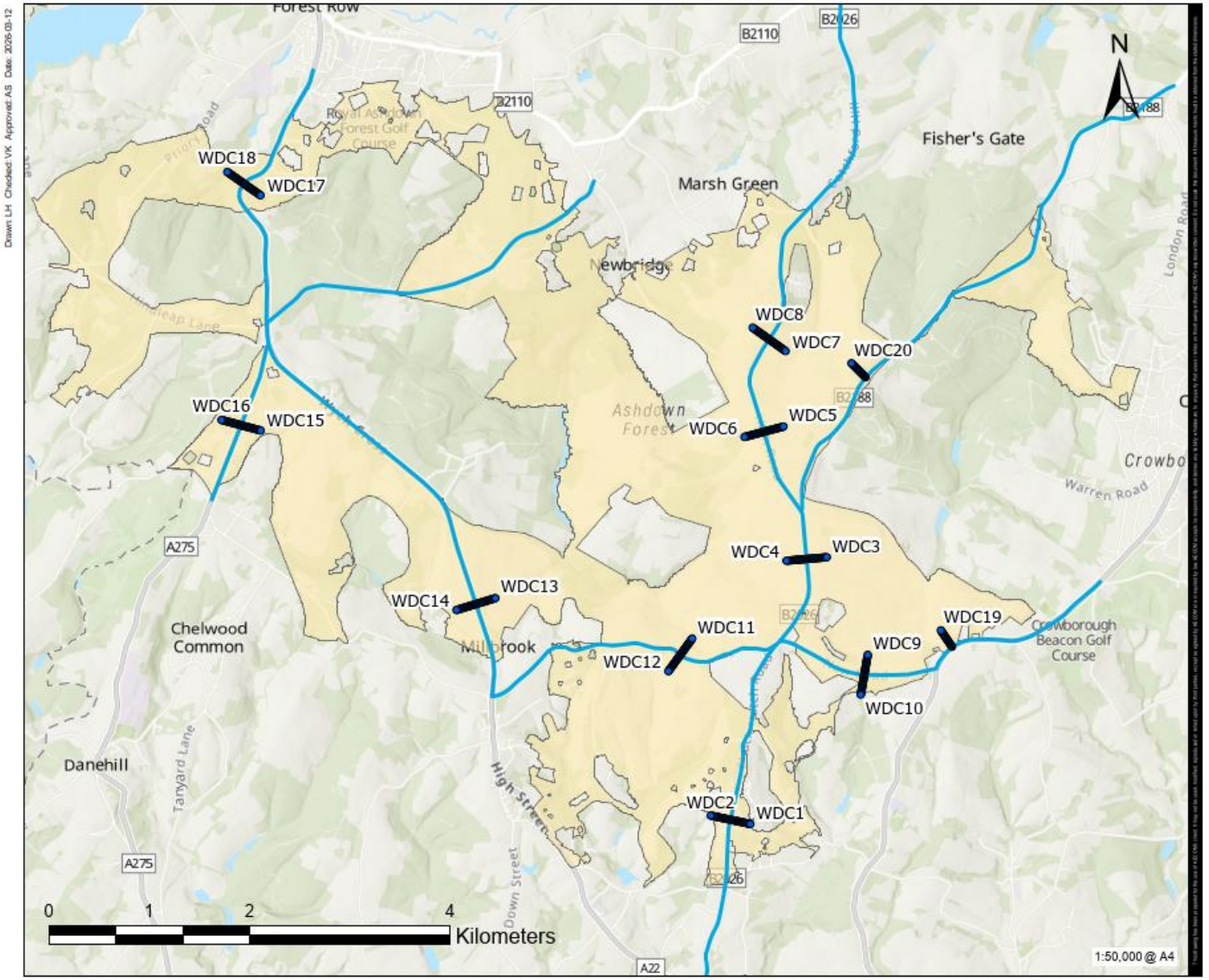
3.24 The transects are situated at key locations where the greatest impacts upon the SACs are likely to occur. The locations are presented in Figure 1 and Figure 2, with further details presented in Annex A.2.

3.25 The receptors are situated at the closest point to the road within the SACs, and spaced every 10m within the transects, up to 200m from the roadside. All receptors are modelled at ground level.

3.26 The greatest impacts will generally occur where both the greatest change in traffic flows is expected, and the sensitive habitat lies closest to the road. This information has been used to select transect locations. The approach taken is to place a transect adjacent to a modelled link (sometimes having a transect either side of the road to account for differences in the dispersion of emissions due to meteorology), with each link being defined as a stretch of road between changes in emissions (i.e. where there are changes in traffic flows and/or speeds).

3.27 The Ashdown Forest SAC modelled transects (Figure 1) and Lewes Downs SAC modelled transects (Figure 2) provide good coverage of the SACs, match well with air quality monitoring locations and previously modelled transects, and avoid modelling in areas where there is only woodland within 200m of the road. This is based on confirmation from Natural England that woodland is not an SAC interest feature, only a Site of Specific Scientific Interest (SSSI) feature.

Figure 1: Ashdown Forest SAC Modelled Road Network and Ecological Receptor Transects



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LEGEND
- Ecological Receptor Transects
- Road Links
- SAC

NOTES
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FINAL

PROJECT NUMBER
60778093

FIGURE TITLE
Modelled Road Network and Ecological Transects

FIGURE NUMBER
Figure 1

Figure 2: Lewes Downs SAC Modelled Road Network and Ecological Receptor Transects



Model Setup

3.28 As detailed above, road traffic emissions of NO_x were derived using v14.1 of Defra's EFT and associated guidance and tools (Defra, 2026). For the base year (2023), emission factors and vehicle fleet assumptions representative of the base year were applied. For all future year (2042) scenarios, the 2040 projected fleet as described in the methodology above (Paragraph 3.16) was used with the default 2040 EFT emission factors. Road traffic emissions of NH_3 were derived using emission rates from CREAM V2A (Air Quality Consultants, 2025), combined with the EFT v14.1 vehicle fleet for the relevant year, using the same vehicle fleet methodology as described above for NO_X.

3.29 Detailed dispersion modelling was undertaken using the current version of ADMS-Roads (v5.1) to model concentrations of NO_x and NH_3 using the parameters in Table 2 for the following scenarios:

- Baseline traffic (2023) flows - 2023 AADT, 2023 emission factors and 2023 background concentrations for model verification;
- 2042 Future Baseline – 2023 AADT, 2040 emission factors (latest supported year), 2040 projected vehicle fleet, and 2040 background concentrations (the latest projected year available from Defra);
- Future year (2042) Option 1 - 2042 AADT without Local Plan, 2040 emission factors (latest supported year), 2040 projected vehicle fleet, and 2040 background concentrations; and
- Future year (2042) Option 2 - 2042 AADT with Local Plan, 2040 emission factors (latest supported year), 2040 projected vehicle fleet, and 2040 background concentrations.

3.30 The future baseline is a hypothetical scenario as it applies improvements in vehicle emissions standards to the baseline vehicle fleet without allowing for any traffic growth. However, such an approach enables the 'in combination' effect of development and traffic growth to be seen, unobscured by improvements in emissions technology / performance.

3.31 The difference between the Option 2 and the Option 1 scenarios provides the impact of the Draft Local Plan, alone. The difference between the Option 2 and the 'future baseline' scenarios provides a thorough and precautionary assessment of the impact of the Draft Local Plan 'in combination', as the 'future baseline' accounts for no future growth.

Table 2: General ADMS-Roads Model Conditions

Variables	ADMS-Roads Model Input
Surface roughness at source	0.5 m
Surface roughness at Meteorological Site	0.2 m
Minimum Monin-Obukhov length for stable conditions	30 m
Terrain types	Flat
Receptor location	x, y coordinates determined by GIS, z = 0 m
Emissions	NO_x – Defra's EFT v14.1 NH_3 – CREAM V2A
Meteorological data	1 year (2023) hourly sequential data from Gatwick meteorological station.
Receptors	Ecological transects
Model output	Long-term (annual) mean NO_x and NH_3 concentrations.

Plume Depletion

3.32 Plume depletion due to dry deposition onto vegetation was taken into account in the model. This was enabled by using the ADMS-Roads 'Dry Deposition' module, applying the 'grassland'

deposition rates presented in the Air Quality Technical Advisory Group (AQTAG) deposition velocities that are cited in 2020 IAQM guidance (IAQM, 2020), as shown in Table 3.

3.33 The deposition velocity for NO_2 was applied to raw modelled NO_x. This assumes that 100% of NO_x is emitted as NO_2 and therefore represents an optimistic depletion of NO_x from the atmosphere.

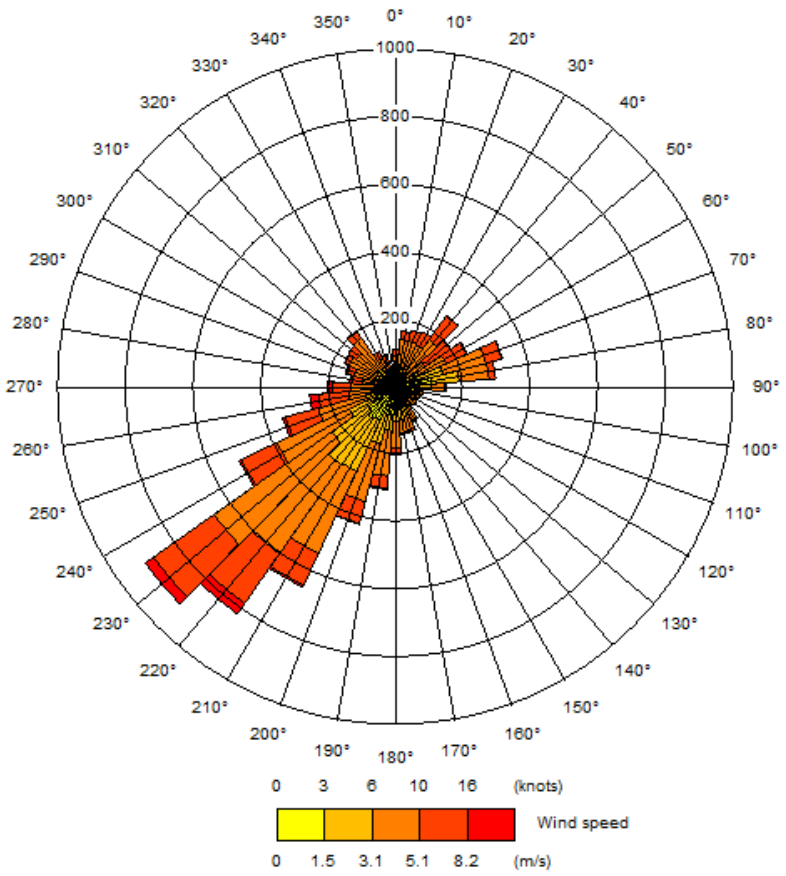
Table 3: Nitrogen Deposition Velocities and Conversion Rates

Pollutant	Habitat	Nitrogen deposition conversion rates	Deposition velocity
NO_2	Grassland / short vegetation	1 µg/m^3 NO_2 = 0.14 kgN/ha/yr	0.0015 m/s
NH_3	Grassland / short vegetation	1 µg/m^3 NH_3 = 5.2 kgN/ha/yr	0.020 m/s

Meteorological Data

3.34 One year (2023) of hourly sequential observation data from Gatwick meteorological station has been used in this assessment to correspond with the baseline traffic data and emission factors. The station is located approximately 26 km and 33 km northwest of Ashdown Forest SAC and Lewes Downs SAC, respectively, and experiences meteorological conditions that are representative of those experienced within the air quality study areas. Figure 3 shows that the dominant direction of wind was from the south-west, as is typical for the UK.

Figure 3: Wind Rose, Gatwick Airport Meteorological Data, 2023



Background Data

3.35 Background concentrations of NO_2 and NO_x for 2023 and 2040 were extracted from Defra's 2021-based 1x1 km background maps (Defra, 2024). Contributions from explicitly modelled source sectors were removed from the background concentrations, in accordance with Defra guidance

(Defra, 2025). The data presented in Table 4 show that the concentrations are predicted to decrease between 2023 and 2040 and NO_x concentrations are well below the Critical Load shown in Table 1.

3.36 Whilst fleet data beyond 2040 are provided within the EFT, 2040 is the latest year for which the accompanying tools are available e.g. mapped background concentrations and the NO_x-to-NO_2 calculator (Defra, 2024).

Table 4: Defra Mapped Background Pollutant Concentrations

Transects	Road Name	Grid Square (X, Y)	Annual Mean Concentrations(µg/m³)			
			2023 NO_2	**2023 NO_x**	**2040 NO_2**	**2040 NO_x**
WDC1	B2026	546500, 127500	7.34	9.39	4.76	5.95
WDC2	B2026	546500, 127500	7.34	9.39	4.76	5.95
WDC3	B2188	547500, 129500	7.22	9.23	4.72	5.89
WDC4	B2188	547500, 129500	7.22	9.23	4.72	5.89
WDC5	B2026	546500, 130500	7.13	9.10	4.68	5.84
WDC6	B2026	546500, 130500	7.13	9.10	4.68	5.84
WDC7	B2026	546500, 131500	7.19	9.18	4.71	5.89
WDC8	B2026	546500, 131500	7.19	9.18	4.71	5.89
WDC9	New Road	547500, 128500	7.25	9.27	4.73	5.91
WDC10	New Road	547500, 128500	7.25	9.27	4.73	5.91
WDC11	Crowborough Road	546500, 128500	7.27	9.29	4.74	5.92
WDC12	Crowborough Road	546500, 128500	7.27	9.29	4.74	5.92
WDC13	A22	544500, 129500	7.35	9.40	4.83	6.04
WDC14	A22	544500, 129500	7.35	9.40	4.83	6.04
WDC15	A275	541500, 131500	7.72	9.90	5.09	6.38
WDC16	A275	541500, 131500	7.72	9.90	5.09	6.38
WDC17	A22	541500, 133500	7.89	10.13	5.14	6.45
WDC18	A22	541500, 133500	7.89	10.13	5.14	6.45
WDC19	A26	548500, 128500	7.48	9.58	4.80	6.00
WDC20	B2188	547500, 131500	7.12	9.08	4.68	5.85
LD1	A26	542500, 110500	9.68	12.61	5.82	7.34
LD2	B2192	542500, 111500	9.18	11.91	5.6	7.05

Note: Sectors removed as emissions included in detailed dispersion modelling: Trunk A road (in of 1x1km grid square)

Monitoring Data

3.37 Monitoring within Ashdown Forest has been undertaken on behalf of WDC (Figure 4). Data for NO_2, NOx and NH_3 is available for 2022-2025. NO_2 concentrations have been annualised using the National Bias adjustment factor for the appropriate year (Defra, 2025) and converted to NOx using the NOx-NO_2 calculator.

The data is presented in Table 5 and

3.38 Table 6.

Figure 4: Air Quality Monitoring Sites in Ashdown Forest SAC

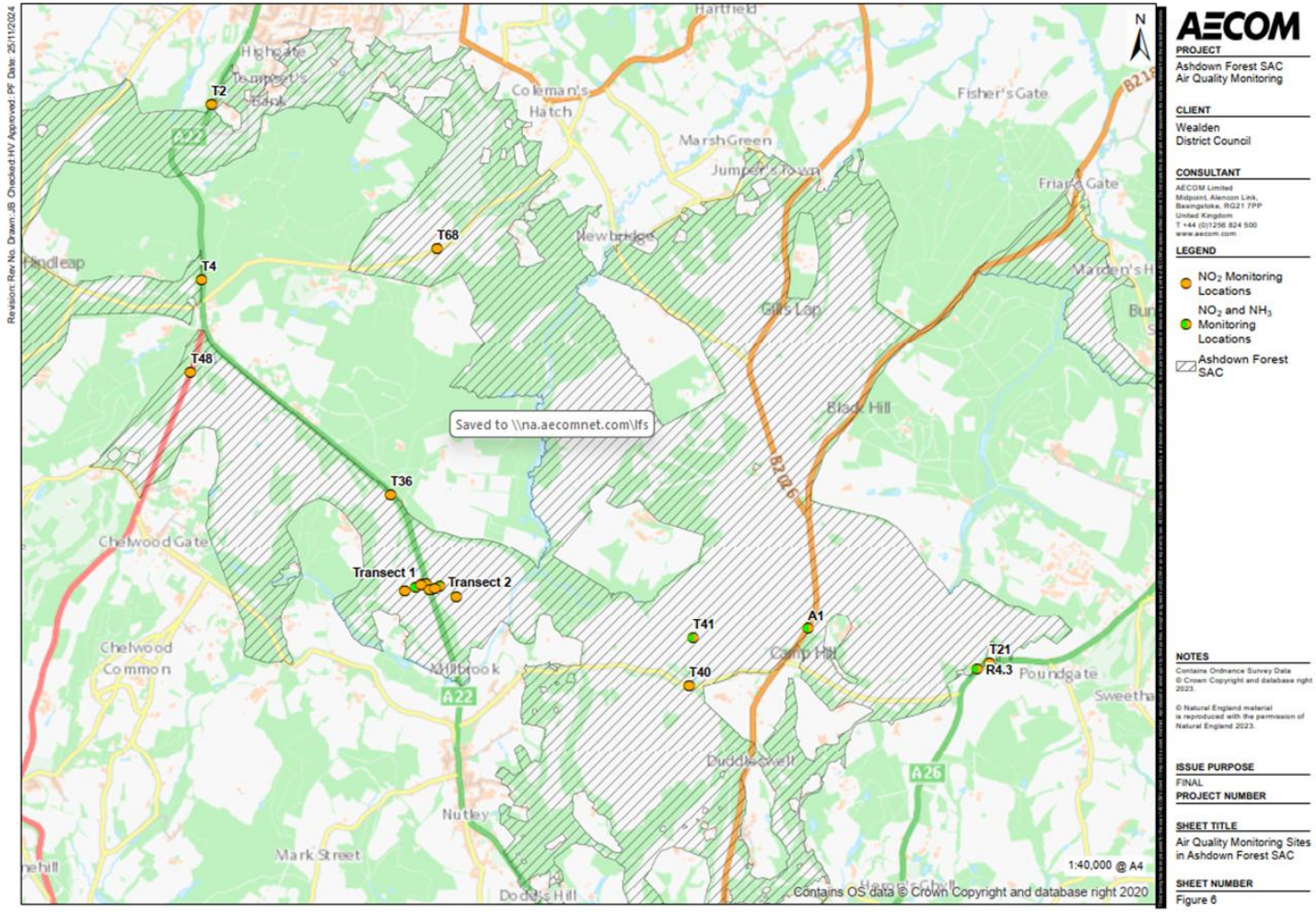


Table 5: Monitored NO_2 and NO_x Concentrations

Tube ID	Annualised Mean Concentrations (µg/m³)							
	2022*		2023		2024		2025	
	NO_2	NO_x	NO_2	NO_x	NO_2	NO_x	NO_2	NO_x
T2	12.83	20.41	11.09	16.80	9.15	12.90	10.86	16.58
T4	25.63	51.37	18.90	34.27	18.81	34.16	20.88	39.25
T21	20.06	37.32	16.16	28.18	16.95	30.11	17.05	30.45
T36	18.90	34.45	13.14	21.38	14.64	24.80	17.10	30.50
T40	8.31	11.27	6.52	7.79	6.91	8.84	7.44	9.91
T41	7.24	9.31	5.642	6.89	6.31	7.54	5.90	7.05
T48	13.03	20.92	12.83	20.59	10.03	14.77	10.24	15.33
A1	9.49	13.73	7.90	10.60	7.55	10.02	7.11	9.27
T68	8.49	11.64	7.55	9.86	6.79	8.71	7.17	9.35
R1.1	27.16	55.97	20.94	39.56	20.62	38.84	22.43	43.43
R1.2	20.11	37.46	14.63	24.72	12.49	20.14	14.84	25.43
R1.3	12.21	19.31	9.49	13.68	8.95	12.70	10.13	15.28
R1.4	10.27	15.18	8.49	11.62	7.87	10.50	9.07	13.08
R1.5	9.03	12.61	7.26	9.22	6.81	8.37	8.03	10.95
R1.6	8.35	11.21	6.58	7.81	5.88	7.06	8.23	11.36
R1.7	7.57	9.63	6.00	7.23	5.87	7.05	6.08	7.22
R1.8	7.90	10.29	6.26	7.49	6.05	7.23	6.03	7.16
R2.1	17.25	30.61	14.89	25.30	15.13	25.95	16.76	29.76
R2.2	16.01	27.74	13.83	22.94	13.11	21.49	14.54	24.75
R2.3	12.82	20.63	10.76	16.33	10.98	16.92	13.94	23.43
R2.4	11.46	17.70	9.47	13.63	9.38	13.58	9.06	13.07
R2.5	9.75	14.10	8.15	10.93	10.62	16.17	8.74	12.41
R2.6	6.90	8.36	6.06	7.31	5.00	6.20	8.39	11.77
R2.7	7.00	8.56	6.47	7.72	6.08	7.28	7.52	10.01
R2.8	6.90	8.36	7.03	9.01	5.86	7.06	6.22	7.42
R4.3	14.32	23.92	12.10	19.19	11.52	18.08	12.87	21.11

Note: This data represents monitored annual mean concentrations for NO_2 following annualisation and bias adjustment. These measured values were used to calculate annual mean NO_x concentrations presented in this table.

* 2022 monitoring started in June, DT23 and DT25 with especially low data capture.

Table 6 Monitored NH_3 Concentrations

Tube ID	Mean Concentrations (µg/m³)			
	2022*	2023	2024	2025
T41	0.15	0.34	0.53	0.84
A1	0.68	0.55	0.72	1.21
R1.1	1.85	1.38	1.61	1.08
R1.3	0.69	0.40	0.57	1.25
R1.4	0.60	0.38	0.49	1.05
R1.5	0.61	0.31	0.57	1.06
R1.7	0.57	0.32	0.27	1.64
R2.1	1.09	0.76	1.09	0.58
R2.3	0.76	0.57	0.68	0.76
R2.4	0.60	0.52	0.57	1.34
R2.5	0.32	0.27	0.40	1.31
R2.7	0.41	0.46	0.51	0.84
R4.3	1.21	0.50	0.63	1.21

Note: * Monitoring started in June 2022, with missing data for July 2022. $ Monitoring data is only available up to September 2025, with data missing for June 2025.

3.39 Monitoring data at Ashdown shows a sharp increase in NH_3 concentrations in 2025, compared to 2023 and 2024 concentrations. Annual mean NH_3 concentrations at Ashdown increased at all but 2 monitoring locations with an average concentration of 0.53 µg/m³ being measured in 2023 compared to an average of 1.06 µg/m³ in 2025, representing an increase in the average of 0.53 µg/m³ (approximately 100%). It should be noted that the two locations which did not experience an increase are both kerbside sites, meaning that they are very close to the road and therefore less influenced by meteorological influenced dispersion conditions.

3.40 Traffic count data for road links from the Department for Transport (DfT) (DfT, 2026) surrounding the Ashdown Forest monitoring locations were reviewed to determine whether changes in road traffic could explain the increase in NH_3 concentrations observed in 2025.

3.41 Road 1 (the A22), is representative of the road serving the majority of transect monitoring locations (R1.4-R1.8 and R2.1-R2.7) showed an increase in AADT flows from 9,695 vehicles/day in 2023 to 9,937 vehicles/day in 2025, equivalent to approximately 2.5%. Similar comparisons were undertaken for all road links with available traffic count data within the Ashdown Forest road network. The changes in traffic flows between 2023 and 2025 were generally small and are not considered sufficient to explain the magnitude of the increase in monitored NH_3 concentrations across the Ashdown Forest SAC.

3.42 A review of the available NH_3 monitoring data in the wider region indicates that the increase observed at Ashdown between 2023 and 2025 is not an isolated occurrence. Comparable increases in NH_3 monitoring data were also recorded at four nearby rural monitoring sites. The change between 2023 and 2025 ranged from 0.07 µg/m³ to 0.35 µg/m³, with all comparison sites showing higher concentrations in 2025 than in 2023. In particular, Lullington Heath increased by 0.32 µg/m³ (0.284 to 0.607 µg/m³), an increase of approximately 114%. Percentage increases in other sites include Detling (~16%), Old Winchester Hill (~36%) and Thursley Common (~47%).

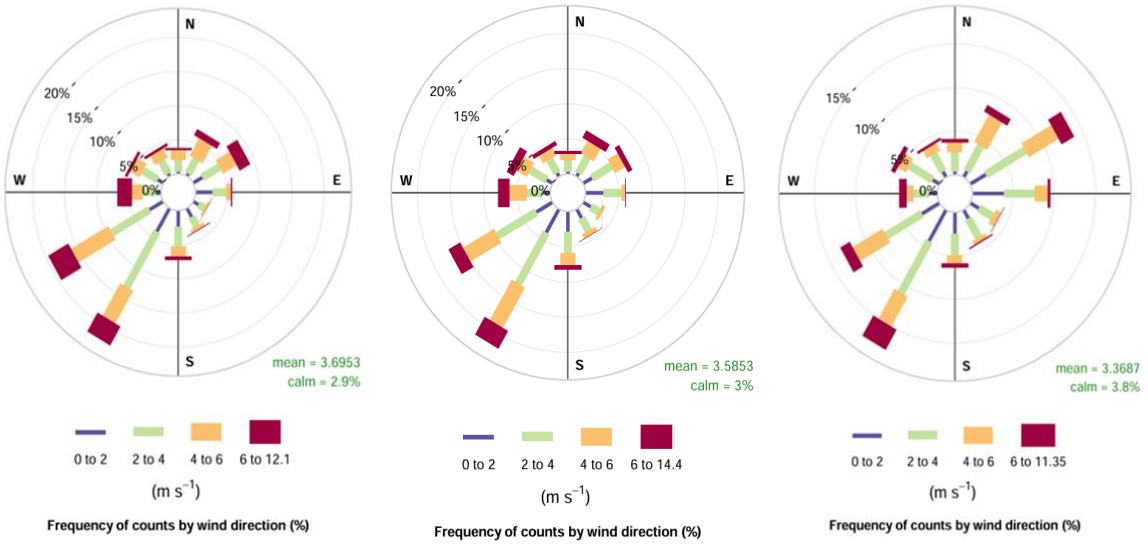
3.43 The consistent increase across all nearby monitoring locations suggests that the elevated concentration recorded at Ashdown Forest is likely to reflect a broader regional variation in atmospheric NH_3 concentrations between the two years, rather than a site-specific anomaly.

3.44 Meteorological data were obtained from the NOAA Integrated Surface Database (ISD), a quality-controlled dataset comprising observations from established monitoring stations to further review this trend. The dataset provides quality-controlled hourly observations, including wind speed and

direction. NOAA data been analysed to assess whether changes in dispersion conditions may have influenced the monitored concentrations (NOAA, 2025).

3.45 Comparison of the annual and seasonal wind roses in Figure 5 indicates that average wind speeds were generally lower and the proportion of calm conditions was higher during 2025 than in 2023 and 2024. For Gatwick, calm conditions increased from 2.4% during spring 2023 and 2024 to 4.2% during spring 2025, and from 2.6% to 3.2% during winter 2023 and 2024 to 4.9% during winter 2025.

Figure 5: Annual wind roses for Gatwick meteorological station - 2023 - 2024 - 2025



3.46 Reduced wind speeds and more frequent calm periods can limit atmospheric dispersion, allowing locally emitted NH_3 to accumulate leading to elevated concentrations at the monitoring sites. The increase in NH_3 concentrations recorded during 2025 therefore may, in part, reflect less favourable dispersion conditions alongside changes in the transport of emissions from surrounding sources.

Ecological Data

3.47 The Air Pollution Information System (APIS[3]) provides '*a searchable database and information on pollutants and their impacts on habitats and species*'. Data for the appropriate habitats have been applied for each receptor in the study. This includes critical loads of nitrogen and the average nitrogen and acid deposition rates to the habitat, as presented in Table 7. It should be noted that the critical loads (both nitrogen and acid) differ between the Ashdown Forest and Lewes Downs SACs in Table 7 due to the presence of different sensitive features.

3.48 While gorse scrub and other shrubs are present in Ashdown Forest SAC, they are not of significance to heathland integrity in dense stands. The deposition velocity to short vegetation is applicable where such shrubs are interspersed as part of the heathland matrix. Lewes Downs SAC is designated for semi-natural dry calcareous grassland, which is sensitive to nitrogen and NH_3 deposition and includes rare orchid species. The deposition velocity to short vegetation is therefore also applicable.

3.49 Background concentrations of NH_3 were also sourced from modelled maps available from APIS, thereby accounting for all sources that are not explicitly defined in the model. The NH_3 background concentrations from APIS presented in Table 7 are greater than the average monitored concentration of 0.16µg/m^3, which is used in the Ashdown Forest SAC model verification and calculations for the baseline and future year assessments.

3.50 In order to create a robust and scientifically agreed projection for background nitrogen deposition trends in the UK, even allowing for growth, the Joint Nature Conservation Committee (JNCC) commissioned the Nitrogen Futures project, which reported in 2020 (JNCC, 2020). The JNCC Nitrogen Futures project investigated whether a net improvement in nitrogen deposition

[3] https://www.apis.ac.uk/

(including expected development over the same period) was expected to occur to 2030 under a range of scenarios ranging from the most cautious scenario (Business As Usual (BAU), reflecting simply existing emission reduction commitments / measures already in place) to much more ambitious scenarios that would require varying amounts of additional, currently uncommitted, measures from the UK government and devolved administrations.

3.51 The report concluded that *'The scenario modelling predicts a substantial decrease in risk of impacts on sensitive vegetation by 2030, under the most likely future baseline [a scenario called '2030 NAPCP+DA (NECR NOx)']. This is estimated to achieve the UK Government's Clean Air Strategy (CAS) target for England, defined as a 17% decrease in total reactive N deposition onto protected priority sensitive habitats, with a predicted 18.9% decrease [for England] from a 2016 base year'*. The report predicted a fall in nitrogen deposition by 2030 under every modelled scenario, including the most cautious (2030 BAU). For the BAU scenario, nitrogen deposition was forecast to decrease between 2017 and 2030 from 277.1 kt N to 239.5 kt N (i.e. a reduction of 37.6 kt N).

3.52 Background nitrogen deposition at Ashdown Forest was specifically discussed in Annex 5 of the report as a case study. The report predicted a 1-2 kgN/ha/yr reduction in background nitrogen deposition to low growing vegetation (i.e. the heathland interest feature) at the SAC between 2016 and 2030, depending on scenario, and noted that *'The emission reductions predicted between the 2017 and 2030 baseline scenarios cover a range of sectors, including road transport, and so improvements are predicted to occur over the whole site, including the worst-affected roadside locations'*. This was the case under all modelled scenarios.

3.53 In summary, the Nitrogen Futures study forecast a minimum rate of improvement in background nitrogen deposition of 0.07 kgN/ha/yr at Ashdown Forest, with other forecasts indicating a greater rate of reduction. In line with the forecast for Ashdown Forest, and therefore taking a precautionary approach, this study applies a projected decrease in background nitrogen of 0.07 kgN/ha/yr. The corresponding decrease is also reflected in the total average acid deposition rate for nitrogen in the future scenarios.

3.54 Over the 17-year period (2023-2040), this equates to a reduction in the APIS background nitrogen deposition rate presented in Table 7 (3-year average, 2020-22) of 1.19 kg N/ha/yr for the 2042 model scenarios. This decrease is also reflected in the total average acid deposition rate for nitrogen in the 2042 scenarios (reduction of 0.09 keq/ha/yr N).

3.55 No other adjustments to the 2023 APIS data (APIS, 2026) have been made from those presented for any modelled scenario.

3.56 Not to make *any* allowance for improvements in emission factors or background concentrations would result in increased emissions, and hence concentrations, over the plan period as an increased number of vehicles is expected on the roads. This is not expected to occur as can be seen from previous long-term trends in the UK, which show the slowing of improvements over extended periods, not worsening. Historical records (e.g. Defra monitoring trends of NOx) show that the increasing number of vehicles entering the fleet is offset by improvements in the emissions of the newer vehicles and the removal of older vehicles.

3.57 In 2018 the Court of Justice of the European Union (CJEU) ruled in cases C-293/17 and C-294/17 (often dubbed the Dutch Nitrogen cases). One aspect of that ruling concerned the extent to which autonomous measures (i.e. improvements in baseline nitrogen deposition that are not attributable to the Local Plan) can be taken into account in appropriate assessment. The CJEU ruled that it *was* legally compliant to take such autonomous measures into account provided the benefits were not 'uncertain' (paras. 130&132). Note that previous case law on the interpretation of the Habitats Directive has clarified that 'certain' does not mean absolute certainty but '*where no reasonable scientific doubt remains'*[4] [emphasis added].

3.58 The forecasts for improvements in NO_x emission factors, background concentrations and background deposition rates used in this report are considered to be precautionary but realistic and have the requisite level of certainty. This is because a) data are used and to a large extent they build upon established historic trends in NO_x and oxidised nitrogen deposition and b) for

[4] Case C-239/04 Commission v Portugal [2006] ECR 10183, para. 24; Holohan et al vs. An Bord Pleanála (C-461/17), para. 33

total nitrogen deposition they are based on a cautious use of evidenced central government forecasts associated with uptake of technology that has either already been introduced or is widely expected within the professional community to be introduced and effective before 2030, as illustrated in the Nitrogen Futures project:

- When it comes to forecasting the NO_x emissions of additional traffic, it would overestimate those emissions to assume that by 2042 the emission factors will be no different to those in 2023; to make such an assumption would be to fail to take account of the expected continued uptake of Euro 6 compliant vehicles between 2023 and 2042 and would assume (putting it simply) that no motorists would replace their cars during the entire plan period. For example, the latest (Euro 6/VI) emissions standard only became mandatory in 2014 (for heavy duty vehicles) and 2015 (for cars) and the effects will not therefore be visible in the data available from APIS because relatively few people will have been driving vehicles compliant with that standard as early as 2023. Far more drivers can be expected to be using Euro 6 compliant vehicles by the end of the Local Plan period.
- The vehicle emission factors within the air quality modelling tools available only project out to 2040. As the fuel technology is projected out to 2040 following the DfT decarbonisation pathway, and the breakdown of euro classifications published in the EFT extends to 2040, the 2042 assessment year does not recognise continued uptake of more stringent emissions standards. Therefore, the results are likely to be cautious in terms of emissions related to vehicle age.

Table 7: APIS Data for Ecological Transects for 2022-2024

Transect	Average N Dep kgN/ha/yr[$]	Critical Load N Dep kgN/ha/yr	Total Av. Acid Dep keq/ha/yr N[$]	Critical Load N Acid Dep keq/ha/yr MinCLMaxN	Background NH_3 (µg/m^3)*
WDC1	12.48	5 - 15	0.89	0.809	0.93
WDC2	12.48	5 - 15	0.89	0.809	0.93
WDC3	12.67	5 - 15	0.90	0.809	0.89
WDC4	12.67	5 - 15	0.90	0.809	0.89
WDC5	12.89	5 - 15	0.92	0.809	0.88
WDC6	12.89	5 - 15	0.92	0.809	0.88
WDC7	13.03	5 - 15	0.92	0.809	0.88
WDC8	13.03	5 - 15	0.92	0.809	0.88
WDC9	12.53	5 - 15	0.89	0.809	0.89
WDC10	12.53	5 - 15	0.89	0.809	0.89
WDC11	12.62	5 - 15	0.90	0.809	0.79
WDC12	12.62	5 - 15	0.90	0.809	0.90
WDC13	12.94	5 - 15	0.92	0.809	0.89
WDC14	12.94	5 - 15	0.92	0.809	0.89
WDC15	13.37	5 - 15	0.95	0.809	0.89
WDC16	13.37	5 - 15	0.95	0.809	0.89
WDC17	13.38	5 - 15	0.95	0.809	0.93
WDC18	13.38	5 - 15	0.95	0.809	0.93
WDC19	12.57	5 - 15	0.90	0.809	0.88
WDC20	12.94	5 - 15	0.92	0.809	0.90
LD1	12.30	10 - 20	0.89	4.856	1.07
LD2	12.45	10 - 20	0.90	4.856	1.08

Note: [$] Average nitrogen deposition rate (kgN/ha/yr) projected to decrease by 1.33 kgN/ha/yr from base year to future year (i.e. 0.07 x 17 years = 1.19 kgN/ha/yr). This results in a corresponding decrease in acid deposition of 0.09 keq/ha/yr N.

Verification

3.59 Model verification is the process by which the performance of the model is assessed to identify any discrepancies between modelled and measured concentrations at air quality monitoring sites within the study area.

3.60 Monitoring data have been used to make a direct comparison between 'road source' modelled and measured concentrations at the same location, so as to calculate an adjustment factor – or 'verification factor' – for each pollutant, to enable adjustment of the model results to account for any model bias.

3.61 Defra provide guidance regarding verification of NO_x and NO_2 concentrations (Defra, 2025). There are currently no guidelines for verifying against NH_3 measurements. However, the same principles have been followed as for other road sources (i.e. comparing modelled and monitored road source contributions, separate from background concentrations). This is aligned with general air quality modelling convention.

3.62 Statistical evaluations have been used to evaluate the model performance e.g. correlation coefficient, fractional bias and Root Mean Square Error (RMSE), allowing for a better understanding of how the model results agree or diverge from the monitored observations.

NOx Verification

3.63 Modelled predictions were made for annual mean NO_x concentrations at monitoring locations in the Ashdown Forest SAC to compare monitored and modelled pollutant concentrations. The comparison of model outputs was made against 2023 monitoring data to correspond with the baseline year of assessment. Due to the absence of suitable air quality monitoring data within the Lewes Downs SAC model domain, site-specific verification could not be undertaken for this location.

3.64 Following detailed analysis of each monitoring location in the study area, a total of 8 roadside monitoring sites were taken forward in the model verification process. Duplicate sites on transects were removed, as well as T40, A1, and T68 which were lower than background concentrations. Table 8 details the sites used in model verification and these are shown in Figure 6.

3.65 Model performance was analysed at these monitoring sites. Without adjustment the RMSE was 3.8 µg/m^3. A model adjustment factor was calculated (1.51) and applied to the model results. After adjustment the RMSE was reduced to 3.0 µg/m^3 as shown in Table 9.

3.66 The factor of 1.51 was applied to both Ashdown and Lewes Downs SAC, as this is higher than the standard adjustment factor commonly adopted in the absence of appropriate local monitoring data and is therefore considered to be conservative in professional practice.

Table 8: Local Authority NO_2 Monitoring Sites used in Model Verification

Site ID	Total modelled NO_2 before adjustment (µg/m^3)	Total modelled NO_2 after adjustment (µg/m^3)
T2	11.00	12.58
T4	10.57	11.91
T21	13.90	16.97
T36	10.01	11.24
T48	9.52	10.42
R1.3	9.60	10.65
R2.3	11.01	12.75
R4.3	11.92	14.09

Table 9: NO_2 Model Verification details

Number of Sites	Number of Monitoring Sites within ±10% of the Monitored Concentration Pre-Adjustment	RMSE pre-adjustment (µg/m^3)	Model Adjustment Factor Applied	Number of Sites within ±10% of the Monitored Concentration Post Adjustment	RMSE post adjustment (µg/m^3)	Fractional Bias post adjustment)
17	7	3.8	1.51	1	3.0	0.0

NH_3 Verification

3.67 Modelled predictions were made for annual mean NH_3 concentrations at monitoring locations in order to compare monitored and modelled pollutant concentrations. The comparison of model outputs was made against 2023 monitoring data so as to correspond with the baseline year of assessment.

3.68 Following detailed analysis of each monitoring location in the study area, a total of 3 monitoring sites were taken forward in the model verification process. Duplicate sites on transects were removed, as well as background sites. R1.1 and R2.1 were considered too close to the kerb, and R1.5 was below the background concentrations. Table 10 summarises the sites used in model verification, and these are indicated in Figure 6.

3.69 A model adjustment factor was calculated (0.25) and applied to the model results. The RMSE was reduced to 0.06 µg/m^3 (from 0.42 µg/m^3) following adjustment. It should be noted that the 0.28 verification factor derived above applies only to the Ashdown Forest SAC, where site-specific NH_3 monitoring data were available to support this adjustment. In the absence of equivalent monitoring data within the Lewes Downs SAC model domain, a verification factor of 1.0 has been applied to NH_3 model outputs for Lewes Downs.

Table 10: Local Authority NH_3 Monitoring Sites used in Model Verification

Site ID	Total modelled NH_3 before adjustment (µg/m^3)	Total modelled NH_3 after adjustment (µg/m^3)
R1.3	0.41	0.42
R2.3	0.70	0.49
R4.3	0.88	0.54

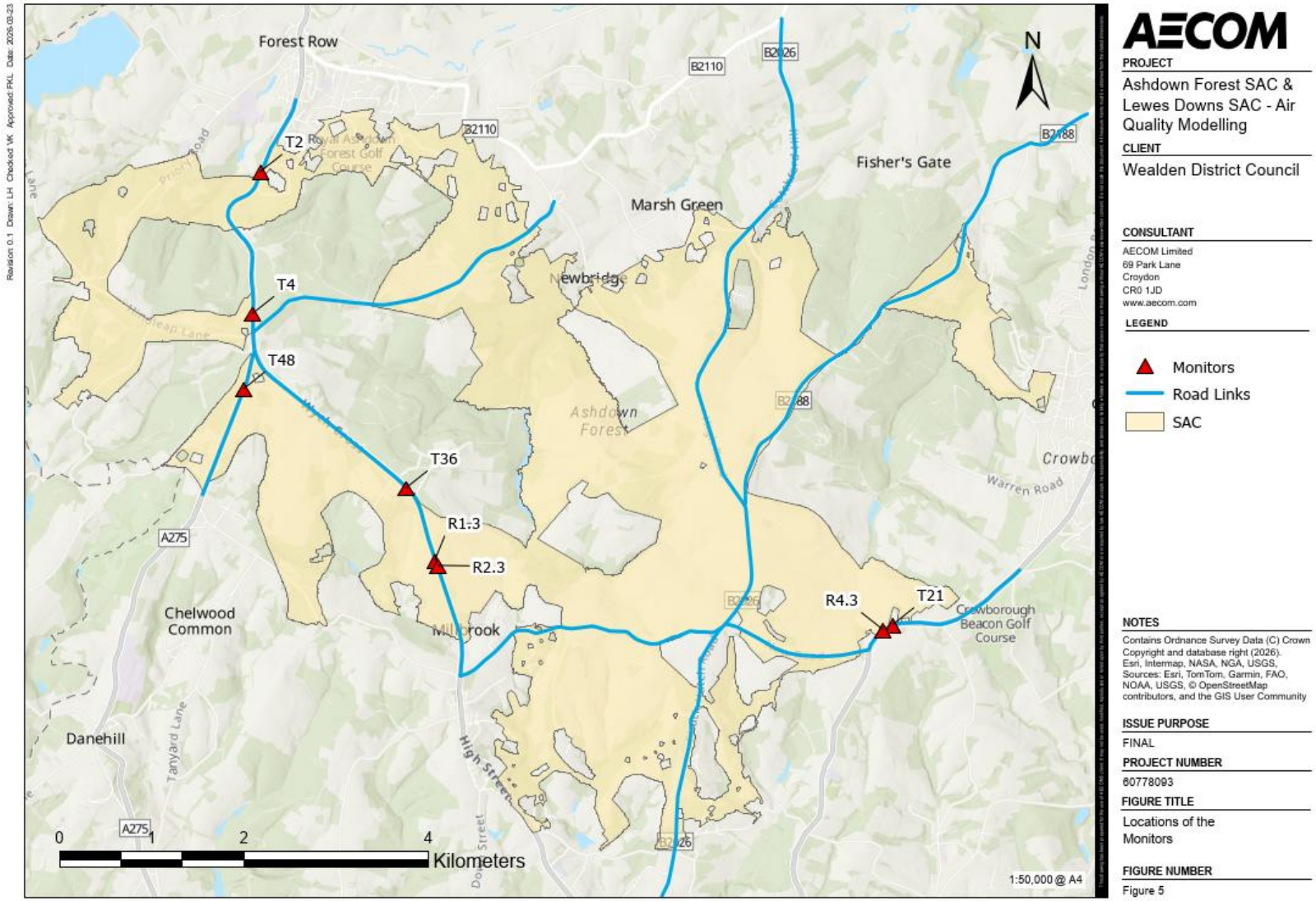
Table 11: NH_3 Model Verification details

Number of Sites	Number of Monitoring Sites within ±10% of the Monitored Concentration Pre-Adjustment	RMSE pre-adjustment (µg/m^3)	Model Adjustment Factor Applied	Number of Sites within ±10% of the Monitored Concentration Post Adjustment	RMSE post adjustment (µg/m^3)	Fractional Bias post adjustment)
10	0	0.4	0.25	1	0.1	0.0

Deposition velocities

Deposited nitrogen from road traffic derived NH_3 and NO_2 was estimated using the deposition velocities presented in Table 3. The conversion rates were applied to the final modelled NO_2 and NH_3 concentrations from road traffic, to provide kgN/ha/year. All of the transects were modelled and analysed as heathland / grassland (i.e. 'short vegetation' was used at all locations as Ashdown Forest SAC is designated for heathland and Lewes Downs SAC is designated for calcareous grassland).

Figure 6: WDC Monitoring Sites used for verification



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5. Annexes

A.1 Traffic Data

Link	2023 Base			2042 Option 1			2042 Option 2		
	AADT	HDV %	Speed (kph)	AADT	HDV %	Speed (kph)	AADT	HDV %	Speed (kph)
Road 0 - A22	11626	5.9	71.5	12998	4.5	70.5	12828	3.7	71.0
Road 1 – A22	15836	4.1	75.0	17339	4.2	74.5	16614	3.3	75.5
Road 2 – A22	15836	4.1	75.0	17339	4.2	74.5	16614	3.3	75.5
Road 3 – A26	23253	4.1	70.0	26986	3.5	65.5	26488	3.4	66.5
Road 4 – A275	6622	4.5	76.5	8284	3.7	76.0	9110	3.7	75.5
Road 5 – Crowborough Road	2675	3.4	51.5	3093	4.5	51.0	3668	3.9	51.0
Road 6 – B2026	9354	3.0	62.5	13961	2.7	58.5	13127	2.7	59.5
Road 7 – B2026	9077	2.8	61.0	14896	2.5	56.0	14417	2.5	56.5
Road 8 – B2188	3346	0.3	63.5	4425	0.3	63.5	4357	0.3	63.5
Road 9 – New Road	8486	3.0	48.0	10638	2.8	43.5	11349	2.7	44.0
Road 10 – Colemans Hatch Road	2613	3.4	50.0	3488	2.9	49.5	3904	2.9	49.5
Road 11 – B2026	3729	1.5	52.5	8192	2.1	50.0	7769	2.1	50.0
Road 12 – B2026	14538	2.2	51.0	25734	2.1	48.0	24834	2.1	48.5
Road 13 – Crowborough Road	2675	3.4	51.5	3093	4.5	51.0	3668	3.9	51.0
Road 14 – B2188	3370	4.2	63.0	4401	3.6	62.5	4301	3.5	63.0
Road 15 – A26	21719	4.4	70.5	25439	3.7	65.5	24878	3.7	64.5
Road 16 – A275	6622	4.5	76.5	8284	3.7	76.0	9110	3.7	75.5
Road 17 – A22	9649	6.6	35.0	10577	5.0	33.5	10381	4.1	34.0
Road 18 – A22	9649	6.6	45.5	10577	5.0	45.0	10381	4.1	45.0
Road 19 – B2026	8466	3.3	63.5	13234	2.8	59.5	12584	2.8	60.5
Road 20 – A22	14538	2.2	51.0	25734	2.1	48.0	24834	2.1	48.5
Lewes Road 0 – B2192	16240	4.0	44.5	20119	3.5	40.5	22370	3.3	46.0

Link	2023 Base			2042 Option 1			2042 Option 2		
	AADT	HDV %	Speed (kph)	AADT	HDV %	Speed (kph)	AADT	HDV %	Speed (kph)
Lewes Road 1 – B2192	16240	4.0	57.5	20119	3.5	55.0	22370	3.3	53.0
Lewes Road 2 – A26	16259	4.3	29.5	17767	4.1	28.5	14953	4.0	23.5
Lewes Road 3 – A26	32478	4.2	26.5	37425	3.8	23.5	37280	3.6	24.0
Lewes Road 4 – A26	29099	4.3	34.0	33732	3.8	32.0	33529	3.7	32.0

A.2 Modelled Ecological Receptor Locations

Transect WDC1	X co-ordinate (m)	Y co-ordinate (m)	Transect WDC2	X co-ordinate (m)	Y co-ordinate (m)
WDC1_1m	546585	127072	WDC2_1m	546579	127073
WDC1_10m	546594	127070	WDC2_10m	546570	127075
WDC1_20m	546604	127068	WDC2_20m	546560	127077
WDC1_30m	546614	127066	WDC2_30m	546550	127079
WDC1_40m	546624	127064	WDC2_40m	546541	127081
WDC1_50m	546633	127062	WDC2_50m	546531	127083
WDC1_60m	546643	127060	WDC2_60m	546521	127086
WDC1_70m	546653	127058	WDC2_70m	546511	127088
WDC1_80m	546663	127055	WDC2_80m	546501	127090
WDC1_90m	546672	127053	WDC2_90m	546492	127092
WDC1_100m	546682	127051	WDC2_100m	546482	127094
WDC1_110m	546692	127049	WDC2_110m	546472	127096
WDC1_120m	546702	127047	WDC2_120m	546462	127098
WDC1_130m	546712	127045	WDC2_130m	546453	127100
WDC1_140m	546721	127043	WDC2_140m	546443	127102
WDC1_150m	546731	127041	WDC2_150m	546433	127104
WDC1_160m	546741	127039	WDC2_160m	546423	127106
WDC1_170m	546751	127037	WDC2_170m	546413	127108
WDC1_180m	546761	127035	WDC2_180m	546404	127110
WDC1_190m	546770	127033	WDC2_190m	546394	127113
WDC1_200m	546780	127031	WDC2_200m	546384	127115
Transect WDC3	**X co-ordinate (m)**	**Y co-ordinate (m)**	**Transect WDC4**	**X co-ordinate (m)**	**Y co-ordinate (m)**
WDC3_1m	547344	129673	WDC4_1m	547338	129672
WDC3_10m	547353	129673	WDC4_10m	547329	129671
WDC3_20m	547363	129674	WDC4_20m	547319	129670
WDC3_30m	547373	129675	WDC4_30m	547309	129669
WDC3_40m	547383	129676	WDC4_40m	547299	129669
WDC3_50m	547393	129677	WDC4_50m	547289	129668
WDC3_60m	547403	129678	WDC4_60m	547279	129667
WDC3_70m	547413	129679	WDC4_70m	547269	129666
WDC3_80m	547423	129679	WDC4_80m	547259	129665
WDC3_90m	547433	129680	WDC4_90m	547249	129664
WDC3_100m	547443	129681	WDC4_100m	547239	129663
WDC3_110m	547453	129682	WDC4_110m	547229	129662
WDC3_120m	547463	129683	WDC4_120m	547219	129662
WDC3_130m	547473	129684	WDC4_130m	547209	129661

WDC3_140m	547483	129685	WDC4_140m	547199	129660
WDC3_150m	547493	129686	WDC4_150m	547189	129659
WDC3_160m	547503	129686	WDC4_160m	547179	129658
WDC3_170m	547512	129687	WDC4_170m	547169	129657
WDC3_180m	547522	129688	WDC4_180m	547159	129656
WDC3_190m	547532	129689	WDC4_190m	547149	129655
WDC3_200m	547542	129690	WDC4_200m	547139	129655
Transect WDC5	**X co-ordinate (m)**	**Y co-ordinate (m)**	**Transect WDC6**	**X co-ordinate (m)**	**Y co-ordinate (m)**
WDC5_1m	546918	130941	WDC6_1m	546913	130940
WDC5_10m	546927	130944	WDC6_10m	546904	130938
WDC5_20m	546937	130946	WDC6_20m	546895	130935
WDC5_30m	546946	130949	WDC6_30m	546885	130932
WDC5_40m	546956	130951	WDC6_40m	546875	130930
WDC5_50m	546966	130954	WDC6_50m	546866	130927
WDC5_60m	546975	130956	WDC6_60m	546856	130925
WDC5_70m	546985	130959	WDC6_70m	546846	130922
WDC5_80m	546995	130962	WDC6_80m	546837	130920
WDC5_90m	547004	130964	WDC6_90m	546827	130917
WDC5_100m	547014	130967	WDC6_100m	546817	130914
WDC5_110m	547024	130969	WDC6_110m	546808	130912
WDC5_120m	547033	130972	WDC6_120m	546798	130909
WDC5_130m	547043	130975	WDC6_130m	546789	130907
WDC5_140m	547053	130977	WDC6_140m	546779	130904
WDC5_150m	547062	130980	WDC6_150m	546769	130901
WDC5_160m	547072	130982	WDC6_160m	546760	130899
WDC5_170m	547082	130985	WDC6_170m	546750	130896
WDC5_180m	547091	130988	WDC6_180m	546740	130894
WDC5_190m	547101	130990	WDC6_190m	546731	130891
WDC5_200m	547110	130993	WDC6_200m	546721	130888
Transect WDC7	**X co-ordinate (m)**	**Y co-ordinate (m)**	**Transect WDC8**	**X co-ordinate (m)**	**Y co-ordinate (m)**
WDC7_1m	546969	131861	WDC8_1m	546965	131863
WDC7_10m	546976	131855	WDC8_10m	546957	131868
WDC7_20m	546985	131850	WDC8_20m	546949	131874
WDC7_30m	546993	131844	WDC8_30m	546941	131880
WDC7_40m	547001	131838	WDC8_40m	546933	131886
WDC7_50m	547009	131832	WDC8_50m	546925	131892
WDC7_60m	547017	131826	WDC8_60m	546916	131898
WDC7_70m	547025	131820	WDC8_70m	546908	131903
WDC7_80m	547033	131815	WDC8_80m	546900	131909

WDC7_90m	547042	131809	WDC8_90m	546892	131915
WDC7_100m	547050	131803	WDC8_100m	546884	131921
WDC7_110m	547058	131797	WDC8_110m	546876	131927
WDC7_120m	547066	131791	WDC8_120m	546868	131932
WDC7_130m	547074	131786	WDC8_130m	546860	131938
WDC7_140m	547082	131780	WDC8_140m	546851	131944
WDC7_150m	547090	131774	WDC8_150m	546843	131950
WDC7_160m	547099	131768	WDC8_160m	546835	131956
WDC7_170m	547107	131762	WDC8_170m	546827	131961
WDC7_180m	547115	131757	WDC8_180m	546819	131967
WDC7_190m	547123	131751	WDC8_190m	546811	131973
WDC7_200m	547131	131745	WDC8_200m	546803	131979
Transect WDC9	**X co-ordinate (m)**	**Y co-ordinate (m)**	**Transect WDC10**	**X co-ordinate (m)**	**Y co-ordinate (m)**
WDC9_1m	547915	128521	WDC10_1m	547915	128515
WDC9_10m	547917	128530	WDC10_10m	547914	128506
WDC9_20m	547919	128540	WDC10_20m	547912	128496
WDC9_30m	547921	128550	WDC10_30m	547910	128486
WDC9_40m	547922	128560	WDC10_40m	547908	128476
WDC9_50m	547924	128569	WDC10_50m	547907	128467
WDC9_60m	547926	128579	WDC10_60m	547905	128457
WDC9_70m	547927	128589	WDC10_70m	547903	128447
WDC9_80m	547929	128599	WDC10_80m	547901	128437
WDC9_90m	547931	128609	WDC10_90m	547900	128427
WDC9_100m	547933	128619	WDC10_100m	547898	128417
WDC9_110m	547934	128629	WDC10_110m	547896	128407
WDC9_120m	547936	128638	WDC10_120m	547894	128398
WDC9_130m	547938	128648	WDC10_130m	547893	128388
WDC9_140m	547940	128658	WDC10_140m	547891	128378
WDC9_150m	547941	128668	WDC10_150m	547889	128368
WDC9_160m	547943	128678	WDC10_160m	547888	128358
WDC9_170m	547945	128688	WDC10_170m	547886	128348
WDC9_180m	547947	128697	WDC10_180m	547884	128338
WDC9_190m	547948	128707	WDC10_190m	547882	128329
WDC9_200m	547950	128717	WDC10_200m	547881	128319
Transect WDC11	**X co-ordinate (m)**	**Y co-ordinate (m)**	**Transect WDC12**	**X co-ordinate (m)**	**Y co-ordinate (m)**
WDC11_1m	546084	128719	WDC12_1m	546080	128714
WDC11_10m	546089	128726	WDC12_10m	546075	128707
WDC11_20m	546095	128734	WDC12_20m	546069	128699
WDC11_30m	546101	128742	WDC12_30m	546063	128691

WDC11_40m	546107	128750	WDC12_40m	546057	128683
WDC11_50m	546112	128758	WDC12_50m	546051	128675
WDC11_60m	546118	128767	WDC12_60m	546045	128667
WDC11_70m	546124	128775	WDC12_70m	546040	128659
WDC11_80m	546130	128783	WDC12_80m	546034	128650
WDC11_90m	546136	128791	WDC12_90m	546028	128642
WDC11_100m	546142	128799	WDC12_100m	546022	128634
WDC11_110m	546148	128807	WDC12_110m	546016	128626
WDC11_120m	546154	128815	WDC12_120m	546010	128618
WDC11_130m	546159	128823	WDC12_130m	546004	128610
WDC11_140m	546165	128831	WDC12_140m	545998	128602
WDC11_150m	546171	128839	WDC12_150m	545993	128594
WDC11_160m	546177	128847	WDC12_160m	545987	128586
WDC11_170m	546183	128856	WDC12_170m	545981	128578
WDC11_180m	546189	128864	WDC12_180m	545975	128570
WDC11_190m	546195	128872	WDC12_190m	545969	128561
WDC11_200m	546201	128880	WDC12_200m	545963	128553

Transect WDC13	X co-ordinate (m)	Y co-ordinate (m)	Transect WDC14	X co-ordinate (m)	Y co-ordinate (m)
WDC13_1m	544048	129224	WDC14_1m	544041	129222
WDC13_10m	544057	129226	WDC14_10m	544032	129219
WDC13_20m	544066	129229	WDC14_20m	544023	129216
WDC13_30m	544076	129232	WDC14_30m	544013	129213
WDC13_40m	544085	129235	WDC14_40m	544004	129210
WDC13_50m	544095	129238	WDC14_50m	543994	129207
WDC13_60m	544104	129241	WDC14_60m	543984	129204
WDC13_70m	544114	129244	WDC14_70m	543975	129202
WDC13_80m	544124	129247	WDC14_80m	543965	129199
WDC13_90m	544133	129250	WDC14_90m	543956	129196
WDC13_100m	544143	129253	WDC14_100m	543946	129193
WDC13_110m	544152	129256	WDC14_110m	543937	129190
WDC13_120m	544162	129259	WDC14_120m	543927	129187
WDC13_130m	544171	129261	WDC14_130m	543918	129184
WDC13_140m	544181	129264	WDC14_140m	543908	129181
WDC13_150m	544191	129267	WDC14_150m	543898	129178
WDC13_160m	544200	129270	WDC14_160m	543889	129175
WDC13_170m	544210	129273	WDC14_170m	543879	129172
WDC13_180m	544219	129276	WDC14_180m	543870	129169
WDC13_190m	544229	129279	WDC14_190m	543860	129166
WDC13_200m	544238	129282	WDC14_200m	543851	129164

Transect WDC15	X co-ordinate (m)	Y co-ordinate (m)	Transect WDC16	X co-ordinate (m)	Y co-ordinate (m)
WDC15_1m	541706	131005	WDC16_1m	541700	131007
WDC15_10m	541715	131002	WDC16_10m	541691	131009
WDC15_20m	541725	131000	WDC16_20m	541682	131012
WDC15_30m	541735	130997	WDC16_30m	541672	131014
WDC15_40m	541744	130995	WDC16_40m	541662	131017
WDC15_50m	541754	130992	WDC16_50m	541653	131020
WDC15_60m	541763	130989	WDC16_60m	541643	131022
WDC15_70m	541773	130987	WDC16_70m	541633	131025
WDC15_80m	541783	130984	WDC16_80m	541624	131027
WDC15_90m	541792	130982	WDC16_90m	541614	131030
WDC15_100m	541802	130979	WDC16_100m	541605	131033
WDC15_110m	541812	130976	WDC16_110m	541595	131035
WDC15_120m	541821	130974	WDC16_120m	541585	131038
WDC15_130m	541831	130971	WDC16_130m	541576	131040
WDC15_140m	541841	130969	WDC16_140m	541566	131043
WDC15_150m	541850	130966	WDC16_150m	541556	131046
WDC15_160m	541860	130964	WDC16_160m	541547	131048
WDC15_170m	541870	130961	WDC16_170m	541537	131051
WDC15_180m	541879	130958	WDC16_180m	541527	131053
WDC15_190m	541889	130956	WDC16_190m	541518	131056
WDC15_200m	541899	130953	WDC16_200m	541508	131058

Transect WDC17	X co-ordinate (m)	Y co-ordinate (m)	Transect WDC18	X co-ordinate (m)	Y co-ordinate (m)
WDC17_1m	541734	133412	WDC18_1m	541728	133417
WDC17_10m	541741	133407	WDC18_10m	541721	133422
WDC17_20m	541750	133401	WDC18_20m	541713	133428
WDC17_30m	541758	133395	WDC18_30m	541704	133434
WDC17_40m	541766	133390	WDC18_40m	541696	133439
WDC17_50m	541774	133384	WDC18_50m	541688	133445
WDC17_60m	541782	133378	WDC18_60m	541680	133451
WDC17_70m	541790	133372	WDC18_70m	541672	133456
WDC17_80m	541799	133367	WDC18_80m	541663	133462
WDC17_90m	541807	133361	WDC18_90m	541655	133468
WDC17_100m	541815	133355	WDC18_100m	541647	133474
WDC17_110m	541823	133350	WDC18_110m	541639	133479
WDC17_120m	541831	133344	WDC18_120m	541631	133485
WDC17_130m	541840	133338	WDC18_130m	541622	133491
WDC17_140m	541848	133332	WDC18_140m	541614	133497
WDC17_150m	541856	133327	WDC18_150m	541606	133502

WDC17_160m	541864	133321	WDC18_160m	541598	133508
WDC17_170m	541872	133315	WDC18_170m	541590	133514
WDC17_180m	541881	133309	WDC18_180m	541582	133520
WDC17_190m	541889	133304	WDC18_190m	541573	133525
WDC17_200m	541897	133298	WDC18_200m	541565	133531
Transect WDC19	**X co-ordinate (m)**	**Y co-ordinate (m)**	**Transect WDC20**	**X co-ordinate (m)**	**Y co-ordinate (m)**
WDC19_1m	548790	128796	WDC20_1m	547928	131484
WDC19_10m	548785	128804	WDC20_10m	547922	131490
WDC19_20m	548779	128812	WDC20_20m	547915	131497
WDC19_30m	548774	128820	WDC20_30m	547908	131504
WDC19_40m	548768	128829	WDC20_40m	547901	131511
WDC19_50m	548763	128837	WDC20_50m	547894	131518
WDC19_60m	548757	128845	WDC20_60m	547887	131525
WDC19_70m	548751	128854	WDC20_70m	547880	131533
WDC19_80m	548746	128862	WDC20_80m	547872	131540
WDC19_90m	548740	128870	WDC20_90m	547865	131547
WDC19_100m	548735	128878	WDC20_100m	547858	131554
WDC19_110m	548729	128887	WDC20_110m	547851	131561
WDC19_120m	548723	128895	WDC20_120m	547844	131568
WDC19_130m	548718	128903	WDC20_130m	547837	131575
WDC19_140m	548712	128912	WDC20_140m	547830	131582
WDC19_150m	548707	128920	WDC20_150m	547823	131589
WDC19_160m	548701	128928	WDC20_160m	547816	131596
WDC19_170m	548695	128936	WDC20_170m	547809	131603
WDC19_180m	548690	128945	WDC20_180m	547802	131610
WDC19_190m	548684	128953	WDC20_190m	547795	131617
WDC19_200m	548679	128961	WDC20_200m	547788	131624
Transect LD1	**X co-ordinate (m)**	**Y co-ordinate (m)**	**Transect LD2**	**X co-ordinate (m)**	**Y co-ordinate (m)**
LD1_12.35m	542275	110918	LD2_63.1m	542821	111422
LD1_20m	542282	110921	LD2_70m	542822	111415
LD1_30m	542292	110925	LD2_80m	542824	111405
LD1_40m	542301	110929	LD2_90m	542826	111395
LD1_50m	542310	110933	LD2_100m	542827	111386
LD1_60m	542319	110936	LD2_110m	542829	111376
LD1_70m	542328	110940	LD2_120m	542831	111366
LD1_80m	542338	110944	LD2_130m	542833	111356
LD1_90m	542347	110948	LD2_140m	542834	111346
LD1_100m	542356	110952	LD2_150m	542836	111336
LD1_110m	542365	110956	LD2_160m	542838	111327

LD1_120m	542374	110960	LD2_170m	542839	111317
LD1_130m	542384	110964	LD2_180m	542841	111307
			LD2_190m	542843	111297
			LD2_200m	542845	111287

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