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South Downs Local Plan and Lewes Joint Core Strategy: Habitat Regulations Assessment Addendum

Traffic-Related Effects on Ashdown Forest SAC – April 2018

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1 Executive Summary

1.1.1 In March 2017 a High Court judgment against the adopted Lewes/South Downs Joint Core Strategy (JCS)[1] concluded that the method that had been used in the JCS Habitat Regulations Assessment to rule out the potential for 'in combination' air quality effects from their plan on Ashdown Forest SAC was legally flawed, whether or not it complied with advice the Council had been given by Natural England, because it relied entirely on examining the flows arising from the JCS in isolation and took no account of the potential accumulation of growth from multiple authorities all affecting vehicle flows through the SAC, and the role (or not) of the JCS in any cumulative effect. In layman's terms, because the JCS used a shorthand assessment method agreed with Natural England, the HRA of the JCS *asserted* that its contribution was too small to contribute meaningfully to any 'in combination' effect but did not *demonstrate* that conclusion since it did not attempt to quantify the 'in combination' effect or demonstrate what the contribution of the JCS would actually mean in terms of changes in air quality.

1.1.2 In September 2017 AECOM undertook an air quality impact assessment for Lewes District Council and South Downs National Park Authority, which modelled forecast traffic growth on key roads within 200m of Ashdown Forest SAC over the period 2017 to 2033, including that expected due to the quantum and distribution of growth in the adopted Lewes Joint Core Strategy (as it relates to Lewes District outside the South Downs National Park) and the South Downs Local Plan. Tunbridge Wells Borough Council commissioned AECOM to use the same traffic and air quality models to undertake an identical analysis for the emerging Tunbridge Wells Local Plan. Sevenoaks District Council also commissioned an analysis. This report presents the results of the updated modelling including the detailed modelling of growth in Lewes, Tunbridge Wells and Sevenoaks. In order to address comments made during the consultation on the Local Plan and its HRA, the modelling work also includes consideration of ammonia emissions. It therefore replaces and supersedes the previously published addendum to the 2017 South Downs Local Plan (and Lewes JCS) HRA in its entirety. However, its overall conclusion does not undermine and is similar to that of the previous Addendum.

1.1.3 Forecast vehicle flows on roads through Ashdown Forest in 2033 are compared with baseline flows on the same roads in order to ascertain the air quality effect. The relative contribution of growth in South Downs Local Plan/Lewes Joint Core Strategy (JCS) is then separated out from growth in other authorities in order to establish the relative contribution of the South Downs Local Plan/Lewes JCS to any change in air quality by 2033.

1.1.4 In summary, the analysis concludes that ammonia concentrations at the closest areas of heathland to affected roads (5m from the A275 and A22) are below 1 μm^{-3} and nitrogen deposition rates along all links are forecast to experience a net improvement of 1.6-1.9 kgN/ha/yr by 2033, even allowing for traffic growth, due to improvements in NOx emission factors and background concentrations/deposition rates over the same timetable. The maximum 'in combination' additional nitrogen deposition forecast to the nearest areas of heathland by 2033 is 0.3 kgN/ha/yr. Based on published research into dose-response relationships in heathland this would be c. 25% of the nitrogen 'dose' that might result in a significant retardation of any improvement in species richness that might otherwise be observed at the forecast background deposition rates and is not expected to result in a significant change in grass cover. Moreover, the contribution of the South Downs Local Plan/JCS is negligible, being a maximum 0.07 kgN/ha/yr at the roadside of the A275.

1.1.5 Furthermore, the Local Plan and Joint Core Strategy both contain sustainability policies (notably Local Plan policy SD19 (Transport and Accessibility) and Joint Core Strategy policy 13 (Sustainable Travel)) which are not factored into these traffic/air quality calculations and aspects of which have some potential to reduce the need for journeys to work by private vehicle towards Ashdown Forest; thus further reducing the already small contribution to increased vehicle movements on the A26 that is forecast to arise from the Local Plan and JCS.

1.1.6 Although it does not constitute mitigation (and is not presented as such), as a further safeguard the South Downs National Park Authority has also convened an Ashdown Forest Working Group

[1] Wealden District Council vs Secretary of State for Communities and Local Government. Lewes District Council and South Downs National Park Authority and Natural England. [2017] EWHC 351 (Admin)

which first met in April 2017. The shared objective of the working group is to ensure that impacts on the Ashdown Forest are properly assessed through HRA and that, if required, a joint action plan is put in place should such a need arise. It should be noted that the absence of any need for 'mitigation' associated with the scale of future growth in a particular authority does not prevent the Ashdown Forest authorities cooperatively working together to do whatever they jointly consider appropriate in reducing traffic and improving nitrogen deposition etc. around the Forest as a matter of general good stewardship, at least until 2040 after which it is likely an improvement in road-related air quality will start to be realised due to the Government's announcement to ban the sale of new petrol and diesel vehicles at that point. The aforementioned working group would be a suitable forum.

2 Introduction

2.1.1 Ashdown Forest is an extensive area of common land lying between East Grinstead and Crowborough entirely within Wealden District. The soils are derived from the predominantly sandy Hastings Beds. It is one of the largest single continuous blocks of heath, semi-natural woodland and valley bog in south-east England, and it supports several uncommon plants, a rich invertebrate fauna, and important populations of heath and woodland birds. It is both a Special Area of Conservation (SAC) and Special Protection Area (SPA)

2.1.2 The SPA is designated for its populations of breeding Dartford Warbler *Sylvia undata* and Nightjar *Caprimulgus europaeus*. The SAC is designated for its Annex I habitats, namely Northern Atlantic wet heaths with *Erica tetralix* and European dry heaths; as well as for its Annex II species, namely Great Crested Newts.

2.1.3 Exhaust emissions from vehicles are capable of adversely affecting the protected heathland found in Ashdown Forest. Accordingly, in September 2017 AECOM undertook an air quality impact assessment for Lewes District Council and South Downs National Park Authority, which modelled forecast traffic growth on key roads within 200m of Ashdown Forest SAC over the period 2017 to 2033, including that expected due to the quantum and distribution of growth in the adopted Lewes Joint Core Strategy (as it relates to Lewes District outside the South Downs National Park) and the South Downs Local Plan. Tunbridge Wells Borough Council commissioned AECOM to use the same traffic and air quality models to undertake an identical analysis for the emerging Tunbridge Wells Local Plan. Sevenoaks District Council also commissioned an analysis. This report presents the results of the updated modelling including the detailed modelling of growth in Lewes, Tunbridge Wells and Sevenoaks. In order to address comments made during the consultation on the Local Plan and its HRA, the modelling work also includes consideration of ammonia emissions. It therefore replaces and supercedes the previously published addendum to the 2017 South Downs Local Plan HRA in its entirety. However, its overall conclusion is similar to that of the previous Addendum.

2.1.4 The methodology used in this analysis is compliant with the requirement of the Conservation of Habitats and Species Regulations 2017 to consider whether an adverse effect on the integrity of a European site will result either alone, or in combination with other plans and projects.

2.1.5 In addition to determining the total cumulative ‘in combination’ effect on roadside air quality at Ashdown Forest SAC, the calculations presented in this analysis also consider the contribution of South Downs Local Plan and the Lewes Joint Core Strategy to that ‘in combination’ effect. This is necessary to determine whether the contribution is ecologically material and thus whether mitigation of that contribution is required.

3 Methodology

3.1.1 Vehicle exhaust emissions generally only have a local effect within a narrow band along the roadside, within 200m of the centreline of the road. Beyond 200m emissions are considered to have dispersed sufficiently that atmospheric concentrations are essentially background levels. The rate of decline is steeply curved rather than linear. In other words concentrations will decline rapidly as one begins to move away from the roadside, slackening to a more gradual decline over the rest of the distance up to 200m.

3.1.2 There are two measures of particular relevance regarding air quality impacts from vehicle exhausts and which are modelled using standard forecasting. The first is the concentration of oxides of nitrogen (known as NOx) in the atmosphere. In extreme cases NOx can be directly toxic to vegetation but its main importance is as a source of nitrogen, which is then deposited on adjacent habitats. The guideline atmospheric concentration advocated by Government for the protection of vegetation is 30 micrograms per cubic metre (μgm^{-3}), known as the Critical Level, as this concentration relates to the growth effects of nitrogen derived from NOx on vegetation.

3.1.3 The second important metric is a measure of the rate of the resulting nitrogen deposition. The addition of nitrogen is a form of fertilization, which can have a negative effect on heathland and other habitats over time by encouraging more competitive plant species that can force out the less competitive species that are more characteristic. Unlike NOx in atmosphere, the nitrogen deposition rate below which we are confident effects would not arise is different for each habitat. The rate (known as the Critical Load) is provided on the UK Air Pollution Information System (APIS) website (www.apis.ac.uk) and is expressed as a quantity (kilograms) of nitrogen over a given area (hectare) per year ($kgNha^{-1}yr^{-1}$).

3.1.4 A third pollutant included in this assessment is ammonia emissions from traffic. In ecological terms ammonia differs from NOx in that it is not only a source of nitrogen but can also be directly toxic to vegetation in relatively low concentrations. Using the process set out in Design Manual for Roads and Bridges, ammonia emissions for traffic are not normally calculated. However, for completeness, and in response to representations made by Wealden District Council, they have been included in this iteration of AECOM's modelling, both in terms of atmospheric concentrations and as a source of nitrogen.

3.1.5 Finally, and for completeness, rates of acid deposition have also been calculated. Acid deposition derives from both sulphur and nitrogen. It is expressed in terms of kiloequivalents (keq) per hectare per year. The thresholds against which acid deposition is assessed are referred to as the Critical Load Function. The principle is similar to that for a nitrogen deposition Critical Load but it is calculated very differently.

3.2 Traffic modelling

3.2.1 A series of road links within 200m of Ashdown Forest Special Area of Conservation (SAC) were identified for investigation. These links were chosen as they are all representative points on the busiest roads through the SAC and are also the roads likely to experience the greatest increase in flows over the period to 2033. As such, these are the roads where an air quality effect due to additional traffic growth is most likely to be observed.

3.2.2 Traffic data were generated for each of these links for three scenarios, described in this report as:

- Base Case
- Do Nothing (DN)
- Do Something (DS)

3.2.3 The Base Case uses measured flows, percentage Heavy Duty Vehicles (HDVs) and average vehicle speeds on the relevant links, as provided by Wealden District Council (WDC). The Wealden traffic counts were for 2014 (either undertaken in that year, or adjusted to that year). For the purposes of consistency with wider traffic modelling used to inform the Habitat Regulations Assessment (HRA) of the South Downs Local Plan, which use measured traffic counts from 2017, these data were 'grown' by AECOM transport planners to 2017. Since the emerging Sevenoaks Local Plan is backdated to 2015, the emerging South Downs Local Plan and emerging Tunbridge Wells Local Plan to 2014 and the Joint Core Strategy to 2010, this means that housing and employment development that has been delivered and occupied prior to 2017 is allowed for in the measured baseline flows. However, this is also true for all other local authorities, so there is no disparity in treatment of local authorities in the modelling. Development that has been consented but not actually completed/occupied does not appear in the baseline flows.

3.2.4 The Do Nothing scenario is the term used in this report to describe the future flows on the same roads at the end of the South Downs Local Plan period (2033), without consideration of the role of the Tunbridge Wells Local Plan, South Downs Local Plan, Sevenoaks Local Plan or Lewes Joint Core Strategy. This therefore presents the expected contribution of other plans and projects to flows by 2033, outside these four authorities. The end of the Local Plan period has been selected for the future scenario as this is the point at which the total emissions due to Tunbridge Wells Local Plan/Sevenoaks Local Plan/South Downs Local Plan/JCS traffic will be at their greatest. The scenario is calculated by extrapolating the observed traffic data. The Do Nothing scenario adds all traffic growth from 2017 to 2033 that will result in additional journeys on the modelled road links.

3.2.5 For the purposes of 'in combination' assessment (i.e. incorporating growth into the model due to multiple Local Plans and Core Strategies for surrounding authorities) it was decided that modelling the adopted Local Plans directly would not reflect actual housing growth in those authorities between 2017 and 2033 because:

1. Since most commence in 2006 they include a large number of allocations that are historic (i.e. already delivered and occupied) and these are already part of the measured base flows.
2. Adopted plans for these authorities may not accurately reflect growth over the period 2017 to 2033 because, with the exception of Lewes Joint Core Strategy, all the adopted plans for the boroughs/districts immediately around Ashdown Forest SAC finish seven years before the South Downs Local Plan, which runs to 2033 whereas the adopted plans (other than the Lewes JCS) all run to 2026 or 2027. This means that there will be 6-7 years of growth which is not covered by most adopted plans.

3.2.6 Expected development in these authorities over the period 2017 to 2033 was therefore included in the model by using the National Trip End Model Presentation Program (TEMPRO). TEMPRO produces a growth factor that is applied to the measured flows. It is based on data for each local authority district in the UK (distributed by statistical Middle Layer Super Output Area[2]) regarding future changes in population, households, workforce and employment (in addition to data such as car ownership) but is not limited to a given period of time. Traffic growth factors are utilised for the statistical Middle Layer Super Output Areas (MSOAs) within which the modelled links are located. TEMPRO has the advantages of being forecastable to 2033 and beyond, using growth assumptions that are regularly updated and distributed to the level of Middle-Layer Super Output Area (of which there are 21 in Wealden District alone) and of being an industry standard database tool across England meaning that modelling exercises that use TEMPRO will have a high degree of consistency.

3.2.7 The other authorities immediately surrounding Ashdown Forest are those in which development is most likely to influence annual average daily traffic flows through the SAC. For those authorities (Wealden, Mid-Sussex and Tandridge) scrutiny of the relevant adopted Local Plans or Core Strategies and the associated housing growth rates in TEMPRO resulted in the conclusion that the adopted plans (and TEMPRO) may currently underestimate growth to 2033 and this could in turn materially affect the estimation of 2033 AADT flows on the relevant roads. The decision was therefore made to raise the growth allowances for these authorities to reflect their most recent Objectively Assessed Need (OAN) at time of traffic modelling[3]. The OAN figure was

[2] Middle Layer Super Output Areas are a geographical hierarchy designed to improve the reporting of small area statistics in England and Wales. They are a series of areas each of which has a minimum population of 5,000 residents. They have a mean population of 7,200 residents.

[3] Note that the Objectively Assessed Need figures in the Do Nothing component of the model date from June 2017. For Wealden District this broadly matches the growth rates that authority has used in its own modelling. In September 2017 the Government released a new Objectively Assessed Housing Need for each local authority. Other than Tunbridge Wells and Sevenoaks (whose elevated OAN is taken into account in this updated modelling), only 1 of the relevant authorities has a higher OAN using the Government method than the figure used in the previous Do Nothing modelling: Tandridge's OAN increases from 470 to 645. On the other hand, two of the authorities modelled in Do Nothing have OAN's lower than those used in the model (Wealden and Mid-Sussex). Therefore, given that the Government method is still out to

derived from published information released by the Councils themselves or (in the case of Mid-Sussex) by their Local Plan inspector. Although housing growth rates were adjusted upwards, expected broad housing distributions were not altered. Employment growth assumptions in TEMPRO for these authorities were not adjusted. The authorities and their quanta and broad distributions of housing growth as considered in our analysis are as follows:

- **Wealden** – Adopted Local Plan Core Strategy Policy WCS1 specifies delivery of 4,525 dwellings over the period 2010 to 2027 (266 per annum). A new draft Local Plan has been consulted upon but is currently being updated and revised. Growth in Uckfield and Crowborough (as well as smaller settlements around the SAC such as Maresfield) is most likely to affect flows through the SAC, although development across the district is likely to contribute cumulatively. At Uckfield '*The* [adopted] *Local Plan will allow for a redevelopment of the towns retail centre providing some 10,000 m² of new retail space as well as the creation of 12,650 m² of employment space. It limits to 1000 the number of new homes to be built between now and 2027, and identifies Ridgewood as the most sustainable place for the growth needed to support the vibrancy of the town'*.[4] The main focus of growth at Uckfield is an urban extension to the west of the town. At Crowborough: '*Wealden's* [adopted] *Core Strategy Local Plan, approved in 2012, allows for a significant amount of new housing in Crowborough, with supporting office space and commercial premises within the town at appropriate locations. It will see some 450 new houses built in existing settlements across Wealden each year up until 2027… Within Crowborough the Local Plan allows for some 140 new homes to be built in the town at Pine Grove and Jarvis Brook. It also allows for 160 new homes to be built in an urban extension to the south east of the town.'*[5] The most recent Objectively Assessed Need for Wealden is 832 dwellings per annum. Since this is a substantial difference from that in the published Core Strategy the higher rate was used in the model, although it is accepted that this may overestimate the scale of growth that the next iteration of Wealden Local Plan actually proposes for the district.

- **Mid-Sussex** – The submitted Local Plan (2014 – 2031) plans for 13,600 dwellings (800 dwellings per annum). A large part of the housing and employment development is intended to consist of a new strategic development (3,500 dwellings) north of Burgess Hill, 13km south-west of the SAC, as well as existing commitments in that same settlement. The submitted plan also proposes 600 dwellings at Pease Pottage, 12km west of the SAC and smaller levels of growth elsewhere. Housing in East Grinstead (and to a lesser extent Haywards Heath) is most likely to be relevant to flows through Ashdown Forest as East Grinstead lies on the A22 approximately 4km north of the SAC. These are both Category 1 settlements in the Local Plan's hierarchy and can therefore be expected to take a sizeable proportion of the dwellings expected to be allocated 'elsewhere in the district' over the plan period according to policy DP5. During the plan's Examination in Public, the Inspector identified in February 2017 that he was minded to increase the growth rate from 800 per annum to 1,026 per annum. Although it is now understood that number may be reduced, the 1,026 figure has been used in this analysis to be precautionary.

- **Tandridge** – The adopted Core Strategy expects 2,500 dwellings from 2006 to 2026 at an average rate of 125 dwellings per annum. The majority of development will take place within the existing built up areas of Caterham, Warlingham, Whyteleafe, Oxted and Hurst Green. The new Local Plan is in the early stages of development (broad strategy published in March 2017 but no information on detailed scale or location of growth) with a forthcoming Garden Village consultation in autumn 2017. The most recent Objectively Assessed Need for Tandridge at the time the traffic modelling was undertaken was 470 dwellings per annum. Since this is a substantial difference from that in the published Core Strategy the higher rate was used in the model as a precaution, although it is accepted that the level of growth in the final Local Plan for Tandridge may be less than this number. Tandridge are currently

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consultation, and for consistency with the previous Lewes/South Downs work, the housing growth rates for Tandridge, Mid-Sussex and Wealden have been left as per the original South Downs/Lewes model.

[4] http://www.wealden.gov.uk/Wealden/Residents/Planning_and_Building_Control/Planning_Policy/CoreStrategy/Planning_Core_Strategy_Uckfield.aspx (accessed 05/09/17)

[5] http://www.wealden.gov.uk/Wealden/Residents/Planning_and_Building_Control/Planning_Policy/CoreStrategy/Planning_Core_Strategy_Crowborough.aspx (accessed 05/09/17)

considering the location of a new Garden Village but the location is not determined at this point and therefore no specific location for this Garden Village was included in the modelling.

3.2.8 The Do Nothing (and thus Do Something) Scenario is therefore intentionally precautionary and allows for growth over the period to 2033 beyond that in adopted (or even published draft) Local Plans in those authorities immediately surrounding Ashdown Forest SAC. Both scenarios assume a consistent rate of housing delivery over the plan period. It is understood that a Statement of Common Ground is being produced between the various authorities around Ashdown Forest and included in that SoCG are detailed proposals for future modelling regarding traffic numbers that should be assumed. However, that agreement is still in progress and the traffic modelling used in this report was undertaken before that aspect of the agreement was devised. Therefore, this modelling may overestimate growth rates in some authorities, particularly Mid-Sussex District.

3.2.9 TEMPRO provides a consistent and standard approach to traffic forecasting when a large number of sources (e.g. local authority areas) are involved. However, a more nuanced forecast can be obtained by creating a bespoke model that manually distributes trips according to journey to work data. This approach provides a better understanding of where traffic associated with the proposed Local Plan development is likely to be most concentrated. Tunbridge Wells Borough Council, Lewes District, Sevenoaks District Council and South Downs National Park Authority therefore commissioned AECOM to create a bespoke model for their authorities.

3.2.10 The bespoke modelling exercise adds traffic in the aforementioned four local authority plans into the existing Do Nothing modelling to create the Do Something scenario. Since the original modelling undertaken for the National Park Authority in autumn 2017 only added South Downs National Park and Lewes JCS to create the Do Something scenario (leaving the other authorities in Do Nothing) this (March 2018) modelling therefore supercedes that earlier modelling exercise and the Do Nothing and Do Something flows are different to those reported in that earlier document. The 2033 Do Something scenario reported in this document includes bespoke modelling for Lewes District, Sevenoaks District, South Downs National Park and Tunbridge Wells Borough, although the relative contribution of South Downs National Park/Lewes JCS to that Do Something forecast is identifiable.

3.2.11 The Do Something scenario reflects the combined role of the Tunbridge Wells Local Plan, Sevenoaks Local Plan, South Downs Local Plan, Lewes Joint Core Strategy and subsidiary Neighbourhood Plans by 2033, in addition to growth in other authorities. Detailed modelling of Local Plan/Neighbourhood Plan growth locations undertaken by the AECOM transport planning team was added to the adjusted TEMPRO growth for all other authorities. To build the Local Plan model, housing and employment sites in Tunbridge Wells, Sevenoaks District, Lewes District and the National Park (allocations in the Local Plan, Joint Core Strategy, allocations in Neighbourhood Plans, unimplemented planning permissions and windfall) were geographically assigned to 'distribution groups' across Tunbridge Wells Borough, Sevenoaks District, the National Park and Lewes District using GIS software. The distribution of each of these groups was calculated using Census 2011 journey to work data, and the trips associated with each distribution group then manually assigned across the network.

3.2.12 The 'in combination' growth scenario is therefore the Do Something flows, as these include existing traffic, all future journeys arising from within Tunbridge Wells Borough, the South Downs National Park, Sevenoaks District and Lewes District due to the Local Plan, Joint Core Strategy or Neighbourhood Plan proposals (from AECOM's model), and future traffic arising from all other authorities (from TEMPRO, adjusted for expected higher growth rates in some authorities). The difference between the Do Something scenario and the Do Nothing scenario illustrates the role of the Tunbridge Wells Local Plan, Sevenoaks Local Plan, JCS and South Downs Local Plan (and Neighbourhood Plans) in changing future flows compared to what would be expected without the Local Plan/Joint Core Strategy proposals.

3.3 Air quality calculations

3.3.1 Using these scenarios and information on total traffic flow, average vehicle speeds and percentage Heavy Duty Vehicles (which influence the emissions profile), AECOM air quality specialists calculated expected NOx concentrations, nitrogen deposition rates, ammonia concentrations and acid deposition rates at receptor points along each modelled road link. The predictions for NOx and nitrogen deposition are based on the assessment methodology presented in Annex F of the Design Manual for Roads and Bridges (DMRB), Volume 11, Section

3, Part 1 (HA207/07)[6] for the assessment of impacts on sensitive designated ecosystems due to highways works[7]. Background data for NOx and NO_2 were sourced from the Department of Environment, Food and Rural Affairs (Defra) background maps[8]. Background data for ammonia was sourced from monitoring undertaken at Ashdown Forest[9].

3.3.2 The DMRB does not provide a method for forecasting ammonia emissions from traffic. A method has therefore been devised for this modelling. The methodology for this is presented in detail in Appendix D. The research undertaken in Ashdown Forest indicates that beyond 20m from the roadside ammonia contributions are expected to tend towards background and so the contribution of road sources would be limited beyond this point.

3.3.3 Given that the assessment year (2033) is a considerable distance into the future, it is important for the air quality calculations to take account of improvements in background air quality and vehicle emissions that are expected nationally over the plan period. Making an allowance for a realistic improvement in background concentrations and deposition rates is in line with the Institute of Air Quality Management (IAQM) position[10] as well as that of central government[11]. Background nitrogen deposition rates were sourced from the Air Pollution Information System (APIS) website[12]. Although in recent years improvements have not kept pace with predictions, the general long-term trend for NOx has been one of improvement (particularly since 1990) despite an increase in vehicles on the roads[13]. There is also an improving trend for nitrogen deposition, although the rate of improvement has been much lower than for NOx[14]. The current DMRB guidance for ecological assessment suggests reducing nitrogen deposition rates by 2% each year between the base year and assessment year. However, due to some uncertainty as to the rate with which projected future vehicle emission rates and background pollution concentrations are improving, the precautionary assumption has been made in this assessment that not all improvements projected by DMRB (for nitrogen deposition) or Defra (for NOx concentrations) will occur. With regards to background ammonia concentrations; as there is greater uncertainty associated with rates of improvement over time, background concentrations have been kept the same through all assessment years.

3.3.4 Therefore, the air quality calculations assume that conditions in 2023 (an approximate midpoint between the base year and the year of assessment) are representative of conditions in 2033 (the year of assessment). The effect on the 2033 data is equivalent to assuming a 0.75% per annum improvement in background NOx concentrations and nitrogen deposition rates between 2017 and 2033. The approach of not assuming all projected improvements occur (known as Gap Analysis) is accepted within the professional air quality community and accounts for known recent improvements in vehicle technologies (new standard Euro 6/VI vehicles), whilst excluding the more distant and therefore more uncertain projections on the evolution of the vehicle fleet. No discussion is made in this analysis of the UK Government's recent decision to ban the sale of new petrol and diesel vehicles from 2040 since it would not affect the time period under consideration, but that announcement illustrates the general long-term direction of travel for roadside air quality in the UK and underlines that allowing for improvements in both vehicle emissions factors and background rates of deposition over long timescales is both appropriate and realistic.

3.3.5 Annual mean concentrations of NOx were calculated at varied intervals back from each road link up to a maximum of 200m, with the closest distance being the closest point of the designated site to the road. Predictions were made using the latest version of ADMS-Roads using emission rates derived from the Defra Emission Factor Toolkit (version 8.0.1) which utilises traffic data in the form of 24-hour Annual Average Daily Traffic (AADT), %HDV and average speed. The tables in

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6 Design Manual for Roads and Bridges, HA207/07, Highways Agency

7 DMRB advocates a nitrogen deposition velocity of 0.1 cms^{-1} for non-woodland vegetation and that velocity is therefore used in AECOMs modelling.

8 Air Quality Archive Background Maps. Available from: http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html

9 Ashdown Forest SAC, Air Quality Monitoring and Modelling, October 2017

10 http://www.iaqm.co.uk/text/position_statements/vehicle_NOx_emission_factors.pdf

11 For example, The UK Government's recent national Air Quality Plan also shows expected improvements over the relevant time period (up to 2030) https://www.gov.uk/government/publications/air-quality-plan-for-nitrogen-dioxide-no2-in-uk-2017

12 Air Pollution Information System (APIS) www.apis.ac.uk

13 Emissions of nitrogen oxides fell by 69% between 1970 and 2015. Source: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/579200/Emissions_airpollutants_statisticalrelease_2016_final.pdf [accessed 08/06/17]

14 Total nitrogen deposition (i.e. taking account of both reduced and oxidised nitrogen, ammonia and NOx) decreased by 13% between 1988 and 2010. This is an improvement of 0.59% per annum on average.

Appendix A present the calculated changes in NOx concentration, nitrogen deposition and acid deposition ‘in combination’ (i.e. the difference between Do Something and the 2017 Base case) and the role played by Local Plan/Joint Core Strategy development compared to that which would occur in any case over the plan period (i.e. the difference between Do Something and Do Nothing).

Model verification

3.3.6 To assist in the verification of the AECOM model (produced December 2017) AECOM were provided with a partially redacted version of a report prepared for Wealden District Council by Air Quality Consultants (‘AQC’) (Ashdown Forest SAC, Air Quality Monitoring and Modelling, December 2017). This report provided grid references, distance to road (m) and NO2/NOX concentrations for a number of measurement locations. The measurement height of these diffusion tubes was not recorded in the AQC report and this has been taken as 2m to match the stated height of the Ammonia ALPHA samplers, which are also included within this report.

3.3.7 Using these diffusion tube data AECOM was able to model the latest version of the Ashdown Forest model (December 2017) which uses 2017 backgrounds based on the base year 2015 and the NO_x to NO_2 Calculator v6.1 for 2017 using All non-urban UK traffic for the local authority of Wealden.

3.3.8 This verification process calculated a model adjustment factor of 2.73[15] with an RMSE of 4.2. The RMSE should ideally be within 10% of the relevant air quality criterion, but is acceptable where it is within 25% of the relevant air quality criterion, as is the case here[16].

[15] This adjustment factor (2.73) is higher than the main factors produced by AQC in their report. The modelling approach taken by AQC includes canyoning effects, time-varying emission profiles, CURED emission rates, terrain data and incorporates the effects of road gradient on NO_X emissions all of which may increase concentrations within close proximity to the road source where the verification diffusion tubes are located. It is also noted that the tube height of 2m is an assumption which would affect the overall factor if the tubes are at a different height.

[16] Defra (2016), Local Air Quality Management Technical Guidance (TG16)

4 Results

4.1 Traffic modelling

4.1.1 The flows forecast by 2033, and how these differ between Do Nothing (without the Local Plans/JCS) and Do Something (*including* the Sevenoaks, Tunbridge Wells and South Downs Local Plans and the Lewes JCS) are presented overleaf.

Table 1. Traffic flow data used in the air quality modelling

A	B	C	D	E	F	G	H
Link ID	**Link Description**	**Wealden Model Base 2014 AADT**	**2017 Base AADT**	**2033 DN AADT (traffic growth <u>excluding</u> Sevenoaks, Lewes, South Downs and Tunbridge Wells Local Plans)**	**2033 DS AADT (traffic growth <u>including</u> Sevenoaks, Lewes, South Downs and Tunbridge Wells Local Plans)**	**Difference between 2017 Base and DS (i.e. net traffic growth from 2017 to 2033)**	**Difference between DS and DN**
6	A22 Royal Ashdown Forest Golf Course	11,480	11,509	12,887	13,167	1,658	280
33	A22 Wych Cross	12,340	12,371	13,852	14,009	1,638	157
34	A22 Nutley	11,360	11,389	12,752	12,915	1,526	163
37	A275 Wych Cross	4,530	4,542	5,085	5,413	871	328
38	A26 Poundgate	16,150	16,191	18,129	19,205	3,014	1,076

Table 2. Breakdown of Do Something scenario to show the relative contributions of South Downs Local Plan/Lewes JCS to the change in flows between 2017 and 2033, expressed as AADT and as percentage contribution to the difference between DS and DN

Link ID	South Downs Local Plan/Lewes JCS (AADT)
6	192 (69%)
33	69 (44%)
34	75 (46%)
37	237 (72%)
38	380 (35%)

The percentages in Table 2 can be applied to the difference between DS and DN in Appendix 1 to determine the relative contribution of the Local Plan to ammonia, NOx, nitrogen deposition and acid deposition.

4.1.2 All links are forecast to experience an increase in traffic flows between 2017 and 2033 when all expected traffic growth sources (including the Tunbridge Wells Local Plan, Sevenoaks Local Plan, South Downs Local Plan, and Lewes JCS) are taken into account (Column G of Table 1). Note that this traffic growth can be expected to occur incrementally over the plan period, matching the housing delivery trajectory.

4.2 Air quality calculations

Ammonia

4.2.1 Ammonia concentrations in atmosphere are discussed in this section. Ammonia as a source of nitrogen is discussed in the following section on nitrogen deposition.

4.2.2 There are two critical levels for ammonia in atmosphere, which represent the differing sensitivities of lower plants (lichens and mosses) and higher plants (all other vegetation) to the gas. The difference is because higher plants have a protective cuticle which makes them less vulnerable to the gas than lower plants. A judgment must be made over which is more appropriate in a given location. The lower critical level (1 $µm^{-3}$) is only appropriate to use in an HRA where the affected area within the modelled transect has a high lichen/bryophyte interest that is relevant to the integrity of the SAC habitat. Otherwise the higher critical level (3 $µm^{-3}$) is more appropriate. If concentrations are forecast to be below the critical level within the relevant part of the SAC then there is good reason to conclude no adverse effect will arise.

4.2.3 Heathlands can support a diverse terricolous lichen flora provided the sward is sufficiently open for colonisation. All heathland SACs therefore automatically have the lower critical level assigned to them on the UK Air Pollution Information System (www.apis.ac.uk) and APIS makes it clear that this is due to an *a priori* assumption of lichen/bryophyte interest somewhere in the site. However, APIS assigns critical levels to SACs fairly generically rather than basing the decision on location specific data. In practice there are many areas of heathland that do not support a diverse lichen flora, since management is very significant in influencing lichen diversity and abundance and closed dense swards are much less likely to support a terricolous lichen community than more open swards. In such cases the higher critical level of 3 $µm^{-3}$ is a more appropriate reference threshold.

4.2.4 Some parts of Ashdown Forest SAC do support a diverse terricolous heathland lichen assemblage. However, Wealden District Council has produced habitat maps using Earth Observation (satellite imagery and airborne systems) and commissioned site vegetation surveys[17]. None of these data indicate the presence of a significant assemblage of terricolous heathland lichens adjacent to any of the modelled roads[18] and such an assemblage would not be expected in these areas given the tall dense swards (including a high proportion of bracken, scrub and trees). This has been verified by site inspections undertaken by AECOM. Even in heathland that is not scrub and bracken encroached, diverse lichen assemblages will generally only occur where the sward is managed to keep it open to control dwarf shrub (i.e. heather) cover. As such, the higher critical level is considered more appropriate for the relevant roadside locations at Ashdown Forest SAC.

4.2.5 Bearing that in mind, modelling undertaken by Air Quality Consultants Ltd for Wealden District Council indicates that the 3 $µm^{-3}$ critical level for these specific roadside locations is not exceeded and is not forecast to be exceeded. This is supported by AECOM's modelling (Appendix A). Therefore, using this critical level, no direct toxicity effects of ammonia are expected on the key habitats of the SAC, whether associated with traffic emissions or other sources such as agriculture.

4.2.6 Nonetheless, for completeness, Table 3 below summarises the ammonia concentration results for each link with reference to whether the lower critical level (1 $µm^{-3}$) is forecast to be exceeded at the nearest area of heathland based on AECOM modelling.

[17] Two interim ecological survey reports have been released so far, the most recent dated May 2016. These are available at http://www.wealden.gov.uk/Wealden/Residents/Planning_and_Building_Control/Planning_Policy/Evidence_Base/Planning_Evidence_Base_Habitat_Regulations_Assessment.aspx

[18] Paragraph 3.3.2 of the 2015 interim botanical survey report for Ashdown Forest states that '*Varying amounts of bryophytes and lichens were recorded, with Cladonia present in some areas but not particularly prevalent along transects'.*

Table 3. Summary of ammonia results for the nearest areas of heathland to each modelled link, with reference to the 1 μm^{-3} critical level for ammonia

Link/Transect	Nearest area of heathland	Summary of results by reference to the 1 μm^{-3} critical level
Transect 38: A26 at Poundgate	Approximately 45m from the road, although most is more distant. Intervening habitat is woodland.	2033 ammonia concentrations are forecast to fall below 1 μm^{-3} by 30m from the road
Transect 37W: A275 at Wych Cross	Extensive areas approximately 5m from the road. Area within 15m of the road unlikely to support terricolous lichens as vegetation is tall, dense and gorse encroached, providing a closed sward.	2033 ammonia concentrations are forecast to fall below 1 μm^{-3} by 5m from the road
Transect 37E: A275 at Wych Cross	Extensive areas approximately 5m from the road. Area within 15m of the road unlikely to support terricolous lichens as vegetation is tall, dense and gorse encroached, providing a closed sward.	2033 ammonia concentrations are forecast to fall below 1 μm^{-3} by 5m from the road
Transect 34: A22 at Nutley	No heathland within 200m of the road; woodland occupies this zone	2033 ammonia concentrations are forecast to fall below 1 μm^{-3} by 20m from the road
Transect 33: A22 at Wych Cross	Extensive areas approximately 5m from the road. Area within 15m of the road unlikely to support terricolous lichens as vegetation is tall, dense and gorse encroached providing a closed sward.	2033 ammonia concentrations are forecast to fall below 1 μm^{-3} by 10m from the road. Even at the roadside the contribution of the South Downs Local Plan and Lewes JCS to elevating ammonia will be effectively zero (i.e. less than 0.01 μm^{-3}).
Transect 6b_37_33: junction of A22 and A275	No heathland within 200m of the road; woodland occupies this zone.	2033 ammonia concentrations are forecast to fall below 1 μm^{-3} by 50m from the road
Transect 6b: A22 at Royal Ashdown Forest Golf Course	Large patch of heathland approximately 30m from the road, otherwise woodland occupies this zone	2033 ammonia concentrations are forecast to fall below 1 μm^{-3} by 13m from the road
Transect 6aSW: A22 at Royal Ashdown Forest Golf Course	Small patch approximately 10m from the road although heavily woodland encroached. Very unlikely to support terricolous heathland lichens due to closed canopy.	2033 ammonia concentrations are forecast to fall below 1 μm^{-3} by 15m from the road. By 10m from the road the contribution of the South Downs Local Plan and Lewes JCS to elevating ammonia will be effectively zero (i.e. less than 0.01 μm^{-3}).
Transect 6aSE: A22 at Royal Ashdown Forest Golf Course	Approximately 100m from the road although heavily scrub and tree encroached. The rest of the zone is occupied by woodland	2033 ammonia concentrations are forecast to fall below 1 μm^{-3} by 20m from the road.
Transect 6aNE: A22 at Royal Ashdown Forest Golf Course	No heathland within 200m of the road; woodland occupies this zone.	2033 ammonia concentrations are forecast to fall below 1 μm^{-3} by 15m from the road.
Transect 33N: A22 at Wych Cross	Extensive areas approximately 30m from the road; a woodland belt occupies the intervening zone.	2033 ammonia concentrations are forecast to fall below 1 μm^{-3} by 10m from the road.

4.2.7 It can be seen that even if one were to use a reference critical level of 1 μm^{-3} the nearest areas of heathland would not be affected.

Oxides of Nitrogen

4.2.8 Appendix A shows the annual mean NOx concentrations for the Baseline, Do Nothing scenario and Do Something Scenario. It also shows the 'Projected Baseline'. This is the modelled NOx concentrations in the hypothetical scenario of no traffic growth to 2033 but allowing for improvements in vehicle emissions for the existing traffic and an associated reduction in background nitrogen deposition. It is presented such that the additional NOx emissions due to traffic growth can be visually separated from the reduction in NOx concentrations due to the improving baseline. When assessing the likely effects of the planned growth in South Downs National Park by 2033, it is necessary to consider: i) the additional NOx emissions caused by growth in the region (DS - Proj BL); ii) the contribution of National Park growth to the additional emissions; and iii) the overall change in annual mean NOx concentrations by 2033, taking into account improvements in vehicle emissions standards as applied to both existing and future traffic (DS - BL).

4.2.9 Based on background mapping, adjusted for the effect of the road, the air quality calculations provided in Appendix A show that the baseline NOx concentrations are modelled to be above the 30 μgm^{-3} general Critical Level for vegetation at the roadside along all transects except for the A275.

4.2.10 The additional NOx emissions due to traffic growth 'in combination' to any heathland along the A26 (column 'DS-ProjBL' in Appendix A) would be approximately 7 μgm^{-3} by 2033, although it would drop away quickly, falling nearly 50% by 5m from the road and falling further to 1.08 μgm^{-3} at the nearest area of heathland, approximately 40m from the A26. The contribution of South Downs Local Plan/Lewes JCS to additional NOx at the closest part of the SAC to the A26[19] is forecast to be 0.96 μgm^{-3}, falling to 0.13 μgm^{-3} by the nearest area of heathland. However, improvements in NOx emission factors would also apply to the existing vehicle fleet. When a cautious allowance is made for improved emission factors applied to all traffic (existing and future), NOx is expected to remain above the critical level, but is forecast to experience a net *reduction* of c. 20 μgm^{-3} at the closest point of the SAC to the A26. The improvements in vehicle emission factors expected to 2033 are thus forecast to more than offset the increase in NOx from an increase in the volume of vehicle movements.

4.2.11 The same pattern is forecast at the roadside of the A22 and A275. At the closest point of the SAC to the A275 the additional NOx emitted due to traffic growth 'in combination' by 2033 would be approximately 2 μgm^{-3}, although it would fall off quickly, dropping c. 50% by 5m from the roadside. The contribution of South Downs Local Plan/JCS to NOx[20] would be 0.51 μgm^{-3}. When forecast improvements in emission factors across the vehicle fleet are taken into account, NOx at this location is actually forecast to experience a net reduction of c. 6 μgm^{-3} by 2033. At the closest area of heathland to the A22 (at Wych Cross) the additional NOx emitted due to traffic growth 'in combination' by 2033 would be approximately 2.3 μgm^{-3}, although it would fall off quickly, dropping c. 40% by 5m from the roadside. The contribution of South Downs Local Plan/JCS to NOx[21] would be a minimal 0.08 μgm^{-3}. When forecast improvements in emission factors across the vehicle fleet are taken into account, NOx at this location is actually forecast to experience a net reduction of c. 11 μgm^{-3} by 2033.

4.2.12 In summary, by 2033, NOx concentrations on all modelled links are forecast to experience a net reduction due to changes in vehicle emissions, notwithstanding the projected increase in traffic on the roads, including that attributable to the South Downs Local Plan/Lewes JCS[22]. The greatest net improvement is forecast to occur at the roadside on the link with the highest flows (c. 20 μgm^{-3} on the A26), while the smallest net improvement is forecast to occur at the roadside on the link with the lowest flows (c. 6 μgm^{-3} on the A275).

[19] 35% of the modelled difference between Do Something and Do Nothing in Appendix A i.e. 35% of the value in the DS-DN column

[20] 72% of the modelled difference between Do Something and Do Nothing in Appendix A

[21] 44% of the modelled difference between Do Something and Do Nothing in Appendix A

[22] Appendix C contains a technical note confirming that traffic emissions are expected to reduce year on year during the modelled plan period notwithstanding traffic growth over that same timetable; i.e. the improving trend is consistent throughout the plan period.

Nitrogen deposition

4.2.13 Since the ecologically significant role of NOx is as a source of nitrogen the next step is to consider what effect this may have on nitrogen deposition rates, and this also factors in the role of ammonia as a source of nitrogen.[23] Calculating nitrogen deposition rates rather than relying purely on scrutiny of NOx concentrations has the advantage of being habitat specific (the critical level for NOx is entirely generic; in reality different habitats have varying tolerance to nitrogen) and of being directly relatable to measurable effects on the ground through scrutiny of published dose-response relationships that do not exist for NOx.

4.2.14 As with NOx, Appendix A shows the annual mean nitrogen deposition rates for the Baseline, Do Nothing scenario and Do Something Scenario. It also shows the 'Projected Baseline'. This is the modelled nitrogen deposition rates in the hypothetical scenario of no traffic growth to 2033 but allowing for improvements in vehicle emissions for the existing traffic and an associated reduction in background nitrogen deposition. It is presented such that the additional nitrogen deposition due to traffic growth can be visually separated from the reduction in nitrogen deposition due to the improving baseline. When assessing the likely effects of the planned growth in South Downs National Park by 2033, it is necessary to consider: i) the additional nitrogen deposition caused by growth in the region (DS - Proj BL); ii) the contribution of National Park growth to the additional nitrogen; and iii) the overall change in annual mean nitrogen deposition rates by 2033, taking into account improvements in vehicle emissions standards as applied to both existing and future traffic (DS - BL).

4.2.15 Although much of Ashdown Forest SAC (including the borders of many roads) is covered with woodland and the habitat is a feature of the SSSI, woodland is not a notified feature of the internationally important wildlife sites. Ashdown Forest SAC is designated for its heathland and it is this habitat on which the birds of Ashdown Forest SPA depend. In order to undertake the nitrogen deposition modelling it is necessary to select an appropriate deposition velocity and background deposition rate. Since heathland is the SAC habitat appropriate deposition velocities for this habitat were used in the modelling since deposition to other habitats (e.g. woodland) is not relevant to the assessment.

4.2.16 Critical loads are always presented as a range, which for heathland is 10 kgN/ha/yr to 20 kgN/ha/yr[24]. The lowest part of the nitrogen Critical Load range has been used in this assessment as that is the most precautionary stance to take. The baseline for nitrogen deposition to heathland along A26 and A275 is above the Critical Load and has been modelled to be c.16-20 kgN/ha/yr at the closest points to the road, declining to 13-14 kgN/ha/yr by 200m from the road. Measured data suggests that against some road links actual deposition rates are considerably higher. The results relating to the nearest areas of heathland are summarised in Table 4 below.

Table 4. Total additional nitrogen deposition due to growth 'in combination' at closest area of heathland

Link/Transect	Nearest existing area of heathland	Summary of results 'in combination'
Transect 38: A26 at Poundgate	Approximately 40m from the road, although most is more distant.	0.16 kgN/ha/yr at 40m from the road (0.98 kgN/ha/yr at the roadside)
Transect 37W: A275 at Wych Cross	Extensive areas approximately 5m from the road.	0.16 kgN/ha/yr at 5m from the road (0.34 kgN/ha/yr at the roadside)
Transect 37E: A275 at Wych Cross	Extensive areas approximately 5m from the road.	0.15 kgN/ha/yr at 5m from the road (0.26 kgN/ha/yr at the roadside)
Transect 34: A22 at Nutley	No heathland within 200m of the road	-
Transect 33: A22 at Wych Cross	Extensive areas approximately 5m from the road.	0.20 kgN/ha/yr at 5m from the road (0.34 kgN/ha/yr at the roadside)
Transect 6b_37_33: junction of A22 and A275	No heathland within 200m of the road	-

[23] Acid deposition rates for all transects on all modelled links are expected to improve over the plan period and the contribution of the South Downs Local Plan/Lewes JCS to any retardation of that improvement is effectively zero, in that any contribution is too small to show in the model (i.e. it would affect the third decimal place or beyond, which are never reported in modelling). Acid deposition is therefore not discussed further in this document.

[24] APIS advises to use the high end of the range with high precipitation and the low end of the range with low precipitation and to use the low end of the range for systems with a low water table, and the high end of the range for systems with a high water table.

Transect 6b: A22 at Royal Ashdown Forest Golf Course	Large patch approximately 30m from the road	0.07 kgN/ha/yr at 33m from the road (0.28 kgN/ha/yr at the roadside)
Transect 6aSW: A22 at Royal Ashdown Forest Golf Course	Small patch approximately 10m from the road although heavily scrub and tree encroached.	0.18 kgN/ha/yr at 10m from the road (0.47 kgN/ha/yr at the roadside)
Transect 6aSE: A22 at Royal Ashdown Forest Golf Course	Approximately 100m from the road although heavily scrub and tree encroached.	0.05 kgN/ha/yr at 100m from the road (0.58 kgN/ha/yr at the roadside)
Transect 6aNE: A22 at Royal Ashdown Forest Golf Course	No heathland within 200m of the road	-
Transect 33N: A22 at Wych Cross	Extensive areas approximately 30m from the road.	0.06 kgN/ha/yr at 30m from the road (0.31 kgN/ha/yr at the roadside)

4.2.17 At the closest areas of heathland to modelled links (which are along the A275 and part of the A22) the worst-case additional deposition due to extra traffic is forecast to be c. 0.3 kgN/ha/yr at the roadside, declining rapidly, such that they reduce by c. 50% by 5m from the roadside. The contribution of South Downs Local Plan/Lewes JCS to nitrogen deposition at the roadside of the A275 would be a negligible 0.07 kgN/ha/yr[25], falling to effectively zero by 20m from the road. The contribution of South Downs Local Plan/Lewes JCS to nitrogen deposition at the roadside of the A22 would be a negligible 0.02 kgN/ha/yr[26], falling to effectively zero by 20m from the road.

4.2.18 Most importantly, the DS-BL column in Appendix A shows that the deposition from additional traffic (irrespective of source) is forecast to be offset by a much larger reduction in background deposition expected over the same timescale. As a result a net *reduction* in deposition of 1.6-1.9 kgN/ha/yr (depending on link) is actually forecast at the roadside notwithstanding traffic growth[27].

Ecological significance

4.2.19 The modelling demonstrates that there will be a net decreasing trend in nitrogen deposition rates to heathland within the SAC along the modelled links. Accordingly, the Local Plans will not have significant in-combination effects on the SAC by way of contributing to any net increase in nitrogen deposition.

4.2.20 It is however worth considering whether the Local Plans could have a significant effect on the SAC as a result of retarding the improvement of nitrogen deposition rates, as paragraph 4.2.17 and the modelling in Appendix A identify that the forecast improvement in deposition rates to heathland would be slightly lower due to expected traffic growth than in the hypothetical situation of no further traffic growth (compare column DS, which is the forecast 2033 deposition rates including traffic growth, with column 'Proj BL', which is the forecast 2033 deposition rates if there were no traffic growth). Drawing a conclusion on this matter requires ecological interpretation to determine whether an abstract retardation of improvement in nitrogen deposition is likely to result in a real terms ecological impact.

4.2.21 Deposition of nitrogen can cause a variety of responses in heathland: transition from heather to grass dominance, decline in lichens (such as *Cladionia* species), changes in plant biochemistry and increased sensitivity to stress[28]. The physical, measurable and observable manifestations of these responses are generally in terms of reduction in species richness[29], reduction in cover (or increase in grass cover) and resulting changes in broad habitat structure. These responses are not independent: for example, reduction in species richness can cause, and in turn be

[25] 72% of the modelled difference between Do Something and Do Nothing for this link in Appendix A
[26] 44% of the modelled difference between Do Something and Do Nothing for this link in Appendix A
[27] If the actual current roadside deposition rates are substantially higher than that included in the AECOM model, the percentage reduction in nitrogen deposition rate by 2033 would be the same but the actual reduction in deposition rate would be much greater.
[28] Caporn, S., Field, C., Payne, R., Dise, N., Britton, A., Emmett, B., Jones, L., Phoenix, G., S Power, S., Sheppard, L. & Stevens, C. 2016. Assessing the effects of small increments of atmospheric nitrogen deposition (above the critical load) on semi-natural habitats of conservation importance. Natural England Commissioned Reports, Number 210. Table 1 page 2
[29] This is a good indicator of the effect of nitrogen deposition on vegetation as it arises at low background deposition rates, is easily detectable and occurs across different habitats. The exception appears to be calcareous grassland where there is no correlation between nitrogen deposition and species richness; for that habitat, rather than there being a reduction in the average number of species per quadrat the reduced frequency of less competitive species appears to be offset by the increased frequency of more competitive species.

exacerbated by, changes in habitat structure. Note that 'reduction in species richness' only means that fewer species are recorded in a randomly placed 2m x 2m quadrat. Therefore, it does not mean species are 'lost' from the affected area; it simply means that at least one species occurs at a reduced frequency[30]; it is therefore a relatively subtle metric.

4.2.22 Critical Loads have been in use for a number of years and have been defined as: '*a quantitative estimate of exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge*'. However, more recent studies[31] comparing deposition rate with reduction in species richness and other parameters indicate that the response of habitats such as heathland to long-term nitrogen deposition is curved for most parameters, with some of the sharpest losses in diversity occurring below the critical load[32]. Moreover, those studies also indicate that the effect on species richness of adding a given amount of nitrogen in many habitats is not simple, linear and additive as is often assumed (i.e. 'x' amount of further nitrogen equates to 'x' amount of vegetation effect irrespective of current nitrogen dose) but is heavily influenced by the existing nitrogen deposition rate. It has thus become clear that the response of vegetation to nitrogen deposition is more nuanced that the 'black and white' critical load concept suggests.

4.2.23 The amount of extra nitrogen needed to cause a measurable ecological effect has been shown from a range of studies on a range of sites to be considerably greater in lowland heathland subject to high existing deposition rates than it is in those with low existing deposition rates. This is true for most parameters, whether that effect is defined in terms of reduction in species richness, reduction in species cover, or probability of species presence[33]. The only metric for which this relationship appears not to be true is with regard to increases in grass cover[34]. Putting it simply, a small amount of additional nitrogen is much less likely to significantly affect a heathland already subject to high inputs than it is to affect one subject to low inputs. Ultimately, it is the predicted effect on the site vegetation (and thus its ability to achieve its conservation objectives) that is the key factor in determining whether there will actually be a significant effect i.e. an effect on the integrity of a site, rather than NOx concentrations or nitrogen deposition rates in the abstract. Therefore, it is possible for an increase in nitrogen deposition to fail to result in a measurable (and thus significant) ecological effect on the ground, even when the critical load is far exceeded, depending on the size of the 'dose'.

4.2.24 Given this background, it is necessary to refer to dose-response relationships and the forecast background deposition rate by 2033 to determine the ecological effect of a given retardation in nitrogen deposition rate. Since there is a significant improvement in nitrogen deposition rates in the Do Something scenario, the relevant question is whether there would be an ecological difference between any improvement in the vegetation due to the Projected Baseline and that resulting from the Do Something scenario. In real terms, would one expect a meaningful ecological difference in vegetation characteristics between an improvement in the rate of nitrogen deposition of 1.71 kgN/ha/yr and one of 1.55 kgN/ha/yr (the nearest area of heathland at receptor 38, the A26 at Poundgate) or between an improvement of 1.96 kg N/ha/yr and one of 1.68 kgN/ha/yr (adjacent to receptor 37W, A275 at Wych Cross), or between an improvement of 1.93 kgN/ha/yr and one of 1.67 kgN/ha/yr (receptor 37E, A275 at Wych Cross) or between an improvement of 1.70 kgN/ha/yr and one of 1.65 kgN/ha/yr (receptor 33N, A22 at Wych Cross).

4.2.25 Reference to Appendix 5 of Caporn et al (2016) suggests that at background deposition rates of c. 15kgN/ha/yr (the approximate deposition rate forecast at the closest areas of heathland in this modelling) the forecast net reduction in nitrogen deposition at the most affected areas of heathland (a little less than 2kgN/ha/yr) could potentially result in an increase in species richness (whether grass species richness, moss species richness or total species richness) of up to c. 3-4% of the maximum. Using a total maximum species richness of 37 species[35] this would mean approximately 1-2 more species could be found in the sward on average. Such a reduction in deposition rates could also result in a reduction in grass (graminoid) cover of up to 1%[36] **if** other

[30] Caporn et al (2016), page 39
[31] Compiled and analysed in Caporn et al 2016
[32] Ibid. paragraph 5 page ii
[33] Ibid. Tables 20-22, pages 57-60 show that, for lowland heathland, as background deposition rates increase the effect of adding a given amount of extra nitrogen decreases for most parameters
[34] Grasses often benefit at the expense of other species in habitats subject to elevated nitrogen deposition and as such their abundance increases rather than decreases; however, grass cover is also heavily influenced by other factors unrelated to nitrogen deposition
[35] 37 species is the maximum species richness in the lowland heathland sample reported in NECR2010 and is the reference species richness for lowland heathland used throughout that report.
[36] Appendix 5, Caporn et al (2016)

factors that are likely to have a much greater effect on species richness and grass cover than nitrogen deposition (such as management and drainage) are suitable.

4.2.26 Appendix 5 of Caporn et al (2016) also suggests that at a background deposition rate of 15 kgN/ha/yr the worst-case additional nitrogen deposition to heathland as a result of traffic growth (c. 0.3 kgN/ha/yr at the A275 and parts of the A22) could, if it constituted a net increase in deposition, result in a 0.1% increase in grass (graminoid) cover and a 0.6% reduction in species richness (whether grasses, mosses or total species richness) at the roadside (the change away from the roadside would be much less). However, expressing the change in species richness as a percentage takes no account of the fact that one cannot have a fraction of a species (for example, 0.6% of 37 species would be a reduction of 0.2 species, which is not possible). This interpretive problem is addressed by expressing the same data in relation to the nitrogen dose that would reduce species richness by at least 1 species. In practice this therefore defines the minimum nitrogen dose that would be expected to result in a change in the number of species recorded. Table 21 of Caporn et al (2016) shows that, based on the heathlands surveyed, at a background nitrogen deposition rate of c. 15 kgN/ha/yr species richness in lowland heathland would not be expected to change until a dose of c. 1.3 kgN/ha/yr.

4.2.27 In terms of changes in coarse habitat structure it is considered that the small forecast additional nitrogen deposition (equivalent to c. 2% of the deposition rate otherwise forecast in these locations by 2033) would not stimulate growth to such an extent that a material change in management burden occurred, and the structure of the sward is dictated primarily by management.

4.2.28 Bearing in mind that a net reduction in nitrogen deposition is actually being forecast, the most that might be expected by 2033 due to traffic growth on roads through the SAC is that one *might* record a reduction in percentage grass cover immediately adjacent to the A22 and A275 of 0.9%, as opposed to a potential 1% reduction in the hypothetical case of no traffic growth. Whether any difference would actually be observed in practice would depend heavily on other factors, because management regime in particular has a much greater influence than nitrogen deposition on parameters such as percentage grass cover and species richness. The total species richness (or number of moss species or grass species) would not be expected to be any different in practice than would be the case without any traffic growth.

4.2.29 This conclusion can be stated with a high degree of confidence for a number of reasons. First, AECOM has carried out sensitivity testing of nitrogen deposition rates using different deposition velocities. The AECOM model uses a nitrogen deposition velocity for heathland ('short vegetation') of 0.1 $cms^{-1.}$ That accords with the DMRB guidance and is also very close to that used in Environment Agency guidance (which uses a figure of 0.15 cms^{-1}). However, the trends described above would still arise with much higher deposition velocities[37].

4.2.30 Secondly, the results hold true even if actual measured deposition rates are substantially higher than those extrapolated from Defra mapping, as is suggested by measured data provided by Wealden District Council[38]. For example, at background deposition rates of 30 kgN/ha/yr, an additional 2.4 kgN/ha/yr would be required to reduce the average species richness of the sward.[39]

4.2.31 Thirdly, the conclusions are supported by solid academic research. Southon et al (2013) studied over fifty heathlands across England at deposition rates of up to 32.4kgN/ha/yr and found that above 20 kgN/ha/yr *'… declines in species richness plateaued, indicating a reduction in sensitivity as N loading increased'.* The heathland sites covered by the research reported in Caporn et al (2016) had a wide geographic spread and were subject to a range of different 'conditions' but the identified trends were nonetheless observable. The fact that a given heathland site may not have been included in the sample cannot be a basis for the identified trend to be dismissed as inapplicable. On the contrary, the value of the available dose-response research is precisely in the fact that it covers a geographic range of sites subject to a mixture of different influences that might otherwise mask the nitrogen relationships if a given site was looked at in isolation. Caporn et al (2016) illustrates that consistent trends have been identified *despite* the differing geographic locations of those habitats and different conditions at the sites involved.

[37] AECOM has undertaken sensitivity testing using deposition velocities of 0.24 cms^{-1} and 0.34 cms^{-1} to heathland (Environment Agency and DMRB guidance reserves such high deposition velocities for woodland). This still results in a large forecast net improvement in nitrogen deposition.
[38] AQC report- Ashdown Forest SAC, Air Quality Monitoring and Modelling, December 2017 update with some redacted locations reinstated
[39] Table 21 of Caporn et al 2016

4.2.32 Heathland and acid grassland (a related habitat that is often found intermixed with heathland) have been particularly well studied across broad geographical, climatic and pollution gradients covering different levels of soil organic matter, rates of nutrient cycling, plant species assemblages and management regimes. Despite this, the overall trends, including that a given 'dose' of nitrogen generally has less effect on a range of vegetation parameters (other than gras cover) as background deposition rates rise has been reported by various peer reviewed academic papers[40]. Southon et al (2013) surveyed 52 heathlands across England and observed statistically significant trends despite the large differences in conditions of these heathlands. That paper specifically states that '*the biggest reductions in species number* [were] *associated with increasing N inputs at the low end of the deposition range'* and that '*The similarity of relationships between upland and lowland environments, across broad spatial and climatic gradients, highlights the ubiquity of relationships with N*'. Based on the consistent trend across the range of habitats studied (including wet habitats such as bogs as well as lowland heathland, upland heathland and dune systems) there is no basis to assume that the identified trends would not be applicable to all types of heath, including wet heath. Upland heathlands tend to be wetter than lowland heathlands due to climate differences and yet the same pattern has been observed as reported in Southon et al (2013).

4.2.33 Due to the existence of other influences (such as management) that have a much greater effect on relevant vegetation parameters than does nitrogen deposition, there can be no absolute certainty that the reported trends would be observed in a given part of Ashdown Forest. However, there is a reasonable scientific expectation that the observed relationships would be detected if Ashdown Forest was included in the broader sample.

4.2.34 Fourthly, although it is necessary to carry out an 'in-combination' assessment of effects, it remains relevant to consider the extent to which South Downs Local Plan and Lewes JCS contribute to that in-combination effect. On that assessment, their contribution to nitrogen deposition is negligible at the closest areas of heathland to all modelled links.

4.2.35 Finally, in discussions over the emerging Statement of Common Ground, Natural England advised that the impact assessment should only include those areas which are currently heathland rather than speculate about parts of the SAC that constitute other habitats (particularly woodland) and may or may not be put down to heathland at an unspecified point in the future. As set out above, in relation to the A26 at Poundgate, there is no significant presence of heathland within 40m of the roadside so the relevant comparison is an improvement in the rate of nitrogen deposition in the Projected Baseline of 1.71 kgN/ha/yr and an improvement in the Do Something Scenario of 1.55 kgN/ha/yr (rather than 2.73 kgN/ha/yr and 1.75 kgN/ha/yr). A retardation of improvement of 0.16 kgN/ha/yr is clearly not of any ecological significance. Nonetheless, as a final precautionary step and for completeness, those areas were included in the modelling presented in Appendix A on the hypothetical (and unrealistic) assumption that heathland might be created at the roadside at some stage in the future. This enables consideration of whether, in the event that proposals emerged during the period to 2033 to establish heathland at the most affected part of the modelled network, the deposition rates forecast would hinder that process. The most affected part of the network according to this modelling is the location where forecast additional nitrogen deposition due to traffic growth is greatest, irrespective of the habitat actually present, and is an area of woodland immediately adjacent to the A26.

4.2.36 In the event that plans emerged to establish heathland in the area immediately adjacent to the A26 this location would still experience a net reduction in nitrogen deposition rate of c. 1.75 kgN/ha/yr by 2033 compared to the baseline situation. Due to traffic growth over the period to 2033, this reduction in deposition rate would be c. 0.98 kgN/ha/yr less than might otherwise be the case. Reference to Appendix 5 of Caporn et al (2016) suggests that the contribution of all growth at the closest point to the A26 *may* be sufficient to reduce heathland species richness by 2% compared to what would otherwise occur at that location in the absence of traffic growth, but according to Table 21 of Caporn et al (2016) this is still less than the amount required to result in an actual reduction in the number of species recorded in a quadrat at the forecast background

[40] Stevens, C. J.; Dise, N. B.; Gowing, D. J. G. and Mountford, J. O. (2006). Loss of forb diversity in relation to nitrogen deposition in the UK: regional trends and potential controls. Global Change Biology,12(10), pp. 1823–1833.
Southon GE, Field C, Caporn SJM, Britton AJ, Power SA (2013) Nitrogen Deposition Reduces Plant Diversity and Alters Ecosystem Functioning: Field-Scale Evidence from a Nationwide Survey of UK Heathlands. PLoS ONE 8(4): e59031. doi:10.1371/journal.pone.0059031
Stevens, Carly; Dupre, Cecilia; Dorland, Edu; Gaudnik, Cassandre; Gowing, David J. G.; Bleeker, Albert; Diekmann, Martin; Alard, Didier; Bobbink, Roland; Fowler, David; Corcket, Emmanuel; Mountford, J. Owen; Vandvik, Vigdis; Aarrestad, Per Arild; Muller, Serge and Dise, Nancy B. (2010). Nitrogen deposition threatens species richness of grasslands across Europe. Environmental Pollution, 158(9), pp. 2940–2945.

rate of 17 kgN/ha/yr[41]. The contribution of South Downs Local Plan/Lewes JCS to additional nitrogen at the closest part of the SAC to the A26 is forecast to be 0.12 kgN/ha/yr.[42] However, the forecast deposition rate of c. 16-17 kgN/ha/yr (with or without future traffic growth) would not prevent heathland being established if there was ever a desire to do so. The ability to create heathland adjacent to the A26 is likely to be influenced much more by other factors such as management, soil pH, soil phosphate levels, drainage and the removal of tree trunks and root systems[43].

[41] Using the relationships identified in Caporn et al (2016) species richness would need to be 50 species for a reduction in species-richness of 2% to equate to a reduction of 1 species.

[42] 35% of the modelled difference between Do Something and Do Nothing for this link in Appendix A

[43] The process of creating, and then resurfacing/maintaining a significant road and buried roadside services (where these are present) or drainage, often results in changes to the underlying geology and hydrological function of the soils at the roadside, including from the importation of atypical fill material during historic road construction. These habitats can be further affected by surface water runoff all year round (depending on local topography) and salt spray from winter gritting. In addition, it is often desirable to retain a belt of permanent forestry adjacent to roads in order to serve as a buffer feature to the heathland and (for the SPA) the disturbance-sensitive bird populations that lie behind it. The area adjacent to the road is the area most affected by nitrogen deposition due to local traffic.

5 Conclusion

5.1.1 The development of nitrogen dose-response relationships for various habitats clarifies the rate of additional nitrogen deposition required to achieve a measurable effect on heathland vegetation. It is therefore possible to use these relationships to determine that a plan or collection of plans will not have an adverse effect. Such a plan would be one in which one could say with confidence that a) there would not be a significant difference in the vegetation whether or not that plan proceeded and b) there would not be a significant effect on the vegetation (and thus protection conveyed to the European site) whether or not the contribution of that plan was 'mitigated' (i.e. reduced to such an extent that it did not appear in the model at all). It would clearly be unreasonable to claim that such a plan caused an adverse effect 'in combination' or that it should be mitigated. The contribution of the South Downs Local Plan and Lewes JCS falls within those parameters.

5.1.2 Since a) air quality in 2033 is forecast to be significantly better than in 2017 notwithstanding the precautionary assumptions made about both growth and improvements in vehicle emissions factors, b) no significant in combination retardation of vegetation improvement at the closest and most affected areas of heathland is expected and c) the contribution of South Downs Local Plan/Lewes JCS to the 'in combination' scenario is negligible, the modelling in Appendix A does not provide any basis to conclude an adverse effect on integrity of Ashdown Forest SAC or SPA from growth in South Downs National Park or Lewes District over that period in combination with other plans. Since no net adverse effect on integrity is forecast, no mitigation as such would be required.

5.1.3 It should be noted that the assessment undertaken to inform this conclusion was precautionary. For example:

- The Design Manual for Roads and Bridges and Defra guidance recommend making a 2% reduction per annum in background emissions/deposition rates throughout the period from base year to assessment year in order to allow for improvements such as the introduction of Euro6 standard vehicles. AECOM took a considerably more cautious approach in this modelling which could therefore prove to underestimate improvements in background nitrogen deposition.
- Rather than simply model the rates of growth set out in adopted or submitted Core Strategies and Local Plans, the AECOM model increased the housing delivery rates for those authorities immediately surrounding Ashdown Forest SAC (Wealden District, Mid-Sussex District and Tandridge District) to allow for additional growth in line with the most-recently expressed Objectively Assessed Need as of June 2017. In some cases (e.g. Mid-Sussex) this substantially increased the amount of housing allowed for over the period to 2033. In practice, therefore, growth around Ashdown Forest SAC may have been over-estimated. For example, the recent Government consultation on Objectively Assessed Need (OAN) proposes a significantly lower OAN for Wealden District than was allowed for in the AECOM model.

5.1.4 It is therefore be concluded that no adverse effect upon the integrity of Ashdown Forest SAC is expected to result from development provided by the South Downs Local Plan/Lewes JCS, even in combination with other plans and projects. This is due to a combination of a) an expected net improvement in air quality over the Local Plan period, b) the fact that, whether or not that improvement occurs to the extent forecast, the contribution of the South Downs Local Plan/Lewes JCS to changes in roadside air quality is demonstrably ecologically negligible due to the very small magnitude and c) the precautionary nature of the modelling. Moreover, the Local Plan and Joint Core Strategy both contain sustainability policies (notably Local Plan policy SD19 (Transport and Accessibility) and Joint Core Strategy policy 13 (Sustainable Travel)) which are not factored into these traffic/air quality calculations and aspects of which have some potential to reduce the need for journeys to work by private vehicle towards Ashdown Forest; thus further reducing the already small contribution to increased vehicle movements on the A26 that is forecast to arise from the Local Plan and JCS. For information, these policies are presented in Appendix F.

5.1.5 This conclusion is not intended to suggest that no active attempt should be made to reduce background NOx concentrations and nitrogen deposition around Ashdown Forest as a matter of general good stewardship if that is what the authorities agree, and the authorities already have a forum for collaborative involvement in this issue via the working group that has recently been convened by South Downs National Park Authority. The aforementioned forum will also be important in monitoring long-term trends in roadside air quality within Ashdown Forest SAC at regular (e.g. five-year) intervals, in order to track the forecast improvements and, if necessary, trigger updates to the modelling and its conclusions during the plan period. The first practical outcome of this forum is a multi-authority agreement to prepare a Statement of Common Ground (SoCG) relating to nitrogen impacts on Ashdown Forest. The SoCG will include actions such as a Site Nitrogen Action Plan (SNAP) for the SAC/SPA to address sources of background nitrogen such as agriculture and existing traffic. This forum will provide a further safeguard to ensure that changes in traffic flows and vehicular emissions stemming from development do not result in adverse effects upon the integrity of Ashdown Forest SAC in isolation or in combination.

Appendix A. Detailed Modelling Results

Ammonia Concentrations

Receptor 38: the A26 at Poundgate

			Annual Mean NH_3 Conc. (ug/m3)				
Lookup		**Distance**	**BL**	**DN**	**DS**	**Change**	
ID	**Road Link**	**From Road (m)**	**Base**	**(Base 2033)**	**(Scn1 2033)**	**(DS-DN)**	**(DS-BL)**
1	38_0m	0	2.32	2.47	2.58	0.11	0.26
2	38_5m	5	1.61	1.69	1.75	0.06	0.15
3	38_10m	10	1.31	1.36	1.41	0.05	0.10
4	38_15m	15	1.15	1.19	1.23	0.04	0.08
5	38_20m	20	1.05	1.08	1.11	0.03	0.06
6	38_30m	30	0.93	0.95	0.97	0.02	0.05
7	38_40m	40	0.86	0.88	0.89	0.02	0.04
8	38_50m	50	0.81	0.83	0.84	0.01	0.03
9	38_60m	60	0.78	0.79	0.81	0.01	0.03
10	38_70m	70	0.76	0.77	0.78	0.01	0.02
11	38_80m	80	0.74	0.75	0.76	0.01	0.02
12	38_90m	90	0.72	0.73	0.74	0.01	0.02
13	38_100m	100	0.71	0.72	0.73	0.01	0.02
14	38_125m	125	0.69	0.69	0.70	0.01	0.01
15	38_150m	150	0.67	0.68	0.68	0.00	0.01
16	38_175m	175	0.66	0.67	0.67	0.00	0.01
17	38_200m	200	0.65	0.66	0.66	0.00	0.01

Receptor 37W – A275 at Wych Cross

			Annual Mean Nox Conc. (ug/m3)				
Lookup		**Distance**	**BL**	**DN**	**DS**	**Change**	
ID	**Road Link**	**From Road (m)**	**Base**	**(Base 2033)**	**(Scn1 2033)**	**(DS-DN)**	**(DS-BL)**
18	37W_0m	0	1.07	1.11	1.14	0.03	0.07
19	37W_5m	5	0.86	0.88	0.89	0.02	0.04
20	37W_10m	10	0.78	0.79	0.80	0.01	0.03
21	37W_15m	15	0.74	0.75	0.76	0.01	0.02
22	37W_20m	20	0.71	0.72	0.73	0.01	0.02
23	37W_30m	30	0.68	0.69	0.70	0.01	0.01
24	37W_40m	40	0.67	0.67	0.68	0.00	0.01
25	37W_50m	50	0.66	0.66	0.66	0.00	0.01
26	37W_60m	60	0.65	0.65	0.66	0.00	0.01
27	37W_70m	70	0.64	0.65	0.65	0.00	0.01
28	37W_80m	80	0.64	0.64	0.64	0.00	0.01
29	37W_90m	90	0.64	0.64	0.64	0.00	0.00
30	37W_100m	100	0.63	0.64	0.64	0.00	0.00
31	37W_125m	125	0.63	0.63	0.63	0.00	0.00
32	37W_150m	150	0.62	0.63	0.63	0.00	0.00
33	37W_175m	175	0.62	0.62	0.62	0.00	0.00

34	37W_200m	200	0.62	0.62	0.62	0.00	0.00

Receptor 37E – A275 at Wych Cross

Lookup ID	Road Link	Distance From Road (m)	Annual Mean Nox Conc. (ug/m3) BL Base	DN (Base 2033)	DS (Scn1 2033)	Change (DS-DN)	(DS-BL)
35	37E_0m	0	1.03	1.06	1.09	0.03	0.06
36	37E_5m	5	0.84	0.86	0.87	0.02	0.03
37	37E_10m	10	0.77	0.78	0.79	0.01	0.02
38	37E_15m	15	0.73	0.74	0.75	0.01	0.02
39	37E_20m	20	0.71	0.72	0.72	0.01	0.02
40	37E_30m	30	0.68	0.69	0.69	0.00	0.01
41	37E_40m	40	0.66	0.67	0.67	0.00	0.01
42	37E_50m	50	0.65	0.66	0.66	0.00	0.01
43	37E_60m	60	0.65	0.65	0.65	0.00	0.01
44	37E_70m	70	0.64	0.65	0.65	0.00	0.01
45	37E_80m	80	0.64	0.64	0.64	0.00	0.01
46	37E_90m	90	0.64	0.64	0.64	0.00	0.00
47	37E_100m	100	0.63	0.64	0.64	0.00	0.00
48	37E_125m	125	0.63	0.63	0.63	0.00	0.00
49	37E_150m	150	0.63	0.63	0.63	0.00	0.00
50	37E_175m	175	0.62	0.62	0.63	0.00	0.00
51	37E_200m	200	0.62	0.62	0.62	0.00	0.00

Receptor 34 – A22 at Nutley

Lookup ID	Road Link	Distance From Road (m)	Annual Mean Nox Conc. (ug/m3) BL Base	DN (Base 2033)	DS (Scn1 2033)	Change (DS-DN)	(DS-BL)
52	34_0m	0	1.70	1.79	1.80	0.01	0.11
53	34_5m	5	1.26	1.31	1.32	0.01	0.06
54	34_10m	10	1.06	1.10	1.11	0.01	0.04
55	34_15m	15	0.96	0.99	0.99	0.00	0.03
56	34_20m	20	0.89	0.91	0.92	0.00	0.03
57	34_30m	30	0.81	0.83	0.83	0.00	0.02
58	34_40m	40	0.77	0.78	0.78	0.00	0.02
59	34_50m	50	0.74	0.75	0.75	0.00	0.01
60	34_60m	60	0.72	0.73	0.73	0.00	0.01
61	34_70m	70	0.70	0.71	0.71	0.00	0.01
62	34_80m	80	0.69	0.70	0.70	0.00	0.01
63	34_90m	90	0.68	0.69	0.69	0.00	0.01
64	34_100m	100	0.67	0.68	0.68	0.00	0.01
65	34_125m	125	0.66	0.66	0.66	0.00	0.01
66	34_150m	150	0.65	0.65	0.65	0.00	0.00
67	34_175m	175	0.64	0.64	0.65	0.00	0.00
68	34_200m	200	0.64	0.64	0.64	0.00	0.00

Receptor 33 – A22 at Wych Cross

Lookup ID	Road Link	Distance From Road (m)	Annual Mean Nox Conc. (ug/m3) BL Base	DN (Base 2033)	DS (Scn1 2033)	Change (DS-DN)	(DS-BL)
69	33_0m	0	1.36	1.42	1.43	0.01	0.07

70	33_5m	5	1.05	1.08	1.09	0.01	0.04
71	33_10m	10	0.92	0.94	0.94	0.00	0.03
72	33_15m	15	0.85	0.86	0.87	0.00	0.02
73	33_20m	20	0.80	0.82	0.82	0.00	0.02
74	33_30m	30	0.75	0.76	0.76	0.00	0.01
75	33_40m	40	0.72	0.73	0.73	0.00	0.01
76	33_50m	50	0.70	0.71	0.71	0.00	0.01
77	33_60m	60	0.69	0.69	0.69	0.00	0.01
78	33_70m	70	0.68	0.68	0.68	0.00	0.01
79	33_80m	80	0.67	0.67	0.67	0.00	0.01
80	33_90m	90	0.66	0.66	0.67	0.00	0.01
81	33_100m	100	0.66	0.66	0.66	0.00	0.00
82	33_125m	125	0.65	0.65	0.65	0.00	0.00
83	33_150m	150	0.64	0.64	0.64	0.00	0.00
84	33_175m	175	0.63	0.64	0.64	0.00	0.00
85	33_200m	200	0.63	0.63	0.63	0.00	0.00

Receptor 6b_37_33 – Junction of A22 and A275

			Annual Mean Nox Conc. (ug/m3)				
Lookup		**Distance**	**BL**	**DN**	**DS**	**Change**	
ID	**Road Link**	**From Road (m)**	**Base**	**(Base 2033)**	**(Scn1 2033)**	**(DS-DN)**	**(DS-BL)**
86	6b_37_33_0m	0	1.42	1.48	1.51	0.03	0.09
87	6b_37_33_5m	5	1.26	1.31	1.33	0.02	0.07
88	6b_37_33_10m	10	1.18	1.22	1.24	0.02	0.06
89	6b_37_33_15m	15	1.12	1.16	1.17	0.02	0.05
90	6b_37_33_20m	20	1.07	1.11	1.12	0.01	0.05
91	6b_37_33_30m	30	1.00	1.03	1.05	0.01	0.04
92	6b_37_33_40m	40	0.95	0.98	0.99	0.01	0.04
93	6b_37_33_50m	50	0.91	0.93	0.94	0.01	0.03
94	6b_37_33_60m	60	0.87	0.89	0.90	0.01	0.03
95	6b_37_33_70m	70	0.85	0.86	0.87	0.01	0.03
96	6b_37_33_80m	80	0.82	0.84	0.85	0.01	0.02
97	6b_37_33_90m	90	0.80	0.82	0.82	0.01	0.02
98	6b_37_33_100m	100	0.79	0.80	0.81	0.01	0.02
99	6b_37_33_125m	125	0.75	0.77	0.77	0.00	0.02
100	6b_37_33_150m	150	0.73	0.74	0.74	0.00	0.01
101	6b_37_33_175m	175	0.71	0.72	0.72	0.00	0.01
102	6b_37_33_200m	200	0.70	0.70	0.71	0.00	0.01

Receptor 6b - A22 at Royal Ashdown Forest Golf Course

			Annual Mean Nox Conc. (ug/m3)				
Lookup		**Distance**	**BL**	**DN**	**DS**	**Change**	
ID	**Road Link**	**From Road (m)**	**Base**	**(Base 2033)**	**(Scn1 2033)**	**(DS-DN)**	**(DS-BL)**
103	6b_3m	3	1.19	1.23	1.25	0.01	0.06
104	6b_8m	8	0.99	1.02	1.03	0.01	0.04
105	6b_13m	13	0.89	0.91	0.92	0.01	0.03
106	6b_18m	18	0.83	0.85	0.86	0.01	0.02
107	6b_23m	23	0.80	0.81	0.81	0.00	0.02
108	6b_33m	33	0.75	0.76	0.76	0.00	0.01
109	6b_43m	43	0.72	0.73	0.73	0.00	0.01

110	6b_53m	53	0.70	0.71	0.71	0.00	0.01
111	6b_63m	63	0.69	0.69	0.69	0.00	0.01
112	6b_73m	73	0.68	0.68	0.68	0.00	0.01
113	6b_83m	83	0.67	0.67	0.67	0.00	0.01
114	6b_93m	93	0.66	0.66	0.67	0.00	0.01
115	6b_103m	103	0.66	0.66	0.66	0.00	0.01
116	6b_128m	128	0.65	0.65	0.65	0.00	0.00
117	6b_153m	153	0.64	0.64	0.64	0.00	0.00
118	6b_178m	178	0.63	0.64	0.64	0.00	0.00
119	6b_203m	203	0.63	0.63	0.63	0.00	0.00

Receptor 6aSW – A22 at Royal Ashdown Forest Golf Course

			Annual Mean Nox Conc. (ug/m3)				
Lookup		**Distance**	**BL**	**DN**	**DS**	**Change**	
ID	**Road Link**	**From Road (m)**	**Base**	**(Base 2033)**	**(Scn1 2033)**	**(DS-DN)**	**(DS-BL)**
120	6aSW_0m	0	1.56	1.64	1.67	0.02	0.10
121	6aSW_5m	5	1.12	1.16	1.17	0.01	0.05
122	6aSW_10m	10	0.96	0.98	0.99	0.01	0.04
123	6aSW_15m	15	0.87	0.89	0.90	0.01	0.03
124	6aSW_20m	20	0.82	0.83	0.84	0.01	0.02
125	6aSW_30m	30	0.76	0.77	0.77	0.00	0.02
126	6aSW_40m	40	0.72	0.73	0.73	0.00	0.01
127	6aSW_50m	50	0.70	0.71	0.71	0.00	0.01
128	6aSW_60m	60	0.68	0.69	0.69	0.00	0.01
129	6aSW_70m	70	0.67	0.68	0.68	0.00	0.01
130	6aSW_80m	80	0.66	0.67	0.67	0.00	0.01
131	6aSW_90m	90	0.66	0.66	0.66	0.00	0.01
132	6aSW_100m	100	0.65	0.66	0.66	0.00	0.01
133	6aSW_125m	125	0.64	0.64	0.65	0.00	0.00
134	6aSW_150m	150	0.63	0.64	0.64	0.00	0.00
135	6aSW_175m	175	0.63	0.63	0.63	0.00	0.00
136	6aSW_200m	200	0.63	0.63	0.63	0.00	0.00

Receptor 6aSE – A22 at Royal Ashdown Forest Golf Course

			Annual Mean Nox Conc. (ug/m3)				
Lookup		**Distance**	**BL**	**DN**	**DS**	**Change**	
ID	**Road Link**	**From Road (m)**	**Base**	**(Base 2033)**	**(Scn1 2033)**	**(DS-DN)**	**(DS-BL)**
137	6aSE_0m	0	1.79	1.89	1.92	0.03	0.13
138	6aSE_5m	5	1.26	1.31	1.32	0.02	0.07
139	6aSE_10m	10	1.06	1.09	1.10	0.01	0.05
140	6aSE_15m	15	0.95	0.98	0.99	0.01	0.04
141	6aSE_20m	20	0.89	0.91	0.92	0.01	0.03
142	6aSE_30m	30	0.81	0.83	0.84	0.01	0.02
143	6aSE_40m	40	0.77	0.79	0.79	0.00	0.02
144	6aSE_50m	50	0.75	0.76	0.76	0.00	0.01
145	6aSE_60m	60	0.73	0.74	0.74	0.00	0.01
146	6aSE_70m	70	0.71	0.72	0.72	0.00	0.01
147	6aSE_80m	80	0.70	0.71	0.71	0.00	0.01
148	6aSE_90m	90	0.70	0.70	0.70	0.00	0.01
149	6aSE_100m	100	0.69	0.70	0.70	0.00	0.01
150	6aSE_125m	125	0.68	0.68	0.68	0.00	0.01

151	6aSE_150m	150	0.67	0.67	0.68	0.00	0.01
152	6aSE_175m	175	0.66	0.67	0.67	0.00	0.01
153	6aSE_200m	200	0.66	0.66	0.66	0.00	0.01

Receptor 6aNE – A22 at Royal Ashdown Forest Golf Course

			Annual Mean Nox Conc. (ug/m3)				
Lookup		Distance	BL	DN	DS	Change	
ID	Road Link	From Road (m)	Base	(Base 2033)	(Scn1 2033)	(DS-DN)	(DS-BL)
154	6aNE_0m	0	1.53	1.61	1.63	0.02	0.10
155	6aNE_5m	5	1.14	1.18	1.20	0.01	0.06
156	6aNE_10m	10	0.98	1.01	1.02	0.01	0.04
157	6aNE_15m	15	0.90	0.92	0.93	0.01	0.03
158	6aNE_20m	20	0.85	0.86	0.87	0.01	0.02
159	6aNE_30m	30	0.78	0.80	0.80	0.00	0.02
160	6aNE_40m	40	0.74	0.76	0.76	0.00	0.01
161	6aNE_50m	50	0.72	0.73	0.73	0.00	0.01
162	6aNE_60m	60	0.70	0.71	0.71	0.00	0.01
163	6aNE_70m	70	0.69	0.70	0.70	0.00	0.01
164	6aNE_80m	80	0.68	0.69	0.69	0.00	0.01
165	6aNE_90m	90	0.67	0.68	0.68	0.00	0.01
166	6aNE_100m	100	0.66	0.67	0.67	0.00	0.01
167	6aNE_125m	125	0.65	0.66	0.66	0.00	0.01
168	6aNE_150m	150	0.64	0.65	0.65	0.00	0.00
169	6aNE_175m	175	0.64	0.64	0.64	0.00	0.00
170	6aNE_200m	200	0.63	0.64	0.64	0.00	0.00

Receptor 33N – A22 at Wych Cross

			Annual Mean Nox Conc. (ug/m3)				
Lookup		Distance	BL	DN	DS	Change	
ID	Road Link	From Road (m)	Base	(Base 2033)	(Scn1 2033)	(DS-DN)	(DS-BL)
171	33N_0m	0	1.32	1.38	1.39	0.01	0.07
172	33N_5m	5	1.02	1.05	1.05	0.01	0.04
173	33N_10m	10	0.89	0.92	0.92	0.00	0.03
174	33N_15m	15	0.83	0.84	0.85	0.00	0.02
175	33N_20m	20	0.79	0.80	0.80	0.00	0.02
176	33N_30m	30	0.74	0.75	0.75	0.00	0.01
177	33N_40m	40	0.71	0.72	0.72	0.00	0.01
178	33N_50m	50	0.69	0.70	0.70	0.00	0.01
179	33N_60m	60	0.68	0.68	0.68	0.00	0.01
180	33N_70m	70	0.67	0.67	0.67	0.00	0.01
181	33N_80m	80	0.66	0.66	0.67	0.00	0.01
182	33N_90m	90	0.65	0.66	0.66	0.00	0.00
183	33N_100m	100	0.65	0.65	0.65	0.00	0.00
184	33N_125m	125	0.64	0.64	0.64	0.00	0.00
185	33N_150m	150	0.63	0.64	0.64	0.00	0.00
186	33N_175m	175	0.63	0.63	0.63	0.00	0.00
187	33N_200m	200	0.63	0.63	0.63	0.00	0.00

NOx, Nitrogen Deposition and Acid Deposition

Receptor 38: the A26 at Poundgate

	Annual Mean NOx (ug/m^3)							Annual Mean Total N Dep (kg N/ha/yr)							Annual Mean Total N Acid Dep (keq/ha/yr)						
Distance	BL	Proj BL	DN	DS	Change			BL	Proj BL	DN	DS	Change			BL	Proj BL	DN	DS	Change		
From Road (m)	Baseline	Proj Baseline	(Base 2033)	(Scn1 2033)	(DS-DN)	(DS-ProjBL)	(DS-BL)	Baseline	Proj Baseline	(Base 2033)	(Scn1 2033)	(DS-DN)	(DS-ProjBL)	(DS-BL)	Baseline	Proj Baseline	(Base 2033)	(Scn1 2033)	(DS-DN)	(DS-ProjBL)	(DS-BL)
0	73.83	46.59	51.01	53.74	2.73	7.15	-20.09	19.50	16.77	17.41	17.75	0.34	0.98	-1.75	1.59	1.49	1.53	1.56	0.02	0.07	-0.03
5	47.07	30.26	32.96	34.44	1.47	4.17	-12.64	16.88	14.58	14.97	15.17	0.20	0.59	-1.70	1.40	1.33	1.36	1.37	0.01	0.04	-0.03
10	35.91	23.49	25.37	26.44	1.06	2.95	-9.47	15.73	13.65	13.93	14.08	0.15	0.42	-1.66	1.32	1.27	1.29	1.30	0.01	0.03	-0.02
15	29.98	19.91	21.39	22.21	0.82	2.30	-7.78	15.12	13.16	13.38	13.49	0.11	0.33	-1.63	1.27	1.23	1.25	1.25	0.01	0.02	-0.02
20	26.19	17.63	18.82	19.50	0.68	1.88	-6.69	14.72	12.84	13.02	13.12	0.09	0.27	-1.60	1.25	1.21	1.22	1.23	0.01	0.02	-0.02
30	21.66	14.92	15.79	16.28	0.49	1.36	-5.38	14.24	12.47	12.60	12.67	0.07	0.20	-1.57	1.21	1.18	1.19	1.20	0.00	0.01	-0.02
40	19.09	13.38	14.07	14.45	0.38	1.08	-4.64	13.96	12.25	12.35	12.41	0.05	0.16	-1.55	1.19	1.17	1.17	1.18	0.00	0.01	-0.02
50	17.37	12.36	12.92	13.25	0.33	0.90	-4.12	13.78	12.11	12.19	12.24	0.05	0.13	-1.54	1.18	1.16	1.16	1.16	0.00	0.01	-0.01
60	16.17	11.63	12.10	12.38	0.27	0.75	-3.79	13.65	12.01	12.08	12.12	0.04	0.11	-1.53	1.17	1.15	1.15	1.16	0.00	0.01	-0.01
70	15.27	11.10	11.50	11.75	0.25	0.65	-3.52	13.55	11.93	11.99	12.03	0.03	0.10	-1.52	1.16	1.14	1.15	1.15	0.00	0.01	-0.01
80	14.56	10.68	11.04	11.26	0.22	0.58	-3.30	13.47	11.87	11.93	11.96	0.03	0.09	-1.52	1.16	1.14	1.14	1.14	0.00	0.01	-0.01
90	14.01	10.34	10.68	10.85	0.16	0.50	-3.17	13.41	11.83	11.88	11.90	0.03	0.08	-1.51	1.15	1.14	1.14	1.14	0.00	0.01	-0.01
100	13.55	10.07	10.36	10.52	0.16	0.45	-3.03	13.37	11.79	11.83	11.85	0.02	0.07	-1.51	1.15	1.13	1.14	1.14	0.00	0.00	-0.01
125	12.70	9.56	9.80	9.93	0.13	0.36	-2.77	13.27	11.72	11.75	11.77	0.02	0.05	-1.50	1.14	1.13	1.13	1.13	0.00	0.00	-0.01
150	12.11	9.21	9.41	9.51	0.11	0.30	-2.59	13.21	11.67	11.70	11.71	0.01	0.04	-1.50	1.14	1.12	1.13	1.13	0.00	0.00	-0.01
175	11.67	8.96	9.12	9.21	0.09	0.25	-2.47	13.16	11.63	11.65	11.67	0.01	0.04	-1.49	1.13	1.12	1.12	1.12	0.00	0.00	-0.01
200	11.35	8.76	8.90	8.98	0.08	0.22	-2.37	13.13	11.60	11.62	11.63	0.01	0.03	-1.49	1.13	1.12	1.12	1.12	0.00	0.00	-0.01

Receptor 37W – A275 at Wych Cross

	Annual Mean NOx (ug/m^3)							Annual Mean Total N Dep (kg N/ha/yr)							Annual Mean Total N Acid Dep (keq/ha/yr)						
Distance	BL	Proj BL	DN	DS	Change			BL	Proj BL	DN	DS	Change			BL	Proj BL	DN	DS	Change		
From Road (m)	Baseline	Proj Baseline	(Base 2033)	(Scn1 2033)	(DS-DN)	(DS-ProjBL)	(DS-BL)	Baseline	Proj Baseline	(Base 2033)	(Scn1 2033)	(DS-DN)	(DS-ProjBL)	(DS-BL)	Baseline	Proj Baseline	(Base 2033)	(Scn1 2033)	(DS-DN)	(DS-ProjBL)	(DS-BL)
0	27.10	18.70	19.93	20.64	0.71	1.94	-6.46	15.69	13.73	13.91	14.01	0.10	0.28	-1.68	1.32	1.29	1.30	1.31	0.01	0.02	-0.02
5	19.43	13.96	14.63	15.02	0.38	1.06	-4.41	14.86	13.06	13.16	13.22	0.06	0.16	-1.64	1.26	1.24	1.25	1.25	0.00	0.01	-0.01
10	16.64	12.24	12.72	12.97	0.25	0.73	-3.67	14.55	12.82	12.89	12.93	0.04	0.11	-1.62	1.24	1.22	1.23	1.23	0.00	0.01	-0.01
15	15.17	11.34	11.71	11.90	0.19	0.56	-3.27	14.39	12.69	12.74	12.77	0.03	0.08	-1.61	1.23	1.21	1.22	1.22	0.00	0.01	-0.01
20	14.27	10.79	11.08	11.25	0.16	0.46	-3.02	14.29	12.61	12.65	12.68	0.02	0.07	-1.61	1.22	1.21	1.21	1.21	0.00	0.00	-0.01
30	13.23	10.14	10.37	10.48	0.12	0.34	-2.75	14.17	12.52	12.55	12.57	0.02	0.05	-1.60	1.22	1.20	1.20	1.20	0.00	0.00	-0.01
40	12.62	9.78	9.95	10.05	0.10	0.27	-2.57	14.10	12.47	12.49	12.51	0.01	0.04	-1.60	1.21	1.20	1.20	1.20	0.00	0.00	-0.01
50	12.24	9.54	9.69	9.77	0.08	0.22	-2.47	14.06	12.43	12.46	12.47	0.01	0.03	-1.60	1.21	1.19	1.20	1.20	0.00	0.00	-0.01
60	11.97	9.38	9.51	9.57	0.07	0.20	-2.40	14.03	12.41	12.43	12.44	0.01	0.03	-1.59	1.21	1.19	1.19	1.19	0.00	0.00	-0.01
70	11.78	9.26	9.37	9.43	0.06	0.17	-2.34	14.01	12.39	12.41	12.42	0.01	0.03	-1.59	1.20	1.19	1.19	1.19	0.00	0.00	-0.01
80	11.62	9.16	9.27	9.32	0.05	0.15	-2.30	13.99	12.38	12.39	12.40	0.01	0.02	-1.59	1.20	1.19	1.19	1.19	0.00	0.00	-0.01
90	11.50	9.09	9.18	9.23	0.05	0.14	-2.27	13.98	12.37	12.38	12.39	0.01	0.02	-1.59	1.20	1.19	1.19	1.19	0.00	0.00	-0.01
100	11.40	9.03	9.12	9.16	0.04	0.13	-2.24	13.97	12.36	12.37	12.38	0.01	0.02	-1.59	1.20	1.19	1.19	1.19	0.00	0.00	-0.01
125	11.22	8.92	8.99	9.03	0.03	0.11	-2.19	13.95	12.34	12.36	12.36	0.00	0.02	-1.59	1.20	1.19	1.19	1.19	0.00	0.00	-0.01
150	11.09	8.84	8.91	8.93	0.03	0.09	-2.16	13.93	12.33	12.34	12.35	0.00	0.01	-1.59	1.20	1.19	1.19	1.19	0.00	0.00	-0.01
175	11.00	8.78	8.84	8.87	0.02	0.08	-2.13	13.92	12.32	12.33	12.34	0.00	0.01	-1.59	1.20	1.19	1.19	1.19	0.00	0.00	-0.01
200	10.93	8.74	8.79	8.82	0.02	0.07	-2.11	13.92	12.32	12.33	12.33	0.00	0.01	-1.59	1.20	1.19	1.19	1.19	0.00	0.00	-0.01

Receptor 37E – A275 at Wych Cross

Distance From Road (m)	Annual Mean NOx (ug/m^3)							Annual Mean Total N Dep (kg N/ha/yr)							Annual Mean Total N Acid Dep (keq/ha/yr)						
	BL	Proj BL	DN	DS	Change			BL	Proj BL	DN	DS	Change			BL	Proj BL	DN	DS	Change		
	Baseline	Proj Baseline	(Base 2033)	(Scn1 2033)	(DS-DN)	(DS-ProjBL)	(DS-BL)	Baseline	Proj Baseline	(Base 2033)	(Scn1 2033)	(DS-DN)	(DS-ProjBL)	(DS-BL)	Baseline	Proj Baseline	(Base 2033)	(Scn1 2033)	(DS-DN)	(DS-ProjBL)	(DS-BL)
0	25.65	17.80	18.92	19.57	0.66	1.77	-6.08	15.53	13.60	13.77	13.86	0.09	0.26	-1.67	1.31	1.28	1.29	1.30	0.01	0.02	-0.02
5	18.80	13.57	14.20	14.55	0.35	0.98	-4.25	14.79	13.00	13.10	13.15	0.05	0.15	-1.64	1.26	1.23	1.24	1.25	0.00	0.01	-0.01
10	16.23	12.00	12.45	12.70	0.25	0.70	-3.54	14.50	12.78	12.85	12.88	0.04	0.10	-1.62	1.24	1.22	1.22	1.23	0.00	0.01	-0.01
15	14.90	11.17	11.52	11.71	0.19	0.54	-3.18	14.36	12.66	12.72	12.74	0.03	0.08	-1.61	1.23	1.21	1.21	1.22	0.00	0.01	-0.01
20	14.05	10.66	10.95	11.11	0.17	0.45	-2.94	14.26	12.59	12.63	12.66	0.02	0.07	-1.61	1.22	1.21	1.21	1.21	0.00	0.00	-0.01
30	13.09	10.06	10.27	10.39	0.11	0.32	-2.71	14.16	12.51	12.54	12.56	0.02	0.05	-1.60	1.21	1.20	1.20	1.20	0.00	0.00	-0.01
40	12.53	9.72	9.89	9.98	0.09	0.26	-2.55	14.09	12.46	12.48	12.50	0.01	0.04	-1.60	1.21	1.20	1.20	1.20	0.00	0.00	-0.01
50	12.18	9.51	9.65	9.73	0.07	0.22	-2.45	14.05	12.43	12.45	12.46	0.01	0.03	-1.59	1.21	1.19	1.20	1.20	0.00	0.00	-0.01
60	11.93	9.35	9.48	9.54	0.06	0.19	-2.39	14.03	12.41	12.42	12.43	0.01	0.03	-1.59	1.21	1.19	1.19	1.19	0.00	0.00	-0.01
70	11.75	9.24	9.35	9.41	0.05	0.17	-2.34	14.01	12.39	12.41	12.41	0.01	0.02	-1.59	1.20	1.19	1.19	1.19	0.00	0.00	-0.01
80	11.60	9.15	9.26	9.30	0.05	0.15	-2.30	13.99	12.38	12.39	12.40	0.01	0.02	-1.59	1.20	1.19	1.19	1.19	0.00	0.00	-0.01
90	11.49	9.09	9.18	9.22	0.04	0.14	-2.27	13.98	12.37	12.38	12.39	0.01	0.02	-1.59	1.20	1.19	1.19	1.19	0.00	0.00	-0.01
100	11.40	9.03	9.12	9.16	0.04	0.13	-2.24	13.97	12.36	12.37	12.38	0.01	0.02	-1.59	1.20	1.19	1.19	1.19	0.00	0.00	-0.01
125	11.23	8.93	9.00	9.03	0.03	0.11	-2.20	13.95	12.35	12.36	12.36	0.00	0.02	-1.59	1.20	1.19	1.19	1.19	0.00	0.00	-0.01
150	11.12	8.86	8.93	8.95	0.03	0.09	-2.17	13.94	12.34	12.35	12.35	0.00	0.01	-1.59	1.20	1.19	1.19	1.19	0.00	0.00	-0.01
175	11.04	8.81	8.87	8.90	0.02	0.09	-2.15	13.93	12.33	12.34	12.34	0.00	0.01	-1.59	1.20	1.19	1.19	1.19	0.00	0.00	-0.01
200	10.98	8.77	8.83	8.85	0.02	0.08	-2.13	13.92	12.32	12.33	12.33	0.00	0.01	-1.59	1.20	1.19	1.19	1.19	0.00	0.00	-0.01

Receptor 34 – A22 at Nutley

Distance From Road (m)	Annual Mean NOx (ug/m^3)							Annual Mean Total N Dep (kg N/ha/yr)							Annual Mean Total N Acid Dep (keq/ha/yr)						
	BL	Proj BL	DN	DS	Change			BL	Proj BL	DN	DS	Change			BL	Proj BL	DN	DS	Change		
	Baseline	Proj Baseline	(Base 2033)	(Scn1 2033)	(DS-DN)	(DS-ProjBL)	(DS-BL)	Baseline	Proj Baseline	(Base 2033)	(Scn1 2033)	(DS-DN)	(DS-ProjBL)	(DS-BL)	Baseline	Proj Baseline	(Base 2033)	(Scn1 2033)	(DS-DN)	(DS-ProjBL)	(DS-BL)
0	52.42	32.83	35.67	36.22	0.55	3.39	-16.20	18.46	15.91	16.33	16.38	0.06	0.47	-2.08	1.52	1.44	1.47	1.48	0.00	0.03	-0.04
5	35.52	22.91	24.67	24.86	0.19	1.96	-10.65	16.76	14.55	14.81	14.84	0.03	0.29	-1.92	1.40	1.35	1.37	1.37	0.00	0.02	-0.03
10	27.98	18.50	19.76	19.89	0.14	1.39	-8.09	15.99	13.95	14.13	14.15	0.02	0.20	-1.84	1.35	1.30	1.32	1.32	0.00	0.01	-0.03
15	23.89	16.13	17.08	17.19	0.11	1.06	-6.70	15.56	13.61	13.76	13.77	0.02	0.16	-1.79	1.32	1.28	1.29	1.29	0.00	0.01	-0.02
20	21.32	14.62	15.39	15.50	0.11	0.88	-5.82	15.29	13.41	13.52	13.53	0.01	0.13	-1.76	1.30	1.27	1.27	1.27	0.00	0.01	-0.02
30	18.29	12.86	13.42	13.48	0.05	0.62	-4.81	14.97	13.16	13.24	13.25	0.01	0.09	-1.72	1.27	1.25	1.25	1.25	0.00	0.01	-0.02
40	16.54	11.85	12.30	12.36	0.05	0.51	-4.18	14.79	13.02	13.08	13.09	0.01	0.07	-1.70	1.26	1.24	1.24	1.24	0.00	0.01	-0.02
50	15.42	11.20	11.57	11.62	0.05	0.42	-3.80	14.67	12.93	12.98	12.99	0.01	0.06	-1.68	1.25	1.23	1.24	1.24	0.00	0.00	-0.02
60	14.63	10.73	11.05	11.08	0.03	0.35	-3.56	14.58	12.86	12.91	12.91	0.01	0.05	-1.67	1.25	1.23	1.23	1.23	0.00	0.00	-0.02
70	14.03	10.38	10.66	10.69	0.03	0.30	-3.35	14.52	12.81	12.85	12.86	0.00	0.05	-1.66	1.24	1.22	1.23	1.23	0.00	0.00	-0.01
80	13.57	10.12	10.36	10.39	0.03	0.27	-3.18	14.47	12.77	12.81	12.81	0.00	0.04	-1.66	1.24	1.22	1.22	1.22	0.00	0.00	-0.01
90	13.21	9.90	10.12	10.14	0.03	0.24	-3.07	14.43	12.74	12.78	12.78	0.00	0.04	-1.65	1.23	1.22	1.22	1.22	0.00	0.00	-0.01
100	12.91	9.73	9.93	9.95	0.02	0.22	-2.96	14.40	12.72	12.75	12.75	0.00	0.03	-1.65	1.23	1.22	1.22	1.22	0.00	0.00	-0.01
125	12.36	9.41	9.57	9.59	0.02	0.18	-2.77	14.34	12.67	12.70	12.70	0.00	0.03	-1.64	1.23	1.21	1.21	1.22	0.00	0.00	-0.01
150	11.98	9.19	9.32	9.33	0.01	0.14	-2.64	14.30	12.64	12.66	12.66	0.00	0.02	-1.64	1.23	1.21	1.21	1.21	0.00	0.00	-0.01
175	11.70	9.03	9.14	9.15	0.01	0.12	-2.55	14.27	12.62	12.64	12.64	0.00	0.02	-1.63	1.22	1.21	1.21	1.21	0.00	0.00	-0.01
200	11.49	8.90	9.00	9.01	0.01	0.11	-2.48	14.25	12.60	12.62	12.62	0.00	0.02	-1.63	1.22	1.21	1.21	1.21	0.00	0.00	-0.01

Receptor 33 – A22 at Wych Cross																					
	Annual Mean NOx (ug/m^3)							Annual Mean Total N Dep (kg N/ha/yr)							Annual Mean Total N Acid Dep (keq/ha/yr)						
Distance	BL	Proj BL	DN	DS	Change			BL	Proj BL	DN	DS	Change			BL	Proj BL	DN	DS	Change		
From Road (m)	Baseline	Proj Baseline	(Base 2033)	(Scn1 2033)	(DS-DN)	(DS-ProjBL)	(DS-BL)	Baseline	Proj Baseline	(Base 2033)	(Scn1 2033)	(DS-DN)	(DS-ProjBL)	(DS-BL)	Baseline	Proj Baseline	(Base 2033)	(Scn1 2033)	(DS-DN)	(DS-ProjBL)	(DS-BL)
0	39.24	25.44	27.50	27.75	0.25	2.30	-11.49	16.89	14.64	14.94	14.98	0.04	0.34	-1.91	1.41	1.35	1.37	1.38	0.00	0.02	-0.03
5	27.31	18.33	19.56	19.69	0.14	1.36	-7.61	15.65	13.66	13.84	13.86	0.02	0.20	-1.79	1.32	1.28	1.29	1.30	0.00	0.01	-0.03
10	22.37	15.39	16.25	16.34	0.08	0.95	-6.03	15.13	13.25	13.38	13.39	0.01	0.14	-1.73	1.28	1.25	1.26	1.26	0.00	0.01	-0.02
15	19.75	13.82	14.51	14.56	0.05	0.74	-5.18	14.85	13.03	13.13	13.14	0.01	0.11	-1.70	1.26	1.24	1.24	1.24	0.00	0.01	-0.02
20	18.08	12.82	13.39	13.44	0.05	0.62	-4.64	14.67	12.90	12.98	12.98	0.01	0.09	-1.68	1.25	1.23	1.23	1.23	0.00	0.01	-0.02
30	16.09	11.64	12.05	12.10	0.05	0.46	-3.98	14.45	12.73	12.79	12.80	0.01	0.07	-1.66	1.24	1.22	1.22	1.22	0.00	0.00	-0.02
40	14.94	10.97	11.31	11.34	0.03	0.37	-3.60	14.33	12.64	12.69	12.69	0.00	0.05	-1.64	1.23	1.21	1.21	1.21	0.00	0.00	-0.02
50	14.20	10.52	10.80	10.83	0.03	0.31	-3.37	14.25	12.57	12.61	12.62	0.00	0.04	-1.63	1.22	1.20	1.21	1.21	0.00	0.00	-0.01
60	13.66	10.21	10.45	10.47	0.02	0.27	-3.18	14.19	12.53	12.57	12.57	0.00	0.04	-1.62	1.22	1.20	1.20	1.20	0.00	0.00	-0.01
70	13.28	9.97	10.18	10.21	0.02	0.24	-3.07	14.15	12.50	12.53	12.53	0.00	0.03	-1.62	1.21	1.20	1.20	1.20	0.00	0.00	-0.01
80	12.96	9.79	9.98	10.00	0.02	0.21	-2.97	14.12	12.47	12.50	12.50	0.00	0.03	-1.61	1.21	1.20	1.20	1.20	0.00	0.00	-0.01
90	12.71	9.64	9.81	9.83	0.02	0.19	-2.88	14.09	12.45	12.48	12.48	0.00	0.03	-1.61	1.21	1.20	1.20	1.20	0.00	0.00	-0.01
100	12.51	9.52	9.67	9.69	0.02	0.18	-2.82	14.07	12.43	12.46	12.46	0.00	0.02	-1.61	1.21	1.19	1.20	1.20	0.00	0.00	-0.01
125	12.13	9.29	9.42	9.43	0.01	0.15	-2.69	14.03	12.40	12.42	12.42	0.00	0.02	-1.60	1.21	1.19	1.19	1.19	0.00	0.00	-0.01
150	11.86	9.13	9.24	9.26	0.01	0.13	-2.61	14.00	12.38	12.40	12.40	0.00	0.02	-1.60	1.20	1.19	1.19	1.19	0.00	0.00	-0.01
175	11.67	9.02	9.11	9.13	0.01	0.11	-2.54	13.98	12.37	12.38	12.38	0.00	0.02	-1.60	1.20	1.19	1.19	1.19	0.00	0.00	-0.01
200	11.51	8.93	9.01	9.02	0.01	0.10	-2.49	13.96	12.35	12.37	12.37	0.00	0.01	-1.60	1.20	1.19	1.19	1.19	0.00	0.00	-0.01
Receptor 6b_37_33 – Junction of A22 and A275																					
	Annual Mean NOx (ug/m^3)							Annual Mean Total N Dep (kg N/ha/yr)							Annual Mean Total N Acid Dep (keq/ha/yr)						
Distance	BL	Proj BL	DN	DS	Change			BL	Proj BL	DN	DS	Change			BL	Proj BL	DN	DS	Change		
From Road (m)	Baseline	Proj Baseline	(Base 2033)	(Scn1 2033)	(DS-DN)	(DS-ProjBL)	(DS-BL)	Baseline	Proj Baseline	(Base 2033)	(Scn1 2033)	(DS-DN)	(DS-ProjBL)	(DS-BL)	Baseline	Proj Baseline	(Base 2033)	(Scn1 2033)	(DS-DN)	(DS-ProjBL)	(DS-BL)
0	41.87	27.23	29.51	30.22	0.71	2.99	-11.65	17.13	14.83	15.16	15.25	0.09	0.42	-1.88	1.43	1.37	1.39	1.40	0.01	0.03	-0.03
5	35.43	23.41	25.23	25.74	0.52	2.34	-9.68	16.50	14.34	14.60	14.67	0.07	0.33	-1.83	1.38	1.33	1.35	1.35	0.00	0.02	-0.03
10	31.90	21.29	22.85	23.26	0.41	1.97	-8.64	16.15	14.06	14.29	14.35	0.06	0.29	-1.80	1.36	1.31	1.33	1.33	0.00	0.02	-0.03
15	29.64	19.93	21.32	21.68	0.35	1.75	-7.96	15.92	13.88	14.09	14.13	0.05	0.25	-1.79	1.34	1.30	1.31	1.32	0.00	0.02	-0.02
20	27.86	18.88	20.15	20.48	0.33	1.59	-7.39	15.74	13.74	13.93	13.97	0.04	0.23	-1.77	1.33	1.29	1.30	1.30	0.00	0.02	-0.02
30	25.22	17.30	18.37	18.65	0.27	1.35	-6.57	15.46	13.52	13.68	13.72	0.04	0.20	-1.74	1.31	1.27	1.28	1.29	0.00	0.01	-0.02
40	23.17	16.07	17.01	17.25	0.25	1.18	-5.91	15.24	13.35	13.49	13.52	0.03	0.17	-1.72	1.29	1.26	1.27	1.27	0.00	0.01	-0.02
50	21.56	15.11	15.92	16.14	0.22	1.03	-5.42	15.07	13.21	13.34	13.36	0.03	0.15	-1.70	1.28	1.25	1.26	1.26	0.00	0.01	-0.02
60	20.30	14.36	15.07	15.26	0.19	0.91	-5.04	14.93	13.11	13.22	13.24	0.03	0.14	-1.69	1.27	1.24	1.25	1.25	0.00	0.01	-0.02
70	19.29	13.75	14.42	14.58	0.16	0.83	-4.71	14.83	13.02	13.12	13.15	0.02	0.12	-1.68	1.26	1.24	1.24	1.24	0.00	0.01	-0.02
80	18.44	13.25	13.84	14.01	0.16	0.76	-4.44	14.73	12.95	13.04	13.06	0.02	0.11	-1.67	1.26	1.23	1.24	1.24	0.00	0.01	-0.02
90	17.73	12.82	13.35	13.51	0.16	0.69	-4.22	14.66	12.89	12.97	13.00	0.02	0.10	-1.66	1.25	1.23	1.23	1.23	0.00	0.01	-0.02
100	17.13	12.46	12.97	13.10	0.14	0.64	-4.03	14.59	12.84	12.92	12.94	0.02	0.09	-1.66	1.25	1.22	1.23	1.23	0.00	0.01	-0.02
125	15.88	11.72	12.12	12.23	0.11	0.51	-3.65	14.46	12.74	12.80	12.82	0.02	0.08	-1.64	1.24	1.22	1.22	1.22	0.00	0.01	-0.01
150	14.98	11.17	11.52	11.60	0.08	0.44	-3.37	14.36	12.66	12.71	12.73	0.01	0.06	-1.63	1.23	1.21	1.21	1.21	0.00	0.00	-0.01
175	14.27	10.75	11.06	11.14	0.08	0.38	-3.13	14.28	12.60	12.65	12.66	0.01	0.06	-1.62	1.22	1.21	1.21	1.21	0.00	0.00	-0.01
200	13.72	10.42	10.68	10.75	0.07	0.33	-2.97	14.22	12.56	12.59	12.60	0.01	0.05	-1.62	1.22	1.20	1.21	1.21	0.00	0.00	-0.01

Receptor 6b - A22 at Royal Ashdown Forest Golf Course																					
	Annual Mean NOx (ug/m^3)							Annual Mean Total N Dep (kg N/ha/yr)							Annual Mean Total N Acid Dep (keq/ha/yr)						
Distance	BL	Proj BL	DN	DS	Change			BL	Proj BL	DN	DS	Change			BL	Proj BL	DN	DS	Change		
From Road (m)	Baseline	Proj Baseline	(Base 2033)	(Scn1 2033)	(DS-DN)	(DS-ProjBL)	(DS-BL)	Baseline	Proj Baseline	(Base 2033)	(Scn1 2033)	(DS-DN)	(DS-ProjBL)	(DS-BL)	Baseline	Proj Baseline	(Base 2033)	(Scn1 2033)	(DS-DN)	(DS-ProjBL)	(DS-BL)
3	33.09	21.74	23.31	23.64	0.33	1.90	-9.44	16.21	14.09	14.33	14.37	0.05	0.28	-1.84	1.36	1.31	1.33	1.33	0.00	0.02	-0.03
8	25.55	17.30	18.35	18.56	0.22	1.27	-6.99	15.42	13.48	13.63	13.66	0.03	0.19	-1.76	1.31	1.27	1.28	1.28	0.00	0.01	-0.02
13	21.81	15.11	15.89	16.05	0.16	0.94	-5.76	15.03	13.17	13.29	13.31	0.02	0.14	-1.72	1.28	1.25	1.26	1.26	0.00	0.01	-0.02
18	19.60	13.81	14.44	14.55	0.11	0.74	-5.05	14.79	12.99	13.08	13.10	0.02	0.11	-1.69	1.26	1.24	1.24	1.24	0.00	0.01	-0.02
23	18.13	12.95	13.49	13.57	0.08	0.62	-4.56	14.64	12.87	12.95	12.96	0.01	0.09	-1.67	1.25	1.23	1.23	1.23	0.00	0.01	-0.02
33	16.30	11.88	12.29	12.37	0.08	0.49	-3.93	14.44	12.72	12.78	12.79	0.01	0.07	-1.65	1.24	1.22	1.22	1.22	0.00	0.01	-0.02
43	15.20	11.24	11.55	11.63	0.08	0.39	-3.57	14.32	12.63	12.68	12.69	0.01	0.06	-1.64	1.23	1.21	1.21	1.21	0.00	0.00	-0.01
53	14.47	10.81	11.08	11.13	0.05	0.32	-3.33	14.24	12.57	12.61	12.61	0.01	0.05	-1.63	1.22	1.21	1.21	1.21	0.00	0.00	-0.01
63	13.95	10.51	10.74	10.78	0.05	0.28	-3.16	14.19	12.52	12.56	12.57	0.01	0.04	-1.62	1.22	1.20	1.20	1.20	0.00	0.00	-0.01
73	13.54	10.28	10.48	10.52	0.04	0.25	-3.02	14.14	12.49	12.52	12.53	0.01	0.04	-1.62	1.22	1.20	1.20	1.20	0.00	0.00	-0.01
83	13.25	10.10	10.28	10.31	0.04	0.22	-2.93	14.11	12.47	12.49	12.50	0.01	0.03	-1.61	1.21	1.20	1.20	1.20	0.00	0.00	-0.01
93	13.00	9.95	10.12	10.15	0.04	0.20	-2.85	14.08	12.45	12.47	12.48	0.01	0.03	-1.61	1.21	1.20	1.20	1.20	0.00	0.00	-0.01
103	12.80	9.84	9.98	10.02	0.03	0.18	-2.78	14.06	12.43	12.45	12.46	0.01	0.03	-1.61	1.21	1.20	1.20	1.20	0.00	0.00	-0.01
128	12.42	9.62	9.74	9.77	0.03	0.15	-2.66	14.02	12.40	12.42	12.42	0.00	0.02	-1.60	1.21	1.19	1.19	1.19	0.00	0.00	-0.01
153	12.16	9.46	9.57	9.59	0.02	0.13	-2.57	13.99	12.38	12.39	12.40	0.00	0.02	-1.60	1.20	1.19	1.19	1.19	0.00	0.00	-0.01
178	11.97	9.35	9.44	9.46	0.02	0.11	-2.51	13.97	12.36	12.37	12.38	0.00	0.02	-1.60	1.20	1.19	1.19	1.19	0.00	0.00	-0.01
203	11.83	9.27	9.35	9.36	0.02	0.10	-2.47	13.96	12.35	12.36	12.36	0.00	0.01	-1.59	1.20	1.19	1.19	1.19	0.00	0.00	-0.01

Receptor 6aSW – A22 at Royal Ashdown Forest Golf Course																					
	Annual Mean NOx (ug/m^3)							Annual Mean Total N Dep (kg N/ha/yr)							Annual Mean Total N Acid Dep (keq/ha/yr)						
Distance	BL	Proj BL	DN	DS	Change			BL	Proj BL	DN	DS	Change			BL	Proj BL	DN	DS	Change		
From Road (m)	Baseline	Proj Baseline	(Base 2033)	(Scn1 2033)	(DS-DN)	(DS-ProjBL)	(DS-BL)	Baseline	Proj Baseline	(Base 2033)	(Scn1 2033)	(DS-DN)	(DS-ProjBL)	(DS-BL)	Baseline	Proj Baseline	(Base 2033)	(Scn1 2033)	(DS-DN)	(DS-ProjBL)	(DS-BL)
0	52.74	33.68	36.72	37.27	0.55	3.58	-15.48	17.92	15.43	15.83	15.90	0.07	0.47	-2.02	1.48	1.41	1.44	1.44	0.01	0.03	-0.04
5	33.47	22.07	23.70	24.02	0.33	1.96	-9.44	16.09	13.98	14.20	14.24	0.04	0.26	-1.85	1.35	1.31	1.32	1.32	0.00	0.02	-0.03
10	26.29	17.80	18.92	19.14	0.22	1.34	-7.15	15.39	13.44	13.59	13.62	0.03	0.18	-1.77	1.30	1.27	1.28	1.28	0.00	0.01	-0.02
15	22.52	15.58	16.41	16.60	0.19	1.02	-5.92	15.02	13.16	13.27	13.29	0.02	0.14	-1.73	1.28	1.25	1.26	1.26	0.00	0.01	-0.02
20	20.20	14.20	14.88	15.02	0.14	0.82	-5.18	14.79	12.98	13.07	13.09	0.02	0.11	-1.70	1.26	1.23	1.24	1.24	0.00	0.01	-0.02
30	17.50	12.61	13.10	13.19	0.08	0.57	-4.31	14.52	12.78	12.84	12.85	0.01	0.08	-1.67	1.24	1.22	1.22	1.23	0.00	0.01	-0.02
40	15.97	11.72	12.09	12.18	0.08	0.46	-3.79	14.37	12.66	12.71	12.72	0.01	0.06	-1.65	1.23	1.21	1.22	1.22	0.00	0.00	-0.02
50	15.01	11.15	11.47	11.52	0.05	0.37	-3.49	14.27	12.59	12.63	12.64	0.01	0.05	-1.64	1.22	1.21	1.21	1.21	0.00	0.00	-0.01
60	14.33	10.75	11.01	11.06	0.05	0.31	-3.27	14.20	12.53	12.57	12.58	0.01	0.04	-1.63	1.22	1.20	1.21	1.21	0.00	0.00	-0.01
70	13.84	10.46	10.68	10.73	0.05	0.27	-3.11	14.15	12.50	12.53	12.53	0.01	0.04	-1.62	1.22	1.20	1.20	1.20	0.00	0.00	-0.01
80	13.46	10.24	10.43	10.47	0.04	0.24	-2.98	14.12	12.47	12.50	12.50	0.01	0.03	-1.61	1.21	1.20	1.20	1.20	0.00	0.00	-0.01
90	13.17	10.06	10.24	10.27	0.04	0.21	-2.90	14.09	12.45	12.47	12.47	0.00	0.03	-1.61	1.21	1.20	1.20	1.20	0.00	0.00	-0.01
100	12.93	9.92	10.08	10.11	0.03	0.19	-2.82	14.06	12.43	12.45	12.45	0.00	0.03	-1.61	1.21	1.20	1.20	1.20	0.00	0.00	-0.01
125	12.49	9.66	9.78	9.81	0.03	0.15	-2.68	14.02	12.39	12.41	12.42	0.00	0.02	-1.60	1.21	1.19	1.19	1.19	0.00	0.00	-0.01
150	12.19	9.48	9.59	9.61	0.02	0.13	-2.58	13.99	12.37	12.39	12.39	0.00	0.02	-1.60	1.20	1.19	1.19	1.19	0.00	0.00	-0.01
175	11.98	9.36	9.45	9.47	0.02	0.11	-2.51	13.97	12.36	12.37	12.37	0.00	0.02	-1.60	1.20	1.19	1.19	1.19	0.00	0.00	-0.01
200	11.82	9.26	9.34	9.36	0.02	0.10	-2.46	13.95	12.34	12.35	12.36	0.00	0.01	-1.59	1.20	1.19	1.19	1.19	0.00	0.00	-0.01

Receptor 6aSE – A22 at Royal Ashdown Forest Golf Course																					
	Annual Mean NOx (ug/m^3)							**Annual Mean Total N Dep (kg N/ha/yr)**							**Annual Mean Total N Acid Dep (keq/ha/yr)**						
Distance	**BL**	**Proj BL**	**DN**	**DS**	**Change**			**BL**	**Proj BL**	**DN**	**DS**	**Change**			**BL**	**Proj BL**	**DN**	**DS**	**Change**		
From Road (m)	**Baseline**	**Proj Baseline**	**(Base 2033)**	**(Scn1 2033)**	**(DS-DN)**	**(DS-ProjBL)**	**(DS-BL)**	**Baseline**	**Proj Baseline**	**(Base 2033)**	**(Scn1 2033)**	**(DS-DN)**	**(DS-ProjBL)**	**(DS-BL)**	**Baseline**	**Proj Baseline**	**(Base 2033)**	**(Scn1 2033)**	**(DS-DN)**	**(DS-ProjBL)**	**(DS-BL)**
0	62.84	39.74	43.54	44.09	0.55	4.35	-18.75	18.83	16.17	16.67	16.75	0.08	0.58	-2.08	1.55	1.46	1.50	1.50	0.01	0.04	-0.05
5	39.37	25.62	27.63	28.06	0.44	2.45	-11.30	16.65	14.43	14.70	14.75	0.05	0.33	-1.90	1.39	1.34	1.36	1.36	0.00	0.02	-0.03
10	30.66	20.44	21.87	22.14	0.27	1.70	-8.52	15.82	13.77	13.97	14.00	0.04	0.23	-1.82	1.34	1.29	1.31	1.31	0.00	0.02	-0.03
15	26.15	17.75	18.84	19.08	0.25	1.33	-7.07	15.38	13.43	13.58	13.61	0.03	0.18	-1.77	1.30	1.27	1.28	1.28	0.00	0.01	-0.02
20	23.34	16.08	16.98	17.17	0.19	1.09	-6.17	15.10	13.22	13.34	13.37	0.02	0.15	-1.74	1.28	1.25	1.26	1.26	0.00	0.01	-0.02
30	20.06	14.13	14.80	14.93	0.14	0.80	-5.13	14.78	12.97	13.06	13.08	0.02	0.11	-1.70	1.26	1.23	1.24	1.24	0.00	0.01	-0.02
40	18.21	13.04	13.57	13.68	0.11	0.64	-4.53	14.59	12.83	12.90	12.92	0.01	0.09	-1.68	1.25	1.22	1.23	1.23	0.00	0.01	-0.02
50	17.03	12.35	12.80	12.89	0.08	0.54	-4.15	14.48	12.74	12.80	12.81	0.01	0.07	-1.66	1.24	1.22	1.22	1.22	0.00	0.01	-0.02
60	16.24	11.87	12.26	12.34	0.08	0.47	-3.90	14.40	12.68	12.73	12.74	0.01	0.06	-1.65	1.23	1.21	1.22	1.22	0.00	0.00	-0.02
70	15.64	11.52	11.88	11.96	0.08	0.44	-3.68	14.34	12.63	12.68	12.69	0.01	0.06	-1.64	1.23	1.21	1.21	1.21	0.00	0.00	-0.02
80	15.20	11.26	11.58	11.63	0.05	0.37	-3.57	14.29	12.60	12.64	12.65	0.01	0.05	-1.64	1.23	1.21	1.21	1.21	0.00	0.00	-0.01
90	14.85	11.05	11.36	11.41	0.05	0.36	-3.44	14.26	12.57	12.62	12.62	0.01	0.05	-1.63	1.22	1.21	1.21	1.21	0.00	0.00	-0.01
100	14.55	10.88	11.16	11.21	0.06	0.33	-3.34	14.23	12.55	12.59	12.60	0.01	0.05	-1.63	1.22	1.20	1.21	1.21	0.00	0.00	-0.01
125	14.03	10.57	10.81	10.85	0.05	0.28	-3.18	14.17	12.51	12.55	12.55	0.01	0.04	-1.62	1.22	1.20	1.20	1.20	0.00	0.00	-0.01
150	13.65	10.35	10.56	10.60	0.04	0.25	-3.04	14.14	12.48	12.51	12.52	0.01	0.04	-1.62	1.22	1.20	1.20	1.20	0.00	0.00	-0.01
175	13.38	10.19	10.37	10.42	0.04	0.23	-2.96	14.11	12.46	12.49	12.49	0.01	0.03	-1.61	1.21	1.20	1.20	1.20	0.00	0.00	-0.01
200	13.15	10.05	10.22	10.26	0.04	0.21	-2.89	14.08	12.44	12.47	12.47	0.00	0.03	-1.61	1.21	1.20	1.20	1.20	0.00	0.00	-0.01

Receptor 6aNE – A22 at Royal Ashdown Forest Golf Course																					
	Annual Mean NOx (ug/m^3)							**Annual Mean Total N Dep (kg N/ha/yr)**							**Annual Mean Total N Acid Dep (keq/ha/yr)**						
Distance	**BL**	**Proj BL**	**DN**	**DS**	**Change**			**BL**	**Proj BL**	**DN**	**DS**	**Change**			**BL**	**Proj BL**	**DN**	**DS**	**Change**		
From Road (m)	**Baseline**	**Proj Baseline**	**(Base 2033)**	**(Scn1 2033)**	**(DS-DN)**	**(DS-ProjBL)**	**(DS-BL)**	**Baseline**	**Proj Baseline**	**(Base 2033)**	**(Scn1 2033)**	**(DS-DN)**	**(DS-ProjBL)**	**(DS-BL)**	**Baseline**	**Proj Baseline**	**(Base 2033)**	**(Scn1 2033)**	**(DS-DN)**	**(DS-ProjBL)**	**(DS-BL)**
0	51.08	32.71	35.59	36.25	0.66	3.54	-14.83	17.79	15.33	15.72	15.80	0.08	0.47	-1.99	1.47	1.40	1.43	1.43	0.01	0.03	-0.04
5	34.10	22.46	24.12	24.48	0.35	2.02	-9.62	16.18	14.05	14.28	14.32	0.04	0.27	-1.86	1.36	1.31	1.33	1.33	0.00	0.02	-0.03
10	27.16	18.34	19.54	19.78	0.25	1.45	-7.38	15.51	13.53	13.69	13.73	0.03	0.19	-1.78	1.31	1.27	1.28	1.29	0.00	0.01	-0.02
15	23.45	16.13	17.05	17.25	0.19	1.11	-6.20	15.14	13.25	13.38	13.40	0.03	0.15	-1.74	1.29	1.25	1.26	1.26	0.00	0.01	-0.02
20	21.13	14.74	15.50	15.66	0.16	0.92	-5.47	14.91	13.07	13.18	13.20	0.02	0.13	-1.72	1.27	1.24	1.25	1.25	0.00	0.01	-0.02
30	18.32	13.08	13.64	13.75	0.11	0.67	-4.57	14.63	12.86	12.94	12.95	0.01	0.09	-1.68	1.25	1.23	1.23	1.23	0.00	0.01	-0.02
40	16.68	12.12	12.55	12.66	0.11	0.54	-4.02	14.47	12.74	12.80	12.81	0.01	0.07	-1.66	1.24	1.22	1.22	1.22	0.00	0.01	-0.02
50	15.61	11.48	11.84	11.92	0.08	0.44	-3.69	14.36	12.65	12.71	12.72	0.01	0.06	-1.65	1.23	1.21	1.21	1.21	0.00	0.00	-0.01
60	14.88	11.04	11.35	11.43	0.08	0.39	-3.45	14.29	12.60	12.64	12.65	0.01	0.05	-1.64	1.22	1.21	1.21	1.21	0.00	0.00	-0.01
70	14.30	10.70	10.98	11.04	0.06	0.33	-3.27	14.23	12.55	12.59	12.60	0.01	0.05	-1.63	1.22	1.20	1.21	1.21	0.00	0.00	-0.01
80	13.87	10.44	10.69	10.74	0.05	0.30	-3.13	14.19	12.52	12.56	12.56	0.01	0.04	-1.63	1.22	1.20	1.20	1.20	0.00	0.00	-0.01
90	13.51	10.23	10.46	10.50	0.05	0.27	-3.01	14.15	12.49	12.52	12.53	0.01	0.04	-1.62	1.21	1.20	1.20	1.20	0.00	0.00	-0.01
100	13.21	10.06	10.26	10.31	0.04	0.24	-2.91	14.12	12.47	12.50	12.51	0.01	0.03	-1.62	1.21	1.20	1.20	1.20	0.00	0.00	-0.01
125	12.69	9.75	9.91	9.95	0.03	0.20	-2.74	14.07	12.43	12.45	12.46	0.00	0.03	-1.61	1.21	1.19	1.20	1.20	0.00	0.00	-0.01
150	12.32	9.53	9.67	9.70	0.03	0.16	-2.62	14.03	12.40	12.42	12.43	0.00	0.02	-1.60	1.21	1.19	1.19	1.19	0.00	0.00	-0.01
175	12.05	9.37	9.49	9.52	0.02	0.14	-2.54	14.00	12.38	12.40	12.40	0.00	0.02	-1.60	1.20	1.19	1.19	1.19	0.00	0.00	-0.01
200	11.85	9.25	9.36	9.38	0.02	0.13	-2.47	13.98	12.37	12.38	12.38	0.00	0.02	-1.60	1.20	1.19	1.19	1.19	0.00	0.00	-0.01

Receptor 33N – A22 at Wych Cross																					
	Annual Mean NOx (ug/m^3)							Annual Mean Total N Dep (kg N/ha/yr)							Annual Mean Total N Acid Dep (keq/ha/yr)						
Distance	**BL**	**Proj BL**	**DN**	**DS**	**Change**			**BL**	**Proj BL**	**DN**	**DS**	**Change**			**BL**	**Proj BL**	**DN**	**DS**	**Change**		
From Road (m)	**Baseline**	**Proj Baseline**	**(Base 2033)**	**(Scn1 2033)**	**(DS-DN)**	**(DS-ProjBL)**	**(DS-BL)**	**Baseline**	**Proj Baseline**	**(Base 2033)**	**(Scn1 2033)**	**(DS-DN)**	**(DS-ProjBL)**	**(DS-BL)**	**Baseline**	**Proj Baseline**	**(Base 2033)**	**(Scn1 2033)**	**(DS-DN)**	**(DS-ProjBL)**	**(DS-BL)**
0	37.40	24.56	26.50	26.69	0.19	2.13	-10.71	16.70	14.51	14.79	14.82	0.03	0.31	-1.88	1.40	1.34	1.36	1.37	0.00	0.02	-0.03
5	26.02	17.73	18.86	18.97	0.11	1.23	-7.05	15.51	13.56	13.73	13.74	0.02	0.18	-1.77	1.31	1.28	1.29	1.29	0.00	0.01	-0.02
10	21.40	14.97	15.77	15.85	0.08	0.88	-5.55	15.02	13.18	13.30	13.31	0.01	0.13	-1.72	1.28	1.25	1.26	1.26	0.00	0.01	-0.02
15	18.94	13.50	14.11	14.19	0.08	0.69	-4.76	14.76	12.97	13.06	13.07	0.01	0.10	-1.69	1.26	1.23	1.24	1.24	0.00	0.01	-0.02
20	17.39	12.57	13.07	13.12	0.05	0.56	-4.27	14.59	12.84	12.92	12.92	0.01	0.08	-1.67	1.25	1.22	1.23	1.23	0.00	0.01	-0.02
30	15.53	11.47	11.84	11.87	0.03	0.40	-3.67	14.39	12.69	12.74	12.75	0.01	0.06	-1.65	1.23	1.21	1.22	1.22	0.00	0.00	-0.01
40	14.47	10.84	11.13	11.16	0.03	0.32	-3.31	14.28	12.60	12.64	12.65	0.00	0.05	-1.63	1.22	1.21	1.21	1.21	0.00	0.00	-0.01
50	13.79	10.42	10.67	10.69	0.03	0.27	-3.09	14.20	12.54	12.58	12.58	0.00	0.04	-1.62	1.22	1.20	1.21	1.21	0.00	0.00	-0.01
60	13.29	10.13	10.34	10.37	0.02	0.23	-2.93	14.15	12.50	12.53	12.53	0.00	0.03	-1.62	1.21	1.20	1.20	1.20	0.00	0.00	-0.01
70	12.95	9.92	10.10	10.12	0.02	0.20	-2.82	14.11	12.47	12.50	12.50	0.00	0.03	-1.61	1.21	1.20	1.20	1.20	0.00	0.00	-0.01
80	12.67	9.75	9.92	9.94	0.02	0.18	-2.73	14.08	12.45	12.47	12.47	0.00	0.03	-1.61	1.21	1.20	1.20	1.20	0.00	0.00	-0.01
90	12.45	9.62	9.77	9.79	0.02	0.16	-2.66	14.06	12.43	12.45	12.45	0.00	0.03	-1.61	1.21	1.19	1.20	1.20	0.00	0.00	-0.01
100	12.27	9.52	9.65	9.67	0.02	0.15	-2.60	14.04	12.41	12.43	12.44	0.00	0.02	-1.60	1.21	1.19	1.19	1.19	0.00	0.00	-0.01
125	11.94	9.32	9.43	9.44	0.01	0.12	-2.50	14.00	12.39	12.40	12.40	0.00	0.02	-1.60	1.20	1.19	1.19	1.19	0.00	0.00	-0.01
150	11.71	9.18	9.28	9.29	0.01	0.11	-2.42	13.98	12.37	12.38	12.38	0.00	0.02	-1.60	1.20	1.19	1.19	1.19	0.00	0.00	-0.01
175	11.54	9.08	9.16	9.18	0.01	0.09	-2.37	13.96	12.35	12.36	12.37	0.00	0.01	-1.59	1.20	1.19	1.19	1.19	0.00	0.00	-0.01
200	11.42	9.01	9.08	9.09	0.01	0.08	-2.33	13.95	12.34	12.35	12.35	0.00	0.01	-1.59	1.20	1.19	1.19	1.19	0.00	0.00	-0.01

Appendix B. Extract from Caporn et al (2010)

Table 21 of Caporn et al (2010): Summary of relationships between long-term nitrogen deposition and species richness by habitat expressed as the amount of incremental N deposition (in kg N ha^{-1} yr^{-1}) associated with a reduction in species richness of one species along the survey gradient sites. Modelled relationship only applied over N deposition range in which survey sites occurred; where no sites were surveyed at a given N deposition level '-' is shown.

Survey/ Habitat/	Max. species richness	Habitat/ species critical load kg N ha^{-1} yr^{-1}	Increase in N deposition (in kg N ha^{-1} yr^{-1}) required to reduce measured species richness by 1 at different background long-term N deposition levels					
			5 kg N	10 kg N	15 kg N	20 kg N	25 kg N	30 kg N
Upland heath (TU 2009)								
Total species richness	42 spp.	10-20	0.4 kg	0.8 kg	1.3 kg	1.7 kg	2.0 kg	2.4 kg
Upland heath (MRS)*								
Total species richness	16 spp.	10-20	1.7 kg	2.0 kg	2.5 kg	3.3 kg	5.0 kg	20.0 kg
Lowland heath (TU 2009)								
Total species richness	37 spp.	10-20	0.4 kg	0.8 kg	1.3 kg	1.7 kg	2.0 kg	2.4 kg
Bog (TU 2009)								
Total species richness	32 spp.	5-10	3.3 kg					
Sand dunes (TU 2009, all sites)								
Total species richness	77 spp.	8-15	0.1 kg	0.5 kg	1.1 kg	2.0 kg	-	-
Sand dunes TU 2009 (pH ≥6.5)								
Total species richness	77 spp.	8-15	0.3 kg	0.6 kg	0.9 kg	1.3 kg	-	-
Sand dunes TU 2009 + 2002 (Fixed dune grasslands)								
Total species richness	77 spp.	8-15	0.3 kg	0.6 kg	0.9 kg	1.3 kg	-	-
Acid grasslands (BEGIN)								
Total species richness	42 spp.	10-15	1.7 kg	1.7 kg	2.0 kg	2.0 kg	2.5 kg	2.5 kg

*in the upland heath MRS survey quadrat size was 0.5 x 0.5 m. This produced different results than the other surveys which used 2 x 2 m quadrats.

Appendix C. Annual Drop-off Calculations for Intermediate Years between 2017 and 2033

AECOM was asked to undertake calculations for intervening years between 2017 and 2033 (rather than simply the start year of 2017 and end year of 2033) in order to show whether NOx emissions in any given year would increase for any period before a decrease was observed.

Traffic flow data for the interim years were derived from the 2033 traffic modelling for Tunbridge Wells Local Plan in late 2017. EFT v8.0.1 has been used to calculate annual drop off calculations to determine if there is a risk of an intermediate year having higher emissions than the scenarios currently tested by AECOM, although the latest modelling work for Ashdown Forest has used EFT v8.0.0. The differences in the EFT from V8.0.0 to v8.0.1 are reproduced below and should not affect this analysis. To confirm this interpretation the base 2017 and DM/DS 2033 traffic data used in the previous assessment has been reprocessed to confirm the suitability for comparison of the different EFT versions. Changes from EFT v8.0.0 to EFT v8.0.1:

- Bug fix to correct the bus and coach split on London roads when entering data using the Alternative Technologies traffic format input option only.
- Bug fixes to allow compatibility with Excel 2007 and 64-bit instances of Excel.

The drop off calculations have been calculated on the same basis as the 2033 assessment method utilised for the previous assessments, with only partial improvements assumed compared to DEFRA predictions. The emission year associated with each year of traffic data is as follows:

- Base 2017 traffic with 2017 emissions;
- 2020 traffic with 2018 emissions;
- 2023 traffic with 2019 emissions;
- 2025 traffic with 2020 emissions;
- 2028 traffic with 2021 emissions;
- 2031 traffic with 2022 emissions; and
- 2033 traffic with 2023 emissions (as presented in the assessments).

The following graphs, presented separately for the ‘with’ (DS) and ‘without’ (DM) plan scenarios, show the emissions per link for each of the above scenarios.

Figure 1. NOx Emission Rate (g/km/s) Per Year Per Link in DM Scenario

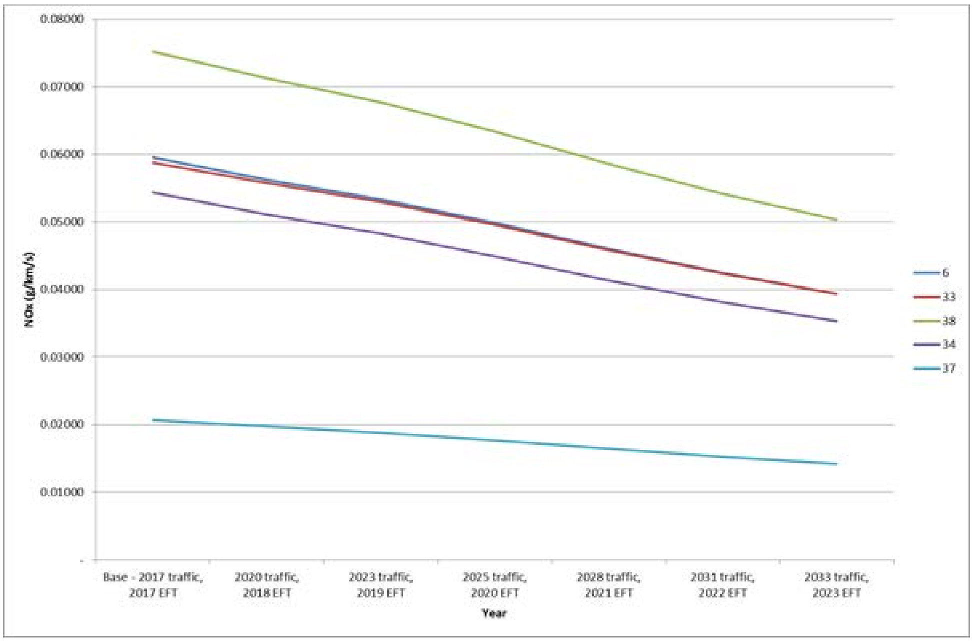
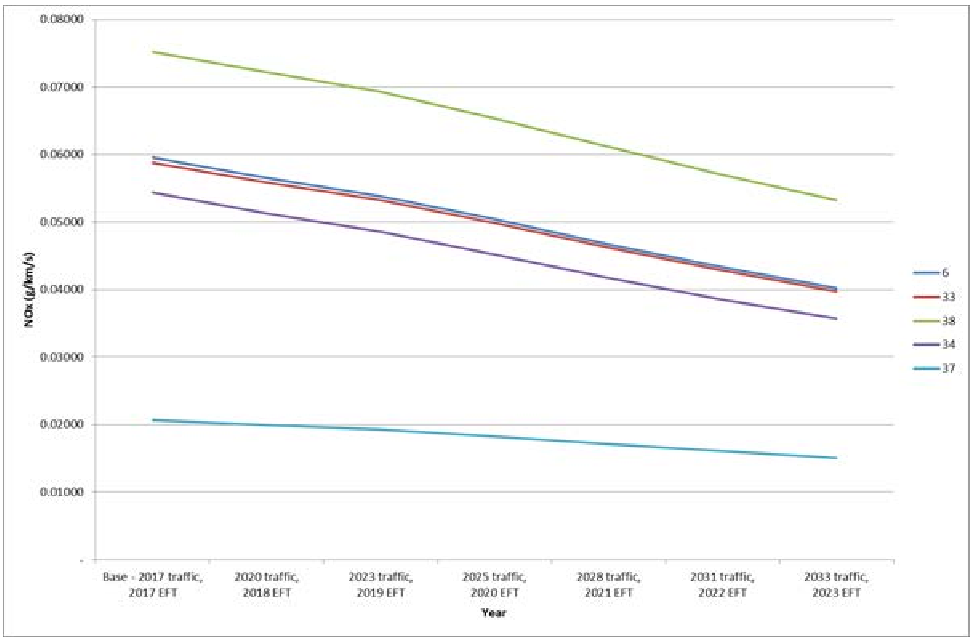


Figure 1 demonstrates that, for the DM scenario (i.e. all growth except Tunbridge Wells Local Plan, Lewes JCS and South Downs Local Plan), emission rates are projected to fall year on year for each link included in the AECOM modelling approach despite the growth in traffic projected in the DM scenario. Each coloured line below represents a separate link.

This effect is also present, although slightly less pronounced, in Figure 2, which represents the DS scenarios. The year on year fall in emissions trend remains the same. The effect is slightly less pronounced than in the DM graph due to the additional traffic from the Local Plans that are incorporated into the DS traffic flows.

Figure 2. NOx Emission Rate (g/km/s) Per Year Per Link in DS Scenario



This analysis has not been carried through into a dispersion model assessment as it is considered this presentation of emission rates clearly falling is sufficient to illustrate that despite the increase in vehicle numbers in the future the increases under the AECOM analysis approach are not of sufficient magnitude to result in an increase in emissions.

Summary

The interim year emissions calculations demonstrate that there are no points where the increase in traffic due to growth or the local plan offsets the improvements in emission rates over time (using conservative assumptions on improvements in emission rates). Therefore no change to standard assessment practice of considering the full plan period is proposed.

It is also essential to note that for vegetation long-term trends in air quality are more important than short-term fluctuations. The ecological effects of nitrogen deposition are most associated with persistent long-term exposure (i.e. many years). Whether growth will result (for example) in an increase in nitrogen deposition for a couple of years before improvements in emission factors and background rates 'catch up' would be less important than whether there will be a persistent net increase or decrease in deposition over the plan period.

Appendix D. Modelling ammonia emissions from traffic

Data Sources

The ammonia modelling has used 2015 road transport emission factors from the National Atmospheric Emissions Inventory website (NAEI, latest available data). This document produces average ammonia emission factors for various types of transport and environments in grams per kilometre (g/km). The NAEI road transport emission factors include average speed throughout the UK and the speeds used to derive these g/km emission rates may be different to the speeds used in the air quality model but this is a known limitation of the ammonia modelling.

Concentration data for the ammonia modelling from AQC transects has been made available in the partially redacted report however the coordinates of the monitoring locations have not been provided. All of the images and data relating the transects and location of the NH_3 sensors has been redacted save for the NO_2 monitored data maps (Figures A1.35 and A1.36 on pages 242/243 of AQC report). This NO_2 monitoring map has been used this to identify the location of the transects as both NO_2 and NH_3 were monitored on the transects. The transects have been identified from the following information:

- Transect 4 ends in monitoring location T18 and is near one of the AECOM modelled roads although NH_3 was not measured on this transect;
- Transect 1 is the only transect extending west as stated on page 14 of the AQC report;
- Transect 2 is opposite transect one as on page 88 it states "*The pattern of fall-off is much steeper for Transect 1 than for Transect 2 , which may reflect the influence of prevailing wind direction on roadside concentrations*"; and
- Transect 3 has "*relatively lower traffic volumes than the roads beside the other transects*" so must be located in isolation away from the other transects.

The AECOM model does not have a modelled link next to transect 3 therefore only transects 1 and 2 have been used to verify NH_3 predictions.

The coordinates for the NH_3 monitoring locations on transect 1 and 2 have been approximated as the specific coordinates for the monitored locations have been redacted. The approximate locations have been confirmed in Google Earth as the measurements sites are visible. These have been informed by the angle from the road in the NO_2 monitoring figure, distance from the road in the AQC report and given a height of 2m as the AQC report states that all ALPHA NH_3 models were at 2m.

A background concentration of 0.6 ug/m^3 has been used from the NH_3 DELTA samplers in the AQC report which states that these were background locations.

The NH_3 measurement data in transects 1 and 2 as used in the verification are presented in Table 2.

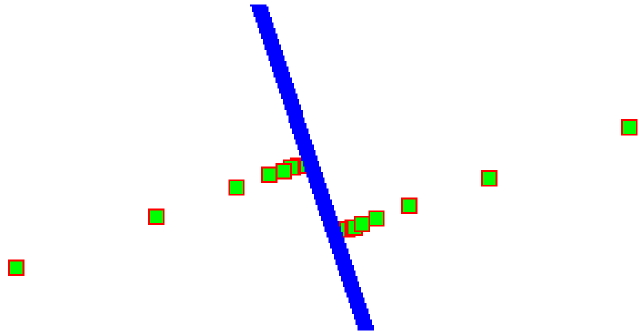
Table 2. Ammonia Monitoring

Transect	Distance from Road (m)	Measured Concentration (µg/m^3)
Transect 1	1.7	1.7
	2.5	1.3

	5.0	0.9
	10	0.9
	22	0.7
	100	0.6
Transect 2	1.7	1.4
	2.5	1.3
	5.0	1.0
	10	0.9
	22	0.7
	100	0.8

Source: AQC report- Ashdown Forest SAC, Air Quality Monitoring and Modelling, October 2017

Transects 1 and 2 are represented in the ADMS-Roads model as follows, with Transect 1 to the west, upwind of the road, and Transect 2 to the east, down wind of the road.



If the road was a notable source of ammonia it would be anticipated that Transect 2, as the downwind transect, would have higher concentrations than Transect 1. Whereas the measurement data shows the opposite trend at the closest points, with slightly higher ammonia concentrations upwind and identical concentrations at 5m.

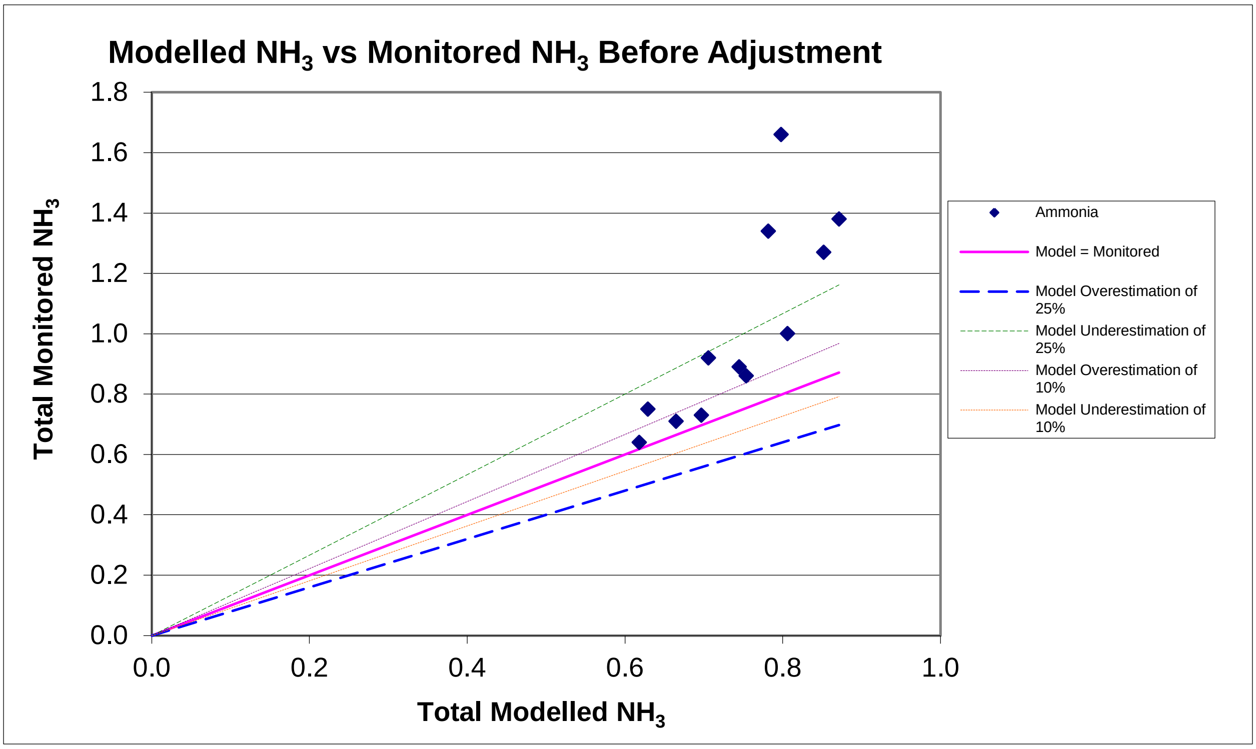
It can also be seen that concentrations of ammonia are very similar to measured background ammonia concentrations of 0.6 µg/m^3 beyond 20m from the road. Any ammonia emissions due to the road are therefore considered to be observable in the measured data, but the patterns are less clear than would be expected from key road traffic pollutants (i.e. NOx), even at the measurement points within 5m of the road and they are largely imperceptible beyond 20m.

The monitoring also shows an increase in ammonia concentrations at 100m on Transect 2, compared to closer points. This indicates that there is likely to be another source of ammonia in the vicinity of the monitoring and shows that other sources of ammonia may be more important locally than the road network.

Verification

Ammonia emissions were input based on a representative vehicle split for rural England in 2015 using data on vehicle fleet from the Emission Factor Toolkit published by Defra, and maintaining the light duty vehicle/heavy duty vehicle (LDV/HDV) split in the traffic data provided, using hot exhaust emission factors only from the NAEI 2015 road transport emission factors.

Plotting monitored vs modelled total NH_3 concentrations before any correction showed two clear patterns of behaviour with four points notably out of agreement with the rest of the dataset. These four points are the two closest points of each transect (at 1.7 and 2.5m) where concentrations are notably higher along with higher adjustment factors.



Using these input data an adjustment factor of **2.94** was calculated, with an RMSE of 0.2.

The adjustment of the ammonia model highlights that the ammonia model is less accurate close to the road source (e.g. at 1.7-2.5m from the road source). This supports the above observations of the measured ammonia concentrations that concentrations are most notably higher than background concentrations very close to the roads, as there is a larger under prediction at these verification locations closer to the road source. This under prediction doesn't appear to be due to canyoning effects as it is fairly open at this location. The resultant verification factor, if applied elsewhere, is therefore conservative as these closest points are included within the overall factor derived above.

Therefore, any ammonia predictions beyond this distance are likely to overestimate ammonia contributions, and beyond 20m, unless the road source is a much larger road than here, ammonia road contributions may not in reality be discernible at the ecosystem compared to normal ammonia background concentrations.

Assessment

Modelling has also been carried out to predict concentrations of ammonia and the influence of ammonia on nitrogen deposition rates using the methodology outlined above with the following assumptions for the assessment year:

- 2033 with and without the local plan traffic flows;
- 2023 traffic fleet mix (in keeping with NOx predictions);
- 2015 ammonia emission rates (as projected rates are not available from the NAEI); and
- Measured background concentration of 0.6 $\mu g/m^3$ (as projected concentrations are not available).

The contribution of ammonia to total nitrogen deposition was calculated using a deposition rate for ammonia of 0.02 m/s, taken from the CERC ADMS-Roads User Guide.

Even with the addition of ammonia as another source of nitrogen within the nitrogen deposition calculations, small rates of deposition are still predicted with a maximum change in deposition rate of 0.2 becoming 0.3 kg N ha^{-1} yr^{-1} at the edge of the road.

Appendix E. Commentary on modelling work undertaken by Air Quality Consultants for Wealden District Council and on Wealden District Council's response to the South Downs National Park Local Plan

AECOM was asked to:

'Produce an appendix to the AQIA to:

a) Explain why your assessment has not relied on the 1000 AADT threshold considered in the Wealden judgment.
b) Set out the key methodological differences between the AQC approach and the AECOM approach;
c) Explain why either i) the methodological differences between AECOM and AQC make no difference to the outcome of the assessment; or ii) the AECOM methodology is preferable. In particular:
d) Explain the evidential basis upon which AECOM has assumed an annual 1% decrease in background deposition rates and explain why that is a scientifically robust assumption notwithstanding historic over-estimates of predicted reductions and notwithstanding the AQC;
e) Explain the relevance of ecological interpretation in assessing the likely significant effects of air pollution on the SAC, and its significance in AECOM's and AQC's assessments
f) Give your expert opinion on whether all or any of the 'scenarios' modelled in the AQC Report are scientifically reasonable and, if so, what is the consequence for the Council's ability to rely on AECOM's conclusion that there are no likely significant adverse effects of planning growth in Tunbridge Wells Borough?
g) Address any miscellaneous points arising out of the representations made by Wealden DC in response to the HRA and/or in relation to planning applications to explain why the criticisms/representations made by Wealden DC are misplaced'.

The below response covers these points and constitutes the requested Appendix.

<u>Point 1(a) – the use of the 1,000 AADT metric</u>

The Wealden vs. Lewes case has undermined the value of the 1,000 AADT metric entirely. There are several fundamental points regarding the 1,000 AADT metric, which we cover below:

1. It was only ever intended as a shorthand method to decide whether it is worth doing actual air quality modelling; the figure of 1,000 AADT has no special air quality significance in itself (other than being widely agreed in the industry that, when translated into air quality modelling, a change of less than 1,000 AADT generally works out to be a change in nitrogen deposition rate so far below any damage threshold that it could be ignored);
2. It was only ever intended to be a first stage in the traffic/air quality assessment process. The core of the assessment process is the air quality modelling which is in any case a more robust way of examining impacts than simply scrutinising AADTs since it allows fleet composition, average vehicle speeds, habitat structure (in broad terms e.g. woodland or grassland), meteorology etc. to be taken into consideration, all of which influence deposition of pollutants.

Therefore, if you have undertaken air quality calculations anyway, the 1,000 AADT metric is irrelevant as its only value is in determining if it is worth performing such calculations. Since the High Court case the main practical change has been the general abandonment of the 1,000 AADT metric: to use it cumulatively requires all the detailed traffic modelling that one would need for the air quality calculations anyway, so one may as well proceed straight to the air quality modelling. This has the advantage of being a much more nuanced assessment than simply summing AADTs (see point 2 above) and is also inherently cumulative/in combination due to the way the models are built.

Points 2(b) to 2(f) – comparison between the AECOM modelling and Air Quality Consultant's modelling

The key differences in modelling approach between the AQC work and AECOM work

The key differences in modelling approach between the AECOM and AQC assessments are:

- Pollutants considered;
    - Both assessments have considered NOx concentrations, ammonia, nitrogen deposition and acid deposition;
    - AQC also considered nitric oxide (NO), nitrogen dioxide (NO_2), particulate ammonium (NH_4^+), airborne reduced nitrogen (NH_x)[2] and particulate nitrate (NO_3^-)[3].
- Air Quality model verification;
    - AQC utilised a single monitoring location for verification for Lewes Downs SAC. This monitoring point was located in a canyon location along the A26 (as described in Lewes Downs SAC Air Quality Assessment, Appendix A2 Modelling Methodology, paragraph A2.3) and was modelled using a canyon module to represent the specific reduced dispersion of pollutants associated with canyon locations and so higher concentrations within canyons. However, AQC did not use the canyon module elsewhere in the modelling indicating that the wider area (i.e. the Lewes Downs SAC under consideration) was not considered to be a canyon. The verification used therefore was optimised to describe pollutant concentrations at the canyon along part of the A26 and not the Lewes Downs SAC and so it is unclear how this will have better represented emissions within the ecosystem);
- Background concentrations;
    - AECOM used Defra background maps;
    - AQC also used Defra background maps but carried out an additional calibration step using national monitoring data uplifting NOx background concentrations by 9.4% (as described in Lewes Downs SAC Air Quality Assessment, Appendix A2 Modelling Methodology, paragraph A2.8). The methodology for derivation of this factor is not provided fully in the document referenced (AQC, 2016, Deriving Background Concentrations of NOx and NO_2 for use with CURED V2A), noting this calibration is based on background sites in the Automatic Urban and Rural Monitoring Network (AURN). However, the method does not indicate whether this calibration is based on all 'urban background' locations, 'suburban background' locations or 'rural background' locations, noting one example of a site at London Hillingdon that has been excluded. A review of Figure 6, (op cit.) suggests that approximately 50 background sites have been used, but that the relationship against the Defra background map is largely good, with a number of outlier points, suggesting that a wider review of sites, such as the review which excluded London Hillingdon had been carried out, may identify that there are other sites that should be excluded or that sites should be better grouped to describe specific types of site (e.g. urban or rural locations). This may then result in a different calibration factor being derived for 2014 for this type of location. It should also be noted that applying this same AQC calibration step to a baseline year of 2015 would result in a reduction of NOx of 0.09%. Therefore, whilst this additional calibration step has been used the factor employed may or may not be appropriate for the Lewes Downs SAC.
    - In those projects where baseline data has been gathered AECOM presents annual averages. Very unusually, AQC have not presented their monitoring data for annual periods, despite this being possible for a large proportion of the data collected so showing normal year to year variations in pollutant

concentrations is possible but not presented. Monitoring data is presented for 2 years of data collection up to the summer of 2016. Therefore, as the report was published in October 2017 three years of data should have been available for consideration. Although, data was installed at a variety of points within the study a large proportion of data is available for 24 months or a large percentage of 24 months. However, curiously data is not presented as annual averages, but as a two year average. Significantly, this prevents the reader from understanding variations between the years of monitoring data as would be expected from annual monitoring surveys.

- Deposition rates;
  - AECOM used deposition rates taken from APIS using a standard fixed deposition velocity (based on DMRB guidance), although sensitivity testing has been undertaken using the higher velocities referenced in the AQC report.
  - AQC used an approach where deposition rates were taken from APIS and using a standard fixed deposition velocity and also a temporally-variable approach to calculating deposition fluxes. Paragraph 7.25 of the AQC report indicates that the modelling method used here involves much higher nitrogen deposition velocities than those used in standard modelling which will partly explain the greater forecast deposition rates that those identified in the AECOM report which uses the standard methods and deposition velocities.
- Future air quality assumptions (NO_x);
  - AECOM typically prepare two scenarios:
    - one assuming all Defra improvements (Emission Factor Toolkit (EFT)); and
    - one with background concentrations and emission rates from approximate midpoint (e.g. 2023 for a 2030 plan) – this second scenario represents reasonable worst case. For the purposes of the modelling of Ashdown Forest only this scenario is reported.
  - AQC presented three scenarios:
    - official predictions using Defra rates of improvement;
    - a sensitivity test using the in-house CURED approach; and
    - no improvements in air quality.
- Future air quality assumptions (nitrogen deposition)
  - AECOM assessments typically assume c.1% reduction per year in background deposition rate, which is half the amount advised in DMRB HA207/07 Annex F and so includes consideration of uncertainty in the rates of reduction over time in nitrogen deposition.
  - AQC prepared an assessment assuming that background nitrogen deposition rates will hold constant at the average 2013-2015 value, on the basis that there is a non-linear relationship between NOx emissions and N-deposition rates.

The AQC modelling includes 24-hour NOx (known as the short-term critical level). The ecological value of the 24hr NOx metric is limited The WHO (2000) guidelines include a short-term (24 hour average) NOx critical level of 75 µg/m^3. Originally set at 200 µg/m^3, the guideline was considerably lowered in 2000 to reflect the fact that, globally, short-term episodes of elevated NOx concentrations are often combined with elevated concentrations of O_3 or SO_2, which can cause effects to be observed at lower NOx concentrations. However, high concentrations of O_3 and SO_2 are rarely recorded in the UK. As such, there is reason to conclude that in the UK the short-term NOx concentration mean is not especially ecologically useful as a threshold. The Centre for Ecology & Hydrology have commented that '*UN/ECE Working Group on Effects strongly recommended the use of the annual mean value, as the long-term effects of NOx are thought to be more significant than the short-term effects*'[44].

[44] Sutton MA, Howard CM, Erisman JW, Billen G, Bleeker A, Grennfelt P, van Grinsven H, Grizzetti B. 2013. The European Nitrogen Assessment: Sources, Effects and Policy Perspectives. Page 414. Cambridge University Press. 664pp. ISBN-10: 1107006120
June 2011. Manual on Methodologies and Criteria for Modelling and Mapping Critical Loads & Levels and Air Pollution Effects, Risks and Trends. Chapter 3: Mapping Critical Levels for Vegetation

The AECOM report models all receptors as if they represented the ‘ideal’ habitat (heathland). In contrast, the AQC report models the habitats that are actually currently present. For the most affected areas this is woodland. However, woodland is not an SAC feature, so effects of the woodland are not relevant to consideration of impacts on the ability of the SAC to achieve its conservation objectives (the primary requirement of the HRA process). Woodland has a higher deposition flux than heathland; for this reason (and because of the use of higher deposition velocities as already mentioned) the modelled nitrogen deposition rates reported are often higher than in the AECOM model.

Why the AECOM approach is preferable
The AQC approach presents four unrealistically conservative scenarios and two that we consider unrealistically optimistic. The most realistic scenarios presented by AQC (Scenarios 3 and 5) apply some conservatism to future emissions from diesel vehicles but assume all other future improvements occur as currently anticipated by Government, which is likely to present a too optimistic picture.

In contrast, the approach to future rates of deposition in the less realistic scenarios are very conservative, assuming no change in background deposition rates despite noting within their report that since 1988 total nitrogen deposition has reduced by 13%, illustrating the presence of an existing improving trend. The deposition rate calculations undertaken by AQC utilising a temporally variable approach is not based on guidance and it is unclear exactly how the variable values were calculated.
It is considered by AECOM, and also stated in paragraph 7.33 of the AQC report, that the future situation is most likely to be somewhere between the scenarios presented in the AQC report (paragraph 7.33 *“Overall, the future-year deposition projections will have a level of uncertainty associated with them, but it is not unreasonable to expect the reality to lie somewhere between the different scenarios that have been modelled.”*) i.e. somewhat less optimistic than AQC Scenarios 3 and 5 but considerably better than the other AQC Scenarios.

AECOM’s modelled scenario falls into this middle ground. The AECOM approach is based on published methods and guidance documents, (e.g. Defra and DMRB), with conservative assumptions made where appropriate (e.g. partial future improvements in concentrations, emissions and deposition rates). The AECOM approach predicts a scientifically reasonable realistic worst case assessment of future air quality and deposition, rather than a range of overly conservative or optimistic predictions. For example, with regard to nitrogen deposition the AQC report produced for Ashdown Forest SAC states in paragraph 3.10 that since 1988, the total deposition of nitrogen has decreased by 13%. Paragraph 7.30 of the same report states that oxidised nitrogen deposition decreased by 14% between 1988 and 2010. This is an improvement of 0.59% (total nitrogen) or 0.64% (oxidised nitrogen) per annum on average. The AECOM modelling assumes a modest improvement in background nitrogen deposition from 2017 to 2033 equivalent to 0.75% per annum on average. This is not a substantive difference from past trends, and as new vehicles (i.e. Euro 6/VI) with reduced emissions replace older vehicles in the vehicle fleet it makes sense to allow for a slightly increased average rate of improvement in the future. This can be seen in the real world emission tests reported in the Department for Transport Vehicle Emissions Testing Programme (2016) which shows that under real world driving conditions Euro 6 emissions are on average lower than the older Euro 5 standard.

The AQC study uses a bespoke modelling method for nitrogen deposition. They relate it to an Environment Agency study published in 2008 (paragraph 7.22). However, paragraph 7.24 of the AQC report acknowledges that one of the drawbacks of the bespoke ‘first principles’ method is that ‘… *some of the parameters used in the deposition model are highly uncertain*’ and that small variations in some, such as stomatal resistance, could have quite large effects on the resulting deposition fluxes. All forecasting methods have their benefits and drawbacks and one risk of using an extremely complex model is that there is more room for uncertainties to affect the results due to the greater number of uncertain parameters in the model.

Whether any or all of the AQC ‘scenarios’ represent a scientifically ‘reasonable’ approach
Seven scenarios have been considered within the AQC report:

- Scenario 1 is a scientifically reasonable representation of current baseline but only represents the baseline rather than any forecasting.

- Scenarios 2 (without the Wealden Local Plan) and 4 (with the Wealden Local Plan) postulate future (2028) scenarios assuming **no** improvements in any rates (emissions, deposition), backgrounds etc. Since they assume no improvement whatsoever (and thus a reversal of long-established trends), these are considered to be an unrealistically pessimistic assessment of the future situation and thus not scientifically reasonable. Even the AQC Ashdown Forest and Lewes Downs reports acknowledge as much. The AQC Ashdown Forest report states (in paragraph 7.11) that '*It is considered that, with respect to vehicular NOx emissions, Scenarios 3 and 5 provide a reasonable worst-case assessment, while Scenarios 2, 4, 6, and 7 provide an extreme worst-case upper-bound'.* In the Lewes Downs report AQC state that '*The results from the sensitivity test and worst-case scenario are likely to over-predict emissions from vehicles in the future*'.

- Scenarios 3 (without the Wealden Local Plan) and 5 (with the Wealden Local Plan) represent the future (2028) scenarios assuming that projected DMRB/Defra improvements in rates (emissions, deposition), backgrounds etc. are **fully** realised. AQC's assessment utilises their bespoke CURED tool to apply a more pessimistic view of improvements in diesel emissions for the future scenario than the published Defra emission rates. This is therefore likely to contain a more reasonable assessment of future emissions than other scenarios assessed; however as only one parameter has been adjusted to account for reduced optimism in future emission rates, whilst assuming full projected improvements in deposition rates and background concentrations, it is likely that these scenarios will present an unrealistically optimistic assessment of the future situation.

- Scenarios 6 (without the Wealden Local Plan) and 7 (with the Wealden Local Plan) postulate the future (2028) scenarios assuming emissions per vehicle, primary NO_2 proportions, and rural background ozone concentrations remain at 2015 values (i.e. no improvement), <u>but</u> with HNO_3, particulate deposition, and wet deposition projected to 2028. These scenarios are also considered to be unrealistically pessimistic and thus scientifically unreasonable, for the same reasons as Scenarios 2 and 4.

In AECOM's view the most scientifically reasonable scenario(s) that AQC have postulated are Scenario 3/5 (although we nonetheless consider them to be excessively optimistic in their assumptions of improvements in background emissions and deposition rates). These are the scenarios that mirror the trends the AECOM analysis has forecast:

- With regard to 'in combination' trends in NOx concentrations, paragraphs 10.55 and 10.56 of the AQC report state that: '***Predicted annual mean NOx concentrations in 2028 with the Local Plan are, in this emissions scenario*** [Scenario 5]***, lower than those at present.*** *This is because the predicted changes in emissions from the average road vehicle more than offset the increases in traffic that are predicted over the same period. Over most of the SAC, the predicted reductions in NOx concentrations are less than 4 μg/m^3, but close to roads the reductions are greater, with changes* [reductions] *greater than 8 μg/m^3 predicted alongside many of the roads'*.

- With regard to trends in nitrogen deposition rates, paragraph 10.72 of the AQC report states that '*Increases* [in nitrogen deposition due to the Wealden Local Plan] *greater than 0.05 kg-N/ha/yr are predicted in the vicinity of roads, but extend out up to almost 300 m from the A22 and 100 m from the B2026.* ***Increases greater than 1 kg-N/ha/yr*** [due to the Wealden Local Plan] ***are predicted close to the A22'*.** However, when moving to the 'in combination' discussion, paragraph 10.77 makes it clear that these 'increases' are considerably more than offset by a forecast large net reduction in nitrogen deposition. Paragraph 10.77 says: *'For the reasons explained for NOx concentrations, nitrogen deposition is predicted to reduce across the entire SAC in this scenario comparison. The minimum reduction is 0.8 kg-N/ha/yr, which is predicted to occur at background locations to short vegetation.* ***The maximum reduction is 14 kg-N/ha/yr, which is predicted to occur to woodland alongside the A22.*** *The reductions are higher where the baseline fluxes are highest (i.e. over woodland and close to roads) because this is where the anticipated reductions in NOx emissions per vehicle are predicted to have the greatest effect'.*

<u>*Whether the results of that scientifically reasonable approach are ecologically significant and why*</u>

The overall trends and relationships in AQC Scenarios 3/5 (the only scenario(s) we consider broadly reasonable) are similar to the trends and relationships that AECOM has forecast, notwithstanding the very different modelling methods.

The forecast contribution of future traffic to nitrogen deposition is considerably greater in the AQC model (more than 1 kgN/ha/yr at the roadside of the A22 at Wych Cross) than in the AECOM model (0.31 kgN/ha/yr at the same location). Similarly, AQCs forecast net improvement in nitrogen deposition (a reduction of 14 kgN/ha/yr adjacent to the A22 at Wych Cross) is much greater than that forecast by AECOM (a reduction of 1.89 kgN/ha/yr forecast for the same location). However, these differences are likely due to a combination of the different habitats modelled (woodland in the AQC work, heathland in the AECOM work), the very different deposition modelling methods used and (regarding improvements in background) the fact that AQC postulate a percentage improvement in deposition (23%) that is nearly double that in the AECOM model (12%) and apply this to a higher baseline deposition rate (60 kgN/ha/yr adjacent to the A22 at Wych Cross according to paragraph 9.19 of the AQC report, compared to 15kgN/ha/yr at the same location in the AECOM model)[45].

The actual rates and concentrations are thus different between the two models, **but** the ecological interpretation of Scenarios 3/5 of the AQC modelling would mirror that of the AECOM scenario. A significant net improvement in nitrogen deposition is forecast even allowing for future growth and the forecast nitrogen contribution of that 'in combination' growth is not only more than offset by the expected improvement (which is expected to be an order of magnitude greater than the contribution of the additional traffic) but is unlikely to result in a measurable retardation in any heathland vegetation recovery/establishment that might otherwise occur. For example, Table 21 of NECR2010 records that at baseline deposition rates of 30kgN/ha/yr (the highest deposition rate cited in that report) a reduction in species richness equivalent to '1' (i.e. a reduction in the frequency with which at least 1 species was encountered in a given sample quadrat) was associated in heathland with a dose (incremental increase) of 2.4kgN/ha/yr. While no areas with deposition rates as high as 60kgN/ha/yr were covered by the analyses in NECR2010 it is reasonable to conclude that the documented trend (i.e. an ever larger dose of nitrogen required to achieve the same negative effect as baseline deposition rates rise) will continue or level off at deposition rates above 30 kgN/ha/yr. Southon et al (2013) studied over fifty heathlands across England at deposition rates of up to 32.4kgN/ha/yr and found that above 20 kgN/ha/yr *'… declines in species richness plateaued, indicating a reduction in sensitivity as N loading increased'.*

In the Statement of Common Ground being drawn up between the various authorities surrounding Ashdown Forest, Wealden District Council has argued that Natural England Research Report NECR2010 is not applicable to Ashdown Forest on the basis that:

- The report did not include Ashdown Forest itself in its sample and thus did not include the influence of local conditions at that site, including the current condition of the heathland;
- There was limited coverage of heathland sites located in the south-east of England; and
- The analysis did not include wet heath.

In fact, the heathland sites covered by the research reported in NECR2010 had a wide geographic spread and were subject to a range of different 'conditions' but the identified trends were nonetheless observable. The fact that a given heathland site may not have been included in the sample cannot be a basis for the identified trend to be dismissed as inapplicable. On the contrary, the value of the available dose-response research is precisely in the fact that it covers a geographic range of sites subject to a mixture of different influences that might otherwise mask the nitrogen relationships if a given site was looked at in isolation. NECR2010 illustrates that consistent trends have been identified *despite* the differing geographic locations of those habitats and different conditions at the sites involved.

Heathland and acid grassland (a related habitat that is often found intermixed with heathland) have been particularly well studied across broad geographical, climatic and pollution gradients covering different levels of soil organic matter, rates of nutrient cycling, plant species assemblages and management regimes. Despite this, the overall trends, including that a given 'dose' of nitrogen generally has less effect on a range of vegetation parameters as background deposition rates rise

[45] This difference in baseline rates is because the AECOM model uses Defra modelled baseline data and models heathland at this location, while AQC uses local measured data and models woodland at this location.

has been reported by various peer reviewed academic papers[46]. Southon et al (2013) surveyed 52 heathlands across England and observed statistically significant trends despite the large differences in conditions of these heathlands. That paper specifically states that '*the biggest reductions in species number* [were] *associated with increasing N inputs at the low end of the deposition range'* and that '*The similarity of relationships between upland and lowland environments, across broad spatial and climatic gradients, highlights the ubiquity of relationships with N*'.

Based on the consistent trend across the range of habitats studied (including wet habitats such as bogs as well as lowland heathland, upland heathland and dune systems) there is no basis to assume that the identified trends would not be applicable to all types of heath, including wet heath. Upland heathlands tend to be wetter than lowland heathlands due to climate differences and yet the same pattern has been observed as reported in Southon et al (2013).

Due to the existence of other influences (such as management) that have a much greater effect on relevant vegetation parameters than does nitrogen deposition, there can be no absolute certainty that the reported trends would be observed in a given part of Ashdown Forest. However, there is a reasonable scientific expectation that the observed relationships would be detected if Ashdown Forest was included in the broader sample.

Point 2(g) – g) Address any miscellaneous points arising out of the representations made by Wealden DC in response to the HRA

AECOM is aware that Wealden District Council submitted a response to the South Downs National Park Local Plan consultation which made a number of criticisms of AECOM's original modelling work undertaken in summer 2017. We respond to the relevant points below.

Complaint 1: Failure to take account in the Lewes Downs SAC modelling of additional Wealden growth identified since 2015

Although proposed growth in Wealden District has changed since the modelling was undertaken, the trends and magnitudes depicted in the modelling are such that they would not be reversed by the additional housing being delivered in surrounding authorities:

- For both modelled roads, comparison of the DS scenario with the Base case forecasts NOx concentrations and nitrogen deposition rates to reduce over the period to 2030. Incorporating additional growth in Wealden District beyond that modelled in 2015 would be highly unlikely to reverse the modelled improving trend in either nitrogen deposition or NOx concentrations as the forecast improvement far exceeds the probable retardation due to additional traffic.
- Moreover, Lewes District/South Downs National Park would still only be responsible for mitigating their contribution to any 'in combination' change in air quality. For both roads the forecast contribution of the South Downs Local Plan to nitrogen deposition is virtually zero even at the closest point to the road. A change of this magnitude, whilst capable of being calculated, would not be capable of having a material effect on the SAC.

Complaint 2: Failure to take account of growth that has already been delivered prior to 2017 in the Ashdown Forest modelling

[46] Stevens, C. J.; Dise, N. B.; Gowing, D. J. G. and Mountford, J. O. (2006). Loss of forb diversity in relation to nitrogen deposition in the UK: regional trends and potential controls. Global Change Biology,12(10), pp. 1823–1833.
Southon GE, Field C, Caporn SJM, Britton AJ, Power SA (2013) Nitrogen Deposition Reduces Plant Diversity and Alters Ecosystem Functioning: Field-Scale Evidence from a Nationwide Survey of UK Heathlands. PLoS ONE 8(4): e59031. doi:10.1371/journal.pone.0059031
Stevens, Carly; Dupre, Cecilia; Dorland, Edu; Gaudnik, Cassandre; Gowing, David J. G.; Bleeker, Albert; Diekmann, Martin; Alard, Didier; Bobbink, Roland; Fowler, David; Corcket, Emmanuel; Mountford, J. Owen; Vandvik, Vigdis; Aarrestad, Per Arild; Muller, Serge and Dise, Nancy B. (2010). Nitrogen deposition threatens species richness of grasslands across Europe. Environmental Pollution, 158(9), pp. 2940–2945.

The model <u>does</u> include traffic already on the network, and thus includes the role of development completed prior to 2017. The 'Do Something' 2033 air quality forecast <u>includes</u> existing NOx concentrations and nitrogen deposition (and thus the projects/plans that will have contributed to them). Doing so illustrates that, even including <u>both</u> the existing traffic <u>and</u> further emissions/deposition due to additional traffic, there is forecast to be a net improvement in air quality by 2033 due to projected improvements in those background concentrations/rates and vehicle emission factors.

<u>*Complaint 3: Suggestion that the area affected by exhaust emissions can extend beyond 200m*</u>
In all cases our modelled transects show that NOx concentrations and nitrogen deposition rates are forecast to fall to background levels well before 200m from the roadside. In any event the greatest impact will always be recorded closest to the road and using this roadside data will provide the most precautionary assessment. Therefore there is no value in extending transects any further.

<u>*Complaint 4: Failure to take account of uncertainty regarding improvements in emissions and deposition*</u>
The specific comment made by Wealden was as follows: *'There is uncertainty with regards to projected future vehicle emissions of NOx and this alone would mean that a precautionary approach should be used within the HRA. If there is a decrease in NOx concentrations from vehicles, the interaction between NOx and nitrogen deposition has not been considered as well as the role of ammonia in this regard. This is a particular issue as the levels of emissions of ammonia from vehicles in the future is unknown, is not currently regulated, and there is a potential for emissions to increase. This provides an added reason for the need to apply the precautionary principle when considering the impact of emissions. In this regard the HRA is considered to be incomplete*.'

The appropriate use of the precautionary principle is not simply to assume that the worst outcome conceivable is the one that will happen. It also involves making a balanced judgment based on past trends and the likelihood of those trends continuing or increasing. There is a long history of improving trends in key pollutants (notably NOx) and in nitrogen deposition rates, and there is no reason to expect that will suddenly cease; on the contrary, as new vehicles (i.e. Euro 6/VI) with reduced emissions replace older vehicles in the vehicle fleet it makes sense to allow for a slightly increased average rate of improvement in the future. This can be seen in the real world emission tests reported in the Department for Transport Vehicle Emissions Testing Programme (2016) which shows that under real world driving conditions Euro 6 emissions are on average lower than the older Euro 5 standard. AECOM has therefore made a precautionary allowance for improvements in background NOx concentrations. On the other hand, in our ammonia modelling no allowance has been made for improvement in background concentrations.

With regard to nitrogen deposition the AQC report produced for Ashdown Forest SAC states in paragraph 3.10 that total nitrogen deposition (i.e. taking account of both reduced and oxidised nitrogen) decreased by 13% between 1988 and 2010. This is an improvement of 0.59% (total nitrogen) per annum on average. The AECOM modelling assumes an improvement in background nitrogen deposition from 2017 to 2033 equivalent to 0.75% per annum on average. This is not a substantive difference, and given the introduction of new vehicles with reduced emissions (as described above) it makes sense to allow for a slightly increased average rate of improvement in the future. The AECOM assessment presents a realistic worst-case that is considerably more cautious than those advocated in the only available Government guidance on the issue (Defra concerning NOx rates of improvement and DMRB concerning rates of N-deposition improvements).

While the AQC reports produced for Wealden District Council include numerous scenarios that assume no improvement in background emissions and deposition rates (and thus a net deterioration in both), we note that AQC themselves do not consider those scenarios to be realistic. The AQC Ashdown Forest report states in paragraph 7.11 that *'It is considered that, with respect to vehicular NOx emissions, Scenarios 3 and 5* [which make significant allowances for improvement in NOx concentrations and background nitrogen deposition rates] *provide a* ***reasonable*** [emphasis added] *worst-case assessment, while Scenarios 2, 4, 6, and 7* [which make no allowance for improvement in background] *provide an* ***extreme*** [emphasis added] *worst-case upper-bound*'. An 'extreme' case, while not impossible, is unreasonable and unrealistic almost by definition. Similarly, in the Lewes Downs report AQC state that *'The results from the sensitivity test and worst-case scenario are likely to over-predict emissions from vehicles in the future'*. AECOM agrees with the statement in paragraph 7.33 of the AQC Ashdown Forest report that '*Overall, the future-year deposition projections will have a level of uncertainty associated with them, but it is not unreasonable to expect the reality to lie somewhere between* *the different scenarios that have been modelled*.' i.e. somewhat less optimistic than AQC Scenarios 3 and 5 but considerably better than the other AQC Scenarios. AECOM's modelled scenario falls into this middle ground.

Complaint 5: *'The modelling only considers the base date and one date in the future (last year of the Plan period). By assuming that there is a reduction by the end of the plan period it cannot take into account the potential damage caused by the emissions at the higher level (earlier in the plan period)'.*

Appendix C of AECOM's updated modelling report contains an analysis of intervening years between 2017 and 2033 to confirm that year-on-year net improvement in emissions is expected. Moreover, for vegetation, long-term trends in air quality are more important than short-term fluctuations. The ecological effects of nitrogen deposition are most associated with persistent long-term exposure (i.e. many years). Whether growth will result (for example) in an increase in nitrogen deposition for a couple of years before improvements in emission factors and background rates 'catch up' would be less important than whether there will be a persistent net increase or decrease in deposition over the plan period.

Complaint 6: Failure to account for ammonia emissions

AECOM's modelling has been updated to account for ammonia emissions. Due to the aforementioned uncertainties no allowance for improvement in background ammonia concentrations has been factored into AECOM's modelling.

Complaint 7: Failure to consider air quality impacts on Pevensey Levels SAC

The Pevensey Levels SAC is designated for its population of Ramshorn Snail (*Anisus vorticulus*). Provided the water is unpolluted and has a fairly diverse flora (without much emergent vegetation e.g. reeds) this species doesn't have very precise habitat structure or botanical requirements.

While eutrophication (excessive vegetation growth from nutrient enrichment) is a risk, the ditches of the Pevensey Levels (like most freshwater bodies) are understood to be 'phosphate-limited', meaning that phosphate is the most important nutrient to control. Phosphate does not derive from atmosphere but does come in large volumes from agricultural runoff and treated sewage effluent. Provided phosphate levels can be controlled then nitrogen inputs (even through the water column) are unlikely to have a material effect on plant growth/habitat structure in the ditches. This is why, in most freshwater SACs, the attention is focussed on controlling phosphate inputs rather than nitrogen inputs.

In any case, since there are no applicable critical loads or NOx critical levels for the interest features of this SAC there are no appropriate reference levels/damage thresholds for any impact assessment. It is also noted that the Site Improvement Plan produced by Natural England does not mention air quality as a concern and we understand from personal communication from Natural England officers that they do not currently see atmospheric nitrogen deposition as a risk to the integrity of this site.

Complaint 8: Suggestion that the model/scenarios in the AQC report are 'better' than the standard method

The AQC studies use a bespoke modelling method for nitrogen deposition that goes back to first principles (such as stomatal resistance), but is related to an Environment Agency study published in 2008 (paragraph 7.22). The fact that a given model is more detailed or elaborate does not necessarily mean it is any more likely to accurately forecast local air quality by 2033 because there is a need to make judgment-based decisions over parameters and future trends that may or may not be correct whatever model is used. One risk of using a complex model is its inherent complexity: there are a large number of parameters in the model and greatly varying levels of certainty in those parameters. Paragraph 7.24 of the AQC report acknowledges this where it states that '… *some of the parameters used in the deposition model are highly uncertain*' and notes that small variations in some, such as stomatal resistance, could have quite large effects on the resulting deposition fluxes. This doesn't mean that such a model shouldn't be used if desired but given the uncertainties in any forecasting it is at least equally defensible to follow the existing simpler method that is deployed as standard good practice and supported by Natural England. While there are uncertainties in (for example) the relationship between NOx concentrations and nitrogen deposition these must be addressed whatever model is used and the improvements in nitrogen deposition rate included in the AECOM modelling are in line with recorded trends, as identified earlier in this note.

The Wealden studies prepared by AQC have modelled a range of scenarios which differ greatly in their outcomes for the same traffic data, ranging from predicting a large net increase in nitrogen deposition to predicting a large net reduction. AQC acknowledge in their reports that most of their modelled scenarios are unrealistic. The scenario that AQC themselves identify as being most realistic (Scenarios 3 and 5 in the Ashdown Forest report) broadly correspond with the AECOM modelling, notwithstanding the considerable difference in methodological details. It forecasts additional nitrogen deposition due to additional traffic but predicts that this will be more than offset by improvements in background and emission factors, leading to a large net reduction in nitrogen deposition. Indeed, the allowances made in the AECOM modelling for improvements in background rates/concentrations and emission factors are actually more conservative than those in AQC scenarios 3 and 5.

Complaint 9: It is considered that Plans that allocate sites, and propose that these sites are deliverable, should have a greater level of assessment than a strategic plan which does not distribute growth to certain areas

For Ashdown Forest we have modelled growth across South Downs and Lewes District in detail (i.e. using information on site allocations). Although the modelling for Lewes Downs SAC was undertaken in 2015 and thus did not include the smaller site allocations in the centre and west of the National Park, it did include the key strategic ones around Lewes as they were in the Joint Core Strategy and the quantum and distribution of growth in the areas of the National Park most likely to affect flows on the SAC (i.e. around Lewes town) have not materially changed since that time.

Appendix F. Existing or Proposed Sustainable Transport Policies

Core Policy 13 – Sustainable Travel

The local planning authority will promote and support development that encourages travel by walking, cycling and public transport, and reduces the proportion of journeys made by car, in order to help achieve a rebalancing of transport in favour of sustainable modes by:

1. **Ensuring that new development is located in sustainable locations with good access to schools, shops, jobs and other key services by walking, cycling and public transport in order to reduce the need to travel by car (unless there is an overriding need for the development in a less accessible location).**
2. **Ensuring that the design and layout of new development prioritises the needs of pedestrians, cyclists and users of public transport over ease of access by the motorist.**
3. **Ensuring that new residential developments are designed to achieve speeds of 20 mph or less.**
4. **Ensuring that new development minimises the need to travel and incorporates appropriate measures to mitigate for any transport impacts which may arise from that development.**
5. **Requiring new development to provide for an appropriate level of cycle and car parking in accordance with parking guidance approved by the local planning authority.**
6. **Requiring development which generates a significant demand for travel, and/or is likely to have other transport implications to:**

   i. **Be supported by a Transport Assessment/Transport Statement and sustainable Travel Plan, where appropriate;**

ii. Contribute to improved sustainable transport infrastructure, including the provision of safe and reliable sustainable transport modes; and
iii. Provide facilities and measures to support sustainable travel modes.

The local planning authority will work with East Sussex County Council and other relevant agencies to encourage and support measures that promote improved accessibility, create safer roads, reduce the environmental impact of traffic movements, enhance the pedestrian environment, or facilitate highway improvements. In particular, the local planning authority will:

a. Support the expansion and improvement of public transport services, particularly those providing links between the rural and urban areas;
b. Encourage improvements to existing rail services, new or enhanced connections or interchanges between bus and rail services, and improvements to the quality and quantity of car and cycle parking at railway stations; and
c. Support the development of a network of high quality walking and cycling routes throughout the district.

<u>South Downs Local Plan Policy SD19: Transport and Accessibility (not yet adopted)</u>

1. Development proposals will be permitted provided that they are located and designed to minimise the need to travel or promote the use of sustainable modes of transport.

2. Development proposals that are likely to generate a significant number of journeys, especially of vehicles, must be located near existing town and village centres, public transport routes, the cycle network and main roads. Such developments will be required to provide a transport assessment or transport statement.

3. Development proposals must demonstrate the continued safe and efficient operation of the strategic and local road networks.

4. The following improvements to public transport infrastructure will be supported:

a) Public transport waiting facilities, particularly those with reliable and accessible information;

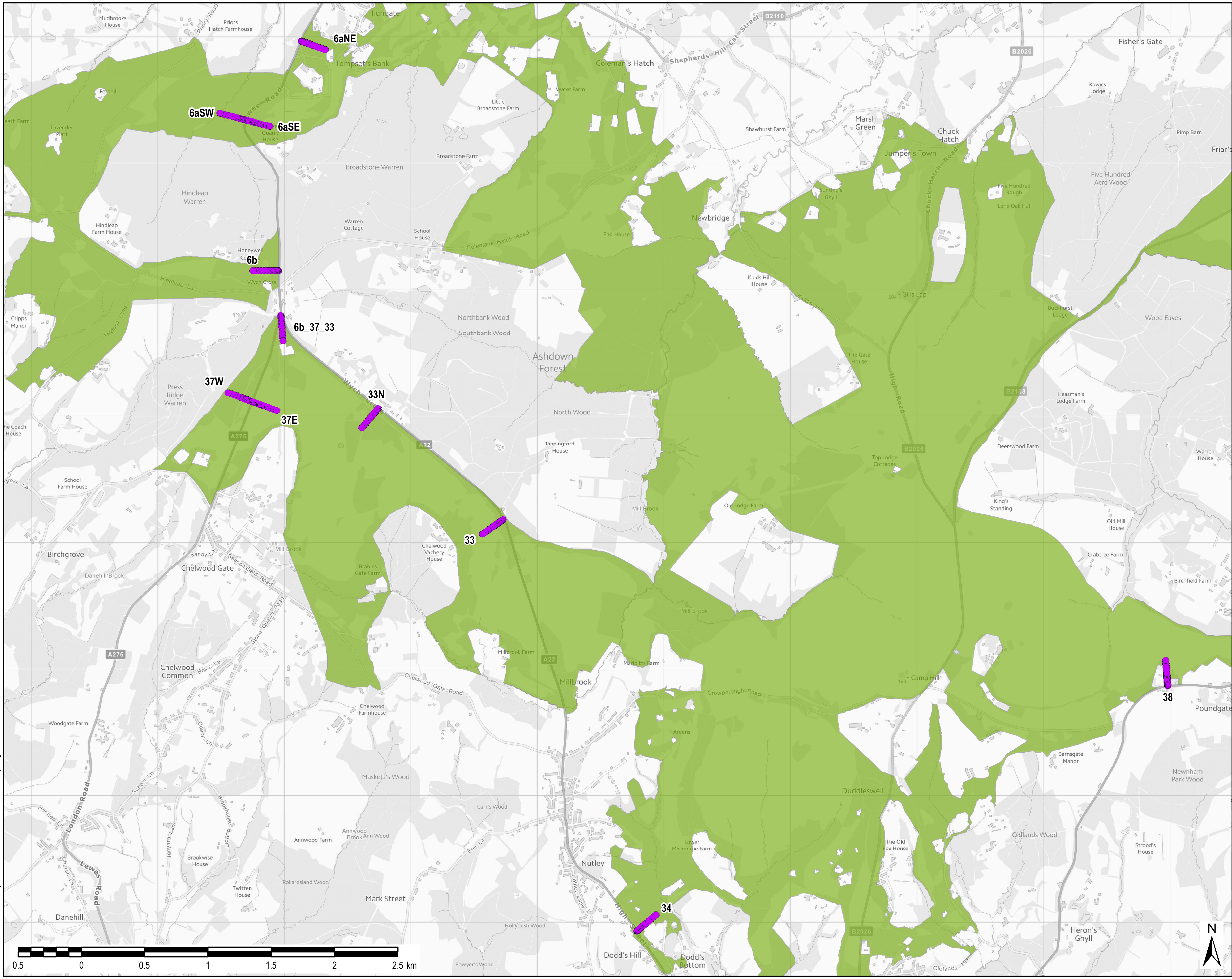
b) Infrastructure supporting the transfer of freight from road to rail and water;

c) Improvements to walking, cycling and bus connectivity at all transport interchanges;

d) Improvements to the quality and provision of cycle parking at railway stations and key bus stops.

5. In town and village centres, development will be permitted which appropriately provides for improved footways and cycle routes, cycle parking, and measures to restrict the impact of heavy goods vehicles and other traffic on historic streets.

6. Development proposals for powered aircraft landing or operation sites, or the expansion or intensification of such uses, will be refused. If exceptional circumstances exist which indicate that such development proposals are necessary, these will only be permitted where the impacts on both the special qualities, and on local amenity, can be fully mitigated.



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LEGEND

- Modelled Receptor
- Ashdown Forest Special Area of Conservation (SAC)

Purpose of Issue
FINAL

Client
SOUTH DOWNS NATIONAL PARK AUTHORITY AND LEWES DISTRICT COUNCIL

Project Title
AIR QUALITY ASSESSMENT FOR ASHDOWN FOREST SAC

Drawing Title
LOCATIONS OF MODELLED TRANSECTS

Drawn	Checked	Approved	Date
CN	JW	JR	13/09/2017

AECOM Internal Project No.	Scale @ A3
60470147	1:27,500

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Drawing Number: FIGURE 1
Rev: 01

File Name: I:\5004 - Information Systems\60470147_Ashdown_Forest\02_Maps\Figure 1 - Location of Modelled Transects.mxd

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