EPPING FOREST DISTRICT COUNCIL: Examination of the District Local Plan, 2011 – 2033.

Natural England's response to the Inspector's questions on Issue 5 within Matter 1 (Legal Compliance): ***Have the requirements of the Conservation of Habitats and Species Regulations 2017 been met?***

1. The Inspector circulated an agenda and set of questions for the hearing on Tuesday 21 May 2019. This paper summarises Natural England's advice on these questions, in the interests of focusing discussion.

1. Overview of the Habitats Regulations Assessment January 2019; and Update on the Mitigation Strategy.

HRA methodology – general issues inc. whether AAs must rule out all reasonable scientific doubt as to the effects of the plan on the relevant sites. If so, do they?

2. Case law including Waddenzee has established that AA must rule out all reasonable scientific doubt. This has been confirmed by the CJEU Judgments (Cases C-293/17 and C-294/17 Coöperatie Mobilisation for the Environment UA and Others v College van gedeputeerde staten van Limburg and Others, referred to as the "Dutch nitrogen cases")

3. Natural England currently considers that there is significant uncertainty relating to the conclusion for the reasons stated under 'current position' (see below).

4. We also have outstanding concerns relating to the mitigation strategy for recreational pressure (see below).

Summary of key findings in relation to each protected site.
Overview/status of the Interim Mitigation Strategy and emerging long term mitigation strategy in relation to recreational pressure and air quality.

5. Natural England has not seen a full mitigation strategy for air quality but understands that mitigation measures will be based on policies relating to modal shift and air quality the outcomes of which we consider uncertain and unquantifiable.

6. An interim strategy for mitigation of recreational pressure has been prepared. Natural England agrees that the SAMMs are appropriate but there is currently insufficient evidence of consideration of SANGs requirements. No details have been provided on location, size, quality required for SANGs and there is currently insufficient details on how these are to be funded and delivered

Has the Plan been reviewed in light of the findings of the updated HRA? If not, is this necessary to ensure that the HRA has informed the Plan?

7. There is currently insufficient policy commitment to mitigation strategies for recreational pressure and air quality.

8. HRA findings should in theory have been used to inform the development of the plan. Given that the final version of the HRA was submitted during the examination period opportunities for avoidance may have been missed.

9. No timetable for delivery of these strategies has currently been secured.

Has the Plan sought to avoid harm as a 'first step' before moving to consider mitigation?

10. Natural England advises that the provision of SANGs could be regarded as avoidance and could therefore be considered the first step on the mitigation hierarchy. This should therefore have been have been given priority before progressing to SAMMs. There is insufficient evidence of consideration of SANGs at this point.

11. Natural England consider that at this point there is insufficient evidence of consideration of avoidance measures in relation to air quality. EFDC should have first sought measures which seek to reduce vehicle movements through the forest, for example traffic management measures or the provision of alternative routes or modes of transport. There is currently limited evidence of this within the documents provided.

12. Findings of the HRA could have been used to inform site selection or other mitigation options had the AA been completed earlier in the process.

Current position of Natural England and the Conservators of Epping Forest.

13. To date insufficient information has been provided to enable Natural England to discount an adverse effects through air quality. This is because in Natural England's view:

    i. The extent to which autonomous measures (Improvements in baseline nitrogen deposition that are not attributable to the plan in question) can be taken into account in an Appropriate Assessment.
    ii. The certainty needed for mitigation measures relied on in the HRA.
    iii. Authorising new plans which may adversely affect the ecological situation where a European site is already in unfavourable conservation status.

14. To date insufficient information has been provided to enable Natural England to discount an adverse effects through recreational pressure. This is because in Natural England's view:

    i. There is currently insufficient policy commitment to the production of a SAMMs and a SANGs strategy
    ii. There is currently no timeframe agreed in policy as to when these strategies will be completed
    iii. There is insufficient information provided on the location, size and quality of Strategic SANG provision
    iv. There is currently insufficient details and policy commitment as to how SANGS will be delivered on site for the strategic allocations in terms of amount and quality.

15. It is unclear from the documentation provided why a 400m HRA consultation zone has been identified to address Urbanisation effects

2. Consideration of each pathway of impact.
Recreational Activity/Urbanisation

Lee Valley SAC/Ramsar Site, inc. overview of findings:

What is the Zone of Influence (ZOI)?

16. Natural England is unaware of any ZOI having been identified for Lee Valley SAC/Ramsar either for recreational pressure or urbanisation however Natural England's Impact Risk Zones can be used as an indication of distances at which we expect an impact might normally occur. For example Turnford and Cheshunt Pits SSSI (a constituent part of the Lee Valley SPA and Ramsar) identifies a buffer of 2000 metres within which development of more than 50 houses would require further assessment.

17. Whilst all designated sites with public access ultimately have the potential to be impacted by increased recreation, the Lee Valley SPA/Ramsar is considered to have greater resilience to recreational pressure than, for example, Epping Forest partly due to its relatively modern creation, design and continuing management by the Lee Valley Regional Park Authority. In the absence of significant evidence of general concerns relating to the management of recreational pressure at Lee Valley SPA/Ramsar, Natural England is content to deal with applications on a case by case basis in the light of the best available and most recent information.

Does AA indicate that there would not be a significant adverse effect even in the absence of mitigation? If so, is it justified to require the relevant developments to comply with Policy DM2?

18. Whilst Natural England currently agrees with the conclusion of the AA in relation to recreational impacts on the Lee Valley SPA/Ramsar, given the duration of the plan and the growth levels proposed in EFDC and adjoining authorities there is a need to monitor the condition of the site. It is therefore important to have appropriate hooks within the plan should significant deterioration of the designated site be identified.

Does the plan identify the relevant sites/areas which must comply?

19. As above. Natural England has not identified any specific impacts on the Lee Valley SPA/Ramsar and is content to deal with applications on a case by case basis in the light of the best available and most resent evidence.

Wormley Hoddesdonpark Woods SAC, inc. overview of findings:
Is mitigation required to avoid an adverse effect? Is it necessary to identify a specific ZOI?

20. Natural England does not dispute the findings of the HRA in this regard

Epping Forest SAC, inc. overview of findings:
Explain ZOI of 6.2km and relevance of 3km distance.

21. The 6.2km ZOI represents the distance from which 75% of visitors to Epping Forest are drawn as identified in submitted evidence document EB715. The method used for identifying this as the ZOI is in accordance with standard/best practice and underpins mitigation strategies for many other internationally important designated sites.

22. The 6.2km ZOI was identified based on the visitor data gathered in October/November and there is a need for further survey work to be carried out this summer which may result in the ZOI being refined

23. The 3km ZOI represents the distance from which Epping Forest intend to gather payments towards SAMMs. As an organisation Natural England does not consider financial matters to be within its remit as long as mitigation offsets the total quanta of housing within the ZOI and is both deliverable and effective.

What are the access management arrangements to which sites within 3km of the SAC should contribute? Will these avoid adverse effects?

24. Mitigation measures contain various measures intended to improve resilience for the SAC; increasing visitor capacity while reducing damage. This includes a list of costed Site Access Management Measures for the whole SAC and includes traffic control, car impact reduction measures and monitoring, improving resilience and reducing damage at key visitor hubs (High Beach and Honey Lane), footpath management, improved signage and interpretation, visitor engagement campaigns, delivery project officer, additional visitor surveys and monitoring.

25. Natural England considers that regardless of management Epping Forest SAC will have a finite carrying capacity and has previously advised that there is a need for a strategy covering both SAMMs and SANGs.

26. At the Local Plan Examination hearing covering Matter 16 Policy DM5 (Green and Blue Infrastructure) the LPA committed to producing a Green Infrastructure Strategy which will include a SANGS element. No timeframe has been identified for the completion of this GI Strategy.

It is recommended that sites of over 400 dwellings within 3-6.2km of the SAC should either provide their own SANG or contribute to the provision of large SANGs. Does this apply only to SP5.1, SP5.2, EPPR1/R2 and NWB.R3 at present? Are the necessary policy requirements in place to secure them and can they be physically provided? Should sites of 100+ houses be expected to provide onsite open space?

27. Natural England considers that sufficient SANGs should be provided for the full quantity of development in the Zone of Influence proposed in the plan as identified in a mitigation strategy. EFDC will have some discretion as to how contributions to large SANGs are collected but we would also expect to see larger sites (certainly those over 100 houses) seek to deliver at least basic recreational needs within the footprint of their development in addition to supporting the delivery of a strategic approach which seeks to minimise increases in recreational visits to the forest as a result of new development.

If off-site strategic SANGs are required, where and how will they be delivered?

28. Natural England has not been provided with sufficient information to be able to respond to this question except to say that we consider a combination of SAMMs and SANGs are likely to be required to address impacts on Epping Forest SAC.

Effects of sites LOU.R5 (Jessel Green) and CHIG.R6 (Limes Estate) within 3km of SAC. Does the HRA support the allocation of these sites? Is specific mitigation required?

29. Natural England recognises that development closest to Epping Forest SAC has the potential to be more damaging alone than development outside of the 3km zone.

However, the impact identified is 'in combination' and as yet we do not consider that a comprehensive strategy has been put forward for dealing with development anywhere within the identified ZOI. We cannot therefore comment further at this time.

What is the role of the Interim/Final Mitigation Strategy?

30. Natural England considers that it may be appropriate to utilise an interim mitigation strategy to allow development applications to meet the basic requirements of HRA and proceed without hampering progression towards long term objectives. A final mitigation strategy should set out a more complete strategic approach for mitigation for the full allocation of development within the ZOI and this should be in place by the time of the local plan's adoption.

Having regard to Tables 5 & 6 in the HRA, and to table 1 of Natural England's Statement (page 10), are there settlements in the District in which development could take place without causing recreational pressure on the SAC?

31. Development outside of an identified zone of influence could be considered unlikely to impact on the SAC (noting that further survey work is required). Any additional allocations would need to be subject to their own HRA and environmental assessments.

2. Consideration of each pathway of impact.

Atmospheric Pollution

Is Epping Forest SAC the only one of the relevant protected sites vulnerable to a likely significant effect? Is this because the other sites are not threatened by this pathway, meaning AA is not necessary?

32. Yes. The risk of Air Pollution to other European Sites was screened within the Local Plan HRA with reference to the DMRB guidance HA 207/07. The HRA identifies that the Local Plan is likely to have a significant effect, alone and/or in combination on Epping Forest SAC and on no other European Site. Natural England accepts this conclusion.

Assessment of likely effects of NOx and ammonia, inc. methodological issues; the relevant development scenarios (DS2-DS5); and confidence in findings.

33. An appropriate assessment "cannot have lacunae and must contain complete, precise and definitive findings and conclusions capable of removing all reasonable scientific doubt as to the effects of the works proposed on the protected site concerned", in order for the plan to be adopted without relying on article 6(4) of the Habitats Directive.

34. According to the Advocate General of the CJEU in the *Sweetman* case the question to be addressed by an appropriate assessment is as follows *'what will happen to the site if this plan or project goes ahead; and is that consistent with "maintaining or restoring the favourable conservation status" of the habitats or species concerned?'*. The corresponding Court judgment explains that, in applying the integrity test, *'in order for the integrity of a site as a natural habitat not to be adversely affected…the site needs to be preserved at a favourable conservation status; this entails… the lasting preservation of the constitutive characteristics of the site concerned that are*

connected to the presence of a natural habitat type whose preservation was the objective justifying the designation of that site'. Taking account of the conclusions of the appropriate assessment for the site concerned, in light of the site's conservation objectives, a plan or project can be authorised only if the decision maker has made certain that it will not adversely affect the integrity of that site. That is the case where no reasonable scientific doubt remains as to the absence of such effects'. An appropriate assessment therefore requires the decision-maker to be informed on the basis of the best scientific evidence as to the likely nature, extent, gravity and duration or reversibility of any realistically possible harms, with particular regard to the nature and condition of the actual habitat and species present on the ground which could be affected, the site's condition and conservation status, and the conservation objectives. A judgment must then be made as to whether harm to the integrity of the site can be excluded.

35. The NOx figures provided in Appendix F to the HRA exceed the guideline critical levels, and the levels of exceedances are potentially of greater concern than suggested by the HRA. The critical levels appear to have been set having regard to appropriate evidence, including interactions between different pollutant gases. This is addressed in detail within the note from Dr Caroline Chapman e-mailed with header 'Epping Forest NOx issue Submission' by Aidan Lonergan at 15.20hours on 17/05/2019 and appendix to this document. The HRA made no habitat-specific assessment of the impacts that the modelled, predicted levels of NOx would have and no analysis of NO_x levels has been undertaken..

36. If adverse impacts on the integrity of the site could not be ruled out as a realistic possibility a priori, Natural England would expect to see an analysis as to how the levels of pollutants would impinge on the site in question. This might conveniently be presented by reference to a dispersion map showing current and forecast levels of pollutants across the protected site, which could be overlaid on or compared with a map showing the various habitats and features of sensitivity or significance within the SAC. No such analysis has been presented.

Have the impacts of ammonia been properly considered? Have the effects of increased concentrations been assessed?

37. The predicted ammonia emissions have been set out in Appendix F and Tables in sections 4.10 & 6.11 of the HRA. The assessment of impacts on SAC features have not been considered at a level of detail sufficient for Natural England to discount an adverse effect on integrity.

38. The HRA states at paragraph 4.12 that because air already exceeds the critical level for ammonia of 1 µg NH_3/ m^3 (annual mean), the additions contributed by the Local Plan will not cause an exceedance. However, what they will do is exacerbate the existing pollution levels which are already in exceedance. For instance, the table after paragraph 4.10 at page 114 predicts increases of between 2% and 21% above the critical level. Paragraph 4.13 therefore rightly notes, 'Since the 1% of the critical level threshold is exceed for both NOx and ammonia at the majority of receptors due to growth 'in combination', appropriate assessment is required'. Paragraph 6.14 is the only paragraph giving reasons for the conclusion in respect of ammonia. It is necessary to appraise the likely magnitude of effect that the predicted contribution from the Local Plan may have (in combination with the effects of other emissions) on important attributes of the SAC features, to enable us to advise whether the Local Plan has an

adverse effect on integrity. This more detailed approach aligns with the best practice proposed within NECR210 (Natural England 2016) for the assessment of incremental contributions of Total Nitrogen above Critical Loads. The HRA does not currently provide the necessary information within its assessment.

39. There are no metrics or details provided within the HRA to assess whether Local-Plan led development of agricultural land some distance north of the surveyed areas would contribute a measurable reduction in Ammonia (as suggested in paragraph 6.24 of the HRA), so this suggestion cannot be quantified or relied upon at this stage within our assessment.

Has nitrogen and ammonia deposition been underestimated by modelling for "short" vegetation rather than "forest" vegetation?

40. Yes, modelled deposition within the HRA will be under-estimated by use of the 'short' vegetation deposition velocity.

41. The use of the lower deposition velocities in the HRA align with standard practices of DMRB (2007) HA 207/07 for assessing the AQ effects of road traffic and consequently our initial assessment was based on these DS2 figures. However, they are likely to be under-estimates of a 'worst-case' scenario for DS2, if one undertakes a detailed assessment given that the habitat in question includes tall vegetation. Paragraph 3.32 of the DMRB advises:

    > 'A detailed assessment should be applied where there exists the potential to cause significant effects on environmental resources and receptors.'

    This would require increased deposition velocities that are habitat specific (e.g., figures from AQTAG06).

42. A brief summary assessment provided by AECOM to Natural England applies AQTAG woodland (forest) deposition velocities of 0.003m/s for Nitrogen deposition. With reference to this, Natural England agrees with the assertion by AECOM that changing the deposition velocity from those used in the HRA will act as an effective x3 conversion factor. The deposition effects from Plan-derived growth in road traffic will be increased threefold compared to those assumed in the HRA, but the benefits from mitigation measures taking vehicles off the road would (*if* these can be relied upon to materialise) also be correspondingly three times larger.

43. Whilst the conversion factor argument means that the overall *trends and patterns* in the modelling are unchanged, the magnitude of the unmitigated deposition and the sensitivity to assumptions increase by a factor of three. The modelled effects from growth, when compared to the existing background, will become more significant.

44. There remains confusion about how the baseline levels have been calculated but it appears that background nitrogen deposition is taken from APIS which will have been calculated taking account of the forest deposition velocities[1]. This is therefore a fixed background based on the high deposition velocities. The modelled 'road contribution' is then added to this background to generate the 'baseline value'. The relative proportion of a baseline figure which therefore comes from the road becomes more

[1] See: http://www.apis.ac.uk/popup/gridded-concentration-deposition-2015?sitecode=UK0012720&deptype=F&featurecode=H9120&accode=UMW

significant if the higher deposition velocities are applied. Likewise the actual reductions which 'mitigation' is anticipated to deliver also become greater.

45. Natural England have not received a full dataset and assessment with application of the AQTAG06 values for Total Nitrogen and Ammonia, but if these are supplied we would endeavour to fast-track our assessment. A quick analysis of the data we have indicates that if the higher 'forest' values were applied, the large-scale emissions would occur at significantly higher concentrations at the roadside for most sampled locations and also effect increased distances into the SAC woodland habitats (eg, over 70metres at location N; over 16m at location I and potentially over 20 metres at location C1).

Overview of the relevant development scenarios DS2-DS5:

§ Confirmation that the HRA is not recommending reliance upon mitigation measures at Wake Arms Roundabout, Robin Hood Roundabout or Honey Lane (DS23 and DS4)?

46. This is Natural England's understanding.

Are there any specific references in the plan to these schemes which require removal?

47. **Any reference to the above schemes will need to be removed from the Infrastructure delivery Plan** (References to the requirement of mitigation measures at Wake Arms Roundabout, Robin Hood Roundabout and Honey Lane are made in the Infrastructure Delivery Plan documents EB1100, EB1101A –Eii)

§ Why are the Honey Lane measures (in DS4) not recommended in addition to the measures considered under DS5?

48. The HRA advises for Scenario I within the Table of Section 2.21: '*There was a professional view that Honey Lane by itself would not achieve significant air quality benefits for the wider network*.' It is Natural England's understanding that this professional view was that of the consultants, possibly in discussion with the Local Planning Authority.

49. Consistent with this, Section 6.16 of the HRA advises: '*Honey Lane alone (DS4) would achieve considerable reductions in the nitrogen dose at modelled receptor transects B1, C1, C2, D2, P and (particularly) O, the latter of which represents a transect on Honey Lane itself. However, it would convey little to no benefit to the other modelled receptor transects*.'

50. Furthermore, Section 6.23 advises: '*Neither potential mitigation scenarios DS3 or DS4 are considered to provide a viable solution (with regard to Wake Arms Roundabout and Robin Hood Roundabout enhancements) or a sufficiently geographically extensive solution (for Honey Lane improvements on their own) to address the in combination effect that is otherwise forecast under scenario DS2 through nitrogen deposition*'.

51. For the avoidance of doubt, Natural England has not been presented with sufficient details of physical measures at Honey Lane to confirm whether any landtake involved

would impact directly onto SAC land, but we did advise that any encroachment towards the SAC may add additional impacts on the SAC (and SSSI) features that would need to be assessed within the HRA.

Explanation of 2030 vs 2023 emission factors used in DS5. Use of DEFRA Emission Factor Toolkit. Have any background benefits been double counted?

52. It is our understanding that each scenario which has been modelled has applied the following emission factors. This understanding is based on the explanation provided in bullet point 2 at para 2.38 and the years stated in the brackets after each scenario in Appendix F:

Scenario	***Defra emission factor***
A	2014
B	2023
C	2023
D	2023
E	2023
F	2023
G	2023
H	2023
I	2030

53. The assertion of double counting does not therefore appear to be substantiated as the scenarios simply apply a different emission factor to the vehicles which make up the traffic being modelled. The Emissions Factor Toolkit webpage explains the toolkit's purpose as follows:

> *'The EFT allows users to calculate road vehicle pollutant emission rates for NO_x, PM_{10}, $PM_{2.5}$ and CO_2 for a specified year, road type, vehicle speed and vehicle fleet composition'.*

54. Changing the emission factor simply tells the model what level of pollutant emission it should assume for each individual vehicle (taking account of different vehicle classes that make up the predicted traffic on the road in question).

Where is transect N? Why is this worst affected? Is any specific mitigation required?

55. With reference to HRA Appendix D Air Quality Modelling Technical Note Figure 2 and the Map on page 21 of the embedded Appendix B Air Quality Transect Locations, the Location N is located as shown on the Map attached in Annex 1 and locally known as High Beach area.

56. It is not clear to Natural England why the Local Plan generates such high traffic volume and emissions at this location, other than to suggest that the roads are close to the Robin Hood roundabout and the busy A104, and provide scenic cut-through links to the A121 (which connects to the M25 junction 26) and the Sewardstone Road A112 (which connects to other A roads leading to the M25 junction 25 etc).

57. The HRA indicates that the levels of nitrogen deposition, ammonia and NOx attributable to the Local Plan DS2 are large compared with the critical load and levels respectively, which has adverse effects on the SAC features as previously described. The habitat at location N is SAC woodland, notably including different age trees (including veterans), mosses and lichens, and character ground flora. Natural England is willing to consider different options for mitigation, including suitable traffic management measures and on-site mitigation at this location and other locations, within the SAC. These would need to avoid adverse impacts to the SAC features and be able to demonstrate an adequate scale of benefit to the features to address the predicted impacts.

Will the measures modelled in DS5 be effective in managing nitrogen loads so that the conclusion of no adverse effects is justified?

58. This is an important question which requires careful consideration. It will be a matter for the Inspector to determine whether such measures meet the certainty standard to allow them to be considered as 'mitigation measures' that can lawfully be relied on in an appropriate assessment.

59. It is apparent to Natural England that the DS5 scenario does not actually purport to model the 'measures' referred to in paragraph 6.18 of the HRA.

60. The way that scenario DS5 was specified is reported in the final row of the table on page 15 of the HRA.

> '*There are no specific emission factors available for the kind of non-road infrastructure interventions that are included within the Epping Forest Local Plan. However, since traffic on the modelled road links in this case is dominated by housing and employment in Epping Forest District* ***a reasonable outcome would be*** *for these interventions to result in total NOx concentrations (and thus nitrogen deposition rates) under Scenario DS2 that better reflected the Defra emission factors for 2030 than those for 2023 (which have been used to model unmitigated traffic growth).Essentially the 2030 emission factors are what Defra's analysis indicates should occur by 2030 without any need for local interventions at all*.' [embolden added].

61. At paragraph 6.8, AECOM state that the 2030 emission factors are used as "a proxy or sensitivity test" for mitigation in scenario DS5.

62. We infer that AECOM have simply run the model with DEFRA's predicted emissions factors for 2030. We would point out that this is merely claimed to be a "reasonable" possible outcome; it is not, and cannot fairly be claimed to be, a certain outcome. It is simply a prediction as to the future fleet composition 10 years hence, based upon assumptions about the vehicle market which may or may not eventuate.

63. Policies DM2.B, DM21 and DM22 are entirely generic and simply require projects to mitigate for air quality impacts, without requiring any specific measures that could be assessed or modelled. The concrete application of Policy T1, which sets out generally desirable transport policy objectives, is inherently unpredictable and difficult to model. Policy D5 simply encourages digital connectivity and the effects of this on air quality cannot be quantified or modelled either.

64. This raises concerns as to whether such measures relied upon for air pollution can, in fact, correctly be regarded as 'mitigation measures' within a HRA context. The recent case law of the European Court of Justice is clear that an appropriate assessment cannot rely on measures that cannot be quantified with certainty. Paragraph 130 of the Dutch nitrogen case[2] reads as follows (emphasis added):
    - *'The appropriate assessment of the implications of a plan or project of the sites concerned is not to take into account the future benefits of such 'measures' if those benefits are uncertain, inter alia because* ***the procedures needed to accomplish them have not yet been carried out or because the level of scientific knowledge does not allow them to be identified or quantified with certainty'****.*

65. It is not unreasonable to anticipate that the list of policies referred to in para 6.18 will *potentially* exert some influence over air pollution. Policies DM 2, DM21 and DM 22 are entirely generic statements of intent and therefore can reasonably be regarded as measures intended to avoid or reduce harmful effects but they cannot be regarded as 'mitigation measures' which can be taken into account for the purpose of an appropriate assessment, as they are entirely generic statements of intent and the parties agree that there is no available guidance or methodology explaining how the anticipated improvement might be quantified.

66. The Habitats Regulations Assessment Handbook[3] (which we understand PINS staff have organisational level access to) considers mitigation measures within the specific context of HRA at section C.5 'Mitigation Measures and the use of Conditions' and a list of principles are provided at C.5.1. These principles are all derived from authoritative guidance and case law; principles 5 and 6 read as follows:
    - *'5. To be taken fully into account, at the appropriate stages, all 'mitigation measures' should be effective, reliable, timely, guaranteed to be delivered and as long-term as they need to be to achieve their objectives.*
    - *6. Any doubts about the effectiveness, reliability, timing, delivery or duration of mitigation measures, should be addressed by the competent authority before relying on such measures when applying the integrity test.'*

67. With reference to the Handbook, Natural England would advise that there are also concerns in respect of whether the policies within the Local Plan referred to at para 6.18 can be regarded as effective or reliable. To satisfy the test of the Habitats Regulations it is necessary to ascertain that a proposed plan or project will have no adverse effect on the integrity of a European site, either alone or in combination with other plans and projects. Case law has established[4] that *'that is the case where no reasonable scientific doubt remains as to the absence of such effects'*. It is therefore necessary to consider whether the proposed measures *remove* the 'reasonable scientific doubt' as to the absence of adverse effects to site integrity which existed in their absence. Given that the effects of the measures referred to cannot be quantified

[2] Joined cases C-293/17 and C-294/17, *The Dutch Nitrogen Case*, 7th November 2018.
[3] See www.dtapublications.co.uk
[4] Case C-127/02 *Waddenzee*

with certainty, it logically follows that they cannot be relied upon to remove the reasonable scientific doubt that remained in their absence.

68. The HRA properly concluded on a precautionary basis not to rely on the 2030 emissions factors as a baseline when assessing the impacts of the Plan, because they were not certain to materialise (see paragraph 2.38). It would therefore follow that it is also unsafe to rely on them as standing in for 'mitigation', or making such mitigation redundant.

69. The 2030 Defra emission factors make no assumptions regarding the content of the Epping District Council Local Plan. Defra state:

> '*The Emissions Factors Toolkit (EFT) is published by Defra and the Devolved Administrations to assist local authorities in carrying out Review and Assessment of local air quality as part of their duties under the Environmental Act 1995* [sic]'.[5]

70. The Toolkit is not specifically designed for the purpose of informing 'appropriate assessments' under the Conservation of Habitats and Species Regulations 2017, and Natural England is not aware that Defra claim its emission factors are certain or guaranteed to materialise in the context of habitats case law .

71. Natural England recognises that the HRA argues that the policy measures *increase the likelihood* that emissions from traffic will, in fact, be closer to the Defra 2030 emission factors, but there would appear to be little confidence in this assertion. Firstly the emission factors apply to the entire fleet of vehicles modelled and only a very small proportion of such vehicles will come from development provided for by the current Local Plan. Secondly, the vague and generic nature of the measures do not provide sufficient confidence. By way of example, the Inspector will need to consider whether a requirement to install electric charging points will compel a resident to purchase an electric car. The cost of installation of such points is rarely a limiting factor for those wishing to purchase such vehicles when seen in light of the overall increased purchase costs. Indeed, the government currently operates the Electric Vehicle Homecharge Scheme which provides grant funding for up to 75% of the cost of installing such charging points at domestic properties.[6] It will also not address increased traffic arising from visits to and from new premises (including deliveries) from vehicles kept elsewhere.

72. Taking into account the requirement for certainty and need to be able to quantify properly any predicted improvements, the Inspector will need to form her own view on whether the measures listed at para 6.18 shouldbe formally counted as mitigation measures in respect of associated effects from air pollution.

---

[5] https://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html

[6] See: https://www.gov.uk/government/collections/government-grants-for-low-emission-vehicles

73. Natural England consider that it would be unrealistic to assume no reductions at all in future vehicular emissions over the life of the Plan, as this fails to take account of actual evidence of improving trends. The uncertainty comes with predicting the rate of improvements and the extent to which initiatives to *encourage* a shift to lower emission vehicles will, in reality, influence changes in the vehicle fleet. This will, in turn, depend on the rate of 'take-up' by members of the public and the speed with which Government initiatives come into force, which is very difficult to predict. Given the relative large contribution from road source emissions in this particular case, Natural England advises applying a significant 'safety factor' to long-range projections to allow for such uncertainties. **Natural England considers it suitably precautionary, in this particular case, when predicting traffic emissions to 2033 to apply the Defra emission factors for 2023**, recognising that the emission factor toolkit is not intended to be used 'with certainty'.

74. There is, again, an important point of principle here, which bears careful consideration. What has happened in this instance is that the Council has undertaken an appropriate assessment under the Habitats Regulations. Adopting a precautionary approach, as required by the Regulations, the Council has not been able to ascertain no adverse effect to site integrity. In seeking to address this, they have not been able to identify measures which can be relied upon to reduce emissions, as the level of scientific knowledge does not allow the benefits from the identified 'measures' to be quantified with certainty. Instead, in the absence of any 'change' to the plan *per se*, they have simply changed the premise of the appropriate assessment such that it has become *less* precautionary. This cannot be a correct approach to the interpretation and application of the Habitats Regulations as it undermines the role and purpose of 'mitigation measures' and also implicitly allows a relaxing of the level of precaution required at an appropriate assessment as revisited *after* 'mitigation' when compared to how the assessment was approached in the first instance. It is therefore the view of Natural England that there is a circularity to the arguments put forward within the HRA.

Can a conclusion of no adverse effects be reached if reduction in exceedances is delayed by development proposed in the plan? How long will the delays in reaching the critical level be and what will be the effects upon the integrity of the SAC?

75. **The potential for delays in achieving the critical level for NO_x have not been analysed or presented. Natural England cannot therefore comment on delays in reaching the critical level from NO_x and what effects upon the integrity of the SAC might be.** Delays in achieving the critical load for Nitrogen deposition have been estimated within the HRA (Section 6.9 and 6.10). However,
    - the HRA does not present the years when it predicts that the critical load will in fact be achieved at each geographical point;
    - The HRA compares modelled improvements in 'baseline' deposition with average improvements according to APIS of 0.4kg/ha/yr. These modelled APIS improvement trend relates to oxidised nitrogen deposition but the reduced nitrogen deposition does not show a corresponding improving trend. The overall nitrogen

deposition trend from APIS shows only marginal improvements between 2005 and 2012 and an overall declining trend from 2012.

- there are ongoing uncertainties in how the 'baseline' values have been calculated with corresponding uncertainties associated with making predictions about background and Plan-derived emissions into the longer-term (see above);
- the HRA provides no detailed ecological consideration of the effects of Ammonia; and no mapped extent of the SAC areas affected;
- nitrogen deposition is a cumulative process such that reducing additional deposition will not remove the stock of deposited nitrogen in the ecosystem.

76. This means there remains reasonable doubt about the duration of the delay to achieving the critical loads and levels, and the scale and duration of the effects on SAC features.

77. The HRA cannot discount that the DS2 scenario will have an adverse effect on the integrity for Nitrogen deposition without mitigation (Section 6.10), and as set out above, the effect of mitigation measures cannot be quantified with certainty.

78. When considering the description of site integrity by European Commission (2000), it is noteworthy that the delay:

    - would be contrary to the SAC's conservation objective (see http://publications.naturalengland.org.uk/publication/5908284745711616) to achieve the Critical Load for Nitrogen deposition and Critical Levels for Ammonia and NOx;
    - will continue to contribute excess nitrogen, which is likely to be detrimental to soil condition and vulnerable SAC habitat features, with adverse implications for their self-repair, restoration and regeneration;
    - would be contrary to, and either delay or compromise the outcomes of a number of conservation management activities (listed within Annex 1 of our Matter 5 Issue 1 document) being undertaken to address 'Restore' targets of the Conservation Objectives for the SAC habitats and composite features.

Is Natural England/Conservators advocating additional measures to reduce any delays?

79. Despite the endeavours by all parties it has not been possible for Natural England to establish the scale of effects with adequate certainty, or the scale of mitigation necessary to ensure an adverse effect on integrity can be avoided. Natural England is willing to consider additional measures for mitigation, including suitable traffic management measures and on-site mitigation within the SAC. These would need to avoid adverse impacts to the SAC features (e.g. not adding to Local Plan impacts identified and ensuring compliance with the *Briels* Judgment[7]), and be able to demonstrate an adequate scale of benefit to the features to address the likely scale of impacts anticipated.

[7] Case C-521/12 reference for a preliminary ruling, 15th May 2014.

80. Natural England advises in HRGN6 (June 2018) that Mitigation measures, whether voluntarily incorporated or formally imposed, must be able to be relied upon to avoid adverse effects on site integrity over the full lifetime of the plan or project. The appropriate assessment should be able to demonstrate that such measures are known to be effective, reliable, timely, guaranteed and of sufficient duration. As a result, the inclusion of such measures should be supported by evidence and confidence that they will be effective and that they can be legally enforced to ensure they are strictly implemented by the plan/project proposer.

81. For each mitigation measure (and for any overall package of measures) the competent authority should understand and show:

    (a) what the measure is, and how it would avoid or reduce harmful effects on the site (considering the predicted duration of the effects)

    (b) how it would be implemented, and by whom

    (c) the degree of confidence in its likely success over time

    (d) the timescale of when it would be implemented, maintained and managed

    (e) how the measure(s) would be secured, monitored and enforced; and,

    (f) if the measure(s) failed, how the failure would be rectified

82. Mitigation measures could include specified limitations to the timing, extent, duration of different elements proposed as part of the plan which would avoid any foreseeable risks.

83. For example, in the mid- to longer-term there is a need to consider different options for traffic flow on key roads adjacent to the SAC. However, the knock-on traffic and air quality implications are likely to be complex and require separate assessment. Consistent with this, there may be options that emerge that would be best explored as part of an updated Epping Forest Transport Strategy, involving City of London, Epping Forest DC, Essex CC Highways in consultation as necessary with Natural England. This would require a suitable strategic framework aiming to reduce traffic and AQ emissions through Epping Forest to achieve adequate scales of improvement.

84. In the short term, there might be scope for on-site mitigation that would reduce the susceptibility of the SAC features to the impacts of AQ emissions, thereby increasing resilience but these would require careful consideration and would need to comply with the specifics of the Habitats Regulations:

85. To be relied upon under article 6(3) of the Habitats Directive, any such management or restoration measures would have to amount to avoidance or mitigation measures which avoided or reduced harms from the Plan arising, rather than measures compensating for damage to the habitats concerned which would still occur.[8]

Implications of the "Dutch nitrogen cases".

[8] Case C-164/17, *Grace and Sweetman v An Bord Peanala* , judgment at [44]-[51].

86. Natural England cannot provide legal advice to be relied upon by the competent authority. The competent authority may wish to seek its own legal advice on the implications of this latest judgment.

87. In Natural England's view, the Dutch nitrogen case[9] does not set a new standard of protection for European sites compared to previous case law. It does, however, provide an illustration of how the Court of Justice of the EU expects the Habitats Directive to be applied in connection with nitrogen pollution.

88. .The case mainly concerned agricultural ammonia pollution. The Dutch authorities had taken a strategic approach whereby they identified the levels for nitrogen deposition below which adverse effects could be ruled out, developed a plan to reduce background levels to below these and then used some of the 'headroom' to authorise projects that would deposit lower levels of nitrogen. Advocate-General Kokott considered that 'it is not sufficient, for the purposes of approval of additional nitrogen deposition,' if deposition declines overall, but the land in question is still overloaded with nitrogen'.[10]

89. The Court clarified that, in principle, such a strategic approach to tackling sources of pollution can be compatible with the Directive, but only 'insofar as a thorough and in-depth examination of the scientific soundness of [the appropriate assessment] makes it possible to ensure that there is no reasonable scientific doubt as to the absence of adverse effects of each plan or project on the integrity of the site concerned' (see [110] and operative part after [138], item 3).

90. The Court reiterated (at [93]) that, 'Having regard to the precautionary principle, where a plan or project not directly connected with or necessary to the management of a site may undermine the site's conservation objectives, it must be considered likely to have a significant effect on that site. The assessment of…risk must be made in the light inter alia of the characteristics and specific environmental conditions of the site concerned by such a plan'. At [98] it reiterated that an appropriate assessment 'cannot have lacunae and must contain complete, precise and definitive findings and conclusions capable of removing all reasonable scientific doubt as to the effects of the plans or the projects proposed on the protected site concerned'.

91. It ruled (item 6) that: ' "appropriate assessment" … may not take into account the existence of "conservation measures"…, "preventive measures", measures specifically adopted for a programme such as that at issue in the main proceedings or "autonomous" measures, in so far as those measures are not part of that programme, if the expected benefits of those measures are not certain at the time of that

---

[9] Joined Cases C-293/17 and C-294/17 *Coöperatie Mobilisation for the Environment UA and Others v College van gedeputeerde staten van Limburg and College van gedeputeerde staten van Gelderland*, and *G.H. Wildenbeest and Others v College van gedeputeerde staten van Brabant*.

[10] See Opinion dated 25 July 2018 at [AG79-AG80] and [AG98] and judgment at [31], [105].[111] and [124].

assessment.' It held (at [130]): 'The appropriate assessment of the implications of a plan or project for the sites concerned is not to take into account the future benefits of such "measures" if those benefits are uncertain, inter alia because the procedures needed to accomplish them have not yet been carried out or because the level of scientific knowledge does not allow them to be identified or quantified with certainty.' Furthermore, potential adverse effects of such measures must be assessed as well as the anticipated benefits ([131]).

92. It further ruled that positive effects of necessary conservation measures, management plans or measures to avoid deterioration habitats under article 6 (1) and (2) could not be relied upon in order to authorise projects that have an adverse effect on the site (at [124]).

93. In relation to site restoration measures, it re-emphasised the distinction in previous case-law between avoidance and mitigation measures on the one hand, and compensatory measures on the other (at [125]) and ruled: 'it is only when it is sufficiently certain that a measure will make an effective contribution to avoiding harm to the integrity of the site concerned, by guaranteeing beyond all reasonable doubt that the plan or project at issue will not adversely affect the integrity of that site, that such a measure may be taken into consideration in the 'appropriate assessment' within the meaning of Article 6(3)'.

94. The Court also recognised that, where the conservation status of a habitat type is already 'unfavourable', the possibility of authorising activities which add further nitrogen loading seems '*necessarily limited*' (at [103]). This was because 'it should be noted that under Article 1(e) of the Habitats Directive, the conservation status of a natural habitat is considered to be 'favourable' when, inter alia, its natural range and the areas it covers within that range are stable or increasing and the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future.'

95. On the facts of our case, the habitat is judged to be in an unfavourable condition and critical levels and loads would be exceeded. In Natural England's view the appropriate assessment contains gaps and does not exclude adverse impacts beyond reasonable scientific doubt, which must therefore be assumed to be likely to occur. It predicts a worsening of NOx, ammonia and nitrogen deposition in the absence of mitigation. The Inspector will need to consider whether the anticipated benefits of autonomous measures (predicted falling baseline trend) and avoidance and mitigation measures (plan policies) are uncertain to materialise and can be quantified with certainty, such that they can be safely relied upon.

Does the plan include adequate safeguards against permitting development which could cause harm?

96. There are no specific quantifiable safeguards in the plan that can be relied upon to avoid the realistic risk of harm beyond reasonable scientific doubt.

97. In the first place, it is unclear given the absence of 'contour'-type emissions dispersal and deposition maps or detailed habitat-specific assessment of the combined impacts of the various pollutant gases (combined with recreational and urbanising pressures), to ascertain the extent and gravity of realistic 'worst-case' effects so as to determine the minimum necessary mitigation or avoidance measures that might be put into place.

98. Secondly, there is no detailed air quality mitigation strategy before the Examination. This might include traffic control or road diversion measures, phasing conditional upon particular steps being taken or air quality benchmarks achieved, and/or policy requirements ensuring in a certain and enforceable manner that development did not materially increase vehicular emissions.

Role of Plan policies and Mitigation Strategy in delivering requisite mitigation.

99. Natural England has previously advised that it considers that policy T1 and DM 22 may not be wholly effective in providing the mitigation identified in the AA as being required. The measures proposed in Policies T1 and DM22 include the introduction of electric vehicle charging points in new developments, promoting sustainable transport choice, revised stringent parking standards, public transport improvements, and promotion of high speed broadband. Whilst these are measures that may make some contribution to reducing background nitrogen loads, there is no supporting evidence provided as to their efficacy or certainty as to their delivery.

3. Overall Conclusions/Implications

Confidence that the Plan and/or Mitigation Strategy provide an appropriate framework for securing the requisite mitigation to support planned growth.

100. Natural England advise that at present there is insufficient certainty that the mitigation required has been adequately identified and that it is secured through plan policy.

Do the findings of the HRA indicate a "ceiling" upon the amount of residential or employment development that can be accommodated in the District?

101. Natural England is committed to the principle of mitigation in relation to recreational pressure. Natural England is committed to the principle of avoidance and mitigation measures in relation to the impacts of air quality and recreational pressure

If the District could potentially accommodate more development, are there particular settlements which are more or less sensitive from an HRA perspective?

102. Locating development allocations outside of any identified ZOI (which may be subject to change pending further visitor surveys) could be considered as an avoidance measure with respect to recreational pressure. In terms of air quality impacts it is the in-combination effect of development on Epping forest SAC which is the issue, and in our view further modelling would be required to determine which settlements, if any, could contribute towards fewer vehicle movements through the forest.

Appendix 1 – Email document sent Fri 17/05/2019 15:20 by Aidan Lonergan

Q Assessment of likely effects of NOx and ammonia, including methodological issues; the relevant development scenarios (DS2-DS5); and confidence in findings.

1. This response has largely been drafted by Dr Caroline Chapman, Director of DTA Ecology Ltd and co-Director of DTA Publications Ltd. Dr Chapman is a specialist in the interpretation and application of the Habitats Regulations and is co-author of *The Habitats Regulations Assessment Handbook*. Subscribers to the Handbook include Governments in England, Wales, and Northern Ireland; Natural England; The Environment Agency; Natural Resources Wales; The Planning Inspectorate; the Marine Management Organisation; all Welsh Planning Authorities and numerous authorities in England together with a growing list of lawyers, consultants, NGOs and practitioners.

2. Dr Chapman was previously the National Specialist for Air Pollution for Natural England and frequently advises on issues relating to the interface between air pollution impacts and the application of the Habitats Regulations. She sat on the first Air Quality Technical Advisory Group (AQTAG) and the Steering Group for the development of the widely used Air Pollution Information System.

Issue of potential concern relating to the assessment of NO_x

3. Paragraphs 2.28-2.29 of the HRA explain that there are two measures of particular relevance to air quality impacts from road emissions. The first is the concentration of NO_x in the atmosphere, and the second is the rate of resulting nitrogen deposition.

4. The appropriate assessment explains at para 6.4 that direct effects of NO_x may arise other than through its role as a contributor to overall nitrogen deposition but then asserts that *'the experimental studies that have investigated such physiological and biochemical effects of NO_x have used doses far in excess of those measures or forecast in Epping Forest'*. It states, '*the critical level for NOx is set as low as 30ug/m^3 largely because this is the concentration above which the nitrogen-mediated growth effects of the gas are known to occur*'. On this basis the appropriate assessment proceeds on the basis that the main effect mechanisms are nitrogen deposition and gaseous ammonia, and fails to further address NO_x. Para 6.5 states, *'Focusing on nitrogen deposition rates in ecological interpretation, rather than relying on scrutiny of NOx concentrations in atmosphere has the advantage of being habitat specific and more directly relatable to effects on vegetation… the critical level for NOx is entirely generic; in reality different habitats have varying tolerance to nitrogen… The rest of this analysis therefore focuses on nitrogen deposition and ammonia'*.

5. Until recently Natural England accepted these assertions at face value. Whilst we have raised the issue of high NO_x concentrations before, we did not pursue the lack of further, habitat-specific assessment of the impact of NO_x emissions in the document as a primary issue.

6. However, we have recently had cause to scrutinise the Appendix F air quality monitoring results in more detail and the NOx concentrations are potentially of greater concern than suggested by paragraph 6.4-6.5.

7. For many transects the 2014 concentrations show significant exceedances of the critical level. Of the 19 transects for which data is presented the critical level for NOx (30ug/m^3) is exceeded along the entire transect (up to a distance of 200m from the road edge) for seven: B1, B2, C1, D1, E2, O and P. The 2017 modelling results show some improvement from 2014 levels but, even by 2017, estimated levels at the roadside significantly exceeded the critical level (being in excess of 140ug/m^3 on two transects). Table 1 below summarises the distance from the road within which the critical level for NOx is exceeded for each transect, based on 2017 modelled data.

Table 1: Distances from roads in exceedance of the critical level of NO_x and maximum concentrations (model for year 2017)

Transect	Exceeded (m)	Max (ug/m^3)	Transect	Exceeded (m)	Max (ug/m^3)
A1	70	58.13	H	15	51.18
A2	60	66.86	I	61	94.63
B1	200	73.81	J	0	31.77
B2	30	51.61	K	15	49.48
C1	200	142.13	L	N/A	26.00
C2	30	79.25	M	N/A	24.25
D1	30	59.62	N	N/A	28.96
D2	60	65.99	O	127.5	94.65
E1	60	76.40	P	200	146.56
E2	100	106.63			

8. The scale and extent of the exceedance are potentially of concern and call into question whether excluding further analysis of NO_x as part of the appropriate assessment can, in fact, be justified?

9. Whilst these levels reflect historic pollution, the DS2 scenario (with growth - unmitigated) still shows a clear picture of continued exceedances of the critical level beyond the road verge as summarised in table 2:

Table 2: Distances from roads in exceedance of the critical level of NO_x and maximum concentrations (model for year 2033, DS2 with-growth, unmitigated)

Transect	Exceeded (m)	Max (ug/m^3)	Transect	Exceeded (m)	Max (ug/m^3)
A1	20	52.57	H	5	44.45
A2	20	48.94	I	31	79.48
B1	30	66.21	J	N/A	24.53
B2	10	50.18	K	5	49.07
C1	80	119.51	L	N/A	29.28
C2	10	65.98	M	N/A	22.85
D1	10	62.02	N	20	41.86
D2	20	64.22	O	82.5	97.19
E1	10	52.85	P	101	109.12
E2	30	73.39			

11. Natural England also note that the scenario DS5 (mitigated) still shows exceedance of critical levels for NO_x at 43 transect locations across the forest. Exceedances in the mitigated scenario extend to 40m at transect C1, 20m at transect I, 42.5m at transect O and 61m at transect P. Natural England have therefore considered the argument that it was warranted to dispense with

further analysis of NO_x concentrations in more detail, and present the following observations below

Key contextual information:

12. Epping Forest is unusual when compared with the SAC series as a whole that form part of the Natura 2000 network in England. Generally speaking, averaged NOx concentrations (across modelled grid squares) rarely exceed the critical level and exceedance are usually only apparent within close proximity to a road. However, at Epping Forest SAC the averaged NO_x concentrations exceed the critical level across many of the grid squares that cover the area of the SAC. This provides some explanation as to why the concentrations adjacent to the road are so high within the forest itself. The relevant data is available from the Air Pollution Information System and is reproduced as Appendix 1: http://www.apis.ac.uk/popup/gridded-concentration-deposition-2015?sitecode=UK0012720&deptype=F&featurecode=H9120&accode=UMW

13. By way of comparison, the gridded concentration data for Ashdown Forest (which has been the subject to intense scrutiny and legal challenge in respect of air pollution) show no grid squares where averaged concentrations exceed the critical level for NOx. See web link information which is reproduced as appendix 2: http://www.apis.ac.uk/popup/gridded-concentration-deposition-2015?sitecode=UK0030080&deptype=M&featurecode=H4030&accode=CA

14. Accordingly, Epping Forest is considered to be a high risk site in respect to potential effects from *concentrations* of NO_x as existing averaged levels are already high.

Evidence basis for the critical level (set at 30ug/m^3)

15. The HRA asserts that direct effects from NO_x are observed from '*doses far in excess of those measured or forecast in Epping Forest (hundreds, and in some cases thousands of ug/m^3)'.* There are indeed studies which identify direct effects at these levels, as referenced within the HRA. However, the Air Pollution Information System website includes a page summarising the effects and implications of nitrogen oxides on woodland habitats which is available here: http://www.apis.ac.uk/nitrogen-oxides-broadleaved-mixed-and-yew-woodland

16. Whilst this page notes that visible decline symptoms can occur at very high concentrations (>400ug/m^3), it also notes that 'e*ffects are mainly on growth, photosynthesis and nitrogen assimilation/metabolism with few species showing visible injury'*, and that they can lead to reductions in species diversity through direct damage to mosses, liverworts and lichens. It notes, '*Davies et al (2007) found a significant inverse relationship between the diversity of epiphytes and NOx concentrations in London. Diversity declined where NOx exceeded 70 µgm-3 and NO2 exceeded 40 µgm-3'*.

17. Importantly this APIS webpage also notes that *'Nitrogen oxides are known to have greater adverse effects in the presence of SO_2 or O_3 and hence the critical level should apply where these pollutants are also close to their critical level.'* The APIS guidance there also notes that the evidence for the critical level is 'quite reliable'.

18. This suggestion that the NO_x critical level takes account of the combined effects with other pollutants echoes earlier guidance published by the WHO in the 2nd Edition of their *Air Quality Guidelines for Europe'.* These were published in the year 2000 and so pre-date the study by *Davies et al* cited by APIS. There are two versions available of this document which have been

referred to as the 'short' and 'long' version. The 'short' version[11] appears to be the Expert Group report whilst the 'long' version[12] is a background document prepared in advance to inform the Expert Group discussions. The long version is therefore most useful in understanding how the WHO guideline critical level was set and provides a table (ch.11, p.8, Table 2) showing the lowest exposure concentrations at which nitrogen dioxide - NO_2 - caused significant effects in the underlying research they consider:

Table 2: Lowest exposure concentrations (in µg/m³) and durations at which NO_2 caused significant effects*

Exposure duration	Effect		
	(Bio)chemical	Physiological	Growth aspects
Long-term		128; 8 months[9]	85; 7 months[17] 120; 5 months[18] 122; 37 weeks[19]
Growing season or winter	50; 39 days[1] 125; 140 days[2] 940; 19 days[3]	120; 22 days[10] 190 (65); 105 hours in 15 days[11]	10–43; 130 days[20] 55–75; 62 days[21] 150–190 (28–33); 120 hours in 40 days[22]
Air pollution episodes	140; 1 day[4] 95; 7 days[5] 65; 1 day[6]	375 (165); 35 hours in 5 days[12] 190; 20 hours[13]	375; 2 weeks[23] 100 (25); 20 hours in 5 days[24]
Short-term	7500; 6 hours[7] 7500; 4 hours[8]	190; 1 hour[14] 850; 7 hours[15] 1100; 1.5 hours[16]	2000–3000; 3.5 hours[25]

* If fumigation was not continuous, an average was estimated and is given in parentheses (calculated assuming a background concentration of 10 µg/m³ during the periods of no fumigation).

19. This table suggest growth and physiological effects from long term exposure of between 85-128ug/m³. These levels – for NO_2 only - are notably higher than the critical level but are, nevertheless, both measured and forecast to occur within the Epping Forest SAC.

20. The WHO guidance goes onto (long version, chapter 11, p.21) to offer an alternative explanation to that put forward in the HRA as to why the critical level is set below these observed effects levels with reference to studies into the combined effects of NO_2 with nitric oxide, SO_2 and O_3. The 'General conclusions on critical levels' reads as follows:

> *'In the majority of studies with NO and NO_2 there were no significant effects at levels below 100 µg/m³ when applied singly, but in combination the effects are obvious. NO_2 changed the response to O_3 mainly with a less-than-additive interaction. In combination with SO_2, NO_2 acted more-than-additively in most cases. In general no interaction (and thus additivity) was found with CO_2 and with NO.*

[11] Shorter version of WHO NO_x vegetation chapter (Working Group Report): http://www.euro.who.int/__data/assets/pdf_file/0005/74732/E71922.pdf

[12] Longer version of WHO NOx vegetation chapter. (apparently an informing Background Document to inform the activity of the Working Group): http://www.euro.who.int/__data/assets/pdf_file/0005/123098/AQG2ndEd_11no2level.pdf?ua=1

In the first edition of these guidelines (1) a CLE for an annual average NO_2 concentration was 30 µg/m³. Based on current information, we estimate the no-effect level for an annual average at around 15–20 µg/m³ for NO_2, both when present as a single compound and in combination with SO_2 and O_3 (the nature of the NO_2 effect changes, but not the no-effect level). For NO a no-effect level for an annual average can only be estimated by extrapolation, but may well be around 15–20 µg/m³ as well. ***Taking the additivity of NO and NO_2 effects into account, a CLE for NO_x that protects all plants from adverse effects should be lower than 15 µg/m³. On the other hand, experimental evidence exists to indicate that the great majority of plant species (though not all) are protected at a NO_x level of 30 µg/m³. We propose this level for the annual mean.'*** **[emphasis added]**

21. This explanation is consistent with the APIS website advising that the critical level set for NO_x should be applied when the levels of SO_2 or O_3 are <u>also</u> close to their critical levels.

22. Professor Mark Sutton of the Centre for Ecology and Hydrology has also made similar observations as part of his regulation 19 submissions in respect of the Wealden District Council Local Plan HRA[13] and the assessment of air pollution effects within Ashdown Forest. Professor Sutton is an environmental physicist who led the first European Nitrogen Assessment, chairs the International Nitrogen Initiative and is co-chair on the Task Force on Reactive Nitrogen which is a body of the UNECE Convention on Long Range Transboundary Air Pollution.[14] He recognises that the critical level values for NO_x have not been substantively reviewed in the past 20 years, and continues to advise that

    'My own expert judgement is that we should consider the NOx annual critical level as uncertain to +/-50% (as illustrated in the AQC Report following my advice) subject to the findings of a future international expert review'.

23. A footnote to Professor Suttons submission continues as follows with reference to the WHO guidelines quoted from above:

    'It should be noted that I earlier made this expert judgement of 30ug/m³ +/-50% uncertainty in the NO_x critical level (CLE) independently, in order to advise on revision of the AQC Report. Reviewing the longer text of the WHO (2000, p 21) (footnote 11, above), my attention is now drawn to its important statement: "Taking the additivity of NO and NO_2 effects into account, a CLE for NOx that protects all plants from adverse effects should be lower than 15 µg/m3. On the other hand, experimental evidence exists to indicate that the great majority of plant species (though not all) are protected at a NO_x level of 30 µg/m3. We propose this level for the annual mean". This is important as it means that the proposed uncertainty range, which I estimated independently, is broadly consistent with an implicit WHO (2000) uncertainty range for protection of all plant species, including those that are most sensitive. As far as I am aware, it is not known whether heathland plants especially sensitive to NO_x compared with other plant species, which again emphasizes the importance of considering an uncertainty range.'

24. The 'short' version of the WHO guidelines is more concise than the 'long' version, but still recognises the combined effects of NO_x with other pollutants. It states:

    'Interactive effects between NO_2 and sulfur [sic] dioxide and/or ozone have been reported frequently (8–13). From a review of recent literature, however, it was concluded that the

[13] Habitats Regulations Assessment - January 2019 (pdf) refer appendix 12© starting on page 850
[14] https://www.ceh.ac.uk/staff/mark-sutton

lowest effective levels for NO_2 are approximately equal to those for combination effects (although in general, at concentrations near to its effect threshold, NO_2 causes growth stimulation if it is the only pollutant, while in combination with sulfur dioxide and/or ozone it results in growth inhibition). Critical levels for a 1-year period are recommended to cover relatively long term effects. The critical level for NO_x (NO and NO_2, added in ppb and expressed as NO_2 in µg/m3) is 30 µg/m3 as an annual mean.'

Summary

25. In answering the question posed by the Inspector in her recent agenda for the hearing on 21 May 2019, in in respect of the effects of NO_x and 'confidence in the findings', Natural England consider it is appropriate for the Inspector to be aware of these recent findings to ensure a full, thorough evaluation of the Council's HRA can be undertaken. In particular, the Inspector should consider whether it was justified to exclude NO_x concentrations from further analysis as part of the appropriate assessment when they were substantially in excess of critical levels. Natural England notes that, apart from the contribution to nitrogen deposition, there is credible evidence of a real risk to natural habitats when the critical level is exceeded, particularly in combination with either SO_2 and/or O_3. It would therefore be reasonable for any further analysis of NO_x to be informed by data on existing levels of these pollutants within the SAC.

26. In this regard Natural England notes that the Air Pollution Information System indicates that levels of SO_2 within the SAC are significantly below the relevant critical level (APIS provides an averaged concentration of 0.33ug/m^3 against a critical level for SO_2 of 10ug/m^3). However we are not in a position to be able to provide such reassurance in respect of ground level ozone. We note that Table 5.12 in the 2012 *Review of Transboundary Air Pollution* report[15] estimates that 57.3% of deciduous woodland in the UK exceeds the critical level for ozone of an AOT40 of 5ppm.h over 6 months. However this report also raises questions over important trends in the exposure of vegetation to ozone across the UK which may not be captured by the AOT40 approach. Section 5.4.7 notes *'Of particular relevance is a significant body of experimental research that has been supported by Defra… which has assessed the effects of relatively low O_3 exposures on species and communities of conservation value in the UK'*.

27. It will be for the competent authority to obtain the information that might reasonably be required to undertake a more detailed analysis of the potential effects from NO_x in light of further information in respect of ground level ozone should the Inspector consider that some further analysis is appropriate.

[15] http://www.rotap.ceh.ac.uk/files/CEH%20RoTAP_0.pdf

Appendix 1: Gridded average NO_x concentrations within the 1km grid squares that comprise the Epping Forest SAC. Levels above 30ug/m^3 exceed the critical level as an averaged value.

Grid Reference (km)	Designation	Site Area (ha)	% Area of Gridsquare covering the site	Nitrogen oxide (NOx) concentration (µg/m3)	Sulphur dioxide (SO2) (µg/m3)
537500,194500	SAC	1605	0 (0%)	32.86	0.36
537500,195500	SAC	1605	0.15 (0.1%)	34.28	0.41
537500,196500	SAC	1605	0.02 (0%)	30.80	0.34
538500,188500	SAC	1605	0.24 (0.2%)	44.14	0.43
538500,189500	SAC	1605	0.16 (0.1%)	41.64	0.46
538500,190500	SAC	1605	0.57 (0.4%)	47.36	0.44
538500,191500	SAC	1605	0.1 (0.1%)	39.50	0.41
538500,194500	SAC	1605	0.78 (0.5%)	32.90	0.37
538500,195500	SAC	1605	2.88 (1.8%)	27.29	0.33
538500,196500	SAC	1605	0.29 (0.2%)	28.85	0.34
539500,188500	SAC	1605	2.98 (1.9%)	41.10	0.40
539500,189500	SAC	1605	2.28 (1.5%)	38.85	0.38
539500,190500	SAC	1605	1.81 (1.2%)	47.99	0.39
539500,191500	SAC	1605	1.9 (1.2%)	38.85	0.37
539500,192500	SAC	1605	0.9 (0.6%)	33.63	0.35
539500,193500	SAC	1605	1.42 (0.9%)	31.87	0.35
539500,194500	SAC	1605	1.58 (1%)	29.94	0.34
539500,195500	SAC	1605	3.82 (2.5%)	28.70	0.34
539500,196500	SAC	1605	1.08 (0.7%)	26.72	0.32
540500,192500	SAC	1605	0.16 (0.1%)	34.76	0.34
540500,193500	SAC	1605	1.87 (1.2%)	32.04	0.34
540500,194500	SAC	1605	2.66 (1.7%)	28.56	0.34
540500,195500	SAC	1605	5.33 (3.4%)	28.41	0.33

Cntd. on next page.

540500,196500	SAC	1605	5.66 (3.6%)	26.13	0.32
540500,197500	SAC	1605	2.75 (1.8%)	24.89	0.34
540500,198500	SAC	1605	0.99 (0.6%)	24.73	0.32
540500,199500	SAC	1605	0 (0%)	33.80	0.33
541500,192500	SAC	1605	0.08 (0.1%)	34.23	0.35
541500,193500	SAC	1605	2 (1.3%)	31.73	0.39
541500,194500	SAC	1605	0.35 (0.2%)	29.52	0.38
541500,195500	SAC	1605	1.58 (1%)	27.11	0.33
541500,196500	SAC	1605	4.29 (2.8%)	24.74	0.32
541500,197500	SAC	1605	6.03 (3.9%)	22.73	0.30
541500,198500	SAC	1605	5.69 (3.7%)	24.18	0.32
541500,199500	SAC	1605	3.89 (2.5%)	26.84	0.33
542500,196500	SAC	1605	0.5 (0.3%)	29.31	0.46
542500,197500	SAC	1605	3.95 (2.5%)	23.80	0.35
542500,198500	SAC	1605	6.04 (3.9%)	21.94	0.30
542500,199500	SAC	1605	4.29 (2.8%)	24.57	0.31
542500,200500	SAC	1605	0.8 (0.5%)	30.76	0.35
543500,198500	SAC	1605	3.17 (2%)	21.29	0.32
543500,199500	SAC	1605	5.67 (3.6%)	21.20	0.29
543500,200500	SAC	1605	2.47 (1.6%)	29.89	0.35
544500,198500	SAC	1605	0.27 (0.2%)	21.47	0.33
544500,199500	SAC	1605	2.33 (1.5%)	21.34	0.30
544500,200500	SAC	1605	4.2 (2.7%)	25.02	0.35
544500,201500	SAC	1605	0.01 (0%)	26.66	0.36

Appendix 2: For purpose of comparison, gridded average NO_x concentrations within the 1km grid squares that comprise the Ashdown Forest SAC where **no grid square averages exceed the critical level for NO_x**.

Grid Reference (km)	Designation	Site Area (ha)	% Area of Gridsquare covering the site	Nitrogen oxide (NOx) concentration (µg/m3)	Sulphur dioxide (SO2) (µg/m3)
539500,131500	SAC	2729	0.15 (0.2%)	11.89	0.23
539500,132500	SAC	2729	0.31 (0.3%)	12.13	0.26
539500,133500	SAC	2729	0.49 (0.5%)	12.15	0.25
540500,130500	SAC	2729	0 (0%)	12.07	0.24
540500,131500	SAC	2729	1.58 (1.7%)	11.98	0.23
540500,132500	SAC	2729	2.08 (2.3%)	12.09	0.23
540500,133500	SAC	2729	2.3 (2.5%)	12.09	0.23
541500,130500	SAC	2729	1.18 (1.3%)	12.30	0.26
541500,131500	SAC	2729	1.21 (1.3%)	12.23	0.23
541500,132500	SAC	2729	0.89 (1%)	12.57	0.23
541500,133500	SAC	2729	2.23 (2.4%)	12.74	0.24
542500,128500	SAC	2729	0.19 (0.2%)	11.70	0.24
542500,129500	SAC	2729	1.91 (2.1%)	11.83	0.24
542500,130500	SAC	2729	3.19 (3.5%)	11.88	0.23
542500,131500	SAC	2729	0.97 (1.1%)	12.49	0.23
542500,133500	SAC	2729	1.39 (1.5%)	12.42	0.23
542500,134500	SAC	2729	0.38 (0.4%)	14.09	0.28
543500,128500	SAC	2729	0.17 (0.2%)	11.47	0.22
543500,129500	SAC	2729	2.35 (2.6%)	11.64	0.22
543500,130500	SAC	2729	1.36 (1.5%)	12.10	0.22
543500,132500	SAC	2729	1.57 (1.7%)	11.65	0.23
543500,133500	SAC	2729	0.82 (0.9%)	11.72	0.23

Cntd. on next page.

543500,134500	SAC	2729	1.01 (1.1%)	13.00	0.25
544500,126500	SAC	2729	0.13 (0.1%)	11.62	0.24
544500,127500	SAC	2729	1.19 (1.3%)	12.37	0.30
544500,128500	SAC	2729	0.82 (0.9%)	12.11	0.27
544500,129500	SAC	2729	3.03 (3.3%)	11.35	0.22
544500,130500	SAC	2729	0.3 (0.3%)	11.20	0.24
544500,131500	SAC	2729	2.04 (2.2%)	11.18	0.21
544500,132500	SAC	2729	3.06 (3.3%)	11.35	0.22
544500,133500	SAC	2729	2.51 (2.7%)	11.56	0.23
544500,134500	SAC	2729	0.22 (0.2%)	12.30	0.35
545500,126500	SAC	2729	0.53 (0.6%)	11.99	0.24
545500,127500	SAC	2729	2.79 (3.1%)	11.26	0.23
545500,128500	SAC	2729	3.46 (3.8%)	11.19	0.23
545500,129500	SAC	2729	1.99 (2.2%)	10.97	0.22
545500,130500	SAC	2729	3.02 (3.3%)	10.89	0.21
545500,131500	SAC	2729	2.65 (2.9%)	10.92	0.21
545500,132500	SAC	2729	1.81 (2%)	11.13	0.22
545500,133500	SAC	2729	0.03 (0%)	11.59	0.22
546500,126500	SAC	2729	0.82 (0.9%)	11.91	0.25
546500,127500	SAC	2729	2.47 (2.7%)	11.46	0.23
546500,128500	SAC	2729	2.57 (2.8%)	11.27	0.22
546500,129500	SAC	2729	3.19 (3.5%)	10.87	0.21
546500,130500	SAC	2729	3.58 (3.9%)	10.95	0.21
546500,131500	SAC	2729	2.41 (2.6%)	11.23	0.21
546500,132500	SAC	2729	3.12 (3.4%)	11.02	0.21

Cntd. on next page.

546500,133500	SAC	2729	0.3 (0.3%)	11.27	0.22
547500,126500	SAC	2729	0.29 (0.3%)	11.59	0.23
547500,127500	SAC	2729	1.01 (1.1%)	11.14	0.23
547500,128500	SAC	2729	2.03 (2.2%)	11.12	0.21
547500,129500	SAC	2729	3.48 (3.8%)	11.12	0.21
547500,130500	SAC	2729	2.02 (2.2%)	11.35	0.21
547500,131500	SAC	2729	3.38 (3.7%)	11.09	0.21
547500,132500	SAC	2729	2.91 (3.2%)	11.18	0.21
547500,133500	SAC	2729	0.54 (0.6%)	11.32	0.22
548500,128500	SAC	2729	1.46 (1.6%)	11.55	0.22
548500,129500	SAC	2729	2.4 (2.6%)	10.96	0.21
548500,130500	SAC	2729	0.03 (0%)	11.02	0.21
548500,131500	SAC	2729	0.28 (0.3%)	11.12	0.21
548500,132500	SAC	2729	0.2 (0.2%)	11.08	0.21
549500,128500	SAC	2729	0.04 (0%)	11.63	0.23
549500,129500	SAC	2729	0.56 (0.6%)	11.39	0.23
549500,131500	SAC	2729	0.74 (0.8%)	11.12	0.21
549500,132500	SAC	2729	2.19 (2.4%)	11.37	0.30
549500,133500	SAC	2729	0.05 (0.1%)	11.33	0.23
550500,131500	SAC	2729	0.58 (0.6%)	12.69	0.23
550500,132500	SAC	2729	0.04 (0%)	11.62	0.25

1. References

2. Adams, K.J. (1996). The bryophyte fauna of pollards and pollarded woodland with particular reference to eastern England. In: Corporation of London 1996. Pollard and Veteran Tree Management II. The Richmond Publishing Company Ltd, pp 12-16.

3. AQTAG06 (2014) Technical guidance on detailed modelling approach for an appropriate assessment for emissions to air. March 2014.

4. Chapman, C (2019) 1079 DTAE NOx Issue submission to Inspector FINAL DRAFT 170519

5. City of London, Epping Forest (2015). Epping Forest – The Next 10 Years. Section 3.7 Developing a new Epping Forest Transport Strategy. Consultation Document 2015. *https://consult.cityoflondon.gov.uk/consult.ti/EF_Management_Plan_1/view?objectId=6711988*

6. Dagley, J & Samuels, A. (1999). Heathland Restoration at Long Running. Essex Naturalist (New Series) 16: 59-70.

7. DMRB (Design Manual for Roads and Bridges) Volume 11, Section 3, Part 1 HA 207/07.

8. DMRB Interim Advice Note 174/13 – Updated advice for evaluating significant local air quality effects for users of DMRB Volume 11, Section 3, Part 1 Air Quality HA 207/07

9. European Communities, (2000) Managing Natura 2000 sites. The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC.

10. Gadsdon, S.R, Dagley, J,R., Wolseley, P.A., Power, S.A., 2010. Relationships between lichen community composition and concentrations of NO2 and NH3. Environmental Pollution 158 (2010): 2553-2560.

11. IAQM (2019) A guide to the assessment of air quality impacts on designated nature conservation sites, Institute of Air Quality Management, Consultation Draft March 2019. Headlined with **Confidential Draft Not to be Quoted –** but available online at http://www.iaqm.co.uk/text/guidance/impacts_nature_conservation_consultation.pdf

12. JNCC (2010). UK Priority Species data collation Zygodon forsteri version 2 15/12/2010 http://jncc.defra.gov.uk/_speciespages/642.pdf

13. JNCC report 386. Leith, I.D., van Dijk, N., Pitcairn, C.E.R., Wolseley, P.A., Whitfield, C.P. and Sutton, M.A. (2005). Biomonitoring methods for assessing the impacts of nitrogen pollution: refinement and testing. JNCC Report No. 386

14. Moffatt, A (2019). Beech tree stress, soil conditions and drought at Burnham Beeches. City of London Corporation (2019). http://www.ajmoffat.co.uk/wp-content/uploads/2019/02/Burnham_Beeches_Report_15_01.pdf

15. Natural England NECR210 (2016). Caporn, S., Field, C., Payne, R., Dise, N., Britton, A., Emmett, B., Jones, L., Phoenix, G., 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.

16. Power, S. A, Green, E.R, Barker, C.G, Bell, N.B. & Ashmore, M.R. (2006).Ecosystem recovery: heathland response to a reduction in nitrogen deposition. Global Change Biology (2006) 12, 1241–1252

17. Tang, Y.S., Gadsdon, S., Love, L., Sutton, M.A. (2005). Ammonia measurements at
18. Epping Forest. Centre for Ecology and Hydrology, Edinburgh (2005) In: Gadsdon, S.R.M., 2007. Ecosystem health at Epping Forest. Ph.D. thesis, Imperial College London, UK.