

**A57 Link Roads
TR 010034**

6.5 Environmental Statement

**Appendix 8.4 Assessment of Likely Significant Air
Quality on Designated Habitats**

APFP Regulation 5(2)(a)

Planning Act 2008 Infrastructure Planning (Applications: Prescribed
Forms and Procedure) Regulations 2009

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1. Introduction

- 1.1.1 This Appendix presents the assessment of additional likely significant environmental effects of the A57 Link Roads Scheme (previously known as Trans Pennine Upgrade Programme) and herein after referred to as the Scheme on biodiversity with regards to air quality in accordance with the updated Design Manual for Roads and Bridges (DMRB) guidance LA 105 Air Quality¹.

¹ LA 105 replaces previous guidance with regards to air quality: HA 207/07, IAN 170/12, IAN 174/13, IAN 175/13 and part of IAN 185/15.

2. Methodology

2.1 Scope

- 2.1.1 In accordance with DMRB LA 105 Air Quality², the air quality assessment should include an assessment of the impacts on “designated habitats” of international, national and local ecological conservation importance for protected/ notable species and habitats and other species identified as being of principal importance for the conservation of biodiversity within the air quality study area. In accordance with DMRB LA 105 Air Quality, designated habitats are defined as ‘Ramsar’ sites³, Special Protection Areas (SPAs), Special Areas of Conservation (SACs), Sites of Special Scientific Interest (SSSIs), Local Nature Reserves (LNRs), Local Wildlife Sites (LWSs), Nature Improvement Areas (NIAs), Ancient Woodland and veteran trees containing habitats sensitive to nitrogen deposition.
- 2.1.2 The Woodland Trust classifies trees of special interest as ‘ancient’, ‘veteran’ and ‘notable’. Both ancient and veteran trees are considered of similar and high ecological importance and are irreplaceable (much the same as Ancient Woodland). As such, both ancient and veteran trees have been scoped into the assessment. Notable trees are of importance within their local environment in comparison to their surroundings. However, as notable trees may be young and not necessarily serve the same ecological function as that of an ancient or veteran tree, notable trees are not included within this assessment.
- 2.1.3 The ecological assessment detailed within this Technical Appendix has been undertaken using the approach detailed in LA 108 Biodiversity⁴, the Chartered Institute of Ecology and Environmental Management (CIEEM) Guidelines for Ecological Impact Assessment⁵ and DMRB LA 105 Air Quality. A detailed methodology for the designated habitats air quality assessment is provided in the Air Quality chapter (Chapter 5) of the Environmental Statement (ES) (TR010034/APP/6.3).

2.2 Study Area

- 2.2.1 The air quality study area considers the Affected Road Network (ARN) which is determined based on the roads meeting the traffic screening criteria in DMRB LA 105 Air Quality and adjoining roads within 200 m. An assessment is required for designated habitats identified within 200 m of the roads that trigger the traffic screening criteria. The modelled nitrogen deposition rates presented herein are based on model transect receptor points up to 200 m from the road. However, in the unusual case that potentially significant air quality impacts were identified at 200 m from the road, additional locations would be further modelled. The roads meeting the traffic screening criteria in DMRB LA 105 Air Quality and the air quality study area are presented in Figure 5.1 (TR010034/APP/6.4).

² LA 105 Air Quality, paragraph 2.25

³ Wetland of international importance’

⁴ DMRB. LA108 Biodiversity (formerly Volume 11, Section 3, Part 4 Ecology and Nature Conservation and IAN 130/10). Revision 1.

⁵ CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine version 1.1. Chartered Institute of Ecology and Environmental Management, Winchester.

2.3 Desk Study

2.3.1 A desk study exercise was undertaken in October 2020 to identify any designated habitats within the air quality study area. A full methodology has been provided within the extended Phase 1 habitat survey provided within Appendix 8.1 (TR010034/APP/6.5).

2.4 Nature Conservation Evaluation

2.4.1 The importance of each designated habitat has been established using the guidance presented in Table 3.9 in DMRB LA 108 Biodiversity. Further details are provided within the Biodiversity chapter (Chapter 8) of the ES (TR010034/APP/6.3).

2.4.2 As ancient and veteran trees are irreplaceable habitat, they are considered of comparable importance to Ancient Woodland. As such, ancient and veteran trees are considered of national importance.

2.5 Field Survey

2.5.1 Field surveys were undertaken in September 2020 in order to visit the receptors where potential air quality impacts were not able to be scoped out. This included four sites which are outlined within Section 5 of this appendix. The surveys broadly followed the Phase 1 habitat survey methodology as set out in Joint Nature Conservation Committee (JNCC) guidance⁶ to record information on the habitats within the survey area and was 'extended' to include a search for evidence of presence and an assessment of the potential for each habitat to support notable and protected species, as recommended by CIEEM⁷.

2.6 Characterisation of Potential Impacts

2.6.1 As detailed in the Air Quality chapter (Chapter 5) of the ES, it was determined that the potential local air quality impacts from construction traffic emissions would be unlikely to give rise to significant effects. Any impact during construction would also be expected to be less than that during operation and would be temporary, therefore, no further quantitative assessment has been undertaken in relation to construction. As such, only operational impacts on air quality are considered.

2.6.2 The assessment in this appendix was undertaken with due regard to Figure 2.98 within DMRB LA 105 Air Quality.

2.6.3 Relevant habitat types have been obtained from the Air Pollution Information System (APIS) database⁸ where available or through field surveys. Critical loads (CL) for habitats were obtained from APIS. Where a range in the critical load was provided for a particular designated habitat, the lowest value in the range was used to give a 'worst-case' assessment (known as the lower critical load).

2.6.4 For each designated habitat, the air quality assessment modelled changes in air quality along 200 m linear transects perpendicular to the affected road, starting from the nearest point of the designated habitat. The modelling was undertaken

⁶ Joint Nature Conservation Committee (2010). Handbook for Phase 1 habitat survey – a technique for environmental audit

⁷ CIEEM (2017) *Guidelines for Preliminary Ecological Appraisal, 2nd edition*. Chartered Institute of Ecology and Environmental Management, Winchester.

⁸ [About the Air Pollution Information System | Air Pollution Information System \(apis.ac.uk\)](https://www.apis.ac.uk) [Accessed October 2020]

at 10 m intervals between 0 m and 200 m, with additional receptor points modelled where further investigation of the change in nitrogen deposition was required. For ancient and veteran trees, nitrogen deposition at the location of the tree was modelled. Further details and the findings of the air quality modelling are presented within the Air Quality chapter (Chapter 5) of the ES and Appendix 5.3 (TR010034/APP/6.5).

- 2.6.5 DMRB LA 105 Air Quality⁹ provides designated habitat screening criteria for determining the need for further consideration of the impacts of nitrogen deposition. The designated habitat screening criteria are considered to be exceeded where total nitrogen deposition is greater than the relevant lower critical load, and the change in nitrogen deposition is greater than 1 % of the relevant lower critical load. Where these criteria are exceeded further consideration was given to the magnitude of the change in nitrogen deposition. Where this is greater than 0.4 kg N/ha/yr then the significance of effect was assessed by a competent expert for biodiversity.
- 2.6.6 The change in nitrogen deposition rates with the Scheme is expected to be less than the DMRB LA 105 designated habitat screening criteria and the magnitude of change of the nitrogen deposition is less than 0.4 kg N/ha/yr at all relevant statutory designated sites (LNR, SSSI, SAC, and SPA) and the majority of the non-statutory designated sites.
- 2.6.7 Given the number of non-statutory designated ecological sites within the air quality study area and the limited information available on designated features within them, detailed habitat identification was not undertaken for all the sites. Nitrogen deposition rates were therefore calculated for all non-statutory designated ecological site receptors as both “woodland” and “grassland” habitat types (for which there are different NO₂ to nitrogen deposition conversion factors).
- 2.6.8 There were, changes to nitrogen deposition expected to exceed 0.4 kg N/ha/yr at four non-statutory designated sites (outlined within Table 3-1 and Table 3-2) that exceed the DMRB LA 105 designated habitat screening criteria, should a relevant woodland habitat be present. These sites were then passed to the Competent Expert for Biodiversity¹⁰ for further assessment (contained herein).
- 2.6.9 Where the change in nitrogen deposition is greater than the DMRB LA 105 designated habitat screening criteria, DMRB LA 105 prescribes a need to identify whether the designated habitat air quality attribute is either ‘Restore’ or ‘Maintain’. Air quality attributes are publicly specified for European designated sites¹¹ (those protected at an international and European level) but not commonly for locally or nationally designated sites for nature conservation or for Ancient Woodland. As such, air quality attributes are not available for the designated habitats considered within this assessment. Where information is available, this has been used to inform a professional judgement to determine the air quality attribute for the designated habitat. Where insufficient information is available, the air quality attribute has been set to ‘Restore’, as acknowledged in DMRB LA 105.

⁹ Paragraph 2.97 to 2.102.

¹⁰ Define as individuals who can demonstrate that they have relevant qualifications; and expertise in biodiversity assessment of infrastructure projects.

¹¹ Outlines within European Site Conservation Objectives for each European Site.

2.6.10 DMRB LA 105 requires an assessment to determine if the change in nitrogen deposition would lead to the theoretical loss of one plant species, using Table 21 of the nitrogen deposition dose response report published by Natural England¹². The study within the Natural England report only considered certain habitats: upland and lowland heath, sand dune grassland, bog (raised and blanket) and acid grassland. Several designated habitats considered within this assessment are designated for their woodland habitat which isn't provided for within this document. The Natural England study does not provide comparable data to inform the dose of nitrogen deposition that would theoretically lead to the loss of one species. Therefore, in accordance with DMRB LA 105, using the Natural England dose response report,

“the habitat with the lowest change in nitrogen deposition likely to lead to the loss of one species, excluding nutrient impoverished sand dunes, shall be used to inform the judgement of significant air quality effects”.

2.6.11 Using the 'Restore' approach, as prescribed in DMRB LA 105 where site specific data is not available, represents a highly conservative assessment whereby the most sensitive habitat to nitrogen deposition is used as a proxy for the designated habitat being considered. Using the actual background deposition levels (as for the 'Maintain' approach) rather than a theoretical background deposition level of 5 kg N/ ha/ yr (as for the 'Restore' approach), is likely to better reflect the conditions at the designated habitats considered within this assessment where background nitrogen deposition is currently over 20 kg N/ ha/ yr at all sites within the air quality study area (background deposition rates for all sites are provided in Appendix A).

2.6.12 Table 2-1, which is based on Table 21 of the Natural England dose response report¹², summarises the criteria used to determine if the change in nitrogen deposition would lead to the theoretical loss of one plant species. It should be noted that Table 21 provides the lowest change in nitrogen deposition likely to lead to a reduction of species-richness of one species at different background nitrogen levels, to be used for those designated habitats covered by the Natural England dose response report (excluding sand dunes).

Table 2-1- Nitrogen Deposition Changes that may Result in the Theoretical Loss of Species Richness¹³

Increase in Nitrogen (N) Deposition (kg N/ha/yr) Required to Reduce Measured Species Richness by One at Different Background N Deposition Levels					
5 kg N	10 kg N	15 kg N	20 kg N	25 kg N	30 kg N
0.4	0.8	1.3	1.7	2.0	2.4

2.6.13 In accordance with DMRB LA 105, for the 'Restore' scenario the lowest change in nitrogen deposition that would bring about a change theoretically equivalent to the loss of one plant species (0.4 kg N/ ha/ yr) is used regardless of background nitrogen deposition. Therefore, an increase of 0.4 kg N/ ha/ yr is used as the threshold for the theoretical loss of one plant species and determination of a potentially significant effect.

¹² 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 seminatural habitats of conservation importance. Natural England Commissioned Reports, Number 210.

¹³ Based on Table 21 of the Natural England dose response report

- 2.6.14 In accordance with DMRB LA 105 Air Quality, for the 'Maintain' scenario the lowest change in nitrogen deposition that would bring about a change theoretically equivalent to the loss of one plant species corresponding to the background nitrogen deposition is used as the threshold (Table 2-1, above). Where the background nitrogen deposition falls between two categories, the lower category has been used, as a precautionary approach.
- 2.6.15 Where the Scheme would result in a theoretical reduction in species richness equivalent to the loss of one plant species, this is identified as a potentially significant effect. Where this threshold would not be exceeded, no significant effect is identified. Where potentially significant effects are identified, professional judgement has been used to provide a qualified statement regarding the potential level of significance of the effects identified in accordance with the categories presented in DMRB LA 104¹⁴ (i.e. Neutral, Slight, Moderate, Large or Very Large). This has been underpinned through use of the impact and effect significance descriptors in DMRB LA 108, as described below.

2.7 Characterisation of Nitrogen Deposition Impacts

- 2.7.1 Nitrogen deposition impacts and their effects that may be significant following application of DMRB LA 105, as described above, have then been characterised against the impact and effect descriptors used in paragraph 3.10 and Table 3.11 of DMRB LA 108, and applicable CIEEM guidance⁷. The approach to describing each impact characteristic that informs the overall Level of Impact under DMRB LA 108, is provided in the Biodiversity chapter (Chapter 8) of the ES. These headings are subsequently used to summarise the predicted impacts and effects of nitrogen deposition from the Scheme on each designated habitat.

2.8 Resource Importance

- 2.8.1 The same method of determining the importance of an ecological receptor (designated habitat) has been followed, as detailed in the Biodiversity chapter (Chapter 8) of the ES. The methodology for assigning importance complies with the approach in the updated DMRB guidance presented in LA 108 Biodiversity.

2.9 Integrity and Key Characteristics of the Resource

- 2.9.1 Potential effects on the integrity and key characteristics of each designated site are assessed with consideration of:
- The type and condition of the habitats for which the designated habitats have been designated;
 - The characterisation of the impact as described above; and,
 - The likely biophysical responses of the designated habitats subject to a potentially significant effect, and whether these responses could undermine the ecological coherence, functioning and conservation status of the features for which the site is designated, and hence it's integrity.

¹⁴ DMRB LA 104 Environmental assessment and monitoring (formerly HA 205/08, HD 48/08, IAN 125/15, and IAN 133/10) Revision 1.

2.10 Mitigation

- 2.10.1 The same approach to mitigation has been followed, as detailed in the Biodiversity chapter (Chapter 8) of the ES.

2.11 Limitations

- 2.11.1 The assessment limitations and assumptions in relation to the air quality modelling is provided within the Air Quality chapter (Chapter 5) of the ES.
- 2.11.2 A critical load cannot be given for nitrogen with respect to rivers and streams, as quantitative relationships between biology and nitrogen concentrations are largely dependent on the status of the concentrations of other nutrients. In accordance with Section 2.26.1 of DMRB LA 105 Air Quality, it is not necessary to include sites designated as a watercourse in the assessment. As such, effects to the river component of the designated habitats have not been explored.
- 2.11.3 Due to the size of the air quality study area, the identification of ancient/ veteran trees was informed by the Woodland Trust's Ancient Tree Inventory¹⁵ and baseline data gathered for the Scheme. This is considered proportionate and appropriate for this assessment.
- 2.11.4 The Natural England study does not provide directly comparable data to inform the dose of nitrogen deposition that would theoretically lead to a reduction in species richness equivalent to the loss of one species. In accordance with DMRB LA 105, the lowest change in nitrogen deposition likely to trigger this criterion from Table 21 of the Natural England dose response report was used as a proxy threshold (as outlined within Table 2-1).

¹⁵ <https://ati.woodlandtrust.org.uk/> [Accessed September 2020]

3. Baseline Conditions

- 3.1.1 In accordance with DMRB LA 105, where the change in nitrogen deposition does not exceed the designated habitat screening criteria, a significant effect would not occur, effects are considered Neutral (not significant) and the designated habitat are not discussed further. All designated habitats within the air quality study area are listed within Appendix A.
- 3.1.2 There are no exceedances of the DMRB LA 105 designated habitat screening criteria and the magnitude of change of the nitrogen deposition is less than 0.4 kg N/ha/yr at all relevant LNR, SSSI, SAC, and SPA. Therefore, the expected change in nitrogen deposition with the Scheme, can be considered not to be significant at all statutory national, European and international sites.
- 3.1.3 Nitrogen deposition rates were calculated for non-statutory designated ecological site receptors as both “woodland” and “grassland” habitat types (for which there are different NO₂ to nitrogen deposition conversion factors).
- 3.1.4 As a precautionary approach, screening against the DMRB LA 105 designated habitat screening criteria was undertaken assuming a “woodland” habitat, prior to identification of actual habitat types present, as there is a higher conversion rate of NO₂ concentrations to nitrogen deposition for “woodland” habitat.
- 3.1.5 Changes to nitrogen deposition exceeding the DMRB LA 105 designated habitat screening criteria and with a magnitude of change of the nitrogen deposition greater than 0.4 kg N/ ha/ yr were identified in small areas at the boundary of the following four non-statutory designated sites:
- Dark Peak NIA
 - Melandra Castle and Railway LWS
 - Peak Forest Canal North SBI
 - Shire Hill Ancient Woodland
- 3.1.6 Changes to nitrogen deposition exceeding the DMRB LA 105 designated habitat screening criteria and with a magnitude of change of the nitrogen deposition greater than 0.4 kg N/ ha/ yr were identified only for “woodland” habitat, which has a higher conversion rate of NO₂ concentrations to nitrogen deposition than “grassland” habitat.
- 3.1.7 Ecological transect receptors meeting the designated habitat screening criteria for “woodland” habitats and where the changes of the nitrogen deposition are greater than 0.4 kg N/ ha/ yr are shown in Figure 5.5 (TR010034/APP/6.5).
- 3.1.8 In accordance with the procedure in DMRB LA 105 (as shown in the flow diagram Figure 2.98), detailed site investigation was required to determine whether there are species that could be adversely affected by increased nitrogen deposition within these four sites.
- 3.1.9 Upon further investigation, through using site citations and aerial views, two sites were reassessed due to not containing woodland habitat and thus a lower conversion factor for a “grassland” habitat was appropriate, under which the magnitude of change of the nitrogen deposition is less than 0.4 kg N/ ha/ yr. These are outlined within Table 3-1, below and in Appendix A.

Table 3-1 – Designated habitats where potentially significant effects have been ruled out

Transect / ID Reference	Designated Habitat	Qualifying Feature	Significance of Effects
T12	Dark Peak NIA	Heathland	Not significant - change in nitrogen deposition does not meet criteria requiring further assessment under DMRB LA 105 for the habitat type (see Appendix A).
E43	Peak Forest Canal North SBI	Watercourse	Not significant - qualifying feature not sensitive to nitrogen deposition

3.1.10 The remaining two designated habitats are predicted to experience an exceedance of the nitrogen deposition designated habitat screening criteria resulting in potential theoretical loss of 1 species and are scoped in for further assessment. These are presented in Table 3-2, below.

Table 3-2 – Designated habitats where potentially significant effects could not be ruled out

Transect / ID Reference	Designated Habitat	Qualifying Feature	Significance of Effects
T9	Shire Hill Ancient Woodland	Broadleaved, Mixed and Yew Woodland	Potentially Significant
T11	Melandra Castle and Railway LWS	Broadleaved, Mixed and Yew Woodland	Potentially Significant

4. Potential Impacts

- 4.1.1 The assessment for the Scheme considered potential impacts from increased nitrogen deposition. Nitrogen is a major growth nutrient and changes in nitrogen deposition can result in both positive and negative impacts on biodiversity, including loss of sensitive species, increases in tree growth, changes to habitat structure and function, the homogenisation of vegetation types, changes in soil chemistry and an increased sensitivity to abiotic and biotic stresses (such as pests and climate).

5. Assessment of Likely Significant Effects

5.1.1 This section identifies changes in nitrogen deposition that may lead to potentially significant adverse effects as a result of the Scheme.

5.1.2 The designated habitat areas and relative exceedance areas are provided within Table 5-1.

Table 5-1 – Area of exceedance within each designated habitat

Designated Habitat	Total Designated Habitat Area (ha)	Exceedance Area (ha)	% of Total Area
Shire Hill Ancient Woodland	30.65	0.1	0.4%
Melandra Castle and Railway LWS	14.05	<0.001	<0.001%

5.1.3 Qualified statements including ecological interpretation are presented below by a Competent Expert for Biodiversity¹⁶ for those designated habitats where the increase in nitrogen deposition may theoretically lead to a reduction in one species.

5.1.4 It is important to highlight that in taking the “Maintain” approach, all the SBIs and Ancient Woodland would not be subject to increases in nitrogen deposition considered to have the potential to result in a theoretical reduction in species richness equivalent to the loss of one plant species. As such, under the “Maintain” approach, a significant effect would not be predicted to occur. Currently, there is no information included within the site citations that clearly indicate if the SBI or Ancient Woodland can be classified as “Maintain”. Field survey visits have been undertaken at these sites to provide a description of habitats and the current conditions.

5.1.5 Photographs and notes of the designated habitats discussed within this section are provided within Appendix B.

5.2 Shire Hill Ancient Woodland

5.2.1 Shire Hill Ancient Woodland is located immediately north of the A57 Woodcock Road and within the air quality study area. Air quality modelling showed that there would be an increase in nitrogen deposition as a result of the Scheme, which exceeds the DMRB LA 105 habitat screening criteria, when taking the “Restore” approach (0.4kg N/ ha/ yr, worst case based on restore criteria). The Ancient Woodland is approximately 30.65 ha in area. The exceedance extends into the site up to 1 m from the road edge and equates to an area of 0.1 ha.

5.2.2 The field survey found that the Ancient Woodland consisted of mostly mature oaks with a single beech and was in good condition. There was limited understorey; however, there were patches of mostly bracken with the occasional silver birch. All trees were in straight lines indicating plantation woodland. No invasive species were found to be present. A drystone wall was located between the woodland edge and edge of the carriageway; however, the tree canopy protrudes over the road for several metres.

¹⁶ As required by DMRB LA 105.

- 5.2.3 A limited proportion of the designated habitat would be affected (0.1 ha potentially impacted, which is 0.4% of total Ancient Woodland area). This is based on model transect receptor points up to 200 m from the road. The duration is anticipated to be approximately 1 year from 2025, with the Scheme delaying long-term reductions in vehicle nitrogen dioxide emissions and overall nitrogen deposition rates rather than leading to long-term increases in these relative to the current baseline.
- 5.2.4 Natural England has published research assessing the effects of small changes in nitrogen deposition on a variety of habitats¹⁷. Although woodland habitats were excluded from the study, the authors considered their findings against other research on deciduous broadleaved woodlands. The Natural England study identified some synergies with other research, for example the potential for wavy hair grass and ruderal woodland species to increase under higher nitrogen deposition loadings, whilst other species including woodland forbs declined. Changes to the communities of epiphytic lower plants (mosses and lichens) have also been linked to altered nitrogen deposition regimes, with a shift to nitrophytes (nitrogen-loving) types that correlates with increased nitrogen deposition rates. Other studies, including a study of data from 1200 woodland plots¹⁸, have been unable to correlate changes in woodland vegetation communities over time with changes in nitrogen deposition rates.
- 5.2.5 In addition, the literature also indicates that nitrogen deposition can lead to both beneficial and adverse effects. Increased nitrogen deposition across a large range (from 30kg N/ ha/ yr to 50kg N/ ha/ yr) has been found to positively correlate with increased stem growth in mature beech trees of 43% (hypothesized to be a consequence of resultant increased soil nitrogen)¹⁹. Conversely, increased soil nitrogen availability may promote reduced root growth, predisposing affected trees to increased drought stress and risk of damage during storm events²⁰.
- 5.2.6 Overall, the research examined demonstrates that whilst adverse effects to woodland and tree habitats can occur as a result of increases in nitrogen deposition, these effects are difficult to detect even with comparatively large doses of nitrogen. Some species/ groups of plants may also benefit rather than being adversely affected by increased deposition rates, including when habitat-specific critical loads are already exceeded. Responses to increases in nitrogen deposition which would be generated by the Scheme is minor at Shire Hill Ancient Woodland (0.44 kg N/ ha/ yr), leading to imperceptible levels of change within the affected habitats or to individual trees.
- 5.2.7 The duration of the impact (approximately 1 year) is considered to be short-term and impact a relatively small area (approximately 0.1 ha), which is considered unlikely to lead to long-term perceptible changes of the composition and species

¹⁷ 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 Report NECR210, 23 March 2016.

¹⁸ Verheyen, K., Baeten, L., De Frenne, P., Bernhardt-Römermann, M., Brunet, J., Decocq, G., Dierschke, H., Eriksson, O., Hédli, R., Heinken, T., Hermy, M., Hommel, P., Kirby, K., Naaf, T., Peterken, G., Petřík, P., Pfadenhauer, J., Van Calster, H., Walther, G.-R., Wulf, M. and Verstraeten, G. Driving factors behind the eutrophication signal in understorey plant communities of deciduous temperate forests. *Journal of Ecology* 100(2): 352-365, 2012

¹⁹ Braun, Sabine; Rihm, Beat; Schindler, Christian; Flückiger, Walter. Growth of Mature Beech in Relation to Ozone and Nitrogen Deposition: an Epidemiological Approach. *Water, Air, Soil Pollution*, Volume 116 (2), 2004

²⁰ Meyer, F.D. ; Paulsen, J. ; Korner, C. Windthrow damage in *Picea abies* is associated with physical and chemical stem wood properties. *Trees-Structure and Function* 22 463-473, 2008

richness of the woodland ground flora or on the health of trees within the woodland taking into consideration the aforementioned referenced studies.

- 5.2.8 Any subtle effects that do occur are not predicted to compromise the integrity or key features of the designated habitats. Whilst taking a precautionary view based on the 'Restore' approach (in the absence of information to determine an air quality attribute), in accordance with DMRB LA 108, it is considered that the Scheme would result in a negligible adverse impact on Shire Hill Ancient Woodland, leading to a neutral effect (not significant).

5.3 Melandra Castle LWS

- 5.3.1 Melandra Castle LWS is located west of the A57 Brookfield and within the air quality study area. Air quality modelling showed that there would be an increase in nitrogen deposition as a result of the Scheme, which exceeds the DMRB LA 105 habitat screening criteria, when taking the "Restore" approach. The site is located 17 m from the road edge and the modelled exceedance extends into the site up to 18 m from the road edge. The site is 14 ha in total with the area impacted measuring approximately <math><0.001\text{ ha}</math> (or

5.3.2 The citation for the site includes a habitat mosaic of acid grassland, rough grassland, tall herb, scrub and secondary broad-leaved woodland. Broad-leaved woodland is present and consists of pedunculate oak, ash, beech, sycamore and rowan with field maple, hazel, hawthorn, and blackthorn in the understorey.

5.3.3 Field surveys of the area impacted in September 2020 showed that the area subject to an increase in nitrogen deposition was a disturbed corner of the LWS predominantly consisting of infrastructure over the fast-flowing Glossop Brook and located directly adjacent to Cottage Lane. The habitats within this area consisted of hardstanding, tall ruderals, and scattered trees. Vegetation within this area consisted of a large dead ash tree (covered with dense ivy) with scattered self-seeded willow and field maple. Invasive species²¹ within this area were abundant with Japanese knotweed, Himalayan balsam, and cotoneaster present. Much discarded litter was also present, most likely from vehicles and walkers along Cottage Lane. The area showed signs of management, predominately from the cutting of overhanging branches onto Cottage Lane.

5.3.4 There is insufficient information to determine an air quality attribute for the designated habitat. As such, the assessment of likely significant effects has been determined based on the 'Restore' approach. A very limited portion (<math><0.001\text{ ha}</math>) of the LWS would be potentially affected by the Scheme, and as outlined above, the current habitats are not considered congruent with the designation of the LWS (consisting of a highly disturbed area with sparse self-seeded young trees, and presence of several invasive species).

5.3.5 Whilst taking a precautionary view based on the 'Restore' approach (in the absence of information to determine an air quality attribute), in accordance with DMRB LA 108, it is considered that the Scheme would result in a neutral impact on Melandra Castle LWS, leading to a neutral (not significant) effect on this designated habitat.

²¹ Listed on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended)

6. Conclusion

- 6.1.1 The assessment in relation to DMRB LA 105 Air Quality considers that there would be no significant effects on ecological receptors (designated habitats) due to operational air quality.



Appendix A. Summary of Designated Habitats within the Air Quality Study Area

Transect ID	Designated Habitat	Habitat	Lowest Critical Load (kg N/ha/yr)	Background nitrogen deposition (5 km average deposition from APIS (kg N/ha/yr) 'Maintain' only)	Nitrogen deposition threshold (kg N/ha/yr) resulting in potential theoretical loss of 1 species (threshold)	Maximum change in N deposition (kg N/ha/yr) between Do Minimum and Do Something experienced by the designated habitat	Distance along the transect the increase in N deposition (kg N/ha/yr) between Do Minimum and Do Something exceeds threshold	Significance of Effect
European Designated Ecological Site (SAC, SPA)								
T2	South Pennine Moors SAC	Raised and blanket bogs	5	32.5	0.4	0.21	n/a	Not significant
T2	Peak District Moors SPA	Montane habitats	5	31.9	0.4	0.21	n/a	Not significant
Nationally Designated Ecological Site (SSSI)								
T2	Dark Peak SSSI	Raised and blanket bogs	5	31.9	0.4	0.21	n/a	Not significant
E46	Huddersfield Narrow Canal SSSI	Watercourse (not sensitive to N deposition)	n/a	34.6	0.4	-0.01	n/a	Not significant
Ancient Woodland and Local Designations Exceeding Screening Criteria								
T9	Shire Hill Ancient Woodland	Broadleaved, Mixed and Yew Woodland	10	35.7	0.4	0.44	1 m	Potential adverse effect - passed to competent biodiversity expert to consider significance (scoped out upon further investigation)
T11	Melandra Castle and Railway LWS	Broadleaved, Mixed and Yew Woodland	10	33.5	0.4	0.41	18 m (first transect receptor point at 17m)	Potential adverse effect – passed to competent biodiversity expert to consider significance (scoped out upon further investigation)
T12	Dark Peak NIA	Broadleaved, Mixed and Yew Woodland	10	34.2	0.4	0.50	3 m	Potential adverse effect - passed to competent biodiversity expert to consider significance (scoped out upon further investigation)
E43	Peak Forest Canal (North) SBI	Broadleaved, Mixed and Yew Woodland	10	37.7	1.4	0.76	n/a	Potential adverse effect – passed to competent biodiversity expert to consider significance (scoped out upon further investigation)
Ancient Woodland and Local Designations Not Exceeding Screening Criteria								
E43	Peak Forest Canal (North) SBI	Watercourse (not sensitive to N deposition)	n/a	24.2	0.4	0.36	n/a	Not significant
T12	Dark Peak NIA	Heathland	10	24.1	0.4	0.24	n/a	Not significant

E1	Dinting Vale Wood Ancient Woodland	Broadleaved, Mixed and Yew Woodland	10	33.5	0.4	0.23	n/a	Not significant
E6	Elmin Pits Farm Wood Ancient Woodland	Broadleaved, Mixed and Yew Woodland	10	34.2	0.4	0.02	n/a	Not significant
E9	Millbrook Bridge Wood Ancient Woodland	Broadleaved, Mixed and Yew Woodland	10	31.8	0.4	0.12	n/a	Not significant
E12	Reaves Stones Plantation Ancient Woodland	Broadleaved, Mixed and Yew Woodland	10	34.2	0.4	0.02	n/a	Not significant
E14	Unnamed Ancient Woodland (Eastwood & Acre Clough)	Broadleaved, Mixed and Yew Woodland	10	34.6	0.4	-0.02	n/a	Not significant
E15	Unnamed Ancient Woodland (A57 Snake Road)	Broadleaved, Mixed and Yew Woodland	10	34.2	0.4	0.02	n/a	Not significant
E16	Robin Wood Ancient Woodland	Broadleaved, Mixed and Yew Woodland	10	33.5	0.4	-0.02	n/a	Not significant
E18	Unnamed Ancient Woodland (Clough at Matley)	Broadleaved, Mixed and Yew Woodland	10	34.6	0.4	0.01	n/a	Not significant
E19	Clough at Matley SBI	Broadleaved, Mixed and Yew Woodland	10	34.6	0.4	0.01	n/a	Not significant
E62	Hurst Clough SBI	Broadleaved, Mixed and Yew Woodland	10	35	0.4	-0.33	n/a	Not significant
E26	Roe Cross Quarry SBI	Broadleaved, Mixed and Yew Woodland	10	34.6	0.4	0.03	n/a	Not significant
E30	Westwood Clough & Longlands Hall SBI - northern section	Broadleaved, Mixed and Yew Woodland	10	34.6	0.4	0.34	n/a	Not significant
E31	Westwood Clough Ancient Woodland	Broadleaved, Mixed and Yew Woodland	10	34.6	0.4	0.34	n/a	Not significant
E33	Audenshaw Reservoir SBI	Broadleaved, Mixed and Yew Woodland	10	37.7	0.4	0.04	n/a	Not significant
E34	Ponds at Denton Golf Course SBI	Broadleaved, Mixed and Yew Woodland	10	37.7	1.4	0.02	n/a	Not significant
E35	Dunkirk Wood SBI	Broadleaved, Mixed and Yew Woodland	10	37.7	0.4	0.16	n/a	Not significant
E37	Westwood Clough & Longlands Hall SBI - southern section	Broadleaved, Mixed and Yew Woodland	10	34.6	0.4	0.32	n/a	Not significant
E40	Grimbocarandrough Woods Ancient Woodland	Broadleaved, Mixed and Yew Woodland	10	34.2	0.4	0.35	n/a	Not significant
E44	Eastwood & Acre Clough SBI	Broadleaved, Mixed and Yew Woodland	10	34.6	0.4	0.01	n/a	Not significant
E45	Huddersfield Narrow Canal (South) SBI	Broadleaved, Mixed and Yew Woodland	10	34.6	0.4	0.00	n/a	Not significant
E47	Dinting Vale Reservoirs and Brook LWS	Broadleaved, Mixed and Yew Woodland	10	33.5	0.4	0.34	n/a	Not significant
E48	Shire Hill LWS	Broadleaved, Mixed and Yew Woodland	10	35.7	0.4	0.07	n/a	Not significant
E49	Dinting Wood LWS	Broadleaved, Mixed and Yew Woodland	10	33.5	0.4	-0.35	n/a	Not significant
E50	Dinting Nature Reserve LWS	Broadleaved, Mixed and Yew Woodland	10	33.5	0.4	-0.48	n/a	Not significant
E51	Dinting Junction Pond LWS	Broadleaved, Mixed and Yew Woodland	10	33.5	0.4	0.23	n/a	Not significant
E54	Gamesley Sidings LWS	Broadleaved, Mixed and Yew Woodland	10	33.5	0.4	0.02	n/a	Not significant
E56	Robin Wood LWS	Broadleaved, Mixed and Yew Woodland	10	33.5	0.4	-0.03	n/a	Not significant

E57	Marple Road Meadows LWS	Broadleaved, Mixed and Yew Woodland	10	33.5	0.4	-0.13	n/a	Not significant
E58	Dinting Lodge Grassland LWS	Broadleaved, Mixed and Yew Woodland	10	33.5	0.4	0.17	n/a	Not significant
E59	The Bank (potential LWS)	Broadleaved, Mixed and Yew Woodland	10	33.5	0.4	0.01	n/a	Not significant
E60	Ashes Farm Meadows (potential LWS)	Broadleaved, Mixed and Yew Woodland	10	33.5	0.4	0.27	n/a	Not significant
E61	Hurst Clough Ancient Woodland	Broadleaved, Mixed and Yew Woodland	10	35	0.4	-0.08	n/a	Not significant
E62	Hurst Clough LNR	Broadleaved, Mixed and Yew Woodland	10	35	0.4	-0.33	n/a	Not significant
E63	Hurst Clough Ancient Woodland	Broadleaved, Mixed and Yew Woodland	10	35	0.4	-0.01	n/a	Not significant
E64	Reddish Vale SBI	Broadleaved, Mixed and Yew Woodland	10	68	0.4	0.07	n/a	Not significant
E65	Tom Wood LWS	Broadleaved, Mixed and Yew Woodland	10	35	0.4	-0.01	n/a	Not significant
E66	Warrastfold Bridge Complex LWS	Broadleaved, Mixed and Yew Woodland	10	35	0.4	-0.01	n/a	Not significant
E67	Crookilley Wood Ancient Woodland	Broadleaved, Mixed and Yew Woodland	10	68	0.4	0.02	n/a	Not significant
E67	Crookilley Wood SBI	Broadleaved, Mixed and Yew Woodland	10	68	0.4	0.02	n/a	Not significant

Appendix B. Site Photographs

Designated Habitat	Photo	Description
Shire Hill Ancient Woodland		<p>The field survey found that the Ancient and Semi-Natural Woodland consisted of mostly mature oaks with a single beech in good condition. There was limited understorey, however, there were patches of mostly bracken with the occasional silver birch. All trees were in straight-lines indicating plantation woodland. No invasive species were found to be present. A drystone wall is located between the woodland edge and edge of the carriageway; however, the tree canopy protrudes over the road for several metres. Overall, the woodland was appeared to be in good condition with the trees in good health.</p>
Melandra Castle and Railway LWS		<p>Field surveys of the area in which there would be a predicted increase in nitrogen deposition was a disturbed corner of the LWS, predominantly consisting of infrastructure over the fast-flowing Glossop Brook and located directly adjacent to Cottage Lane. Vegetation within this area consisted of a large dead ash tree (covered with dense ivy) with scattered self-seeded willow and maple. Invasive species²² within this area were abundant with Japanese knotweed, Himalayan balsam, and cotoneaster present. Much discarded litter was present, most likely from vehicles and walkers along Cottage Lane. The area showed signs of management, predominately from the cutting of overhanging branches onto Cottage Lane.</p>

²² Listed on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended)

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