In Parliament – Session 2022 - 2023

HS2

High Speed Rail (Crewe – Manchester)

Supplementary Environmental Statement 2 and Additional Provision 2 Environmental Statement

Volume 5: Appendix EC-016-00002

Ecology and biodiversity

Designated site assessment for Manchester Mosses Special Area of Conservation (Holcroft Moss)

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Department for Transport

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1 Introduction

1.1 Purpose of this appendix

1.1.1 This report is an appendix to the ecology and biodiversity assessment which forms part of Volume 5 of the Supplementary Environmental Statement 2 (SES2) and Additional Provision 2 Environmental Statement (AP2 ES).

1.1.2 It provides an assessment to enable the identification of likely significant effects on the Holcroft Moss Site of Special Scientific Interest (SSSI) component of the Manchester Mosses Special Area of Conservation (SAC) (hereafter referred to as Holcroft Moss).

1.1.3 This report provides the background assessment for identifying any likely significant effects on Holcroft Moss as a result of the AP2 revised scheme to be reported under the EIA Regulations 2017 (as amended)[1]. This background assessment is provided in Section 3 of this report.

1.1.4 The High Speed Two (HS2) High Speed Rail (Crewe – Manchester) Environmental Statement (ES) was published in 2022[2] (the main ES). Volume 5 of the main ES and SES1 and AP1 ES included a draft assessment to inform a Habitats Regulations Assessment for Holcroft Moss[3,4]. Further and separate assessment is being carried out in line with Regulation 63 of the Conservation of Habitats and Species Regulations 2017 (as amended)[5]. Section 4 of this report provides the emerging results at this current stage of design and assessment, which will be finalised as part of the further and separate assessment.

1.1.5 This report should be read in conjunction with the SES2 and AP2 ES Volume 2, Community Area report: Hulseheath to Manchester Airport (MA06).

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[1] *The Town and Country Planning (Environmental Impact Assessment) Regulations 2017*. *SI 2017 No. 571.* Her Majesty's Stationery Office, London. Available online at: https://www.legislation.gov.uk/uksi/2017/571/contents/made.

[2] High Speed Two Ltd (2022), High Speed Rail (Crewe – Manchester)*, Environmental Statement.* Available online at*:* https://www.gov.uk/government/collections/hs2-phase2b-crewe-manchester-environmental-statement.

[3] High Speed Two Ltd (2022), High Speed Rail (Crewe – Manchester), *Environmental Statement*, *Document to inform a Habitats Regulations Assessment for the Midland Meres and Mosses Phase 2 Ramsar site (Holcroft Moss),* Volume 5, Appendix: EC-016-00002. Available online at: https://www.gov.uk/government/collections/hs2-phase2b-crewe-manchester-environmental-statement.

[4] High Speed Two Ltd (2022), High Speed Rail (Crewe – Manchester), *Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement*. Available online at: https://www.gov.uk/government/collections/hs2-phase-2b-crewe-manchester-supplementary-environmental-statement-1-and-additional-provision-1-environmental-statement.

[5] *The Conservation of Habitats and Species Regulations 2017* (2017/1012), as amended by The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 (2019/579). Her Majesty's Stationery Office, London.

1.1.6 In order to differentiate between the original scheme and the subsequent changes, the following terms are used in the SES2 and AP2 ES:

- 'the original scheme' – the Bill scheme submitted to Parliament in 2022, which was assessed in the main ES;
- 'the SES1 scheme' – the original scheme with any changes described in SES1 that are within the existing powers of the Bill;
- 'the AP1 revised scheme' – the original scheme as amended by SES1 changes and AP1 amendments;
- 'the SES2 scheme' – the original scheme with any changes described in SES1 (submitted in July 2022) and the SES2; and
- 'the AP2 revised scheme' – the original scheme as amended by SES1 and SES2 changes (as relevant) and AP2 amendments.

1.1.7 This report assesses the impacts on Holcroft Moss using an updated methodology for the assessment of air pollution arising from traffic flows. Further details are provided in the SES2 and AP2 ES Volume 5, Appendix: CT-001-00003 Air quality – Technical note – Updated guidance on the assessment methodology for Phase 2b SES2 and AP2 ES.

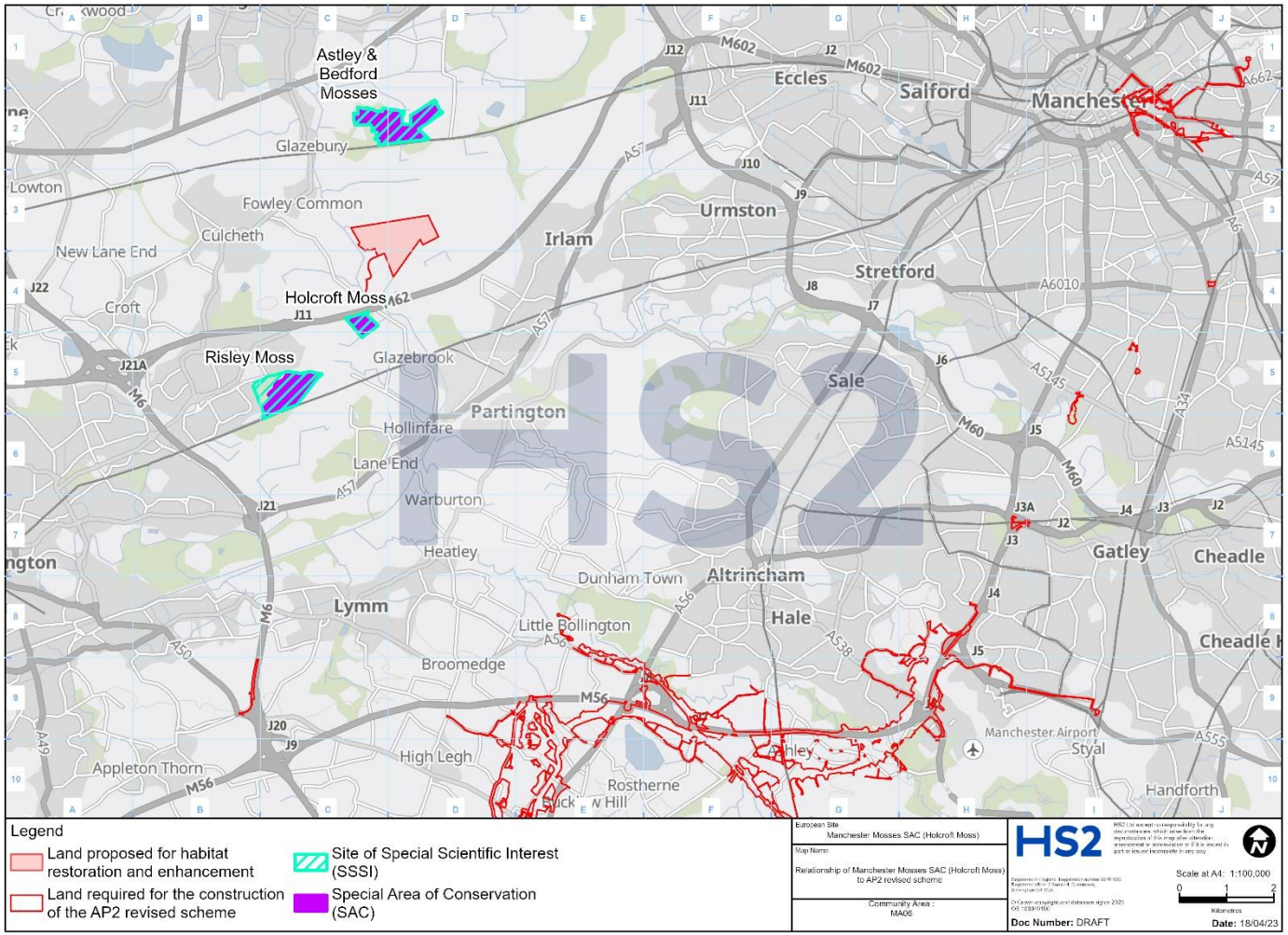
2 Context

2.1 AP2 revised scheme

2.1.1 Holcroft Moss lies approximately 7.2km from the land required for the construction of the AP2 revised scheme in the Hulsheath to Manchester Airport (MA06) community area, as shown on Figure 1. Land required for access modification is found closer, approximately 270m to the north of Holcroft Moss. This is to provide access to Little Woolden Moss where HS2 Ltd propose to contribute to habitat restoration and enhancement rather than to undertake construction activities. The M62, which is immediately north of Holcroft Moss, is expected to be used by workforce traffic and is a planned construction route for Heavy Duty Vehicles[6] (HDV) in the AP2 revised scheme. The proposed duration of construction traffic movements is from 2026 to 2038. In addition, there will be operational traffic flows associated with the AP2 revised scheme, associated with additional demand from Manchester Airport HS2 Station along the M56, causing rerouting of background traffic along the M62.

[6] HDV are defined as those with an unladen weight of greater than 3.5 tonnes, including: large vans; medium goods vehicles (rigid and artic); heavy goods vehicles (rigid and artic); and buses/coaches.

Figure 1: Relationship of Manchester Mosses SAC and Holcroft Moss to the AP2 revised scheme



2.2 Site description and nature conservation targets

Manchester Mosses SAC

2.2.1 Extensive mosslands dominated by highly characteristic, but fragile, *Sphagnum* communities formerly extended between the towns of Leigh and Warrington and across the River Mersey floodplain. Although the vast majority has since been lost to agriculture and development, isolated examples remain, three of which have been notified as separate component SSSI: Astley and Bedford Mosses (1989), Risley Moss (1986), and Holcroft Moss (1991).

2.2.2 However, prior to notification, these and other surviving fragments were subject to inappropriate management, such as burning, drainage and peat cutting. Reflecting historical land ownership, Holcroft Moss is almost unique in that peat cutting is not recorded as ever having taken place, allowing the original peat surface to persist, though today it remains far from natural. All sites, however, have been significantly and negatively influenced by nearby development and intensive agricultural practices on surrounding land. All, with the exception of Risley Moss, still occupy relatively rural locations, surrounded by pasture and arable farmland, with the following notable infrastructure features:

- the M62 lies immediately adjacent to and forms the northern boundary of Holcroft Moss, which has been impacted by construction in the late 1960s and ongoing drainage;
- the alignment of the dismantled Wigan to Glazebrook railway, constructed in the 1880s and abandoned in 1968 forms the western boundary of Holcroft Moss;
- the Manchester to Liverpool railway defines the southern border of Astley and Bedford Mosses, which have been impacted by construction in the 1820s and by ongoing drainage; and
- Warrington New Town, which was constructed in the 1970s, now lies on the edge of Risley Moss, which once formed part of a Royal Ordnance factory during WWII, during which the moss was used, in part, for the disposal of munitions.

2.2.3 Consequently, these three examples remain as heavily modified, isolated fragments, their characteristic peat-forming flora largely replaced with purple moor-grass (*Molinia caerulea*) grasslands, birch (*Betula spp*) woodland and bracken, the peat bodies elevated above the surrounding landscape as land levels have sunk as a consequence of farming practices.

2.2.4 Over the last 40 years, restoration management on increasing areas of land across all three SSSI, carried out by Natural England, Warrington Borough Council, and both Lancashire and Cheshire Wildlife Trusts, has provided suitable physical conditions at the surface to allow the

expansion of peat-forming vegetation[7]. However, this fragile and easily disturbed habitat remains vulnerable to external influences.

2.2.5 As a consequence of these competing factors, the degraded, raised bog features of all three SSSI are considered to be in favourable, or unfavourable recovering, condition (November 2018, Holcroft Moss; February 2020, Astley and Bedford Mosses; and October 2020, Risley Moss).

2.2.6 Reflecting these circumstances, the three SSSI, together extending over 170ha, were designated as the Manchester Mosses SAC in 2005 as examples of the Annex I habitat[8], 'degraded raised bogs capable of natural regeneration'[9]. Although this designation as a 'degraded bog' assumed no active peat formation, it did recognise that it was capable of natural restoration where the hydrology can be repaired and where, with appropriate rehabilitation management there is a reasonable expectation of re-establishing vegetation with peat-forming capability within 30 years[10].

Conservation objectives

2.2.7 The conservation objectives[11] for the Manchester Mosses SAC, state:

'Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring;

- the extent and distribution of qualifying natural habitats;
- the structure and function (including typical species) of qualifying natural habitats; and
- the supporting processes on which qualifying natural habitats rely.'

2.2.8 Raised bogs are dependent on the maintenance of, but vulnerable to adverse changes in, a favourable hydrological regime, both within and beyond the designated site boundaries. Classic raised bogs are ombrotrophic (i.e. reliant on rainfall for water and nutrients) and separated hydrologically from groundwater influences. However, in the case of Holcroft

[7] Joint Nature Conservation Committee (2015), *Manchester Mosses SAC Standard Data Form*. Available online at: https://jncc.gov.uk/jncc-assets/SAC-N2K/UK0030200.pdf.

[8] This refers to Annex I of the Habitats Directive (Council Directive 92.43/EEC). The conservation of those habitats listed in Annex I, require the designation of SAC.

[9] Joint Nature Conservation Committee (2021), *Habitat description for 7120 Degraded raised bogs still capable of natural regeneration.* Available online at: https://sac.jncc.gov.uk/habitat/H7120/.

[10] DG Environment and European Commission (2013), *Interpretation Manual of European Union Habitats.* Available online at: https://eunis.eea.europa.eu/references/2435.

[11] Natural England (2018), *European Site Conservation Objectives for Manchester Mosses Special Area of Conservation. Version 3.* Available online at: https://publications.naturalengland.org.uk/publication/5283870555504640.

Moss, the hydrological regime has been disrupted by peat cutting and changes to local drainage patterns on surrounding land from farming and development.

2.2.9 The conservation objectives are given greater expression in the associated Supplementary advice[12] and Site Improvement Plan (SIP)[13].

2.2.10 The overall aim is to restore the favourable conservation status of the degraded raised bog, by maintaining its current extent, creating an appropriate hydrological regime (in terms of both quality and resources) and reducing both nitrogen deposition and fragmentation.

2.2.11 The Supplementary advice and SIP provide further definition and, importantly, extend these aspirations, where appropriate, onto adjacent land beyond the SAC boundary. In particular, the former seeks to influence development on adjacent land to ensure it does not compromise the structure and function of the SAC.

Condition Assessment

2.2.12 In 2018, Natural England produced a site assessment[14] categorising the entire site as unfavourable recovering. This provides evidence that the existing management regime on Holcroft Moss remains successful, however it reaffirms the importance of the maintenance of a favourable hydrological regime. Although the prognosis for the site would appear to be positive, this cannot be assumed, given the complexities and inherent fragility of degraded raised bogs.

2.2.13 A site assessment[15] was also undertaken in 2021, which confirmed that Holcroft Moss remains in an unfavourable, recovering condition and suggests that air pollution from the M62 may be restricting progress towards favourable status. The condition assessment concludes that restoration is being effective.

[12] Natural England (2016), *European Site Conservation Objectives: Supplementary advice on conserving and restoring site features, Manchester Mosses Special Area of Conservation (SAC).* Available online at: https://publications.naturalengland.org.uk/publication/5283870555504640.

[13] Natural England (2014), *Site Improvement Plan, Manchester Mosses, Version 1.0.* Available online at: https://publications.naturalengland.org.uk/publication/6676598321315840.

[14] Natural England (2018), *Holcroft Moss Condition Assessment.* Available online at: https://publications.naturalengland.org.uk/publication/6676598321315840

[15] Natural England (2021), *Holcroft Moss 'Site Check'.* Available online at: https://designatedsites.naturalengland.org.uk/ReportUnitCondition.aspx?SiteCode=S1006461&ReportTitle=Holcroft%20Moss%20SSSI.

3 Assessment of the AP2 revised scheme

3.1 Introduction

3.1.1 This section provides the background assessment for identifying any likely significant effects on Holcroft Moss to be reported under the EIA Regulations 2017 (as amended). The conclusions of this assessment are summarised in the SES2 and AP2 ES Volume 2, Community Area report: Hulseheath to Manchester Airport (MA06).

3.1.2 This assessment identifies the likely significant effects as a result of the AP2 revised scheme. In addition, the air quality modelling, from which the impacts and effects reported below are derived, has taken into account cumulative effects from background traffic growth, committed developments[16] and impacts related to traffic emissions arising from the SES2 changes and AP2 amendments.

3.2 Scope, assumptions and limitations

3.2.1 Holcroft Moss lies 7.2km from the land required for the construction of the AP2 revised scheme[17]. Given the distance from the site, direct impacts can be ruled out. The potential impacts that could arise as a result of the AP2 revised scheme are restricted to changes in air quality and hydrology.

3.2.2 Holcroft Moss is located in a different surface water catchment (Glaze Brook) and different groundwater body (Lower Mersey Basin and North Merseyside Permo-Triassic Sandstone Aquifers) than the AP2 revised scheme (located over 9km away from this site). It is reasonable to assume that there would be no hydraulic connection between the site and the AP2 revised scheme. Therefore, potential impacts from changes in hydrology can be ruled out.

3.2.3 The Document to inform a Habitats Regulations Assessment for Manchester Mosses Special Area of Conservation (Holcroft Moss), that accompanied the main ES[2], reported on potential impacts from changes in hydrology (from construction of an embankment and viaduct, construction activities and the removal of a gas main, all part of the original scheme. As the SES1 removed the HS2 West Coast Main Line (WCML) connection, which extended from near Hoo Green junction on the HS2 network to the Lily Lane junction, near Golborne, these potential impacts are no longer relevant.

[16] Committed developments relevant to the AP2 revised scheme are reported in Volume 5 Planning data report of the SES2 and AP2 ES (see SES2 and AP2 ES Volume 5, Appendix: CT-004-00000). Committed developments are defined as developments with planning permission and sites allocated for development in adopted development plans, on or close to the land required for the scheme.

[17] Given the type and scale of the works proposed at Little Woolden Moss, despite its proximity to Holcroft Moss (see Section 2), there are no plausible impact pathways from the AP2 revised scheme.

3.2.4 Consequently, the only plausible impact is from air pollution caused by changes in traffic brought about by the AP2 revised scheme, allied with the general growth in traffic in the area. This issue is assessed below.

Air pollution assessment methodology

3.2.5 The assessment of air pollution is informed by established best practice provided by National Highways[18,19], Natural England[20,21], and the Institute for Air Quality Management (IAQM)[22].

3.2.6 These provide evidence that natural or semi-natural habitats can be harmed by vehicle emissions through two intimately linked pathways: via the concentration of nitrogen oxides (NOx) and ammonia (NH_3) and the subsequent deposition of nitrogen and acid. The assessment of the impact of air pollution therefore comprises the analysis of the dispersal of these compounds.

3.2.7 In sufficient concentrations, airborne NOx and NH_3 can result in direct toxic effects on vegetation. Further, the subsequent deposition of nitrogen compounds can lead to the acidification and nutrient enrichment of land and water. Over time, this may not only hinder the growth, abundance and distribution of plants, and especially, bryophytes and lichens, but can also prompt the growth of ruderal species or algal blooms which can lead to changes in the structure and function of qualifying or supporting habitats. Whilst certain species and communities are less susceptible to harm than others, increases in the airborne concentration of pollutants or the rate of their deposition can also exacerbate the effects of other factors such as climate change or pathogens leading to negative, synergistic effects.

3.2.8 The concentrations and/or rates of the deposition of nitrogen compounds fall quickly in the first few metres from the roadside before gradually levelling out; beyond 200m, it becomes difficult to distinguish from background levels. This means that impacts at 10m, 50m or 200m or more can be very different from those at the roadside.

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[18] Highways Agency (2019), *Design Manual for Roads and Bridges (DMRB), Sustainability and Environmental Appraisal, LA 105 Air Quality*, Highways Agency, London. Available online at: https://www.standardsforhighways.co.uk/search/10191621-07df-44a3-892e-c1d5c7a28d90.

[19] National Highways (2021), *Ammonia N Deposition Tool V2.*

[20] Natural England (2018), *Natural England's approach to advising competent authorities on the assessment of road traffic emissions under the Habitats Regulations.* Available online at: https://publications.naturalengland.org.uk/publication/4720542048845824

[21] Although designed for Habitats Regulations Assessments, Natural England (2018) guidance is applicable for the assessment under the EIA Regulations, 2017 (as amended). Section 1.1.6 states: '...this guidance does not specifically cover nationally significant sites, which are covered by a different regulatory framework. However, the general principles for air quality assessment outlined here for European Sites are likely to be equally relevant for this and other designations...'.

[22] Institute of Air Quality Management (2020), *A guide to the assessment of air quality impacts on designated nature conservation sites*, *v1.1*. Available online at: https://iaqm.co.uk/guidance/.

3.2.9 The assessment of air pollution impacts for ecologically sensitive sites within 200m of roads is undertaken where one or more of the following Design Manual for Roads and Bridges (DMRB)[23] criteria are met:

- change in road alignment by 5m or more;
- change in daily traffic flows by 1,000 vehicles or more as Annual Average Daily Traffic (AADT);
- change in daily flows of HDV by 200 AADT or more;
- change in daily average speed by 10kph or more; or
- change in peak hour speed by 20kph or more.

3.2.10 It can be seen, therefore, that the additional emissions that might arise from increased traffic are only likely to be significant where:

- a designated site lies within 200m of a road;
- traffic flows are expected to increase (or other DMRB criteria are met); and
- a qualifying feature is known to be sensitive to such impacts.

3.2.11 Should all three criteria be met, best practice guidance recommends that the ecological characteristics of the site should be explored and, if necessary, traffic and/or air quality assessments carried out to evaluate any impacts during construction or operation.

3.2.12 The ecological characteristics of a site are derived from the formal citations, condition assessments, conservation objectives, Favourable Condition Tables (FCT), SIP, supplementary advice and any other surveys and management plans where available.

3.2.13 Traffic flows are assessed by calculating AADT figures using established models[24]. Should increases in traffic be less than 1,000 AADT[25] or 200 HDV, the risk of a significant effect can be ruled out and no further assessment is required. Should flows exceed these values, air quality analysis is necessary.

3.2.14 The air quality analysis typically models any changes at fixed points on a 200m transect extending from the roadside. Impacts identified through the air quality analysis are assessed by calculating the relative contribution of the plan or project in relation to the relevant

[23] Highways Agency (2019), *Design Manual for Roads and Bridges (DMRB), Sustainability and Environmental Appraisal, LA 105 Air Quality*, Highways Agency, London. Available online at: https://www.standardsforhighways.co.uk/search/10191621-07df-44a3-892e-c1d5c7a28d90.

[24] It should be noted that traffic data used in the air quality assessment presented in the SES2 and AP2 ES is based on daily peak derived traffic data. The assessment presented in this appendix is based on annualised traffic data which is considered more appropriate for the purposes of the Designated Site Assessment.

[25] These values are utilised as there is evidence to show that these equate approximately to a 1% change in critical loads.

critical levels for NOx and NH_3 and the critical loads for the deposition of nitrogen and acid, as described by the Air Pollution Information System (APIS)[26], as follows:

- the critical level for NOx is fixed and is expressed as a concentration: 30µg/m^3. It is a precautionary threshold below which there is confidence that harmful effects on vegetation communities will not arise, and further assessment may not be necessary;
- the critical level for NH_3 is also expressed as a concentration and is set at 3µg/m^3 for higher plants and at 1µg/m^3 where bryophytes or lichens are present and are considered to '…form a key part of the ecosystem integrity"[27];
- the critical loads for nitrogen deposition vary and are specific to each qualifying feature. These are presented as a range of values (expressed as a rate, e.g. 10kg N/ha/yr – 20kg N/ha/yr) and typically, only the lowest value is used (unless there are compelling reasons to do otherwise) as this will emphasise any negative outcomes; and
- acid deposition is also assessed via critical loads, though measured in keq/ha/yr.

3.2.15 Natural England best practice guidance[20] specifies that should nitrogen deposition increase by less than 1% of the lower critical load or concentrations of NOx or NH_3 increase by less than 1% of the critical level, likely significant effects can be ruled out. However, should the 1% threshold be exceeded, a likely significant effect cannot be ruled out.

3.2.16 The assessment of significance of acid deposition differs. If the total concentration is predicted to be less than the lower critical load, then the effect is considered not to be significant. However, a likely significant effect cannot be ruled out when: the change in concentration is more than 1% of the maximum critical load and the total for acid deposition is also greater than the maximum critical load.

3.2.17 The 1% threshold, set at two orders of magnitude below the critical load or level, is highly precautionary. Account must also be taken of the type of habitats (some are more resilient than others) and the distribution of the designated features as not all will be distributed evenly across sites, and other factors may be at play.

3.3 Assessment of impact and effects

3.3.1 Holcroft Moss lies adjacent to the M62, within the 200m threshold described in Section 3.2. Consequently, an assessment of traffic flows is required.

3.3.2 The following assessment utilises relevant traffic and air quality analysis as set out in Annex A and reports any likely significant effects on a precautionary basis. HS2 Ltd is continuing to

[26] UK Centre for Ecology and Hydrology (2021), *Air Pollution Information System*. Available online at: http://www.apis.ac.uk/.

[27] Air Pollution Information System (2016), *Critical Loads and Critical Levels – a guide to the data provided in APIS*. Available online at: https://www.apis.ac.uk/critical-loads-and-critical-levels-guide-data-provided-apis#_Toc279788054.

identify suitable measures to mitigate or compensate for potential significant effects identified on designated sites.

Assessment of traffic flows and air pollution during construction

3.3.3 The traffic analysis (see Section 6.1, Annex A) indicates that the construction of the AP2 revised scheme will exceed the AADT or HDV traffic thresholds described in Section 3.2. Therefore, an air quality assessment is required.

3.3.4 The air quality assessment of traffic flows is summarised in Annex A. This has been undertaken in accordance with the Volume 5, Appendix: CT-001-00001, Environmental Impact Assessment Scope and Methodology Report (SMR)[28] and the SES2 and AP2 ES Volume 5, Appendix: CT-001-00003 Air quality – Technical note – Updated guidance on the assessment methodology for Phase 2b SES2 and AP2 ES.

3.3.5 Two transects, each 200m long, were established at Holcroft Moss, located on the north-east and north-west corners extending southwards to reflect the greatest air quality impact as well as to take account of the most sensitive habitat features. Each transect started from the kerbside. The transects intercepted the boundary of Holcroft Moss at 22m and 26m respectively. All subsequent points fell within the designated site. The location and distribution of the transects are shown in Figure 2.

Critical loads and levels

3.3.6 Two habitat types are found within Holcroft Moss; extending from the M62 these comprise secondary, broadleaved woodland and degraded lowland raised mire (also referred to as raised bog). The woodland extends to a maximum width of approximately 125m and never less than approximately 75m. However, it is the degraded lowland raised mire that dominates the majority of the site, which represents the sole qualifying feature of the SAC. Consequently, the following critical loads for nitrogen and acid deposition and critical levels for NOx and NH_3 for the degraded lowland raised mire are drawn from site-specific values on APIS[26]:

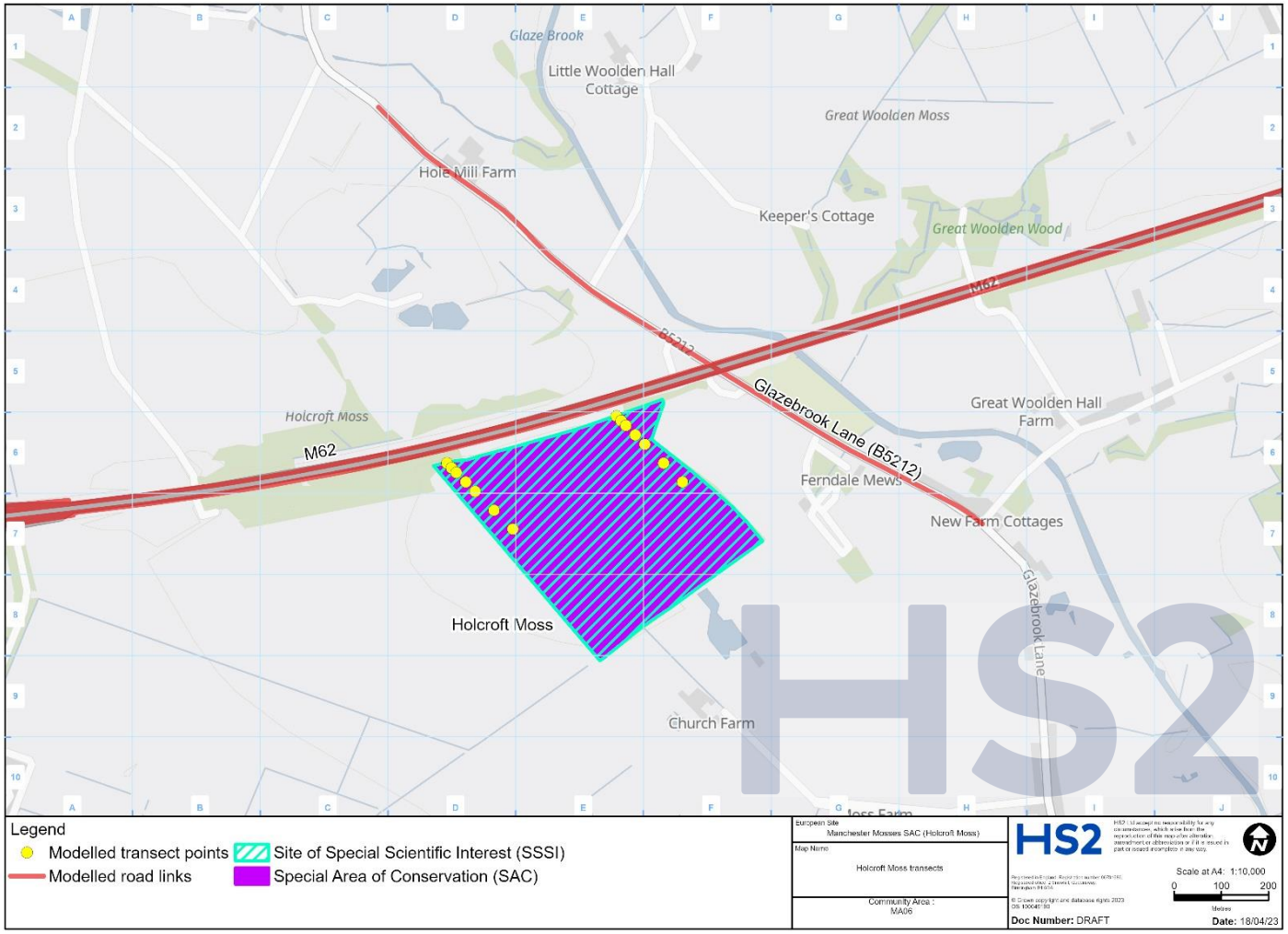
- Nitrogen deposition: 5kg N/ha/yr – 10kg N/ha/yr;
- NH3: 1µg/m^3;
- NOx: 30µg/m^3; and
- Acid deposition: 0.32keq – 0.564keq/ha/yr.

[28] High Speed Two Ltd (2022), High Speed Rail (Crewe – Manchester), *Environmental Statement, Environmental Impact Assessment Scope and Methodology Report,* Volume 5, Appendix: CT-001-00001. Available online at: https://www.gov.uk/government/collections/hs2-phase2b-crewe-manchester-environmental-statement.

3.3.7 Critical loads and levels for the woodland, whilst also drawn from APIS[26], represent generic values and have been provided to simply assist the modelling exercise. Given that the woodland does not represent a qualifying feature, any exceedances of these values within this habitat cannot lead to likely significant effects. Regardless, the following values have been applied:

- Nitrogen deposition: 10kg N/ha/yr – 20kg N/ha/yr;
- NH_3: 3µg/m^3;
- NOx: 30µg/m^3; and
- Acid deposition: 0.321keq – 0.564keq/ha/yr.

Figure 2: Location of Holcroft Moss and the modelled transects



Air pollution impacts

3.3.8 Table A5 of Annex A shows that predicted NOx concentrations with the AP2 revised scheme are lower than the 2018 baseline rates at all modelled receptors (i.e. transect points). In addition, NOx concentrations are predicted to be within the air quality standard at all modelled receptors with or without the AP2 revised scheme. However, there is a greater than 1% exceedance of the NOx critical level brought about by the AP2 revised scheme up to 40m from the roadside. Despite this, as described in Section 3.3, the exceedance is restricted to the broadleaved woodland habitat, which is not a qualifying feature and therefore, likely significant effects can be ruled out.

3.3.9 Table A6 of Annex A shows that predicted NH_3 concentrations with the AP2 revised scheme are lower than the 2018 baseline rates at all modelled receptors. However, NH_3 concentrations are predicted to be above the relevant air quality standard with or without the AP2 revised scheme. Further, there is a greater than 1% exceedance of the critical level. The maximum change is 2.9% 20m from the road where the transect intercepts with the site, though where the transect intercepts with the raised bog at 75m this has fallen to 1.2%. Therefore, likely significant effects cannot be ruled out.

3.3.10 Table A7 of Annex A shows that predicted nitrogen deposition rates with the AP2 revised scheme are lower than the 2018 baseline rates at all modelled receptors. However, nitrogen deposition rates are predicted to be above the relevant air quality standard at all modelled receptors with or without the AP2 revised scheme. In addition, there is a greater than 1% exceedance of the critical load brought about by the AP2 revised scheme. The maximum change is 2.9% at 20m from the road where the transect intercepts with the site, though where the transect intercepts with the raised bog at 75m this has fallen to 1.5%. Therefore, likely significant effects cannot be ruled out.

3.3.11 Table A8 of Annex A shows that predicted acid deposition rates with the AP2 revised scheme are lower than the 2018 baseline rates at all modelled receptors. However, acid deposition rates are predicted to be above the relevant air quality standard across all modelled receptors with or without the AP2 revised scheme. Further, there is a greater than 1% exceedance of the critical load, which falls to just below 1% at 75m from the road. As it is not possible to determine the exact location where the raised bog begins, likely significant effects cannot be ruled out.

Assessment of traffic flows and air pollution during operation

3.3.12 The traffic analysis (see Section 6.5, Annex A) indicates that the operation of the AP2 revised scheme will exceed the AADT or HDV traffic thresholds described in Section 3.2. Therefore, an air quality assessment is required.

3.3.13 The same methodology for the air quality assessment of traffic flows was applied, as described for the construction phase in Section 3.3.

3.3.14 Table A16 of Annex A shows that predicted NOx concentrations with the AP2 revised scheme are lower than the 2018 baseline rates at all modelled receptors. In addition, NOx concentrations are predicted to be within the air quality standard at all modelled receptors with or without the AP2 revised scheme. Further, there is a less than 1% exceedance of the critical level brought about by the AP2 revised scheme. Therefore, likely significant effects can be ruled out.

3.3.15 Table A17 of Annex A shows that predicted NH_3 concentrations with the AP2 revised scheme, are lower than the 2018 baseline rates at all modelled receptors. However, NH_3 concentrations are predicted to be above the relevant air quality standard with or without the AP2 revised scheme. Nonetheless, there is a less than 1% exceedance of the critical level brought about by the AP2 revised scheme. Therefore, likely significant effects can be ruled out.

3.3.16 Table A18 of Annex A shows that predicted nitrogen deposition rates with the AP2 revised scheme are lower than the 2018 baseline rates at all modelled receptors. However, nitrogen deposition rates are predicted to be above the relevant air quality standard at all modelled receptors with or without the AP2 revised scheme. Nonetheless, there is a less than 1% exceedance of the critical load brought about by the AP2 revised scheme. Therefore, likely significant effects can be ruled out.

3.3.17 Table A19 of Annex A shows that predicted acid deposition rates with the AP2 revised scheme are less than the 2018 baseline rates at all modelled receptors. However, acid deposition rates are predicted to be above the relevant air quality standard across all modelled receptors with or without the AP2 revised scheme. In addition, the changes brought about by the AP2 revised scheme do not exceed 1% of the critical load. Therefore, likely significant effects can be ruled out.

3.4 Mitigation measures

3.4.1 The likely significant effects identified above have been identified on a precautionary basis.

3.4.2 HS2 Ltd is continuing to seek to identify suitable measures to mitigate or compensate for potential significant effects identified on designated sites. In doing so HS2 Ltd will continue to engage with stakeholders to fully understand the receptors and the suitability of the measures.

3.5 Summary of likely significant effects

3.5.1 The air quality assessment demonstrates that, in the absence of mitigation, during construction, the relevant air quality standards are exceeded for concentrations of NH_3 and rates of acid and nitrogen deposition, and in addition, there is a greater than 1% increase of the respective critical level and critical loads. Therefore, likely significant effects cannot be ruled out as a result of the AP2 revised scheme during construction.

3.5.2 Whilst the air quality standard for NOx is not exceeded during construction, there is a greater than 1% increase of the critical level. This exceedance falls within the woodland habitat only, which does not comprise a qualifying feature and as such likely significant effects can be ruled out.

3.5.3 During operation, likely significant effects as a result of the AP2 revised scheme can be ruled out because there is a less than 1% increase in concentrations of NOx and NH_3 and rates of nitrogen and acid deposition.

4 Ongoing work

4.1 Introduction

4.1.1 A further and separate assessment is being carried out to meet the needs of Regulation 63 of the Conservation of Habitats and Species Regulations 2017 (as amended) ('Habitats Regulations')[5]. This section provides the emerging results at this current stage of design and assessment, which will be finalised as part of the further and separate assessment.

4.1.2 This section uses language that will be applicable to the further assessment carried out under the Habitats Regulations.

4.1.3 This section considers the AP2 revised scheme in combination with other plans and projects that fall within a 10km radius of the designated site. The other plans and projects relevant to this assessment have been identified in Section 2 of Annex A.

4.2 Air quality assessment of traffic flows in combination

Methodology

4.2.1 The same transects and critical loads and levels, as described in Section 3, were utilised.

4.2.2 The scope of the in combination assessment has been limited to those plans or projects that could contribute to a cumulative increase in air pollution at Holcroft Moss.

4.2.3 In combination effects are taken into account in the traffic and the non-traffic related emission sources used for the assessment, which incorporate likely changes brought about by other proposed and committed developments. The approach to this assessment, which has been agreed with Natural England, is provided in Section 2 of Annex A.

Construction phase impacts in combination

4.2.4 Table A9 of Annex A shows that predicted NOx concentrations with the AP2 revised scheme are lower than the 2018 baseline at all modelled receptors. In addition, NOx concentrations are predicted to be within the air quality standard at all modelled receptors with or without the AP2 revised scheme. However, there is a greater than 1% exceedance of the NOx critical level brought about by the AP2 revised scheme in combination. The maximum change is 1.9% at 20m from the road where the transect intercepts with the site, though where the transect intercepts with the raised bog at 75m this has fallen to just below 1%. However, it is not possible to determine the exact location where the raised bog begins and therefore, although all values lie below the 30µg/m^3 air quality standard, in accordance with Natural England's best practice guidance[20], likely significant effects in combination cannot be ruled out.

4.2.5 Table A10 of Annex A shows that predicted NH_3 concentrations with the AP2 revised scheme are lower than the 2018 baseline rates at all modelled receptors. In addition, NH_3 concentrations are predicted to be above the air quality standard across the transect with or without the AP2 revised scheme. Further, the changes in NH_3 concentrations brought about as a result of the AP2 revised scheme in combination exceed 1% of the critical level. The maximum change is 4.3% at 20m from the road where the transect intercepts with the site, though where the transect intercepts with the raised bog at 75m this has fallen to 2.1%. Likely significant effects therefore cannot be ruled out in combination.

4.2.6 Table A11 of Annex A shows that predicted nitrogen deposition rates with the AP2 revised scheme are lower than the 2018 baseline rates at all modelled receptors. However, nitrogen deposition rates are predicted to be above the air quality standard at all points on the transect with or without the AP2 revised scheme. In addition, the changes in nitrogen deposition brought about by the AP2 revised scheme in combination exceed 1% of the critical load. The data show that the maximum change is 4.2% at 20m from the road where the transect intercepts with the site, though where the transect intercepts with the raised bog at 75m this has fallen to 2.7%. Likely significant effects therefore cannot be ruled out in combination.

4.2.7 Table A12 of Annex A shows that predicted acid deposition rates with the AP2 revised scheme are lower than the 2018 baseline rates at all modelled receptors. However, acid deposition rates are predicted to be above the air quality standard at all modelled receptors with or without the AP2 revised scheme. Further, the changes in acid deposition brought about by the AP2 revised scheme in combination exceed 1% of the critical load. The maximum change is 4.7% above the critical load at 20m from the road where the transect intercepts with the site, though where the transect intercepts with the raised bog at 75m this has fallen to 1.7%. Therefore, likely significant effects cannot be ruled out in combination.

Operational phase impacts in combination

4.2.8 Table A21 of Annex A shows that predicted NOx concentrations with the AP2 revised scheme are lower than the 2018 baseline rates at all modelled receptors. In addition, NOx concentrations are predicted to be within the air quality standard at all modelled receptors with or without the AP2 revised scheme. However, there is a greater than 1% exceedance of the NOx critical level brought about by the AP2 revised scheme in combination, up to 40m from the roadside. Despite this, as described in Section 3.3.6, the exceedance is restricted to the broadleaved woodland habitat, which is not a qualifying feature. Therefore, likely significant effects in combination can be ruled out.

4.2.9 Table A22 of Annex A shows that predicted NH_3 concentrations rates with the AP2 revised scheme, are lower than the 2018 baseline rates at all modelled receptors. However, NH_3 concentrations are predicted to be above the relevant air quality standard at all modelled receptors with or without the AP2 revised scheme. In addition, there is a greater than 1% exceedance of the critical level brought about by the AP2 revised scheme in combination. The maximum change is 5.2% at 20m where the transect intercepts with the site, though

where the transect intercepts with the raised bog at 75m this has fallen to 2.4%. Therefore, likely significant effects in combination cannot be ruled out.

4.2.10 Table A23 of Annex A shows that predicted nitrogen deposition rates with the AP2 revised scheme are lower than the 2018 baseline rates at all modelled receptors. However, nitrogen deposition rates are predicted to be above the relevant air quality standard at all modelled receptors with or without the AP2 revised scheme. In addition, there is a greater than 1% exceedance of the critical load brought about by the AP2 revised scheme in combination. The maximum change is 4.6% at 20m where the transect intercepts with the site, though where the transect intercepts with the raised bog at 75m this has fallen to 2.8%. Therefore, likely significant effects in combination cannot be ruled out.

4.2.11 Table A24 of Annex A shows that predicted acid deposition rates with the AP2 revised scheme are less than the 2018 baseline rates at all modelled receptors. However, acid deposition rates are predicted to be above the relevant air quality standard across all modelled receptors with or without the AP2 revised scheme. In addition, the changes brought about by the AP2 revised scheme exceed 1% of the critical load. The maximum change is 5.5% at 20m from the road where the transect intercepts with the site, though where the transect intercepts with the raised bog at 75m this has fallen to 1.8%. Therefore, likely significant effects in combination cannot be ruled out.

4.3 Current status of the ongoing work

4.3.1 At this current stage of design and assessment, it is considered that likely significant effects cannot be ruled out as a result of the construction and operation of the AP2 revised scheme in combination with other plans or projects.

4.3.2 Therefore, further and separate assessment of the AP2 revised scheme is being carried out to meet the needs of Regulation 63 of the Habitats Regulations. This will confirm the assessment conclusions at that stage of the design and assessment.

Annex A: Additional air quality information

1 Purpose

This annex provides additional air quality information in relation to impacts from vehicle emissions to support an assessment for the Manchester Mosses SAC (Holcroft Moss SSSI).

This annex assesses the impact of air pollution on the Holcroft Moss SSSI component of the Manchester Mosses SAC. For simplicity, it is referred to as Holcroft Moss throughout the rest of this annex except where specific mention is required of the SAC.

2 Scope, assumptions and limitations

The scope, assumptions and limitations for the air quality assessment are set out in full in Volume 1 (Section 8) of the SMR (see Volume 5: Appendix CT-001-00001) and accompanying SMR Technical note – Air quality: Guidance on the assessment methodology[29] and the SES2 and AP2 ES Volume 5, Appendix: CT-001-00003 Air quality – Technical note – Updated guidance on the assessment methodology for Phase 2b SES2 and AP2 ES.

Key elements in relation to the assessment of vehicle emissions on ecologically sensitive sites are:

- screening of traffic data using the criteria set out in the SMR, which is based on the DMRB criteria[18] to identify where assessment is required;
- these criteria are the following for assessing the impacts of the scheme:
  - change in road alignment by 5m or more;
  - change in daily traffic flows by 1,000 vehicles or more as AADT;
  - change in daily flows of HDV by 200 AADT or more;
  - change in daily average speed by 10kph or more; or
  - change in peak hour speed by 20kph or more.
- the following criteria are used for assessing the impacts of the scheme in combination with other plans and projects:
  - change in daily traffic flows by 1,000 vehicles or more as AADT; or
  - change in daily flows of HDV by 200 AADT or more.
- ecological receptors included in the air quality assessment are designated sites with habitats sensitive to nitrogen. These could include SAC, Special Protection Areas (SPA) and Ramsar sites;
- transects have been used within a designated site with modelled points at 0m, 10m, 20m, 30m, 40m, 50m, 75m, 100m, 150m and 200m from the edge of the road unless the shape of the site and potential impacts require different distances to characterise the impacts; and
- a deposition velocity relevant to the habitat of each site has been used, as detailed in the IAQM ecological guidance[22]. Data on ammonia, nitrogen deposition and acid deposition has been taken from the most recent information available on the APIS[26] website. No plume depletion for ammonia dispersion modelling has been included. No reduction in future background deposition rates or background pollutant concentrations has been applied to the APIS data.

[29] High Speed Two Ltd (2022), High Speed Rail (Crewe – Manchester), *Environmental Statement, Environmental Impact Assessment Scope and Methodology Report,* Volume 5, Appendix: CT-001-00001. Available online at: https://www.gov.uk/government/collections/hs2-phase2b-crewe-manchester-environmental-statement.

The following scenarios were assessed:

- baseline;
- selected year(s) within the construction period for the assessment of the effects of construction. The year(s) of assessment were selected based on the worse case annual average traffic data, refined from the peak period traffic data, during the construction programme and when significant effects might be expected; and
- a scenario for the first full operational year after construction is completed.

The baseline scenario represents 2018.

For the construction assessments, emission factors and backgrounds (with the exception of the APIS data) used the earliest construction year (i.e. 2026). This is a worse case assumption as emissions from road vehicles are improving year-on-year (e.g. due to increasing numbers of electric vehicles) and the worst case construction period may not fall in the first year of construction.

For each assessment year, both the scenario without the AP2 revised scheme in place and the scenario with the AP2 revised scheme in place have been modelled, with background pollutant concentrations, deposition rates and emission factors representing the future year being assessed (with the exception of the APIS data). This comparison was used to assess the impacts of the AP2 revised scheme.

For the assessment of the AP2 revised scheme in combination with other plans and projects, a different 'without' scheme scenario was used and described as the 'do nothing' scenario. This uses traffic data from the 2018 baseline, but background pollutant concentrations, deposition rates and emission factors representing the future year being assessed (with the exception of the APIS data).

The assessment incorporated HS2 Ltd Policy on construction vehicle emissions standards. These standards are published in Information Paper E14[30]; Air Quality and include Euro VI for HGV, and Euro 6 and Euro 4 for diesel and petrol Light Duty Vehicles respectively.

The traffic forecasts that underpin this report were derived from strategic traffic models that have been sourced from key stakeholders, including Local Highway Authorities and National Highways. In combination, these models cover the areas that are expected to be affected by the AP2 revised scheme and have been used as the basis of assessment for traffic flow analysis. The models have been developed by the relevant stakeholders in accordance with Transport Analysis Guidance (TAG) provided by the Department for Transport, with each model representing a base year position between 2016 and 2018. It is understood that the strategic traffic models supplied to HS2 Ltd take account of the core development growth scenarios set out in the relevant local plan documents, transport strategy documents and

[30] High Speed Two Ltd (2022*), High Speed Two Phase 2b Information Paper E14: Air Quality.* Version 2.0. Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1084183/E14_Air_quality_v2.pdf.

model forecasting reports published at that time. Information about these development growth scenarios can be found in the following documents:

- Cheshire East Local Plan Strategy 2010-2030, July 2017[31];
- Cheshire West and Chester Local Plan (Part Two) Land Allocations and Detailed Policies, November 2017[32];
- Winsford Transport Strategy Recommendations Report, June 2016[33];
- Northwich Transport Strategy Recommendations Report, April 2018[34];
- Regional Investment Programme (RIP) M6 Junction 19 Improvement PCF Stage 3 Transport Forecasting Report, January 2019[35]; and
- GMVDM4A Uncertainty Log for NTEM GMSF Full Scenario, Version 2, November 2018.

In all cases, the traffic growth forecasts have been constrained to TEMPro version 7.2 which uses the National Trip End Model (NTEM 7.2 (2017))[36] dataset and the National Transport Model (NTM) 2015. TEMPro inherently incorporates future planned development, being based on approved plans, irrespective of whether it is approved, committed, or simply included in approved plans.

Consideration was also given to relevant non-road plans and projects that could contribute to a cumulative increase in air pollution. Searches were carried out for the following non-traffic related emission sources (which were also included in the air quality model) within a 10km radius (unless stated otherwise below). This is considered to be reasonable and proportionate and meets the expectations in Section 4.48 of Natural England's guidance[20]:

- combustion and energy < 20MW (within 5km);
- combustion and energy > 20MW;
- farming, livestock and poultry;
- waste, e.g. landfill gas; and

[31] Cheshire East Council (2022), *Local Plan Strategy 2010 – 2030. Adopted 17 July 2017*. Available online at: https://www.cheshireeast.gov.uk/pdf/planning/local-plan/local-plan-strategy-web-version-1.pdf.

[32] Cheshire West and Chester Council (2019), *Local Plan (Part Two) Land Allocations and Detailed Policies. Adopted 18 July 2019*. Available online at: https://consult.cheshirewestandchester.gov.uk/kse/.

[33] Mott MacDonald (2016), *Winsford Transport Strategy: Recommendations Report*. Available online at: https://cmttpublic.cheshirewestandchester.gov.uk/documents/s48945/Appendix%20B%20Winsford%20Transport%20Strategy.pdf.

[34] Mott MacDonald (2018), *Northwich Transport Strategy: Recommendations Report*. Available online at: https://www.cheshirewestandchester.gov.uk/documents/parking-roads-and-travel/public-transport/transport-strategies/northwich-transport-strategy/northwich-transport-strategy-recommendation-report-130318.pdf.

[35] Highways England (2019), *Regional Investment Programme (RIP) M6 Junction 19 Improvement*. Issue Number 1.0. Available online at: https://assets.highwaysengland.co.uk/roads/road-projects/M6+junction+19/Statement+of+Reasons.pdf.

[36] Department for Transport, *TEMPro version 7.2*. Available online at: https://www.data.gov.uk/dataset/11bc7aaf-ddf6-4133-a91d-84e6f20a663e/national-trip-end-model-ntem.

- minerals activities.

3 Air quality standards

Air quality limit values and objectives are quality standards for clean air and to protect human health or harm to vegetation. The term 'air quality standards' has been used to refer to both the English air quality objectives and the air quality limit values and critical levels introduced in the UK based on EU Directives. Table A1 sets out the air quality standard for NOx.

Table A1: Air quality standards

Pollutant	Averaging period	Standard
NOx (for protection of vegetation)	Annual mean	30µg/m^3

In the context of air pollution impacts on ecological sites (e.g. in this case SAC, SPA and Ramsar sites), road traffic emits NOx and ammonia, which both contribute to nitrogen and acid deposition. Therefore, this assessment considers changes in NOx and ammonia as well as changes in nitrogen and acid deposition. Comparisons have been made against the applicable critical loads[37], critical level or relevant standard for the site, as above or as provided by APIS.

[37] The critical loads for deposition vary and are specific to each qualifying feature. These are presented as a range of values (expressed as a rate, e.g. 10kg N/ha/yr – 20 kg N/ha/yr) and typically, as a precautionary approach, only the lowest value is used (unless there are compelling reasons to do otherwise) as this will emphasise any negative outcomes.

4 How significance is assessed

For the assessment of NOx concentrations, if the change is predicted to be less than 1% of the air quality standard then the effect is considered to be not significant. However, should the NOx concentration change by more than 1% then the assessment of significance will be undertaken by an ecologist and reported within the main report.

For the assessment of ammonia (NH_3), if the change is predicted to be less than 1% of the air quality critical level[38], then the effect is considered to be not significant. However, should the concentration change by more than 1%, then the assessment of significance will be undertaken by an ecologist and reported within the main report.

For the assessment of nitrogen deposition, if the change is predicted to be less than 1% of the lower critical load[38], then the effect is considered to be not significant. However, should the deposition change by more than 1%, then the assessment of significance will be undertaken by an ecologist and reported within the main report.

For the assessment of acid deposition, if the total concentration is predicted to be less than the lower critical load, then the effect is considered to be not significant. If the change in concentration is more than 1% of the maximum critical load and the total for acid deposition is greater than the maximum critical load, then the assessment of significance will be undertaken by an ecologist and reported within the main report.

[38] The critical level for NH_3 is 3µg/m^3 for low level vegetation and 1µg/m^3 high vegetation (e.g. trees).

5 Assessment of construction traffic effects – AP2 revised scheme

5.1 Screening of traffic data

The assessment of construction traffic impacts has used traffic data based on an estimate of the average daily flows in the peak year during the construction period (2026-2039). Traffic data is presented in Table A2.

The screening process identified a total of one road in the area exceeding the screening thresholds:

- the M62 junction 11 to 12.

Further roads have been included in the assessment to account for their emissions at nearby receptors.

Figure A1 presents a detailed map of the modelled area including assessed roads (Modelled Road Links in red) and modelled transect points (yellow dots).

Table A2: Traffic data summary (construction phase, AP2 revised scheme)

Road ID	Road name	Annual Average Daily Traffic (AADT)					Heavy Duty Vehicles (HDV)				
		2018 baseline	2026 without the AP2 revised scheme	2026 with the AP2 revised scheme	AP2 revised scheme change (2026 with AP2 revised scheme – 2026 without AP2 revised scheme)	In combination change (2026 with the Proposed Scheme – 2018 baseline)	2018 baseline	2026 without the AP2 revised scheme	2026 with the AP2 revised scheme	AP2 revised scheme change (2026 with AP2 revised scheme – 2026 without AP2 revised scheme)	In combination change (2026 with the Proposed Scheme – 2018 baseline)
13005_2673, 684_13006	M62 Junction 11 to 12	125,179	132,533	137,595	5,062	12,416	13,682	13,455	13,732	276	50
4147_2697, 2697_4147	B5212 Holcroft Lane north of M62	7,264	8,315	8,315	0	1,051	344	350	350	0	6

Notes: Values in bold indicate change in traffic flow triggering for assessment.

5.2 Receptors assessed and background concentrations

Table A3 shows the background concentrations for NOx, background nitrogen deposition and critical loads. Table A4 shows the background acid deposition, critical loads and background ammonia concentrations. The yellow transect points in Figure A1 represent the closest point to the road for each of the two sensitive habitat types.

Figure A1: Map of Holcroft Moss, including modelled road links and modelled transect points

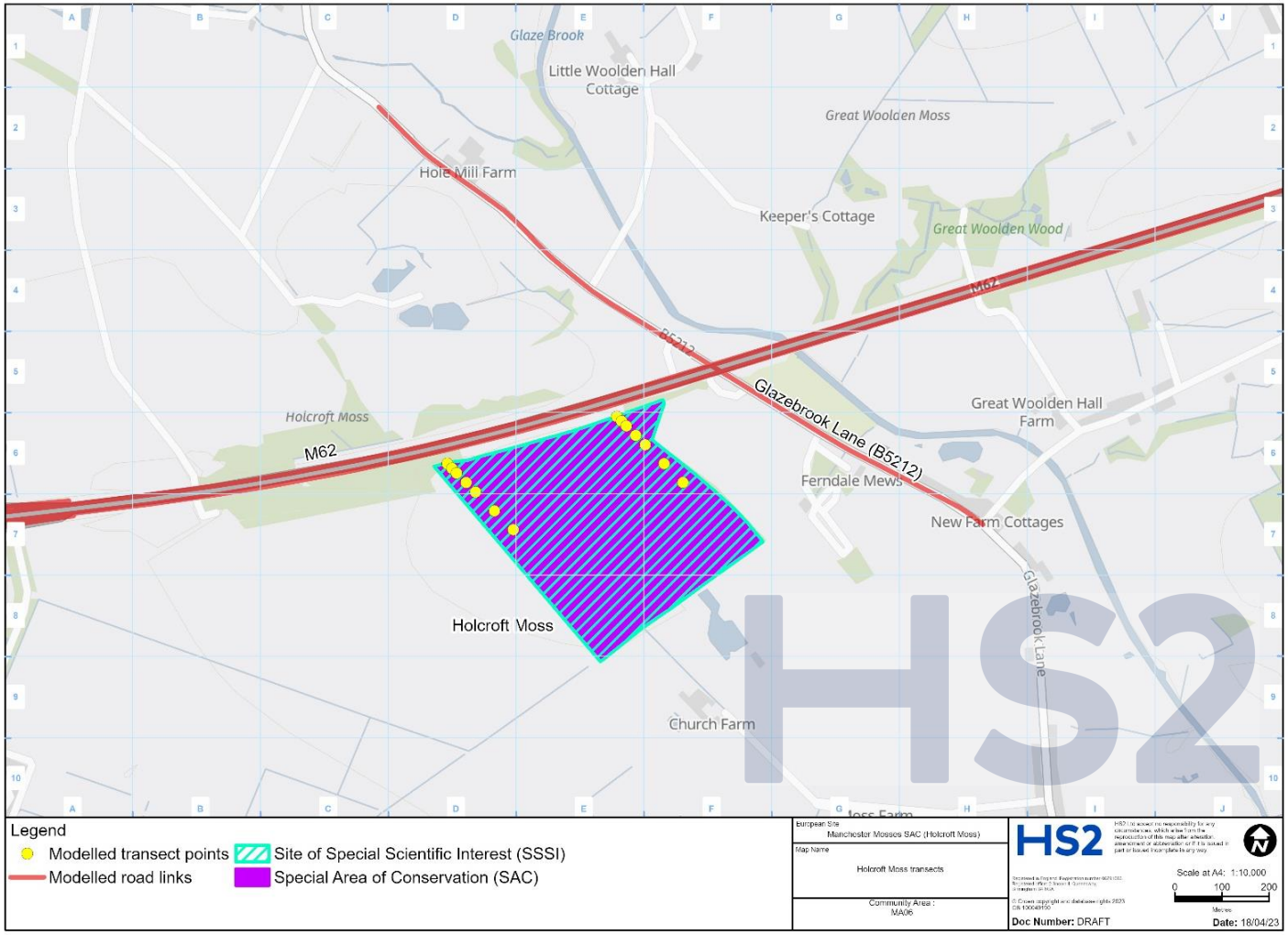


Table A3: Modelled ecological receptor NOx and nitrogen deposition backgrounds and critical loads (construction phase)

Receptor	Sensitive habitat	2018 NOx background concentration (µg/m^3)	2026 NOx background concentration (µg/m^3)	APIS data[26] of average total nitrogen deposition (kg N/ha/yr)	Lower critical load (kg N/ha/yr)
Manchester Mosses – Holcroft Moss	Deciduous Woodland	19.9	13.2	39.6	10
	Degraded raised bog	19.9	13.2	23.6	5

Table A4: Modelled ecological receptor acid deposition backgrounds, critical loads and ammonia background concentrations (construction phase)

Receptor	Sensitive habitat	APIS data of average total acid deposition (k eq/ha/yr)	APIS Critical load nitrogen (k eq/ha/yr) (min)	APIS Critical load nitrogen (k eq/ha/yr) (max)	APIS Ammonia background concentration (µg/m^3)
Manchetser Mosses – Holcroft Moss	Deciduous Woodland	3.1	0.3	0.6	2.7
	Degraded raised bog	1.9	0.3	0.6	2.7

5.3 Assessment results

Table A5 presents a summary of the modelled NOx concentrations for the ecological site, the change in concentration and a comparison against the air quality standard (30µg/m^3).

Table A6 presents a summary of the ammonia concentration results taken from the National Highways Ammonia N Deposition Tool[19], change in concentration and percentage change in relation to the critical level.

Table A7 presents a summary of the modelled nitrogen deposition, with an additional ammonia component applied using the National Highways Ammonia N Deposition Tool, change in deposition and percentage change in relation to the lower critical load.

Table A8 presents a summary of the modelled acid deposition, with an additional ammonia component applied using the National Highways Ammonia N Deposition Tool, and percentage change in deposition and percentage change in relation to the critical load.

Table A5: Assessment of NOx concentrations at ecological sites (construction phase, AP2 revised scheme)

Ecological site	Sensitive Habitat	Distance to road (m)	NOx concentrations (µg/m³)			Change in NOx concentrations (µg/m³)	Comparison against air quality standard (30µg/m³)	Percent change in relation to air quality standard
			Baseline 2018	2026 without AP2 revised scheme	2026 with the AP2 revised scheme			
Manchester Mosses – Holcroft Moss – Transect 1	Deciduous Woodland	25	49.49	25.10	25.45	0.35	Within standard	1.2%
	Deciduous Woodland	30	45.87	23.66	23.97	0.31	Within standard	1.0%
	Deciduous Woodland	40	40.82	21.64	21.89	0.25	Within standard	0.8%
	Deciduous Woodland	50	37.35	20.25	20.46	0.21	Within standard	0.7%
	Degraded raised bog	75	32.03	18.11	18.26	0.15	Within standard	0.5%
	Degraded raised bog	100	29.00	16.89	17.01	0.12	Within standard	0.4%
	Degraded raised bog	150	25.69	15.57	15.64	0.07	Within standard	0.2%
	Degraded raised bog	200	23.94	14.87	14.92	0.05	Within standard	0.2%
Manchester Mosses – Holcroft Moss – Transect 2	Deciduous Woodland	20	53.02	26.51	26.89	0.38	Within standard	1.3%
	Deciduous Woodland	30	45.47	23.50	23.81	0.31	Within standard	1.0%
	Deciduous Woodland	40	40.56	21.54	21.79	0.25	Within standard	0.8%

Ecological site	Sensitive Habitat	Distance to road (m)	NOx concentrations (µg/m³)			Change in NOx concentrations (µg/m³)	Comparison against air quality standard (30µg/m³)	Percent change in relation to air quality standard
			Baseline 2018	2026 without AP2 revised scheme	2026 with the AP2 revised scheme			
	Deciduous Woodland	50	37.15	20.17	20.38	0.21	Within standard	0.7%
	Degraded raised bog	75	31.89	18.06	18.21	0.15	Within standard	0.5%
	Degraded raised bog	100	28.86	16.84	16.96	0.12	Within standard	0.4%
	Degraded raised bog	150	25.52	15.50	15.58	0.08	Within standard	0.3%
	Degraded raised bog	200	23.77	14.80	14.85	0.05	Within standard	0.2%

Table A6: Assessment of ammonia (NH_3) at ecological sites (construction phase, AP2 revised scheme)

Ecological site	Sensitive Habitat	Distance to road (m)	NH_3 concentrations (µg/m³)			Change in NH_3 concentrations (µg/m³)	Comparison against critical level (3µg/m³ for low and 1µg/m³ high vegetation)	Percent change in relation to critical level
			Baseline 2018	2026 without AP2 revised scheme	2026 with the AP2 revised scheme			
Manchester Mosses – Holcroft Moss – Transect 1	Deciduous Woodland	25	3.86	3.64	3.67	0.03	Above standard	2.7%
	Deciduous Woodland	30	3.72	3.53	3.55	0.02	Above standard	2.4%
	Deciduous Woodland	40	3.52	3.37	3.39	0.02	Above standard	2.0%
	Deciduous Woodland	50	3.39	3.26	3.28	0.02	Above standard	1.7%
	Degraded raised bog	75	3.19	3.10	3.11	0.01	Above standard	1.2%
	Degraded raised bog	100	3.07	3.00	3.01	<0.01	Above standard	0.9%
	Degraded raised bog	150	2.94	2.90	2.91	<0.01	Above standard	0.6%
	Degraded raised bog	200	2.88	2.85	2.85	<0.01	Above standard	0.4%
Manchester Mosses – Holcroft Moss – Transect 2	Deciduous Woodland	20	3.99	3.75	3.78	0.03	Above standard	2.9%
	Deciduous Woodland	30	3.70	3.52	3.54	0.02	Above standard	2.3%
	Deciduous Woodland	40	3.51	3.36	3.38	0.02	Above standard	1.9%

Ecological site	Sensitive Habitat	Distance to road (m)	NH_3 concentrations (µg/m^3)			Change in NH_3 concentrations (µg/m^3)	Comparison against critical level (3µg/m^3 for low and 1µg/m^3 high vegetation)	Percent change in relation to critical level
			Baseline 2018	2026 without AP2 revised scheme	2026 with the AP2 revised scheme			
	Deciduous Woodland	50	3.38	3.26	3.27	0.01	Above standard	1.6%
	Degraded raised bog	75	3.18	3.09	3.11	0.02	Above standard	1.2%
	Degraded raised bog	100	3.06	3.00	3.01	<0.01	Above standard	0.9%
	Degraded raised bog	150	2.94	2.90	2.90	<0.01	Above standard	0.6%
	Degraded raised bog	200	2.87	2.84	2.85	<0.01	Above standard	0.4%

Table A7: Assessment of nitrogen deposition with ammonia at ecological sites (construction phase, AP2 revised scheme)

Ecological site	Sensitive habitat	Distance to road (m)	Dry deposition (kg N/ha/yr)			Change in nitrogen deposition (kg N/ha/yr)	Lower critical load (kg N/ha/yr)	Percent change in relation to lower critical load
			Baseline 2018	2026 without the AP2 revised scheme	2026 with the AP2 revised scheme			
Manchester Mosses – Holcroft Moss – Transect 1	Deciduous Woodland	25	52.86	48.64	48.90	0.26	10	2.6%
	Deciduous Woodland	30	51.28	47.55	47.78	0.23	10	2.3%
	Deciduous Woodland	40	49.05	46.02	46.21	0.19	10	1.9%
	Deciduous Woodland	50	47.50	44.96	45.12	0.16	10	1.6%
	Degraded raised bog	75	26.96	25.95	26.02	0.07	5	1.5%
	Degraded raised bog	100	26.13	25.37	25.42	0.05	5	1.1%
	Degraded raised bog	150	25.21	24.73	24.76	0.03	5	0.7%
	Degraded raised bog	200	24.73	24.39	24.42	0.03	5	0.5%
Manchester Mosses – Holcroft Moss – Transect 2	Deciduous Woodland	20	54.40	49.70	49.99	0.29	10	2.9%
	Deciduous Woodland	30	51.10	47.43	47.66	0.23	10	2.3%
	Deciduous Woodland	40	48.93	45.94	46.13	0.19	10	1.9%
	Deciduous Woodland	50	47.42	44.91	45.06	0.15	10	1.6%
	Degraded raised bog	75	26.92	25.93	26.00	0.07	5	1.4%
	Degraded raised bog	100	26.09	25.34	25.39	0.05	5	1.1%
	Degraded raised bog	150	25.17	24.70	24.73	0.03	5	0.7%
	Degraded raised bog	200	24.68	24.36	24.38	0.02	5	0.5%

Table A8: Assessment of acid deposition with ammonia at ecological sites (construction phase, AP2 revised scheme)

Ecological Site	Sensitive habitat	Distance to road (m)	Acid deposition (k eq/ha/yr)			Change in acid deposition (k eq/ha/yr)	Change in acid deposition as percent of CLmax	Total with AP2 revised scheme acid deposition as percent of CLmax
			Baseline 2018	2026 without the AP2 revised scheme	2026 with the AP2 revised scheme			
Manchester Mosses – Holcroft Moss – Transect 1	Deciduous Woodland	25	4.01	3.71	3.73	0.02	3.1%	625.1%
	Deciduous Woodland	30	3.89	3.63	3.65	0.02	2.8%	611.7%
	Deciduous Woodland	40	3.74	3.52	3.53	0.01	2.3%	592.9%
	Deciduous Woodland	50	3.63	3.45	3.46	0.01	1.9%	580.0%
	Degraded raised bog	75	2.12	2.04	2.05	<0.01	0.9%	359.0%
	Degraded raised bog	100	2.06	2.00	2.01	<0.01	0.7%	351.5%
	Degraded raised bog	150	1.99	1.96	1.96	<0.01	0.4%	343.3%
	Degraded raised bog	200	1.96	1.93	1.94	<0.01	0.3%	339.0%
Manchester Mosses – Holcroft Moss – Transect 2	Deciduous Woodland	20	4.12	3.78	3.80	0.02	3.4%	638.1%
	Deciduous Woodland	30	3.88	3.62	3.64	0.02	2.7%	610.2%
	Deciduous Woodland	40	3.73	3.51	3.53	0.02	2.3%	592.0%
	Deciduous Woodland	50	3.62	3.44	3.45	0.01	1.9%	579.3%
	Degraded raised bog	75	2.11	2.04	2.05	<0.01	0.9%	358.7%
	Degraded raised bog	100	2.05	2.00	2.01	<0.01	0.7%	351.2%
	Degraded raised bog	150	1.99	1.96	1.96	<0.01	0.4%	342.9%
	Degraded raised bog	200	1.95	1.93	1.93	<0.01	0.3%	338.6%

5.4 Assessment of significance

NOx concentrations at Holcroft Moss are predicted to be within the air quality standard in all scenarios. Changes in NOx concentrations are greater than 1% of the air quality standard and at modelled locations up to 30m from the road. Potentially significant effects are therefore predicted, and this is addressed further in Section 4.2 of the main report.

NH_3 concentrations at Holcroft Moss are predicted to be above the air quality critical level in all scenarios. Changes in NH_3 concentrations are greater than 1% of the air quality standard up to 75m from the road. Potentially significant effects are therefore predicted, and this is addressed further in Section 4.2 of the main report.

Nitrogen deposition rates are predicted to be above the lower critical load at all modelled receptors in the baseline and future scenarios with or without the AP2 revised scheme. The change in nitrogen deposition due to the AP2 revised scheme is predicted to be greater than 1% of the lower critical load up to 100m from the road. Potentially significant effects are therefore predicted, and this is addressed further in Section 4.2 of the main report.

Acid deposition rates are predicted to be above the lower critical load at all modelled receptors in all scenarios with or without the AP2 revised scheme. The changes in acid deposition due to the AP2 revised scheme are greater than 1% of the critical load up to 50m from the road. Potentially significant effects are therefore predicted, and this is addressed further in Section 4.2 of the main report.

6 Assessment of construction traffic effects – AP2 revised scheme in combination with other plans and projects

6.1 Screening of traffic data

The screening process identified two roads in the area exceeding the screening thresholds: the M62 junction 11 to junction 12; and the B5212 Holcroft Lane north of M62. Table A2 presents the traffic data used in the assessment.

6.2 Non-road plans and projects

No non-road plans or projects have been identified that require further consideration within the in combination assessment.

6.3 Receptors assessed and background concentrations

Receptors assessed, and background concentrations are as presented previously in the Assessment of construction traffic effects – AP2 revised scheme section.

6.4 Assessment results

Table A9 presents a summary of the modelled NOx concentrations for the ecological site, the change in concentration and a comparison against the air quality standard (30µg/m^3).

Table A10 presents a summary of the ammonia concentration results taken from the National Highways Ammonia N Deposition Tool[19], change in concentration and percentage change in relation to the critical level.

Table A11 presents a summary of the modelled nitrogen deposition, with an additional ammonia component applied using the National Highways Ammonia N Deposition Tool, change in deposition and percentage change in relation to the lower critical load.

Table A12 presents a summary of the modelled acid deposition, with an additional ammonia component applied using the National Highways Ammonia N Deposition Tool, and percentage change in deposition and percentage change in relation to the critical load.

Table A9: Assessment of NOx concentrations at ecological sites (construction phase, AP2 revised scheme in combination)

Ecological site	Sensitive habitat	Distance to road (m)	NOx concentrations (µg/m³)			Change in NOx concentrations (µg/m³)	Comparison against air quality standard (30µg/m³)	Percent change in relation to air quality standard
			Baseline 2018	2026 do nothing	2026 with the AP2 revised scheme			
Manchester Mosses – Holcroft Moss – Transect 1	Deciduous Woodland	25	49.49	24.92	25.45	0.53	Within standard	1.8%
	Deciduous Woodland	30	45.87	23.47	23.97	0.50	Within standard	1.7%
	Deciduous Woodland	40	40.82	21.46	21.89	0.43	Within standard	1.4%
	Deciduous Woodland	50	37.35	20.09	20.46	0.37	Within standard	1.2%
	Degraded raised bog	75	32.03	17.98	18.26	0.28	Within standard	0.9%
	Degraded raised bog	100	29.00	16.79	17.01	0.22	Within standard	0.7%
	Degraded raised bog	150	25.69	15.50	15.64	0.14	Within standard	0.5%
	Degraded raised bog	200	23.94	14.81	14.92	0.11	Within standard	0.4%
Manchester Mosses – Holcroft Moss – Transect 2	Deciduous Woodland	20	53.02	26.32	26.89	0.57	Within standard	1.9%
	Deciduous Woodland	30	45.47	23.31	23.81	0.50	Within standard	1.7%
	Deciduous Woodland	40	40.56	21.36	21.79	0.43	Within standard	1.4%
	Deciduous Woodland	50	37.15	20.00	20.38	0.38	Within standard	1.3%
	Degraded raised bog	75	31.89	17.93	18.21	0.28	Within standard	0.9%
	Degraded raised bog	100	28.86	16.74	16.96	0.22	Within standard	0.7%
	Degraded raised bog	150	25.52	15.43	15.58	0.15	Within standard	0.5%
	Degraded raised bog	200	23.77	14.75	14.85	0.10	Within standard	0.3%

Table A10: Assessment of NH_3 concentrations at ecological sites (construction phase, AP2 revised scheme in combination)

Ecological site	Sensitive habitat	Distance to road (m)	NH_3 concentrations (µg/m³)			Change in NH_3 concentrations (µg/m³)	Comparison against critical level (1µg/m³ for low and 3µg/m³ high vegetation)	Percent change in relation to critical level
			Baseline 2018	2026 do nothing	2026 with the AP2 revised scheme			
Manchester Mosses – Holcroft Moss – Transect 1	Deciduous Woodland	25	3.86	3.63	3.67	0.04	Above standard	4.0%
	Deciduous Woodland	30	3.72	3.51	3.55	0.04	Above standard	3.7%
	Deciduous Woodland	40	3.52	3.36	3.39	0.03	Above standard	3.2%
	Deciduous Woodland	50	3.39	3.25	3.28	0.03	Above standard	2.9%
	Degraded raised bog	75	3.19	3.09	3.11	0.02	Above standard	2.1%
	Degraded raised bog	100	3.07	3.00	3.01	0.01	Above standard	1.7%
	Degraded raised bog	150	2.94	2.90	2.91	0.01	Above standard	1.1%
	Degraded raised bog	200	2.88	2.84	2.85	<0.01	Above standard	0.8%
Manchester Mosses – Holcroft Moss – Transect 2	Deciduous Woodland	20	3.99	3.74	3.78	0.04	Above standard	4.3%
	Deciduous Woodland	30	3.70	3.50	3.54	0.04	Above standard	3.8%
	Deciduous Woodland	40	3.51	3.35	3.38	0.03	Above standard	3.3%
	Deciduous Woodland	50	3.38	3.25	3.27	0.02	Above standard	2.9%
	Degraded raised bog	75	3.18	3.08	3.11	0.03	Above standard	2.1%
	Degraded raised bog	100	3.06	2.99	3.01	0.02	Above standard	1.7%
	Degraded raised bog	150	2.94	2.89	2.90	0.01	Above standard	1.1%
	Degraded raised bog	200	2.87	2.84	2.85	<0.01	Above standard	0.8%

Table A11: Assessment of nitrogen deposition with ammonia at ecological sites (construction phase, AP2 revised scheme in combination)

Ecological site	Sensitive habitat	Distance to road (m)	Dry deposition (kg N/ha/yr)			Change in nitrogen deposition (kg N/ha/yr)	Lower critical load (kg N/ha/yr)	Percent change in relation to lower critical load
			Baseline 2018	2026 do nothing	2026 with the AP2 revised scheme			
Manchester Mosses – Holcroft Moss – Transect 1	Deciduous Woodland	25	52.86	48.50	48.90	0.40	10	3.9%
	Deciduous Woodland	30	51.28	47.41	47.78	0.37	10	3.6%
	Deciduous Woodland	40	49.05	45.89	46.21	0.32	10	3.2%
	Deciduous Woodland	50	47.50	44.84	45.12	0.28	10	2.8%
	Degraded raised bog	75	26.96	25.89	26.02	0.13	5	2.7%
	Degraded raised bog	100	26.13	25.32	25.42	0.10	5	2.1%
	Degraded raised bog	150	25.21	24.69	24.76	0.07	5	1.4%
	Degraded raised bog	200	24.73	24.37	24.42	0.05	5	1.0%
Manchester Mosses – Holcroft Moss – Transect 2	Deciduous Woodland	20	54.40	49.56	49.99	0.43	10	4.2%
	Deciduous Woodland	30	51.10	47.29	47.66	0.37	10	3.7%
	Deciduous Woodland	40	48.93	45.81	46.13	0.32	10	3.2%
	Deciduous Woodland	50	47.42	44.78	45.06	0.28	10	2.8%
	Degraded raised bog	75	26.92	25.87	26.00	0.13	5	2.7%
	Degraded raised bog	100	26.09	25.29	25.39	0.10	5	2.0%
	Degraded raised bog	150	25.17	24.66	24.73	0.07	5	1.4%
	Degraded raised bog	200	24.68	24.34	24.38	0.04	5	0.9%

Table A12: Assessment of acid deposition with ammonia at ecological sites (construction phase, AP2 revised scheme in combination)

Ecological Site	Sensitive habitat	Distance to road (m)	Acid deposition (k eq/ha/yr)			Change in acid deposition (k eq/ha/yr)	Change in acid deposition as percent of CLmax	Total with AP2 revised scheme acid deposition as percent of CLmax
			Baseline 2018	2026 do nothing	2026 with the AP2 revised scheme			
Manchester Mosses – Holcroft Moss – Transect 1	Deciduous Woodland	25	4.01	3.70	3.73	0.03	4.7%	625.1%
	Deciduous Woodland	30	3.89	3.62	3.65	0.03	4.3%	611.7%
	Deciduous Woodland	40	3.74	3.51	3.53	0.02	3.8%	592.9%
	Deciduous Woodland	50	3.63	3.44	3.46	0.02	3.3%	580.0%
	Degraded raised bog	75	2.12	2.04	2.05	<0.01	1.7%	359.0%
	Degraded raised bog	100	2.06	2.00	2.01	<0.01	1.3%	351.5%
	Degraded raised bog	150	1.99	1.96	1.96	<0.01	0.9%	343.3%
	Degraded raised bog	200	1.96	1.93	1.94	<0.01	0.6%	339.0%
Manchester Mosses – Holcroft Moss – Transect 2	Deciduous Woodland	20	4.12	3.77	3.80	0.03	5.1%	638.1%
	Deciduous Woodland	30	3.88	3.61	3.64	0.03	4.4%	610.2%
	Deciduous Woodland	40	3.73	3.51	3.53	0.02	3.8%	592.0%
	Deciduous Woodland	50	3.62	3.43	3.45	0.02	3.4%	579.3%
	Degraded raised bog	75	2.11	2.04	2.05	<0.01	1.7%	358.7%
	Degraded raised bog	100	2.05	2.00	2.01	<0.01	1.3%	351.2%
	Degraded raised bog	150	1.99	1.95	1.96	<0.01	0.8%	342.9%
	Degraded raised bog	200	1.95	1.93	1.93	<0.01	0.6%	338.6%

6.5 Assessment of significance

NOx concentrations at Holcroft Moss are predicted to be within the air quality standard in all scenarios. The changes in NOx concentrations between the 2026 do nothing scenario and with the AP2 revised scheme in combination scenario are greater than 1% of the air quality standard up to 50m from the road. Potentially significant effects are therefore predicted, and this is addressed further in Section 4.2 of the main report.

NH_3 concentrations at Holcroft Moss are predicted to be above the air quality critical level in all scenarios. Changes in NH_3 concentrations are greater than 1% of the air quality standard up to 150m from the road. Potentially significant effects are therefore predicted, and this is addressed further in Section 4.2 of the main report.

Nitrogen deposition rates are predicted to be above the relevant critical load at all modelled receptors in the baseline and future scenarios with or without the AP2 revised scheme in combination. Predicted nitrogen deposition rates in 2026, with the AP2 revised scheme in combination, are lower than the 2018 baseline rates at all modelled locations. The changes in nitrogen deposition between the 2026 do nothing scenario and with the AP2 revised scheme in combination scenario are greater than 1% of the relevant critical load up to 150m from the road. Potentially significant effects are therefore predicted, and this is addressed further in Section 4.2 of the main report.

Acid deposition rates are predicted to be above the critical load at all modelled receptors in all scenarios with or without the AP2 revised scheme in combination. The changes in acid deposition between the 2026 do nothing scenario and with the AP2 revised scheme in combination scenario are greater than 1% of the maximum critical load up to 100m from the road. Potentially significant effects are therefore predicted, and this is addressed further in Section 4.2 of the main report.

7 Assessment of operational traffic effects – AP2 revised scheme

7.1 Screening of traffic data

The assessment of operational traffic impacts has used traffic data based on an estimate of the average daily flows in the opening year (2039). Traffic data is presented in Table A13.

The screening process identified one road in the area exceeding the screening thresholds:

- the M62 junction 11 to 12.

Further roads have been included in the assessment to account for their emissions at nearby receptors.

Figure A1 presents a detailed map of the modelled area including assessed roads (Modelled Road Links in red) and modelling transect points (yellow dots).

Table A13: Traffic data summary (operational phase, AP2 revised scheme)

Road ID	Road names	Annual Average Daily Traffic (AADT)				Heavy Duty Vehicles (HDV)			
		2018 baseline	2039 without the AP2 revised scheme	2039 with the AP2 revised scheme	AP2 revised scheme change (2039 with AP2 revised scheme – 2039 without AP2 revised scheme)	2018 baseline	2039 without the AP2 revised scheme	2039 with the AP2 revised scheme	AP2 revised scheme change (2039 with AP2 revised scheme – 2039 without AP2 revised scheme)
13005_2673, 2684_13006	M62 Junction 11 to 12	125,179	137,658	139,477	1,819	13,682	13,945	13,966	21
4147_2697, 2697_4147	B5212 Holcroft Lane north of M62	7,264	8,892	8,892	0	344	353	353	0

Note: Values in bold indicate change in traffic flow triggering for assessment.

7.2 Receptors assessed and background concentrations

Table A14 shows the background concentrations for NOx, background nitrogen deposition and critical loads. Table A15 shows the background acid deposition, critical loads and background ammonia concentrations. The yellow transect points in Figure A1 represent the closest point to the road.

Table A14: Modelled ecological receptor NOx and nitrogen deposition backgrounds and critical loads (operational phase)

Receptor	Sensitive habitat	2018 NOx background concentration (µg/m^3)	2039 NOx background concentration (µg/m^3)	APIS data[26] of average total nitrogen deposition (kg/N/ha/yr)	APIS Critical load (kg N/ha/yr)
Manchester Mosses – Holcroft Moss	Deciduous Woodland	19.9	11.8	39.6	10
	Degraded raised bog	19.9	11.8	23.6	5

Table A15: Modelled ecological receptor acid deposition backgrounds, critical loads and ammonia background concentrations (operational phase)

Receptor	Sensitive habitat	APIS data of average total acid deposition (k eq/ha/yr)	APIS Critical load nitrogen (k eq/ha/yr) (min)	APIS Critical load nitrogen (k eq/ha/yr) (max)	APIS Ammonia background concentration (µg/m^3)
Manchester Mosses – Holcroft Moss	Deciduous Woodland	3.1	0.3	0.6	2.7
	Degraded raised bog	1.9	0.3	0.6	2.7

7.3 Assessment results

Table A16 presents a summary of the modelled NOx concentrations for the ecological site, the change in concentration and a comparison against the air quality standard (30µg/m^3).

Table A17 presents a summary of the ammonia concentration results taken from the National Highways Ammonia N Deposition Tool[19], change in concentration and percentage change in relation to the critical level.

Table A18 presents a summary of the modelled nitrogen deposition, with an additional ammonia component applied using the National Highways Ammonia N Deposition Tool, change in deposition and percentage change in relation to the lower critical load.

Table A19 presents a summary of the modelled acid deposition, with an additional ammonia component applied using the National Highways Ammonia N Deposition Tool, and percentage change in deposition and percentage change in relation to the critical load.

Table A16: Assessment of NOx concentrations at ecological sites (operational phase, AP2 revised scheme)

Ecological site	Sensitive habitat	Distance to road (m)	NOx concentrations (µg/m³)			Change in NOx concentrations (µg/m³)	Comparison against air quality standard (30µg/m³)	Percent change in relation to air quality standard
			Baseline 2018	2039 without the AP2 revised scheme	2039 with the AP2 revised scheme			
Manchester Mosses – Holcroft Moss – Transect 1	Deciduous Woodland	25	49.49	18.28	18.33	0.05	Within standard	0.2%
	Deciduous Woodland	30	45.87	17.49	17.54	0.05	Within standard	0.2%
	Deciduous Woodland	40	40.82	16.39	16.42	0.03	Within standard	0.1%
	Deciduous Woodland	50	37.35	15.63	15.66	0.03	Within standard	0.1%
	Degraded raised bog	75	32.03	14.46	14.48	0.02	Within standard	0.1%
	Degraded raised bog	100	29.00	13.80	13.81	0.01	Within standard	< 0.1%
	Degraded raised bog	150	25.69	13.07	13.08	0.01	Within standard	< 0.1%
	Degraded raised bog	200	23.94	12.69	12.70	0.01	Within standard	< 0.1%
Manchester Mosses – Holcroft Moss – Transect 2	Deciduous Woodland	20	53.02	19.05	19.11	0.06	Within standard	0.2%
	Deciduous Woodland	30	45.47	17.41	17.45	0.04	Within standard	0.1%
	Deciduous Woodland	40	40.56	16.33	16.37	0.04	Within standard	0.1%
	Deciduous Woodland	50	37.15	15.59	15.62	0.03	Within standard	0.1%
	Degraded raised bog	75	31.89	14.43	14.45	0.02	Within standard	0.1%
	Degraded raised bog	100	28.86	13.77	13.78	0.01	Within standard	< 0.1%
	Degraded raised bog	150	25.52	13.04	13.05	0.01	Within standard	< 0.1%
	Degraded raised bog	200	23.77	12.66	12.66	< 0.01	Within standard	< 0.1%

Table A17: Assessment of ammonia (NH_3) at ecological sites (operational phase, AP2 revised scheme)

Ecological site	Sensitive habitat	Distance to road (m)	NH_3 concentrations (µg/m^3)			Change in NH_3 concentrations (µg/m^3)	Comparison against critical level (3µg/m^3 for low and 1µg/m^3 high vegetation)	Percent change in relation to critical level
			Baseline 2018	2039 do nothing	2039 with the AP2 revised scheme			
Manchester Mosses – Holcroft Moss – Transect 1	Deciduous Woodland	25	3.86	3.60	3.60	< 0.01	Above standard	0.7%
	Deciduous Woodland	30	3.72	3.49	3.50	0.01	Above standard	0.6%
	Deciduous Woodland	40	3.52	3.34	3.35	0.01	Above standard	0.5%
	Deciduous Woodland	50	3.39	3.24	3.24	< 0.01	Above standard	0.4%
	Degraded raised bog	75	3.19	3.08	3.08	< 0.01	Above standard	0.3%
	Degraded raised bog	100	3.07	2.99	2.99	< 0.01	Above standard	0.2%
	Degraded raised bog	150	2.94	2.89	2.89	< 0.01	Above standard	0.1%
	Degraded raised bog	200	2.95	2.91	2.91	< 0.01	Above standard	< 0.1%
Manchester Mosses – Holcroft Moss – Transect 2	Deciduous Woodland	20	3.99	3.70	3.71	0.01	Above standard	0.8%
	Deciduous Woodland	30	3.70	3.48	3.48	< 0.01	Above standard	0.6%
	Deciduous Woodland	40	3.51	3.33	3.34	0.01	Above standard	0.5%
	Deciduous Woodland	50	3.38	3.23	3.24	0.01	Above standard	0.4%
	Degraded raised bog	75	3.18	3.08	3.08	< 0.01	Above standard	0.3%
	Degraded raised bog	100	3.06	2.99	2.99	< 0.01	Above standard	0.2%
	Degraded raised bog	150	2.94	2.89	2.89	< 0.01	Above standard	0.1%
	Degraded raised bog	200	2.87	2.84	2.84	< 0.01	Above standard	< 0.1%

Table A18: Assessment of nitrogen deposition with ammonia at ecological sites (operational phase, AP2 revised scheme)

Ecological site	Sensitive habitat	Distance to road (m)	Dry deposition (kg N/ha/yr)			Change in nitrogen deposition (kg N/ha/yr)	Lower critical load (kg N/ha/yr)	Percent Change in relation to lower critical load
			Baseline 2018	2039 without the AP2 revised scheme	2039 with the AP2 revised scheme			
Manchester Mosses – Holcroft Moss – Transect 1	Deciduous Woodland	25	52.86	47.47	47.53	0.06	10	0.6%
	Deciduous Woodland	30	51.28	46.52	46.57	0.05	10	0.5%
	Deciduous Woodland	40	49.05	45.18	45.23	0.05	10	0.4%
	Deciduous Woodland	50	47.50	44.27	44.30	0.03	10	0.3%
	Degraded raised bog	75	26.96	25.69	25.70	0.01	5	0.3%
	Degraded raised bog	100	26.13	25.17	25.18	0.01	5	0.2%
	Degraded raised bog	150	25.21	24.60	24.61	0.01	5	0.2%
	Degraded raised bog	200	25.09	24.66	24.66	< 0.01	5	< 0.1%
Manchester Mosses – Holcroft Moss – Transect 2	Deciduous Woodland	20	54.40	48.40	48.47	0.07	10	0.7%
	Deciduous Woodland	30	51.10	46.41	46.47	0.06	10	0.6%
	Deciduous Woodland	40	48.93	45.12	45.16	0.04	10	0.4%
	Deciduous Woodland	50	47.42	44.22	44.25	0.03	10	0.3%
	Degraded raised bog	75	26.92	25.66	25.68	0.02	5	0.3%
	Degraded raised bog	100	26.09	25.14	25.16	0.02	5	0.2%
	Degraded raised bog	150	25.17	24.57	24.58	0.01	5	0.2%
	Degraded raised bog	200	24.68	24.27	24.28	0.01	5	< 0.1%

Table A19: Assessment of acid deposition with ammonia at ecological sites (operational phase, AP2 revised scheme)

Ecological Site	Sensitive habitat	Distance to road (m)	Acid deposition (k eq/ha/yr)			Change in acid deposition (k eq/ha/yr)	Change in acid deposition as percent of CLNmax	Total with AP2 revised scheme acid deposition as percent of CLNmax
			Baseline 2018	2039 without the AP2 revised scheme	2039 with the AP2 revised scheme			
Manchester Mosses – Holcroft Moss – Transect 1	Deciduous Woodland	25	4.01	3.62	3.63	0.01	0.7%	608.7%
	Deciduous Woodland	30	3.89	3.56	3.56	< 0.01	0.6%	597.2%
	Deciduous Woodland	40	3.74	3.46	3.46	< 0.01	0.5%	581.2%
	Deciduous Woodland	50	3.63	3.40	3.40	< 0.01	0.4%	570.2%
	Degraded raised bog	75	2.12	2.03	2.03	< 0.01	0.2%	355.0%
	Degraded raised bog	100	2.06	1.99	1.99	< 0.01	0.1%	348.5%
	Degraded raised bog	150	1.99	1.95	1.95	< 0.01	< 0.1%	341.4%
	Degraded raised bog	200	1.99	1.96	1.96	< 0.01	< 0.1%	342.5%
Manchester Mosses – Holcroft Moss – Transect 2	Deciduous Woodland	20	4.12	3.69	3.69	< 0.01	0.8%	619.9%
	Deciduous Woodland	30	3.88	3.55	3.55	< 0.01	0.7%	596.0%
	Deciduous Woodland	40	3.73	3.46	3.46	< 0.01	0.5%	580.4%
	Deciduous Woodland	50	3.62	3.39	3.39	< 0.01	0.4%	569.6%
	Degraded raised bog	75	2.11	2.02	2.03	0.01	0.2%	354.7%
	Degraded raised bog	100	2.05	1.99	1.99	< 0.01	0.1%	348.2%
	Degraded raised bog	150	1.99	1.95	1.95	< 0.01	< 0.1%	341.0%
	Degraded raised bog	200	1.95	1.93	1.93	< 0.01	< 0.1%	337.3%

7.4 Assessment of significance

NOx concentrations at Holcroft Moss are predicted to be within the air quality standard in all scenarios, except at distances closer than between 78m and 110m to the road in the 2018 baseline scenario. Changes in NOx concentrations are less than 1% of the air quality standard and therefore not significant.

NH_3 concentrations at the Holcroft Moss are predicted to be above the critical level in all scenarios. Changes in NH_3 concentrations are less than 1% of the air quality standard and therefore not significant.

Nitrogen deposition rates are predicted to be above the lower critical load at all modelled receptors in the baseline and future scenarios with or without the AP2 revised scheme. The change in nitrogen deposition due to the AP2 revised scheme is predicted to be less than 1% of the lower critical load and therefore not significant.

Acid deposition rates are predicted to be above the lower critical load at all modelled receptors in all scenarios with or without the AP2 revised scheme. The changes in acid deposition due to the AP2 revised scheme are less than 1% of the critical load and therefore not significant.

8 Assessment of operation traffic effects – AP2 revised scheme in combination with other plans and projects

8.1 Screening of traffic data

The screening process identified three roads in the area exceeding the screening thresholds:

- the M62 junction 11 to 12; and
- the B5212 Holcroft Lane north of M62.

Further roads have been included in the assessment to account for their emissions at nearby receptors.

Table A20 presents the traffic data used in the assessment.

Table A20: Traffic data summary (operational phase, AP2 revised scheme in combination)

Road ID	Road names	Annual Average Daily Traffic (AADT)				Heavy Duty Vehicles (HDV)			
		2018 baseline	2039 without the AP2 revised scheme	2039 with the AP2 revised scheme	In combination change (2039 with the AP2 revised scheme – 2018 baseline)	2018 baseline	2039 without the AP2 revised scheme	2039 with the AP2 revised scheme	In combination change (2039 with the AP2 revised scheme – 2018 baseline)
13005_2673, 2684_13006	M62 Junction 11 to 12	125,179	137,658	139,477	14,298	13,682	13,945	13,966	284
4147_2697, 2697_4147	B5212 Holcroft Lane north of M62	7,264	8,892	8,892	1,628	344	353	353	9

Note: Values in bold indicate change in traffic flow triggering for assessment.

8.2 Non-road plans and projects

No non-road plans or projects have been identified that require further consideration within the in combination assessment.

8.3 Receptors assessed and background concentrations

Receptors assessed, and background concentrations are as presented previously in the Assessment of construction traffic effects – AP2 revised scheme section.

8.4 Assessment results

Table A21 presents a summary of the modelled NOx concentrations for the ecological site, the change in concentration and a comparison against the air quality standard (30µg/m^3).

Table A22 presents a summary of the ammonia concentration results taken from the National Highways Ammonia N Deposition Tool, change in concentration and percentage change in relation to the critical level.

Table A23 presents a summary of the modelled nitrogen deposition, with an additional ammonia component applied using the National Highways Ammonia N Deposition Tool, change in deposition and percentage change in relation to the lower critical load.

Table A24 presents a summary of the modelled acid deposition, with an additional ammonia component applied using the National Highways Ammonia N Deposition Tool, and percentage change in deposition and percentage change in relation to the critical load.

Table A21: Assessment of NOx concentrations at ecological sites (operational phase, AP2 revised scheme in combination)

Ecological site	Sensitive habitat	Distance to road (m)	NOx concentrations (µg/m³)			Change in NOx concentrations (µg/m³)	Comparison against air quality standard (30µg/m³)	Percent change in relation to air quality standard
			Baseline 2018	2039 do nothing	2039 with the AP2 revised scheme			
Manchester Mosses – Holcroft Moss – Transect 1	Deciduous Woodland	25	49.49	17.99	18.33	0.34	Within standard	1.1%
	Deciduous Woodland	30	45.87	17.22	17.54	0.32	Within standard	1.1%
	Deciduous Woodland	40	40.82	16.15	16.42	0.27	Within standard	0.9%
	Deciduous Woodland	50	37.35	15.42	15.66	0.24	Within standard	0.8%
	Degraded raised bog	75	32.03	14.31	14.48	0.17	Within standard	0.6%
	Degraded raised bog	100	29.00	13.68	13.81	0.13	Within standard	0.4%
	Degraded raised bog	150	25.69	12.99	13.08	0.09	Within standard	0.3%
	Degraded raised bog	200	23.94	12.63	12.70	0.07	Within standard	0.2%
Manchester Mosses – Holcroft Moss – Transect 2	Deciduous Woodland	20	53.02	18.73	19.11	0.38	Within standard	1.3%
	Deciduous Woodland	30	45.47	17.13	17.45	0.32	Within standard	1.1%
	Deciduous Woodland	40	40.56	16.10	16.37	0.27	Within standard	0.9%
	Deciduous Woodland	50	37.15	15.38	15.62	0.24	Within standard	0.8%
	Degraded raised bog	75	31.89	14.28	14.45	0.17	Within standard	0.6%
	Degraded raised bog	100	28.86	13.65	13.78	0.13	Within standard	0.4%
	Degraded raised bog	150	25.52	12.96	13.05	0.09	Within standard	0.3%
	Degraded raised bog	200	23.77	12.60	12.66	0.06	Within standard	0.2%

Table A22: Assessment of NH_3 concentrations at ecological sites (operational phase, AP2 revised scheme in combination)

Ecological site	Sensitive habitat	Distance to road (m)	NH_3 concentrations (µg/m³)			Change in NH_3 concentrations (µg/m³)	Comparison against critical level (3µg/m³ for low and 1µg/m³ high vegetation)	Percent change in relation to critical level
			Baseline 2018	2039 do nothing	2039 with the AP2 revised scheme			
Manchester Mosses – Holcroft Moss – Transect 1	Deciduous Woodland	25	3.86	3.56	3.60	0.04	Above standard	4.8%
	Deciduous Woodland	30	3.72	3.45	3.50	0.05	Above standard	4.4%
	Deciduous Woodland	40	3.52	3.31	3.35	0.04	Above standard	3.8%
	Deciduous Woodland	50	3.39	3.21	3.24	0.03	Above standard	3.3%
	Degraded raised bog	75	3.19	3.06	3.08	0.02	Above standard	2.4%
	Degraded raised bog	100	3.07	2.97	2.99	0.02	Above standard	1.9%
	Degraded raised bog	150	2.94	2.88	2.89	0.01	Above standard	1.3%
	Degraded raised bog	200	2.95	2.90	2.91	0.01	Above standard	0.9%
Manchester Mosses – Holcroft Moss – Transect 2	Deciduous Woodland	20	3.99	3.66	3.71	0.05	Above standard	5.2%
	Deciduous Woodland	30	3.70	3.44	3.48	0.04	Above standard	4.4%
	Deciduous Woodland	40	3.51	3.30	3.34	0.04	Above standard	3.8%
	Deciduous Woodland	50	3.38	3.20	3.24	0.04	Above standard	3.3%
	Degraded raised bog	75	3.18	3.05	3.08	0.03	Above standard	2.4%
	Degraded raised bog	100	3.06	2.97	2.99	0.02	Above standard	1.9%
	Degraded raised bog	150	2.94	2.88	2.89	0.01	Above standard	1.2%
	Degraded raised bog	200	2.87	2.83	2.84	0.01	Above standard	0.9%

Table A23: Assessment of nitrogen deposition with ammonia at ecological sites (operational phase, AP2 revised scheme in combination)

Ecological site	Sensitive habitat	Distance to road (m)	Dry deposition (kg N/ha/yr)			Change in nitrogen deposition (kg N/ha/yr)	Lower critical load (kg N/ha/yr)	Percent change in relation to lower critical load
			Baseline 2018	2039 do nothing	2039 with the AP2 revised scheme			
Manchester Mosses – Holcroft Moss – Transect 1	Deciduous Woodland	25	52.86	47.11	47.53	0.42	10	4.2%
	Deciduous Woodland	30	51.28	46.18	46.57	0.39	10	3.9%
	Deciduous Woodland	40	49.05	44.89	45.23	0.34	10	3.3%
	Deciduous Woodland	50	47.50	44.01	44.30	0.29	10	2.9%
	Degraded raised bog	75	26.96	25.56	25.70	0.14	5	2.8%
	Degraded raised bog	100	26.13	25.07	25.18	0.11	5	2.2%
	Degraded raised bog	150	25.21	24.54	24.61	0.07	5	1.4%
	Degraded raised bog	200	25.09	24.61	24.66	0.05	5	1.0%
Manchester Mosses – Holcroft Moss – Transect 2	Deciduous Woodland	20	54.40	48.01	48.47	0.46	10	4.6%
	Deciduous Woodland	30	51.10	46.08	46.47	0.39	10	3.9%
	Deciduous Woodland	40	48.93	44.83	45.16	0.33	10	3.4%
	Deciduous Woodland	50	47.42	43.96	44.25	0.29	10	2.9%
	Degraded raised bog	75	26.92	25.54	25.68	0.14	5	2.8%
	Degraded raised bog	100	26.09	25.05	25.16	0.11	5	2.2%
	Degraded raised bog	150	25.17	24.51	24.58	0.07	5	1.4%
	Degraded raised bog	200	24.68	24.23	24.28	0.05	5	1.0%

Table A24: Assessment of acid deposition with ammonia at ecological sites (operational phase, AP2 revised scheme in combination)

Ecological Site	Sensitive habitat	Distance to road (m)	Acid deposition (k eq/ha/yr)			Change in acid deposition (k eq/ha/yr)	Change in acid deposition as percent of CLNmax	Total with AP2 revised scheme acid deposition as percent of CLNmax
			Baseline 2018	2039 do nothing	2039 with the AP2 revised scheme			
Manchester Mosses – Holcroft Moss – Transect 1	Deciduous Woodland	25	4.01	3.60	3.63	0.03	5.1%	608.7%
	Deciduous Woodland	30	3.89	3.53	3.56	0.03	4.7%	597.2%
	Deciduous Woodland	40	3.74	3.44	3.46	0.02	4.0%	581.2%
	Deciduous Woodland	50	3.63	3.38	3.40	0.02	3.5%	570.2%
	Degraded raised bog	75	2.12	2.02	2.03	0.01	1.7%	355.0%
	Degraded raised bog	100	2.06	1.98	1.99	0.01	1.4%	348.5%
	Degraded raised bog	150	1.99	1.94	1.95	0.01	0.9%	341.4%
	Degraded raised bog	200	1.99	1.95	1.96	0.01	0.7%	342.5%
Manchester Mosses – Holcroft Moss – Transect 2	Deciduous Woodland	20	4.12	3.66	3.69	0.03	5.5%	619.9%
	Deciduous Woodland	30	3.88	3.52	3.55	0.03	4.7%	596.0%
	Deciduous Woodland	40	3.73	3.44	3.46	0.02	4.0%	580.4%
	Deciduous Woodland	50	3.62	3.37	3.39	0.02	3.5%	569.6%
	Degraded raised bog	75	2.11	2.02	2.03	0.01	1.8%	354.7%
	Degraded raised bog	100	2.05	1.98	1.99	0.01	1.4%	348.2%
	Degraded raised bog	150	1.99	1.94	1.95	0.01	0.9%	341.0%
	Degraded raised bog	200	1.95	1.92	1.93	0.01	0.6%	337.3%

8.5 Assessment of significance

NOx concentrations at Holcroft Moss are predicted to be within the air quality standard in all scenarios. The changes in NOx concentrations between the 2039 do nothing scenario and with the AP2 revised scheme in combination scenario are greater than 1% of the air quality standard just above 30m from the road. Potentially significant effects are therefore predicted, and this is addressed further in Section 4.2 of the main report.

NH_3 concentrations at Holcroft Moss are predicted to be above the critical level in all scenarios. Changes in NH_3 concentrations are more than 1% of the air quality standard up to just above 150m from the road, and therefore are potentially significant. Potentially significant effects are therefore predicted, and this is addressed further in Section 4.2 of the main report.

Nitrogen deposition rates are predicted to be above the relevant critical load at all modelled receptors in the baseline and future scenarios with or without the AP2 revised scheme in combination. Predicted nitrogen deposition rates in 2039, with the AP2 revised scheme in combination, are lower than the 2018 baseline rates at all modelled locations. The changes in nitrogen deposition between the 2039 do nothing scenario and with the AP2 revised scheme in combination scenario are greater than 1% of the relevant critical load up to a distance of 200m from the road. Potentially significant effects are therefore predicted, and this is addressed further in Section 4.2 of the main report.

Acid deposition rates are predicted to be above the critical load at all modelled receptors in all scenarios with or without the AP2 revised scheme in combination. The changes in acid deposition between the 2039 do nothing scenario and with the AP2 revised scheme in combination scenario are greater than 1% of the maximum critical load just above 100m from the road. Potentially significant effects are therefore predicted, and this is addressed further in Section 4.2 of the main report.

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