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-016-00007

Ecology and biodiversity

Designated site assessment for the Midland Meres and Mosses Phase 1 Ramsar site (Tatton Meres)

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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 Tatton Meres Site of Special Scientific Interest (SSSI) component of the Midland Meres and Mosses Phase 1 Ramsar site (hereafter referred to as Tatton Meres).

1.1.3 This report provides the background assessment for identifying any likely significant effects on Tatton Meres 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 included a draft assessment to inform a Habitats Regulations Assessment for Tatton Meres[3]. Further and separate assessment is being carried out in line with Regulation 63 of the Conservation of Habitats and Species Regulations 2017 (as amended)[4]. 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).

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;

[1] *The Town and Country Planning (Environmental Impact Assessment) Regulations 2017*. SI 2017 No. 571. Her Majesty's Stationery Office, London. Available online at: http://www.legislation.gov.uk/uksi/2017/571/pdfs/uksi_20170571_en.pdf.

[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 1 Ramsar site (Tatton Meres)*, Volume 5, Appendix EC-016-00007. Available online at: https://www.gov.uk/government/collections/hs2-phase2b-crewe-manchester-environmental-statement.

[4] *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). London, Her Majesty's Stationery Office.

- '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 Tatton Meres 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 Tatton Meres lies approximately 1.9km west from the land required for the construction of the AP2 revised scheme in the Hulseheath to Manchester Aiport (MA06) community area. The AP2 revised scheme will result in changes to traffic flows during construction and operation along the B5085 Mobberley Road which, at its closest point, lies approximately 163m to the south-east of Tatton Meres.

2.2 Site description and nature conservation targets

Midland Meres and Mosses Phase 1 Ramsar site

2.2.1 The Midland Meres and Mosses Phase 1 Ramsar site extends over 510ha across 16 discrete sites distributed throughout the North-West Midlands, over a land area that extends 80km from north to south and 75km from west to east. Figure 1 shows the location and extent of the Phase 1 Ramsar site and Figure 2 shows the location of Tatton Meres relevant to the AP2 revised scheme.

2.2.2 The Ramsar Information Sheet[5] identifies that the site qualifies for Ramsar status under criteria (1) and (2) on account of the presence of 'a diverse range of habitats from open water to raised bog' and the presence of a number of rare plants and invertebrates. Elsewhere, it describes the entire Phase 1 Ramsar site as comprising open water (meres) and their associated fringing habitats (for example, reed swamps, fen, carr and damp pasture) and a smaller number of nutrient poor peat bogs (mosses). However, not all features are present on all sites. Although the Ramsar-qualifying features are quite broadly described, together they encompass a distinctive group of water bodies with characteristic hydrological regimes, water chemistry and animal and plant communities. However, the Ramsar Information Sheet confirms its primary interest remains the 'wide range of lowland wetland types and successional stages within a distinct biogeographical area'.

[5] Joint Nature Conservation Committee (1997), *Ramsar Information Sheet (RIS): Midland Meres and Mosses Phase 2.* Available online at: https://jncc.gov.uk/jncc-assets/RIS/UK11080.pdf.

Figure 1: Location of the constituent SSSI forming the Midland Meres and Mosses Phase 1 Ramsar site

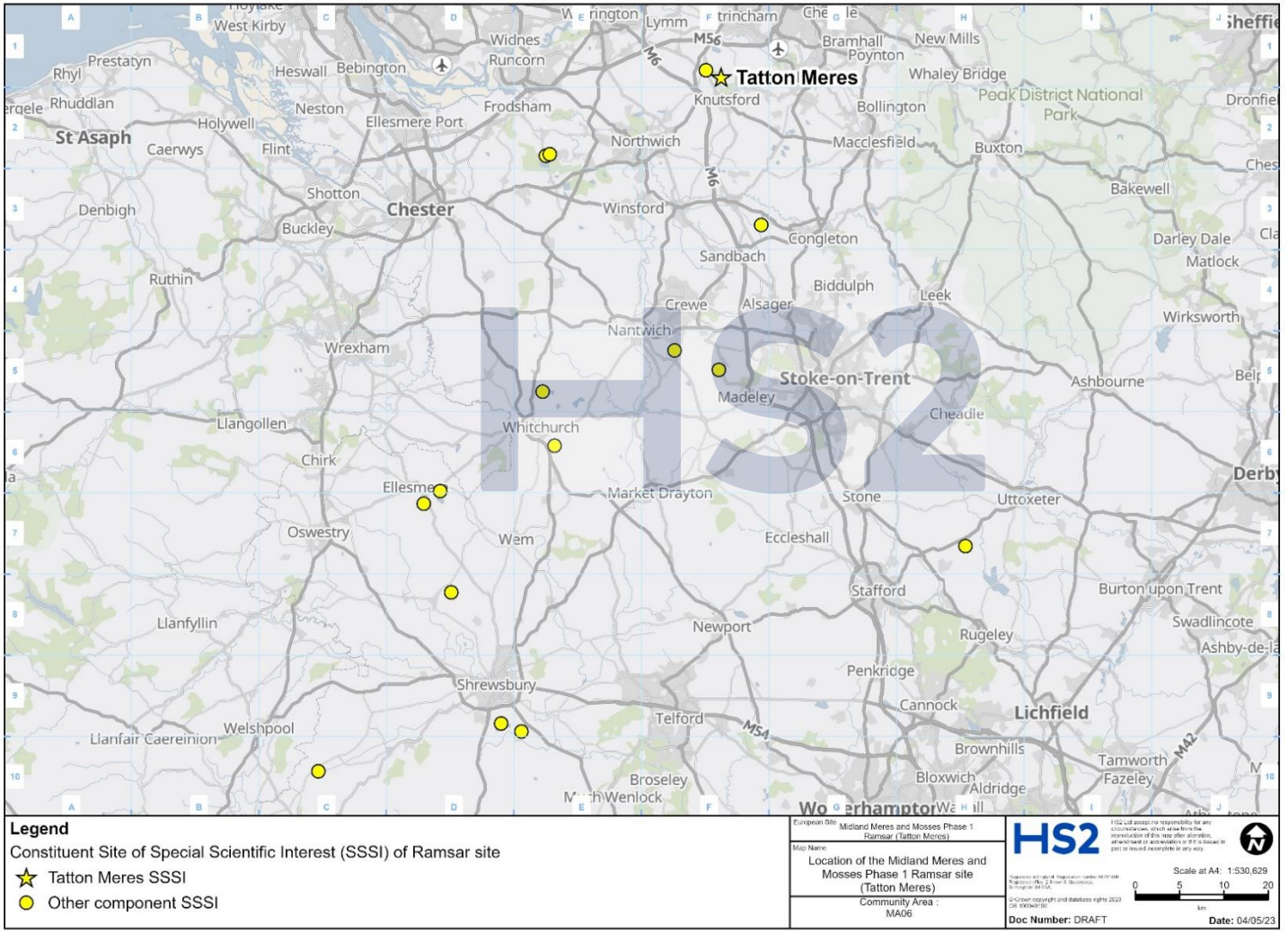
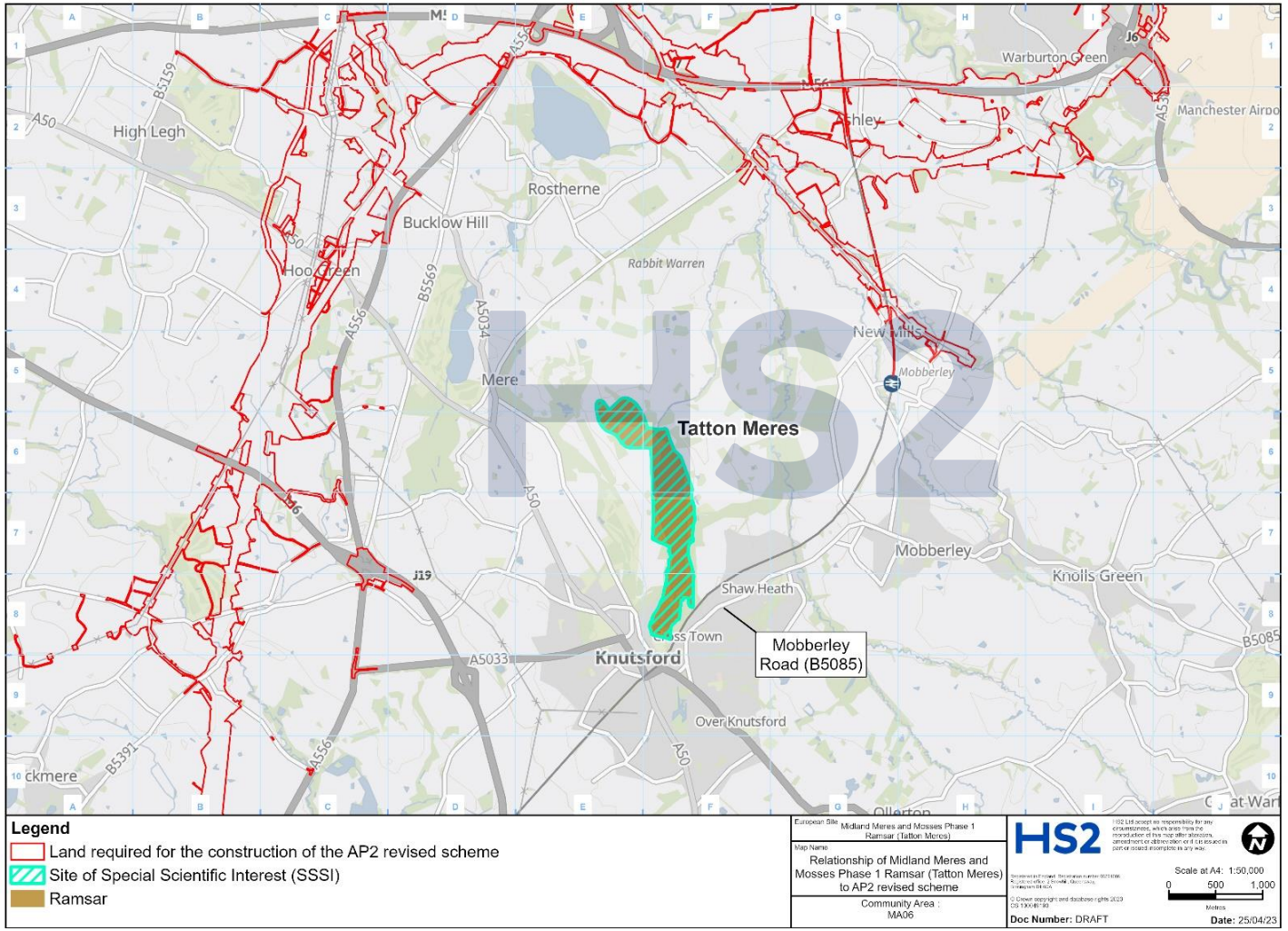


Figure 2: Relationship of Tatton Meres to the AP2 revised scheme



2.2.3 As Natural England does not produce conservation objectives, supplementary advice or site improvement plans for Ramsar sites, evidence is drawn from the citation[6] for Tatton Meres SSSI (which was notified for broadly similar reasons) and its draft Conservation objectives[7].

2.2.4 Tatton Meres SSSI extends over 90ha and comprises four discrete, eutrophic water bodies. Tatton Mere, the largest, lies in the centre with Melchett Mere to the north. Knutsford Moor (or The Moor) is made up of two water bodies and lies to the south. The SSSI citation identifies that Tatton Meres supports an extensive submerged macrophyte flora including autumnal pondweed (*Callitriche hermaphroditica),* stiff-leaved water crowfoot (*Ranunculus circinatus*) and spiked water-milfoil (*Myriophyllum spicatum*) amongst others. Melchett Mere is similar with the addition of slender spike-rush and is surrounded by swamp, fen and flushed pasture. Knutsford Moor supports one of the largest examples of fen and reedswamp in Cheshire. Whilst dominated by common reed, it also supports marsh fern (*Thelypteris thelypteroides*), cowbane (*Cicuta virosa*) and Cyperus sedge (*Carex pseudocyperus*). Alder (*Alnus glutinosa*) dominated wet woodland surrounds the entire site. The Ramsar Information Sheet identifies eutrophication and invasive species as threats at the time of production (1994).

Conservation objectives

2.2.5 In lieu of formal Ramsar conservation objectives, the SSSI conservation objectives have been considered. These are regarded to be a reasonable surrogate for the Ramsar conservation objectives for the site. An extract of the most relevant higher-level targets is provided below, but reference to the entire document is encouraged for additional detail:

'…subject to natural change, to maintain the following habitats … in favourable condition[8], with particular reference to any dependent component special interest features (habitats, vegetation types, species, species assemblages etc.) for which the land is designated…'

- fen, marsh and swamp; and
- standing open water[9].

2.2.6 The Site-Specific Definitions of Favourable Condition for Fen, Marsh and Swamp are 'To maintain the fen, marsh and swamp at Tatton Meres in favourable condition, with particular reference to relevant specific designated interest features:

- habitat composition: no loss of variety of habitat within the site, including open water, swamp, fen and marshy grassland communities; and

[6] English Nature (1979), *Citation for Tatton Meres, SSSI.* Available online at: https://designatedsites.naturalengland.org.uk/PDFsForWeb/Citation/1003604.pdf.

[7] Natural England (2008), *Conservation objectives and definitions of favourable condition for designated features of interest. Tatton Meres*.

[8] Or restored to favourable condition if features are judged to be unfavourable.

[9] It should be noted that Table 1 of the objectives also lists 'woodland' as a Ramsar feature but no specific objectives for this habitat are provided other than to note the loss of some woodland to fen/marsh/swamp would be acceptable. Consequently, in this designated site report woodland is not considered to be a qualifying feature of the Ramsar site.

- vegetation composition (positive indicators):
  - S4 *Phragmites australis* reedswamp: *Phragmites australis* forming a closed or openstand; >90% cover;
  - associated species (*Typha latifolia, T. angustifolia, Carex riparia, Cladium mariscus*, *Berula erecta*) to be present and locally prominent, but <5% cover;
  - S14 *Sparganium erectum* swamp: *Sparganium erectum* to be constant*;*
  - S20 *Schoenoplectus tabernaemontani* swamp: *Schoenoplectus tabernaemontani t*o be constant; and
  - local distinctiveness: Presence of *Carex binervis, Carex elata, Cicuta virosa, Osmunda regalis, Ranunculus circinatus, Schoenoplectus tabernaemontani, Thelypteris palustris, Triglochin palustre, Ranunculus circinatus*'.

2.2.7 The Site-Specific Definitions of Favourable Condition for Open Water are 'To maintain the standing open water at Tatton Meres in favourable condition, with particular reference to relevant specific designated interest features:

- vegetation composition:
  - no reduction in the number of native aquatic species occurring in the meres;
  - non-native species should be no more than rare;
  - community structure; and
  - some beds of submerged macrophytes should be present.
- water quality:
  - total phosphorus <35 µg/l; and
  - pH >7.0 and <9.0'.

2.2.8 Whilst it is clear the above communities represent elements of the 'diverse range of habitats [and] rare species of plants …' described in the Ramsar Information Sheet, it is noted that there is no specific reference to the assemblage of rare invertebrates provided in either the Favourable Condition Tables (FCT)[10] or SSSI citation. Consequently, these are considered to be absent, and no consideration is given to these in this report. If, however, they are shown to be present, their requirements are considered to be satisfactorily addressed by the assessment of the supporting habitats.

Condition assessment

2.2.9 Natural England's most recent condition monitoring assessment of Tatton Meres was carried out in 2009[11] and would have been informed by the conservation objectives. This found that

[10] Provided in Natural England (2008), *Conservation objectives and definitions of favourable condition for designated features of interest. Tatton Meres*.

[11] Natural England (2021), *Condition of SSSI Units for Site Tatton Meres SSSI.* Available online at: https://designatedsites.naturalengland.org.uk/ReportUnitCondition.aspx?SiteCode=S1003604&ReportTitle=Tatton%20Meres%20SSSI.

50.89% of the site, comprising units 6, 8 and 9 (comprising both terrestrial and aquatic habitats) was considered to be in 'favourable' condition. In contrast, 49.11%, comprising Knutsford Moor and Tatton Meres (units 3 and 7, respectively[12]), which lie closest to the B5085 Mobberley Road, were assessed as 'unfavourable no change'. The reason for the unfavourable status appeared to be the presence of invasive species.

2.2.10 Whilst the most recent assessment was carried out fourteen years ago, there is little to suggest circumstances have changed and, overall, it is assumed that approximately half of Tatton Meres remains in an unfavourable condition and vulnerable to external influences. Given this, the objectives are interpreted not as 'to maintain' but 'to restore' the qualifying features in these areas.

2.2.11 The conservation objectives for Tatton Meres remain unchanged and valid. However, a 'Lake Management Plan for Tatton Meres SSSI' was produced in 2014[13]. This evidence informs understanding of the structure and function of the site although there has been no apparent update of the objectives and no subsequent condition assessment.

[12] Note that units 1, 2, 4 & 5 have been replaced by units 3, 6, 7, 8 & 9.

[13] APEM (2014), *Lake Management Plan for Tatton Meres SSSI*.

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 Tatton Meres 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[14] and impacts related to traffic emissions arising from the SES2 changes and AP2 amendments.

3.2 Scope, assumptions and limitations

3.2.1 Tatton Meres lie approximately 1.9km south of land required for the construction of the AP2 revised scheme. Given the distance from the site, direct impacts can be ruled out. The only 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 Tatton Meres is located approximately 3.5km upstream of the AP2 revised scheme and occupies higher ground. It is located in a different hydrological catchment to the AP2 revised scheme. Making the reasonable assumption that groundwater flow in the superficial deposits follows topography, 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 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.

[14] 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.

Air pollution assessment methodology

3.2.4 The assessment of air pollution is informed by established best practice provided by National Highways[15,16], Natural England[17,18], and the Institute for Air Quality Management (IAQM)[19].

3.2.5 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.

3.2.6 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.

3.2.7 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; eventually becoming indistinguishable from background levels. This means that impacts at 10m, 50m or 200m or more can be very different from those at the roadside.

3.2.8 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)[15] 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);

[15] 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.

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

[17] 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: http://publications.naturalengland.org.uk/file/5431868963160064.

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

[19] 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/text/guidance/air-quality-impacts-on-nature-sites-2020.pdf.

- change in daily flows of Heavy Duty Vehicles[20] (HDV) by 200 AADT or more;
- change in daily average speed by 10kph or more; and
- change in peak hour speed by 20kph or more.

3.2.9 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.

3.2.10 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.

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

3.2.12 Traffic flows are assessed by calculating AADT figures using established models[21]. Should increases in traffic be less than 1,000 AADT[22] 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.

3.2.13 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 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)[23], 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;

[20] 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.

[21] 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.

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

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

- 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'[24];
- 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.

3.2.14 Natural England best practice guidance[17] 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.

3.2.15 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.

3.2.16 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 Tatton Meres lie approximately 163m from the B5085 Mobberley Road, within the 200m threshold described in Section 3.2, as shown below in Figure 3. 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 identify suitable measures to mitigate or compensate for potential significant effects identified on designated sites.

[24] 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.

Assessment of traffic flows and air pollution during construction

3.3.3 The traffic analysis (see Section 5.1, Annex A) indicates that the construction of the AP2 revised scheme will not exceed the AADT or HDV traffic thresholds described in Section 3.2. Therefore, no air quality assessment is required.

Assessment of traffic flows and air pollution during operation

3.3.4 The traffic analysis (see Section 7.1, Annex A) indicates that the operation of the AP2 revised scheme will not exceed the AADT or HDV traffic thresholds described in Section 3.2. Therefore, no air quality assessment is required.

3.4 Mitigation measures

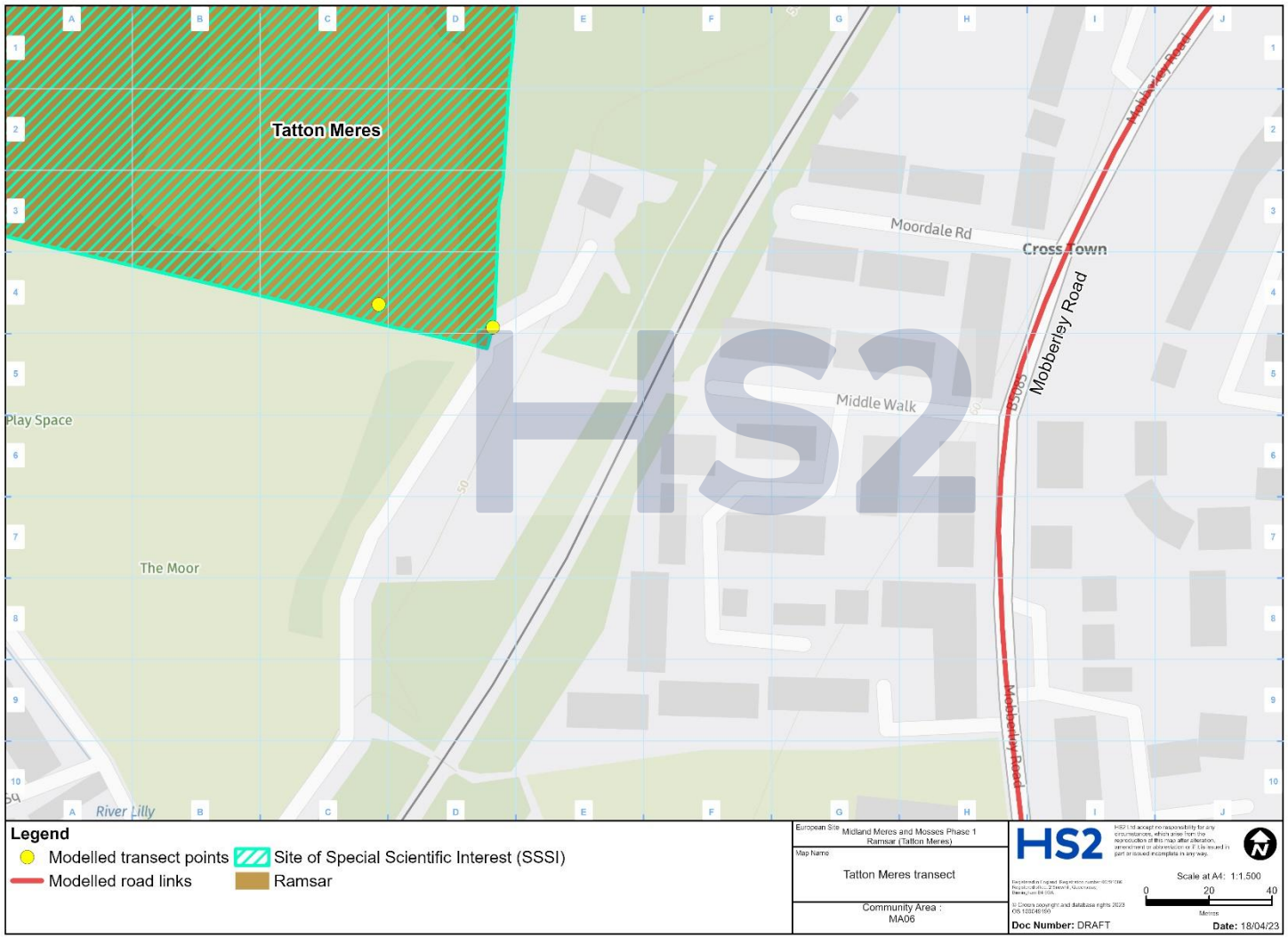
3.4.1 The likely significant effects assessment above has been undertaken on a precautionary basis.

3.4.2 Where necessary, 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 Traffic flows as a result of the AP2 revised scheme during construction and operation do not trigger the requirement for an air quality assessment and therefore, likely significant effects can be ruled out.

Figure 3: Location of B5085 Mobberley Road and the modelled transect in the south-east corner of Tatton Meres



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')[4]. 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 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 Tatton Meres.

4.2.2 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.

Critical loads and levels

4.2.3 The B5085 Mobberley Road was the only road that triggered the AADT thresholds. Given the orientation of the site to the B5085 Mobberley (see Figure 3), only one air quality modelling transect (represented by yellow dots) was employed to reflect the greatest air quality impact as well as to take account of the most sensitive habitat features. The transect initially crossed built development, gardens, a railway line and broadleaved woodland before entering the site at 163m and remaining within it to the full extent of the 200m transect.

4.2.4 Drawing on the type and distribution of habitats provided in the conservation objectives, and evidence derived from APIS, the habitat types found within Tatton Meres and within 200m of the B5085 Mobberley Road were identified in broad terms as woodland, fen/marsh/swamp and open water.

4.2.5 At this point, common practice would be to make reference to the published critical loads for these features at this site. However, APIS fails to provide critical loads for the individual Ramsar features (open water, fen/marsh/swamp and wet woodland). In such circumstances, reference can be made to the values for the underpinning SSSI but in this case, unusually, no critical loads are provided. Normally, supporting evidence can be found in the Site Improvement Plans and the Supplementary Advice provided for Special Protection Areas (SPA) and Special Areas of Conservation (SAC) to explore if nitrogen deposition represented a conceivable threat. However, these are not produced for Ramsar sites. It therefore falls to professional judgement to make cautious, evidence-based and reasonable assumptions to assess the magnitude of any possible impact.

4.2.6 Furthermore, the identification of critical loads can prove challenging in wetland environments which prompted Natural England to provide the following advice in terms of a similar assessment at Rostherne Mere Ramsar site (see Annex A in SES2 and AP2 ES Volume 5, Appendix: EC-016-00003, Designated Site Assessment for Rostherne Mere Ramsar site and Midland Meres and Mosses Phase 1 Ramsar site):

'It is difficult to specify appropriate critical load/levels for standing open waters and the approach generally taken is to apply the relevant loads/levels from associated terrestrial habitat so in the case of Rostherne Mere those relevant to fen, marsh and swamp should be used when assessing impact'.

4.2.7 Drawing on this advice and, given its proximity and ecological similarities with Rostherne Mere, the same approach was adopted at Tatton Meres and the critical loads for poor fen (10 – 15kg N/ha/yr) were applied to all the land and water within the 200m threshold. As a precautionary measure, it was also applied to the fringing woodland which, whilst not considered to be a qualifying feature at this site, can support examples of fen/marsh/swamp.

4.2.8 Following best practice, the lowest value of each critical load was used in the air quality analysis. Consequently, the value of 10kgN/ha/yr for poor fen was used to assess the qualifying features. Again, this represents a precautionary measure that will emphasise any negative outcomes.

4.2.9 Given that bryophytes are considered to be an integral component of these wetland habitats, a critical level for NH_3 of 1µg/m^3 has been applied. As described above, the critical level for NOx is a constant (30µg/m^3).

Construction phase impacts in combination

4.2.10 Table A5 of Annex A shows that NOx concentrations with the AP2 revised scheme are lower than the 2018 baseline 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. Furthermore, there is a less than 1% exceedance of the NOx critical load brought about by the AP2 revised scheme in combination. Therefore, likely significant effects in combination can be ruled out.

4.2.11 Table A6 of Annex A shows that NH_3 concentrations with the AP2 revised scheme are marginally lower than the 2018 baseline. 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. Despite this, at no point within the transect do the increases brought about by the AP2 revised scheme in combination exceed 1% of the critical level. Therefore, likely significant effects in combination can be ruled out.

4.2.12 Table A7 of Annex A shows that nitrogen deposition rates with the AP2 revised scheme are lower than the 2018 baseline 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. Despite this, at no point within the transect do the increases brought about by the AP2 revised scheme in combination exceed 1% of the lower critical load. Therefore, likely significant effects in combination can be ruled out.

4.2.13 Table A8 of Annex A shows that acid deposition rates with the AP2 revised scheme are marginally lower than the 2018 baseline. However, acid deposition rates are predicted to be above the relevant air quality standard at all modelled receptors with or without the AP2 revised scheme. Despite this, at no point within the transect do the increases brought about by the AP2 revised scheme in combination exceed 1% of the critical load. Therefore, likely significant effects in combination can be ruled out.

Operational phase impacts in combination

4.2.14 Table A12 of Annex A shows that 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 below the air quality standard at all modelled receptors with or without the AP2 revised scheme. Furthermore, there is a less than 1% exceedance of the NOx critical level brought about by the AP2 revised scheme, Therefore, likely significant effects in combination can be ruled out.

4.2.15 Table A13 of Annex A shows that NH_3 concentrations with the AP2 revised scheme are lower than the 2018 baseline at all modelled receptors. However, NH_3 concentrations are predicted to be above the air quality standard at all modelled receptors with or without the AP2 revised scheme. Despite this, at no point do the increases brought about by the AP2 revised scheme in combination exceed 1% of the critical level. Therefore, likely significant effects in combination can be ruled out.

4.2.16 Table A14 of Annex A shows that nitrogen deposition rates with the AP2 revised scheme are lower than the 2018 baseline at all modelled receptors. However, nitrogen deposition rates are predicted to be above the air quality standard at all modelled receptors with or without the AP2 revised scheme. Despite this, at no point do the increases brought about by the AP2 revised scheme in combination exceed 1% of the lower critical load. Therefore, likely significant effects in combination can be ruled out.

4.2.17 Table A15 of Annex A shows that acid deposition rates with the AP2 revised scheme are lower than the 2018 baseline at all modelled receptors. However, acid deposition rates are

predicted to be above the air quality standard across all modelled receptors with or without the AP2 revised scheme. Despite this, at no point do the increases brought about by the AP2 revised scheme in combination exceed 1% of the critical load. Therefore, likely significant effects in combination can 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 can be ruled out from the AP2 revised scheme in combination with other plans or projects during construction and operation.

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 Midland Meres and Mosses Phase 1 Ramsar Site.

This annex assesses the impact of air pollution on the Tatton Meres SSSI component of the Midland Meres and Mosses Phase 1 Ramsar Site. For simplicity, it is referred to as Tatton Meres throughout the rest of this annex except where specific mention is required of the Ramsar site.

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[25] 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[15] to identify where assessment is required;
- these criteria are the following for assessing the impacts of the AP2 revised 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; and
  - 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; and
  - 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 Area (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[19]. Data on ammonia, nitrogen deposition and acid deposition has been taken from the most recent information available on the APIS[23] 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.

The following scenarios were assessed:

- baseline;

[25] Volume 5: Appendix CT-001-00001, Environmental Impact Assessment Scope and Methodology Report.

- 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 worst 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[26]; Air Quality and include Euro VI for HGV, and Euro 6 and Euro 4 for diesel and petrol Light Duty Vehicles (LDV) respectively.

The traffic forecasts that underpin the designated sites 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 model forecasting reports published at that time. Information about these development growth scenarios can be found in the following documents:

[26] 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.

- Cheshire East Local Plan Strategy 2010-2030, July 2017[27];
- Cheshire West and Chester Local Plan (Part Two) Land Allocations and Detailed Policies, November 2017[28];
- Winsford Transport Strategy Recommendations Report, June 2016[29];
- Northwich Transport Strategy Recommendations Report, April 2018[30];
- Regional Investment Programme (RIP) M6 Junction 19 Improvement PCF Stage 3 Transport Forecasting Report, January 2019[31]; 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))[32] 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[17]:

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

[27] Cheshire East Council (2022), *Local Plan Strategy 2010 – 2030*. Adopted 17 July 2017. Available online at: https://www.cheshireeast.gov.uk/planning/spatial-planning/cheshire_east_local_plan/local-plan-strategy/local_plan_strategy.aspx.

[28] 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/event/34617/section/.

[29] Mott MacDonald (2016), *Winsford Transport Strategy: Recommendations Report*. Available online at: https://www.cheshirewestandchester.gov.uk/residents/transport-and-roads/public-transport/transport-strategy.

[30] Mott MacDonald (2018), *Northwich Transport Strategy: Recommendations Report*. Available online at: https://www.cheshirewestandchester.gov.uk/residents/transport-and-roads/public-transport/transport-strategy.

[31] 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.

[32] 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.

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[33], critical level or relevant standard for the site, as above or as provided by APIS.

[33] 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 – 20kg 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[34], 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[33], 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.

[34] 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 screening process identified no roads in the area exceeding the screening thresholds, therefore no further assessment of AP2 revised scheme impacts during construction is required.

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

6.1 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 one road in the area exceeding the screening thresholds:

- B5085 Mobberley Road.

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

Road ID	Road names	Annual Average Daily Traffic (AADT)			Heavy Duty Vehicles (HDV)		
		2018 baseline	2039 with the AP2 revised scheme	In combination change (2039 with the AP2 revised scheme – 2018 baseline)	2018 baseline	2039 with the AP2 revised scheme	In combination change (2039 with the AP2 revised scheme – 2018 baseline)
8016_8031, 8031_8016	B5085 Mobberley Road	16,519	17,969	**1,451**	107	110	6

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

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 modelling transect points in Figure A1 represent the closest point to the road for the sensitive habitat type.

Figure A1: Map of Tatton Meres Transect 1, including modelled road links and modelled transect points

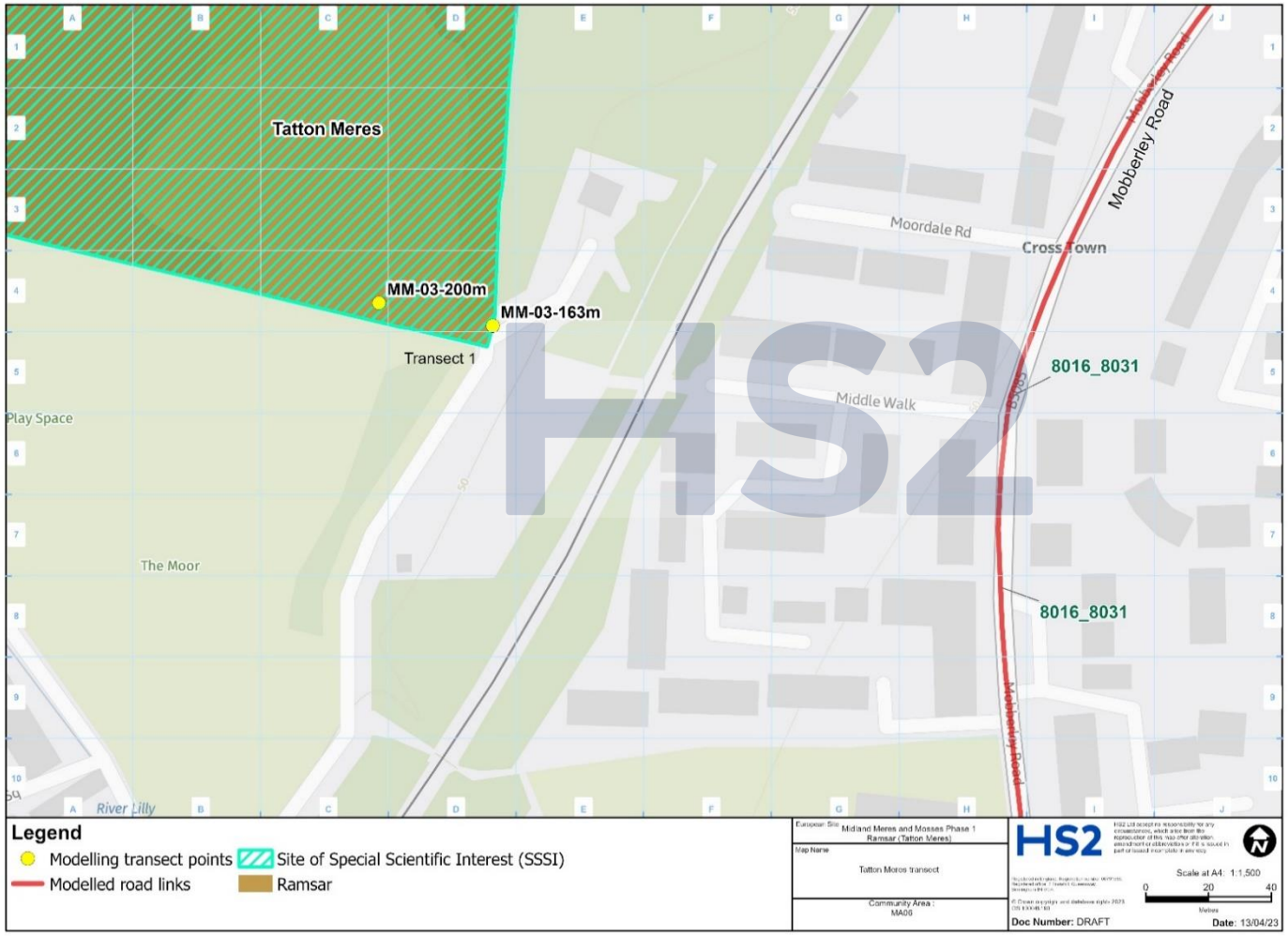


Table A3: Modelled ecological receptor backgrounds, APIS data and critical loads (construction phase)

Receptor	Sensitive habitat	2018 NOx background concentration (µg/m^3)	2026 NOx background concentration (µg/m^3)	APIS data[23] of average total nitrogen deposition (kg N/ha/yr)	APIS Critical load (kg N/ha/yr)
Tatton Meres	Poor fen	18.5	12.9	30.0	10

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 (keq/ha/yr) (min)	APIS Critical load nitrogen (keq/ha/yr) (max)	APIS ammonia background concentration (µg/m^3)
Tatton Meres	Poor fen	2.3	0.2	1.1	3.8

6.4 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[16], 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 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
			2018 baseline	2026 do nothing	2026 with the AP2 revised scheme			
Tatton Meres	Poor fen	163	19.80	13.47	13.53	0.06	Within standard	0.2%
	Poor fen	200	19.48	13.32	13.37	0.05	Within standard	0.2%

Table A6: Assessment of ammonia (NH_3) 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 (3µg/m³ for low and 1µg/m³ high vegetation)	Percent change in relation to critical level
			2018 baseline	2026 do nothing	2026 with the AP2 revised scheme			
Tatton Meres	Poor fen	163	3.90	3.89	3.89	<0.01	Above standard	0.6%
	Poor fen	200	3.88	3.87	3.88	<0.01	Above standard	0.5%

Table A7: 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
			2018 baseline	2026 do nothing	2026 with the AP2 revised scheme			
Tatton Meres	Poor fen	163	30.52	30.39	30.42	0.03	10	0.4%
	Poor fen	200	30.40	30.30	30.33	0.03	10	0.3%

Table A8: 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
			2018 baseline	2026 do nothing	2026 with the AP2 revised scheme			
Tatton Meres	Poor fen	163	2.30	2.29	2.29	<0.01	0.2%	206.2%
	Poor fen	200	2.29	2.29	2.29	<0.01	0.2%	205.6%

6.5 Assessment of significance (construction phase, AP2 revised scheme in combination)

NOx concentrations at Tatton Meres are predicted to be within the air quality standard in all scenarios. Changes in NOx concentrations are less than 1% of the air quality standard and therefore not significant.

NH_3 concentrations at Tatton Meres are predicted to be above the air quality 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 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 less than 1% of the relevant critical load and therefore not significant.

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 less than 1% of the maximum critical load and therefore not significant.

7 Assessment of operational traffic effects – AP2 revised scheme

7.1 Screening of traffic data

The screening process identified no roads in the area exceeding the screening thresholds, therefore no further assessment of AP2 revised scheme impacts during operation is required.

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

8.1 Screening of traffic data

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

- the B5085 Mobberley Road.

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

Table A9 presents the traffic data used in the assessment.

Table A9: 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 with the AP2 revised scheme	In combination change (2039 with the AP2 revised scheme – 2018 baseline)	2018 baseline	2039 with the AP2 revised scheme	In combination change (2039 with the AP2 revised scheme – 2018 baseline)
8016_8031, 8031_8016	B5085 Mobberley Road	16,519	18,056	**1,537**	104	114	10

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

Table A10 shows the background concentrations for NOx, background nitrogen deposition and critical loads. Table A11 shows the background acid deposition, critical loads and background ammonia concentrations. The yellow modelling transect points in Figure A1 represent the closest point to the road.

Table A10: 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[23] of average total nitrogen deposition (kg N/ha/yr)	APIS Critical load (kg N/ha/yr)
Tatton Meres	Poor fen	18.5	11.6	30.0	10

Table A11: 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)
Tatton Meres	Poor fen	2.3	0.2	1.1	3.8

8.4 Assessment results

Table A12 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 A13 presents a summary of the ammonia concentration results taken from the National Highways Ammonia N Deposition Tool[16], change in concentration and percentage change in relation to the critical level.

Table A14 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 A15 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 A12: 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
			2018 baseline	2039 do nothing	2039 with the AP2 revised scheme			
Tatton Meres	Poor fen	163	19.80	11.87	11.90	0.03	Within standard	0.1%
	Poor fen	200	19.48	11.79	11.82	0.03	Within standard	0.1%

Table A13: 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
			2018 baseline	2039 do nothing	2039 with the AP2 revised scheme			
Tatton Meres	Poor fen	163	3.90	3.88	3.88	< 0.01	Above standard	0.5%
	Poor fen	200	3.88	3.87	3.87	< 0.01	Above standard	0.4%

Table A14: 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
			2018 baseline	2039 do nothing	2039 with the AP2 revised scheme			
Tatton Meres	Poor fen	163	30.52	30.33	30.36	0.03	10	0.3%
	Poor fen	200	30.40	30.26	30.28	0.02	10	0.2%

Table A15: 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 CLmax	Total with AP2 revised scheme acid deposition as percent of CLmax
			2018 baseline	2039 do nothing	2039 with the AP2 revised scheme			
Tatton Meres	Poor fen	163	2.30	2.29	2.29	<0.01	0.2%	205.8%
	Poor fen	200	2.29	2.28	2.28	<0.01	0.1%	205.3%

8.5 Assessment of significance

NOx concentrations at Tatton Meres 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 less than 1% of the air quality standard and therefore not significant.

NH_3 concentrations at Tatton Meres are predicted to be above the air quality 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 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 less than 1% of the relevant critical load and therefore not significant.

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 less than 1% of the maximum critical load and therefore not significant.

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