Habitats Regulations Assessment of the Places for Everyone Joint Development Plan

Submission

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Prepared by

Ricardo Energy and Environment

Gemini Building

Fermi Avenue

Harwell

Didcot

https://ee.ricardo.com/

and

The Greater Manchester Ecology Unit

Dukinfield Town Hall

King Street

Dukinfield

Ashton-under-Lyne

gmeu@tameside.gov.uk

For:

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Prepared By	Derek Richardson	Signature	
Checked By	Teresa Hughes	Signature	
Authorised by	Alex McDyre (GMCA)		

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1 Introduction

1.1 European protected sites are of exceptional importance for the conservation of important species and natural habitats. The purpose of Habitats Regulation Assessment (HRA) of land use plans is to ensure that protection of the integrity of European protected sites is an integral part of the planning process at a regional and local level.

Article 6(3) of the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 dealing with the conservation of European protected sites states that:

'Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans and projects, shall be subject to assessment of its implications for the site in view of the site's conservation objectives. In light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after it is ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public.'

The Places for Everyone joint development plan is regarded as a Plan which is considered likely to have significant effect on one or more European protected site and should therefore be subject to assessment.

1.2 Habitats Regulation Assessments can be seen as having a number of discrete stages –

- Stage 1 – Screening
- Stage 2 – Appropriate Assessment
- Stage 3 – Assessment of Alternatives
- Stage 4 – Assessment where no alternatives are available

This document summarises Stage 1 and Stage 2 of the Habitats Regulation Assessment process and contributes (in part) to the fulfilment of the statutory duty of the nine Districts of Greater Manchester who are parties to the Plan as regards Article 6(3). That is, it is an Opinion on and an Assessment of whether

the Plan may have a significant effect on the special interest of any European designated protected sites.

It is also an Opinion on, and an Assessment of, whether any of the identified effects (if any) can be avoided or mitigated or whether any of the actions proposed in the planning application need adjustment.

1.3 Stage 1 – Screening

The purpose of the Screening stage of the HRA process is to initially identify the risk or the possibility of significant adverse effects on a European site which could undermine the achievement of a site's conservation objectives, and which therefore require further detailed examination through an appropriate assessment. If risks which might undermine a site's conservation objectives can clearly be ruled out (based on the consideration of objective information), a proposal will have no likely significant effect (LSE) and no appropriate assessment will be needed.

In order for a policy or an allocation in a Plan to be screened out of the HRA process a conclusion must be made 'beyond reasonable scientific doubt' that the policy or allocation will not have an LSE on the Natura 2000 site or its qualifying features.

Case law has established in relation to screening that -

- An effect is likely if it 'cannot be excluded on the basis of objective information' (Waddenzee C127-02 ∞ 45). This requires consideration and a conclusion made against known and presented data/survey or results/scientific evidence (e.g. literature review).

- An effect is significant if it 'is likely to undermine the conservation objectives' [of the European protected site (Waddenzee (C127-02 ∞ 48)]. This excludes from consideration other impacts not related to the qualifying features and their conservation objectives.

- In undertaking a screening assessment for likely significant effects 'it is not that significant effects are probable, a risk is sufficient, but there must be credible evidence (see above) that there is 'a real, rather than a hypothetical, risk' Boggis v Natural England & Waveney District Council. This refines the understanding of the 'precautionary principle' as it applies to the Habitats Regulations.

- The Sweetman (case C258-11) also offers some simple guidance that the screening step 'operates merely as a trigger', in order to progress to further assessment stages through the process.

1.4 Stage 2 – Appropriate Assessment

In 2017 the decision of the Court of Justice of the European Union (People over Wind, case C323/17) concluded that it was not appropriate within the Screening Stage to consider measures that would mitigate for impacts on the qualifying or designated features of the Natura 2000 site. This ruling has resulted in an update to the Habitats Regulations 2017 as they have been translated into UK domestic legislation and updated to reflect the exit of the UK from the European Union..

In a Stage 2 – Appropriate Assessment, evidence and detail should be considered which can demonstrate that a Plan including any embedded measures or additional mitigation can result in a conclusion that there would be no 'adverse effect on integrity' (AEOI), when considering a Natura 2000 site's conservation objectives.

In applying the Stage 2 – Appropriate Assessment the relevant competent Authority – in this case the Local Authorities concerned - must also consider whether there is a relevant planning mechanism (which may apply at a different level of the planning hierarchy) which can secure the necessary mitigation via either conditions or obligations.

In the case of a high level Strategic Plan the level of detail in land use plans concerning developments that will be permitted under the Plan at some time in the future is rarely sufficient to allow the fullest quantification of potential adverse effects. It is therefore necessary to be cognisant of the fact that HRAs for plans can be tiered, with assessments being undertaken with increasing specificity at lower tiers. This is in line with DCLG guidance and court rulings that the level of detail of the assessment, whilst meeting the relevant requirements of the Habitats Regulations, should be 'appropriate' to the level of plan or project that it addresses.

Government guidance says:

"*The scope and content of an appropriate assessment will depend on the nature, location, duration and scale of the proposed plan or project and the interest features of the relevant site. 'Appropriate' is not a technical term. It indicates that an assessment needs to be proportionate and sufficient to support the task of the competent authority in determining whether the plan or project will adversely affect the integrity of the site*."

That is, the Plan must make every effort to ensure that no Policies or Allocations will cause harm to the special nature conservation interest of European sites. But where some doubt remains as to whether harm will occur the plan must show that sufficient safeguards will be in place in other levels of the planning hierarchy to ensure that no harm will be caused to the special interest of European sites.

A precautionary approach should always be taken.

The advice of Advocate-General Kokott to the European Court of Justice (*9th June 2005, Case C-6/04)* is relevant. She commented that:

"*It would …hardly be proper to require a greater level of detail in preceding plans [rather than planning applications] or the abolition of multi-stage planning*

and approval procedures so that the assessment of implications can be concentrated on one point in the procedure. Rather, adverse effects on areas of conservation must be assessed at every relevant stage of the procedure to the extent possible on the basis of the precision of the Plan. This assessment is to be updated with increasing specificity in subsequent stages of the procedure"

1.5 In Combination Assessment

The Habitats Regulations also include a requirement for an assessment not only for a Plan alone but also for consideration of any LSE in combination with other projects or plans. An 'in combination' assessment should be undertaken for any impact which is shown to have an effect even where it might be considered *'de minimis'* for the plan in isolation. In the application of the in combination test projects or plans are also considered to include reasonably foreseeable proposals (RFP), which may include projects, plans or schemes which have not concluded their passage through the development planning process, whether they are in full or outline or include other strategic planning documents.

The implication of 'in combination' considerations for a plan with the scale of Places for Everyone may be profound, since a very wide range of other plans and proposals may be influenced by the operation of the Plan, and *vice versa*. It would be practically impossible for a detailed analysis to be undertaken of every possible plan or proposal which may be influenced by the Places for Everyone in isolation. Instead, in some cases this Assessment has taken a high-level precautionary approach and assumed that the impacts arising from the operation of the Places for Everyone Plan are likely to result in in-combination effects. This precautionary principle particularly relates to impacts which may arise from air pollution and recreational impact effects.

1.6 The Competent Authority – identification and roles

Under the terms of the Habitats Regulations the role of the competent authority is the body which undertakes the assessment of likely significant effects (LSE). This is usually the Local Planning Authority in relation to the preparation of Plans or the consideration of planning applications, but may also be another statutory body who has authority and powers to permit, consent or licence activities (e.g. the Environment Agency).

Places for Everyone is a joint Plan of nine district Councils of Greater Manchester, namely Bolton, Bury, Manchester, Trafford, Tameside, Salford, Wigan, Rochdale and Oldham They are collectively 'the competent authority' in this case.

Natural England as the statutory government advisor in these matters also has a role in the process to ensure that the Plan will not have any likely significant harmful effects on European sites. Natural England have advised the Councils during the preparation of this HRA.

A recent Judicial Review *(*R (Preston) v Cumbria County Council [2019] EWHC 1362) concerning a project level HRA ruled that a Local Planning Authority cannot rely on the future decisions and assessment of another permitting competent authority within their own conclusions on the Screening (Stage 1) and must give consideration of sufficient securing measures (Stage 2 – Appropriate Assessment) at the time of their own determination of an application for development.

Government guidance in this regard which seems relevant to plans, outline proposals or operations which might require an additional consent/permit from a third party indicates: -

"*a competent authority is permitted to grant a plan or project consent which leaves the applicant free to determine subsequently certain parameters relating to the construction phase, only if that authority is certain that the consent includes conditions that are strict enough to guarantee that those parameters will not adversely affect the integrity of the site."*

While this Plan, and the HRA, are at a high tier of the planning process, this is important when considering any necessary mitigation for identified effects.

1.7 The Greater Manchester Ecology Unit

The Greater Manchester Ecology Unit (GMEU), as the specialist ecological adviser to the Greater Manchester Combined Authority and to the nine Greater Manchester local planning authorities involved in the preparation of this Plan, has prepared this Screening Opinion and Assessment. Natural England and the JNCC were consulted for information on the conservation objectives and favourable condition tables for the European Sites concerned (the information is summarised below).

GMEU ecologists, who are familiar with the European sites concerned and their special interests, reviewed the ecological information for the site. The key vulnerabilities and sensitivities of the European sites concerned are well understood by GMEU allowing for an informed assessment of the possible effects of the Plan, and any specific aims, objectives and policies contained in the Plan.

GMEU has prepared a number of HRAs for District-level Local Plans and Strategies, prepares HRAs for individual planning applications across GM and Lancashire on a regular basis and is often consulted on HRAs prepared by others.

1.8 Scope of the Assessment

This report Assesses only the Policies included in the Plan and the ‘Strategic Allocations’ for development included in the Plan. It is recognised that, as the name suggests, the Plan provides a Framework for all development in the Greater Manchester area up to 2040, including a large number of local allocations specific to each District. This additional level of more local development is not specifically assessed in this report because these

allocations will be assessed as part of HRA appraisals carried out on individual local plans as part of the planning hierarchy. Where Local Plans are yet to be developed or are in progress the overarching mitigation themes of this Framework will be taken into account as the detail of the allocations and/or detailed design briefs are developed.

However, the assessment of cumulative impacts (in-combination assessment) undertaken as part of this HRA has taken into account the total quantum of development encompassed by Places for Everyone. As a consequence a precautionary approach has been taken throughout.

2 Description of the Plan

2.1 The Plan being assessed is the Places for Everyone Joint Development Plan.

Places for Everyone is a joint Plan across nine local authorities in Greater Manchester, primarily to plan for and manage the supply of land for jobs and new homes. Places for Everyone is aimed at ensuring that Greater Manchester has the right land in the right places to deliver housing and employment land up to 2037, along with identifying the new infrastructure (such as roads, rail, Metrolink and utility networks) required to achieve the aspirations of the Plan and describing the required measures and mechanisms to achieve sustainable growth.

The Plan is inclusive and holistic and includes Policies and proposals for improving public health, reducing carbon emissions, reducing flood risks, improving water quality, protecting and enhancing green infrastructure and the natural environment, protecting built heritage assets, improving education, skills and knowledge, improving social cohesion and enhancing recreation.

The Plan will form an overarching development plan within which the nine local planning authorities involved in Plan preparation can identify more detailed sites for jobs and homes in their own areas. As such, the Plan does not cover everything in the detail that a Local Plan would cover, and individual districts will continue to produce their own Local Plans. It is a high-level strategic plan.

Although it is the case that Places for Everyone is planning for growth levels above and beyond those levels already identified in Local Plans, it includes development proposals already put forward as part of Local Plans and therefore includes development proposals that have already been Assessed under the terms of the Habitats Regulations. These proposals have been, or are being, Assessed as part of the Local Plan process and are not therefore Assessed again in this Report, except in relation to the potential cumulative effects when considered in combination with proposals in Places for Everyone. In particular many sites and areas identified for potential future development, and which contribute to the overall projected levels of growth planned for in Places for Everyone have been, or will be, individually Assessed in other assessments of Local Plans.

2.2 Places for Everyone specifically addresses the environmental capacity of the nine Greater Manchester districts involved, setting out how the Plan can enhance and protect the quality of the natural environment, conserve wildlife and tackle low carbon and flood risk issues, so that growth can be accommodated sustainably.

The Plan has two distinct parts –

- Thematic Policies
- Proposals for the identification (allocation) of Strategic areas 'of-scale' for development

The Thematic Policies and the Strategic Areas have been Screened and, where required, Assessed in this report.

2.3 The Plan includes Policies for environmental enhancement, including environmental gain and biodiversity gain, and undertakings to prepare and implement a Nature Recovery Network (NRN) for Greater Manchester, part of a national initiative to develop a national NRN.

Polices for Green Infrastructure improvement focus on important habitats included in European sites, including lowland mossland, upland moorland and canals.

Environmental enhancement and net gain go beyond simple mitigation and compensation for ecological harm caused by development to also require habitat creation and repair. Gain can take place either within the development boundary or, importantly for this Assessment, off-site and potentially some distance from where the development takes place. The implication of this is that development managed by the operation of the Plan may contribute directly to habitat repair within European sites. The contribution that these policies could make to the enhancement of European sites is uncertain and therefore the extent to which enhancement policies could contribute to mitigation for other potentially environmentally damaging parts of the Plan is uncertain. Whether such measures could be described as 'true mitigation' is therefore subject to debate.

The creation and enhancement of Green Infrastructure close to strategic allocations may have a role to play in reducing the harm caused to European sites by public disturbance by encouraging people to enjoy outdoor activities closer to home, reducing the need to travel long distances to European sites. This enhancement is able to be described as ‘true’ mitigation for recreational disturbance.

3 The European designated sites concerned

3.1 This Assessment has first screened European protected sites in the North West of England to decide which of these sites are most likely to be affected by development in Greater Manchester. When assessing the impact of a Plan on European protected sites it is important to consider the impact on sites not only within the administrative area covered by The Plan but also those which fall outside The Plan boundary, as these could still potentially be affected by the implementation of the Plan.

3.2 In carrying out this initial screening process the Assessment has considered the main possible sources of effects on the European sites arising from The Plan, possible pathways to the European sites and the effects on possible sensitive receptors in the European sites. Only if there is an identifiable source, a pathway and a receptor is there likely to be a significant effect.

3.3 Possible sources and pathways for effects arising from development implemented as a result of Plan adoption, and used in the screening of European sites, were considered to include:

- Land take (direct habitat loss)
- Cultivation (agriculture)
- Diffuse and localised air pollution including dust and odour
- Noise disturbance
- Light spill or shading
- Human presence/disturbance
- Emissions to water (surface or ground water) containing pollutants or sediments
- Ground water depression or flow interception
- Decrease in surface water run-off e.g. through interception in a void
- Increase in surface water run-off
- Introduction and spread of invasive species
- Effects on functionally linked land*

- Changes to predator/prey relationships

More specific sources of harm to particular designated sites are listed in the summary descriptions of screened in European sites provided in Appendix 1.

** Areas of land or sea outside of the boundary of a European site may be important ecologically in supporting the populations for which the site has been designated or classified. Occasionally impacts to such habitats can have a significant effect upon the species interest of such sites, where these habitats are considered to be 'functionally linked' to the site.*

3.4 Guidance and precedence concerning distances at which significant effects on European sites are caused by water or air pollution has been taken into account during the screening of European sites. Recommended buffer zones for certain types of 'most damaging' operations (for example, the operation of landfill sites) have been used in the screening of sites. The buffer zones are based on distances before air pollution sources and water pollution sources become so diffuse so as to be indiscernible or impossible to ascribe to particular point sources.

Outside of these buffer zones significant effects on European sites arising from water and air pollution are considered unlikely to arise. The largest (most cautious) buffer zone considered is 15km; that is, most operations with the potential of causing direct water and/or air pollution impacts located further than 15km from the boundary of a European site are considered very unlikely to have a significant effect on the special interest of that site.

Natural England also publish SSSI 'Impact Risk Zones' (IRZs) providing guidance on the types of development which should be considered for their possible impacts on SSSIs, and which impacts should be considered. All European designated sites are also designated as SSSIs. IRZs have also been taken into account when screening European sites which could be affected by the Plan.

Although this guidance has been taken into account when screening European protected sites, in the case of a Plan affecting the development of a very large entire Metropolitan Region, the 15km buffer zone should be regarded as important but not as definitive – for example, this buffer zone may not be sufficient when assessing certain very large-scale developments or secondary impacts. In particular, applying the 15km buffer may not be appropriate where the most likely effect on a European site will be caused by diffuse air or water pollution that may arise from large scale development, or where there are secondary recreational pressures on more distant protected sites arising from increased regional and sub-regional populations.

Functionally linked land may also be located at very large distances from the relevant European site; for example in the case of some seabird species the nesting/overwintering sites may be within a European site, but the feeding areas or important stop-over locations may be located many km away.

3.5 Since Places for Everyone is a high-level, large-scale strategic plan where the main impacts on European sites are likely to be diffuse and cumulative it is considered that certain potential diffuse or indirect sources will be more likely to result from the Plan than more direct sources of harm. None of the proposed allocations in the Plan will result in direct land-take of any European sites

These sources are considered to include –

- air pollution,
- diffuse water pollution and
- recreational pressures.

3.6 Taking the above into account, the following European protected sites were screened in to the Assessment.

1. Manchester Mosses Special Area of Conservation (SAC)
2. Rochdale Canal Special Area of Conservation (SAC)
3. Peak District Moors South Pennines (Phase 1) Special Area of Conservation (SAC)

4. Peak District Moors South Pennines (Phase 1) Special Protection Area (SPA)
5. South Pennine Moors (Phase 2) Special Area of Conservation (SAC)
6. South Pennine Moors (Phase 2) Special Protection Area (SPA)
7. Rixton Claypits Special Area of Conservation (SAC)
8. Mersey Estuary Special Protection Area (SPA)
9. Rostherne Mere Ramsar / National Nature Reserve

In practice sites 3, 4, 5 and 6 are connected and/or contiguous and support similar species and habitat types. Together they encompass a very large area of the South Pennines, and they are sometimes referred to collectively in this Assessment as the 'South Pennine Moors European protected sites'

Details of the special nature conservation interest of these sites is given in Appendix 1.

Other European protected sites were considered to be too distant to fall under the influence of the Plan, or too distant for measurable effects to be discernible.

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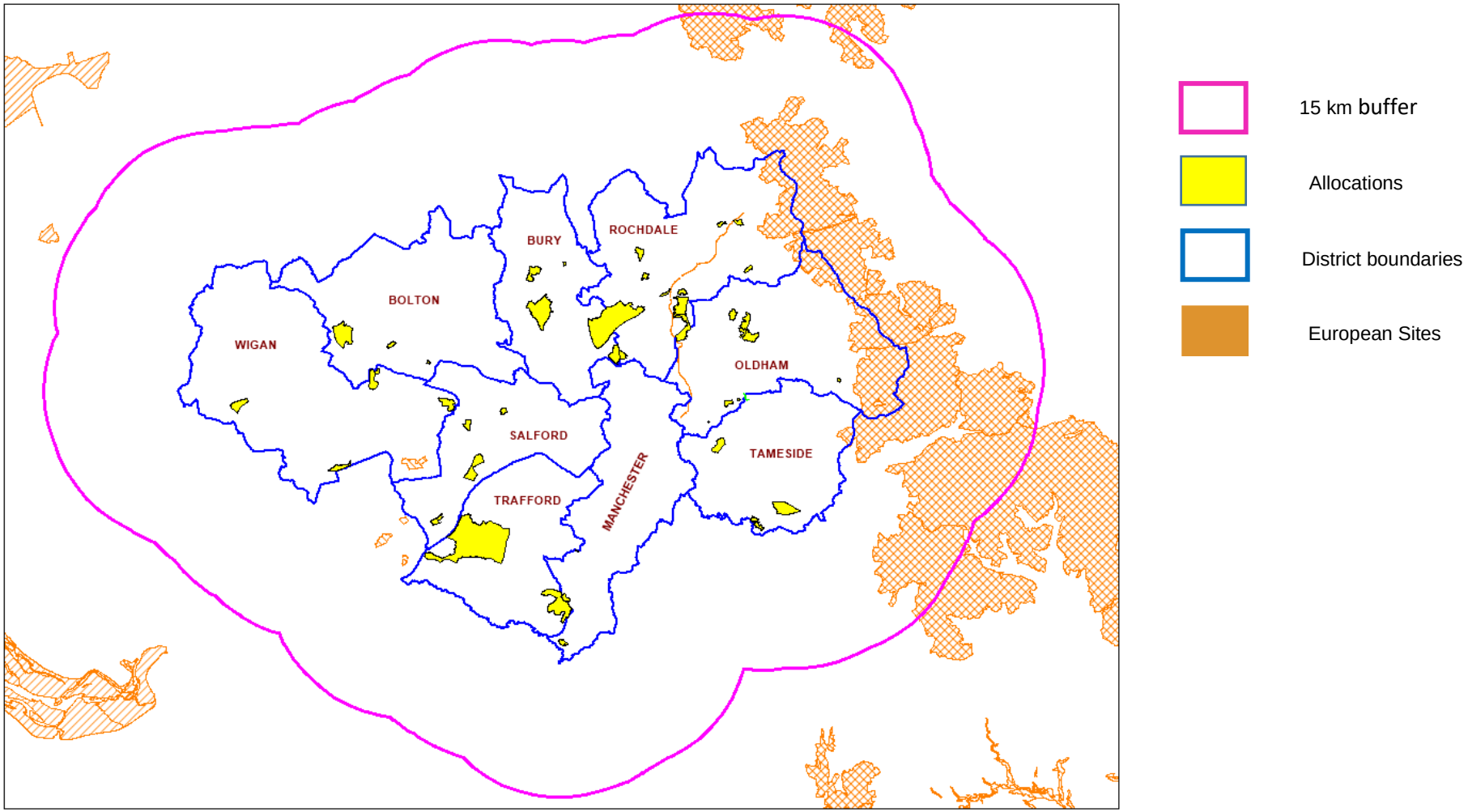
Fig 1 Location and extent of the Plan area in relation to relevant European sites



4 Initial Screening of potential Likely Significant Effects (LSE)

Fig 1 shows the locations and extent of potential strategic allocations for development as identified in the Plan in relation to the European sites screened in to the assessment.

4.1 Given the distances of the allocations from the European sites concerned and the special nature conservation interests of the European sites the following impacts can be effectively screened out of the assessment as being very unlikely to be caused through the operation of the plan, or any effects will be so diffuse or diluted so as to be *nugatory* (that is, too small to be distinguished from background)

- Cultivation
- Land take
- Noise disturbance
- Ground water depression or flow interception
- Decrease in surface water run-off e.g. through interception in a void
- Introduction and spread of invasive species
- Changes to predator/prey relationships

4.2 The following impacts have been screened in to the assessment as considered to have the potential to cause likely significant effects –

- Diffuse and localised air pollution including dust and odour
- Human presence/disturbance
- Emissions to water (surface or ground water) containing pollutants
- Increase in surface water run-off
- Loss of functionally linked land
- Light spill or shading [relevant to the Rochdale Canal SAC only]

The following brief discussion of these impacts is included to give an understanding of the rationale for the conclusions reached in the subsequent Screening process, summarised in Table 5.1 and Table 5.2

4.3 Air Pollution

The main types of air pollutants likely to have an adverse effect on ecological sites are:

- Oxides of Nitrogen (NOx)
- Ammonia (NH_3)
- Dust (including particulates)
- Sulphur Dioxide (SO_2)
- Low level Ozone (O_3)

(*Scott Wilson Ltd 2007)*

4.3.1 Of these NOx (nitrates) are considered to be the most likely to arise as a result of development controlled by the Plan under consideration here. Dust and low level ozone only have effects very close to the source. Ammonia emissions are most closely associated with certain types of intensive agricultural production not identified as a significant land-use within Greater Manchester or not in the scope of the plan being assessed. The emissions of sulphur dioxide are most closely associated with certain industrial operations not in the scope of the Plan being assessed.

Nitrates can cause harm to habitats in two ways –

- Direct effects on species health, particularly to some plant species
- Favouring the growth of some plants (e.g. grasses) over others, leading to increased competition and simplified plant communities

The main sources of these pollutants are road traffic and industrial processes. The greatest damage caused by nitrates occurs within 200 - 250 m of the source. Although the strategic allocations are overwhelmingly located further than 250m from any of the European sites it is recognised that development

within the allocations will generate road traffic over a much wider area, and some of this traffic may subsequently pass within 250m of European sites.

4.3.2 The assessment of air pollution effects on notable habitats within European sites is a specialist discipline. **The modelling and assessment of air pollution which could arise from increases in road traffic has therefore been undertaken by specialists, and the discussion and results presented in this document represent just a summary of this work**. **A more comprehensive discussion of the methodology used in the screening and assessment of air pollution, and the results of the air pollution assessment, are presented in Appendix 2 (Air Quality HRA).**

For all European-designated sites contained in the study area, a sub-regional air dispersion model (RapidAIR) was used to model predicted air quality impacts at a resolution of 3m x 3m. Traffic growth within the study area was provided by the Greater Manchester Variable Demand Model (GMVDM). The air quality impacts associated with the PfE Plan allocations were assessed for three cases:

- 2025 contribution from allocations: assesses the air quality impacts associated with the PfE Plan allocations in 2025.
- 2040 contribution from allocations: assesses the air quality impacts associated with the PfE Plan allocations in 2040.
- 2040 contribution from allocations with link road: assesses the air quality impacts associated with the PfE Plan allocations in 2040, as well as the air quality impacts associated with a new link road between the A57 and M62.

For HRA Stage 1 Screening, air quality impacts on designated sites were assessed based on predicted annual average airborne concentrations of oxides of nitrogen (NOx) and ammonia (NH_3), as well as annual deposition of nutrient nitrogen and acid. The contributions attributable to the allocations in each of the three cases described above were compared to screening thresholds, where the screening threshold for each pollutant / designated site combination was set to 1% of the Critical Load or Critical Level applicable for that pollutant at that

designated site. Likely significant effects (LSEs) can be discounted where the model results and analysis indicate that the contribution from the allocations, alone and in-combination with other applicable plans and projects, is below the 1% screening threshold.

The model has adopted a precautionary, 'worst-case scenario' approach.

4.3.3 For the designated sites where the 1% screening threshold has been reached and which require further analysis and Appropriate Assessment, this process included the following steps:

1. Calculation of the total predicted pollution levels (baseline pollution levels + contribution from allocations) and comparison with the applicable Critical Loads and Critical Levels. This step also considers in-combination effects associated with other plans and projects. Where the total predicted pollution levels are predicted to be below the applicable Critical Loads and Critical Levels, adverse effects on the designated site can be ruled out and no further analysis is necessary.
2. An Appropriate Assessment was undertaken to identify whether the identified impacts from the PfE Plan could affect the integrity of these sites, alone or in combination with other plans and projects. The scope and approach of the Appropriate Assessment was determined in consultation with Natural England. The approach considered the distribution of sensitive qualifying features within the designated site and their predicted exposure to air pollution; the current status of the site (favourable or unfavourable); the conservation objectives for the site; and current plans to increase or restore the distribution of sensitive qualifying features within the site.
3. Limited potential for in-combination impacts has been identified in relation to proposed strategic highways development, and development plans being brought forward or implemented by neighbouring authorities. In one case, it was identified as appropriate for the Greater Manchester Combined Authority to work collaboratively with Warrington Borough Council under the Duty to Cooperate to address the limited potential for in-combination impacts.

4. For the small parts of designated sites where the Appropriate Assessment indicated that there could potentially be adverse effects related to air pollution, mitigation measures were investigated and recommended.
5. Discussions between representatives of Greater Manchester Combined Authority and Natural England have demonstrated that an effective partnership can be developed in order to identify any potentially significant impacts, and to put appropriate mitigation in place, if this should be needed. These will be developed further during the plan consultation process.

Where appropriate, further recommendations have been made for the Greater Manchester Combined Authority to work collaboratively with other local authorities under the Duty to Cooperate. These are recommended in cases where mitigation measures are required for air quality impacts related to the PfE Plan allocations on a particular site, and Habitats Regulations Assessments (HRAs) for other local authority development plans have identified an air quality impact on the same designated site.

4.4 Diffuse Water Pollution

While there is no apparent direct hydrological connectivity between any of the allocated areas and any European sites, pollutants of water courses can be highly mobile and can have discernible impacts on receptors distant from the source.

The most likely source of water pollution arising as a result of plan operation is the discharge of sewage to water courses. Where proposed developments within Greater Manchester are considered to have the potential to result in this type of diffuse pollution arising and affecting a European site, these have been screened into this Assessment.

This is of particular relevance to proposed allocations close to the Rochdale Canal SAC because this site is designated for its aquatic plant communities which are sensitive to water pollution, and to the Mersey Estuary SPA because most of the major rivers in Greater Manchester (*e.g.* Irwell, Medlock & Irk) are

all effectively tributaries of the River Mersey (via the Manchester Ship Canal) and these eventually discharge into the Mersey Estuary

Although the Mersey Estuary is approximately 15km from the boundaries of Greater Manchester, given the scale of development under consideration in this Plan, and the need to take a precautionary approach when preparing an HRA, the Mersey Estuary has been 'Screened In' to this assessment, although in general Individual Policies and Areas have not been specifically identified as being sources of water pollution because of the difficulties involved in attributing a pollution effect on the Estuary with a distant source. However, it is assumed for the purposes of Screening that the Plan in total may contribute to diffuse water pollution in the Estuary.

As such, United Utilities Water Limited, operators of the existing drainage network in Greater Manchester, were approached for their views. **United Utilities Water Limited's response is presented in full in Appendix 4 (Statement on behalf of United Utilities Water Limited in response to infrastructure capacity query).**

The Rochdale Canal is a somewhat unusual SAC because it is a man-made artefact running through heavily industrialised and built-up areas of Greater Manchester, and because it has been designated for the presence of a single species rather than a complex of habitats or a community of species, an aquatic plant called floating water plantain (*Luronium natans)*. There is limited understanding of the effects of water pollution on this plant, and even less is known about the effects of air pollution; a precautionary approach has therefore been taken in relation to potential impacts on the Canal.

4.5 Recreational Pressures (Disturbance)

The effects of significantly increased regional and sub-regional populations on recreational pressures on the north west's European protected sites has been considered in this Assessment because it is recognised that this could be an important harmful impact on the special interest of some European sites.

Recreational use of an internationally designated site has potential to:

- Cause damage through excessive erosion (trampling, wear and tear)
- Cause nutrient enrichment
- Cause disturbance to sensitive species, particularly nesting and overwintering birds
- Prevent appropriate management or exacerbate existing management difficulties

Different types of internationally designated sites are subject to different types of recreational pressures and have different vulnerabilities. The best studied effects of disturbance are concerned with birds, although even with birds studies across a wide range of species have shown that the effects from recreational disturbance can be complex. The outcomes of many of these studies therefore need to be treated with caution. For instance, the effect of disturbance is not necessarily correlated with the impact of disturbance, i.e. the most easily disturbed species are not necessarily those that will suffer the greatest impacts. It has been shown that, in some cases, the most easily disturbed birds simply move to other feeding sites if these are available, whilst others may remain (possibly due to an absence of alternative sites) and thus suffer greater impacts on their population. These facts have to be taken into account when attempting to predict the impacts of future recreational pressure on internationally designated sites, something that is particularly difficult when trying to assess the effects of a large-scale Strategic Plan.

As with diffuse water pollution effects recreational pressures can also be (very) diffuse and it can therefore be difficult to accurately apportion any harmful impacts to a particular development; for example, increased recreational pressures on European sites within the South Pennines may be caused by increases in the population of Greater Manchester, but such pressures may also be caused by increases in national and even international visitors.

For these reasons a precautionary approach has been taken when Screening policies and areas for this effect.

The assessment of recreational pressures on the South Pennine Moors Special Area of Conservation (SAC), Peak District Moors (South Pennine Moors Phase 1) Special Protection Area (SPA) and South Pennine Moors Phase 2 SPA was raised as a concern by Natural England during the consultation process (October 2021). **The assessment of recreational pressures arising from the PfE plan alone and/or in-combination with neighbouring Local Planning Authority (LPA) Local Plans has therefore been undertaken by specialists, and the discussion and results presented in this document represent just a summary of this work**. **A more comprehensive discussion of the methodology used in the assessment of whether there would be an Adverse Effect on Integrity (AEoI), are presented in Appendix 3 (Recreation study).**

4.6 Functionally Linked Land

For an area to be considered to be functionally linked to a European site it must be shown to regularly support significant numbers of species for which a European site has been designated. 'Regularly' is taken to mean over a number of years, but there is no accepted standard definition of what may constitute 'significant numbers' because this will depend on the species concerned.

The concept has been most often studied in relation to birds, bats and marine species, because these species are highly mobile in their habits and can rely on sites very far apart to complete their life cycles.

For an area to be Screened in to this Assessment the following criteria have been used –

- Area supports habitat suitable for use by species for which the European site has been designated
- Area has habitat connectivity with the European site which would facilitate species movement between the designated site and the allocated area

In practice, species associated with the Manchester Mosses SAC and the Rochdale Canal SAC are not mobile in their habits and will not rely on other

land to complete their life cycles. Although Rixton Claypits has been designated for its populations of great crested newts, and great crested newts may rely on land outside of the designated site, they rarely move more than 250m from breeding ponds.

The South Pennine Moors SPA and the Mersey Estuary SPA have been designated for important bird species which are highly mobile in their habits and may rely on land outside of the designated sites to complete their life cycle.

4.7 Surface Water Run-off

Although the scale of built development being planned for in Greater Manchester within the strategic allocations could potentially cause an increase in surface water run-off it is not considered that this effect will cause any harm to any European designated sites. The only European site which could potentially be affected is the Mersey Estuary, since most surface water drainage originating in Greater Manchester ultimately discharges into the Estuary. But the tidal estuary is subject to very large water flows each day such that any increases in run-off from greater Manchester would be nugatory.

As such, United Utilities Water Limited, operators of the existing drainage network in Greater Manchester, were approached for their views. **United Utilities Water Limited's response is presented in full in Appendix 4 (Statement on behalf of United Utilities Water Limited in response to infrastructure capacity query).**

4.8 Light spill and shading

These effects will only apply to the Rochdale Canal, because development may take place close to the Canal and *Luronium natans* is known to be affected by both high artificial light levels and by excessive shading. Whether this impact occurs, and if it does how it is mitigated, depends on the detail of any particular development (e.g. how close buildings are to the Canal banks and/or how high the buildings are) and may be best dealt with at project level rather than in the HRA of a high level strategic plan.

5 Screening of Policies and Allocated Areas

SCREENING SUMMARY TABLES

TABLE 5.1 – SCREENING OF THEMATIC POLICIES

 **Screened out**  **Screened In for further Assessment**

[Note Policy References may be subject to change]

Policy	Brief Summary	Screening Outcome
Spatial Strategy		
JP-Strat 1	**Core Growth Areas** The economic role of the Central Economic Area will be protected and enhanced, with development supporting major growth in the number of jobs provided across the area.	No Likely Significant Effect. Core growth areas are too distant from European sites for effects to occur.
JP-Strat 2	**City Centre** The role of the City Centre as the most significant economic location in the country outside London will be strengthened considerably. The City Centre will continue to provide the primary focus for business, retail, leisure, culture and tourism activity in Greater Manchester.	No Likely Significant Effect. Manchester and Salford City Centres are too distant from European sites for effects to occur.

JP-Strat 3	**The Quays** The [Salford] Quays will continue to develop as an economic location of national significance, characterised by a wide mix of uses. Its business, housing, leisure and tourism roles will all be significantly expanded.	No Likely Significant Effect. Salford Quays is too distant from European sites for effects to occur
JP-Strat 4	**Port Salford** will be developed as an integrated tri-modal facility, with on-site canal berths, rail spur and container terminal as essential elements of the scheme. The overall facility will provide around 500,000m2 of employment floor space. This will include an extension of the permitted scheme onto land to the north and west of Barton Aerodrome.	Likely significant effect. Potential harmful effect from increase in travel to/from Port Salford resulting in potential increases in diffuse air pollution (on the Manchester Mosses)
JP-Strat 5	**Inner Areas** Aims to promote the continued regeneration of the inner areas. High levels of new development will be accommodated, enabling new people to move into these highly accessible areas whilst retaining existing communities. A high priority will be given to enhancing the quality of places, including through enhanced green infrastructure and improvements in air quality.	No Likely Significant Effect. The Inner Areas are too distant from European sites for impacts to occur

JP-Strat 6	**Northern Areas** Aims to achieve a significant increase in the competitiveness of the northern areas will be sought. Although There will be a strong focus on urban regeneration and enhancing the role of the town centres, this will be complemented by the selective release of Green Belt in key locations	Likely significant effect. Potential harmful effects on the Rochdale Canal SAC and South Pennine Moors SAC/SPA by large-scale developments, particularly from air pollution, water pollution and increased recreational disturbance
JP-Strat 7	**M62 North-East Corridor** The M62 North-East Corridor will deliver a nationally-significant area of economic activity and growth, extending along the motorway from junction 18 to junction 21.	Likely significant effect. Potential harmful effects from diffuse air pollution increasing along the M62 corridor through the South Pennines and past the Manchester Mosses SAC, potential recreational impacts on the South Pennines and the Rochdale Canal
JP-Strat 8	**Wigan-Bolton Growth Corridor**	No likely significant effect because the growth corridor is considered to be too distant and separated from any European sites.

	Aims to deliver a regionally significant area of economic and residential development	
JP-Strat 9	**Southern Areas** The economic competitiveness, neighbourhood quality and environmental attractiveness of the southern areas will be protected and enhanced. There will be a strong emphasis on maximising the economic potential of, and benefits of investment in, Manchester Airport and associated transport infrastructure which will be complemented by the selective release of Green Belt for new employment and housing.	Likely significant effect. Potential harmful effect from increase in travel to/from the airport resulting in potential increases in air pollution and from increased recreational use of European sites
JP-Strat 10	**Manchester Airport** will continue to be developed as a world class airport with high quality services and facilities, providing the UK's principal international gateway outside London. The introduction of services to a wide range of new destinations will enable a doubling of passenger numbers to around 55 million per annum.	Likely significant effect. Potential harmful effect from increase in travel to/from the airport resulting in potential increases in diffuse air pollution (all European sites)
JP-Strat 11	**New Carrington** Aims to develop a new settlement with housing, employment, a new centre and transport links	Likely significant effect. Potential harmful effect from increase road traffic resulting in potential increases in diffuse air pollution (particularly Manchester Mosses SAC and Rostherne Mere) and potential recreational disturbance impacts on Manchester Mosses

JP-Strat 12	**Main Town Centres**	No Likely Significant Effect because the main town centres are distant from European sites and because development of the main centres may reduce development pressures closer to sensitive sites.
GM-Strat 13	**Strategic Green Infrastructure** Aims to protect and enhance strategic green infrastructure	No likely significant effect. Strategic Green Infrastructure includes European sites so this Policy would protect the sites and there is a potentially positive effect from GI enhancement because this may reduce recreational pressures on more distant areas.
GM-Strat 14	**A sustainable and integrated transport network** Aims to ensure that half of all daily trips will be made by walking, cycling and public transport	No likely significant effect. Potential positive effect by reducing air pollution
Sustainable and Resilient Places		
JP-S 1	**Sustainable development** Development should aim to maximise its economic, social and environmental benefits simultaneously, minimise its adverse impacts and actively seek opportunities to secure net gains across each of the different objectives	No likely significant effect. Positive effect if environmental benefits are achieved

JP-S 2	**Carbon and Energy** Aims to deliver a carbon neutral Greater Manchester no later than 2038, with a dramatic reduction in greenhouse gas emissions, will be supported through a range of measures.	No likely significant effect. Positive effect by reducing air pollution and mitigating climate change
JP-S 3	**Heat and Energy Networks** The provision of decentralised energy infrastructure is critical to the delivery of Greater Manchester's objectives for low carbon growth, carbon reductions and an increase in local energy generation.	No likely significant effect. Positive effect by reducing air pollution and mitigating climate change effects
JP-S 4	**Resilience** The development of Greater Manchester will be managed so as to increase considerably the capacity of its citizens, communities, businesses and infrastructure to survive, adapt and grow in the face of physical, social, economic and environmental challenges.	No likely significant effects. Positive effect by reducing air pollution and mitigating climate change effects

JP-S 5	**Flood risk and the water environment** An integrated catchment based approach will be taken to protect the quantity and quality of water bodies and managing flood risk.	No likely significant effect. Positive effect by reducing water pollution.
JP-S 6	**Clean Air** A comprehensive range of measures will be taken to support improvements in air quality, focusing particularly on locations where people live, where children learn and play, and where air quality targets are not being met.	No likely significant effect. Positive effect by improving air quality
JP-S 7	**Resource Efficiency** Aims to achieve a circular economy and a zero-waste economy	No likely significant effect. May benefit European sites by reducing air and water pollution.
Places for Jobs		
JP-J1	**Supporting long-term economic growth** A thriving and productive economy will be sought in all parts of Greater Manchester. There will be an emphasis on maintaining a very high level of economic diversity across Greater Manchester.	Likely significant effect. Potential diffuse harm from unsustainable growth (e.g. increases in diffuse air and water pollution, recreational disturbance)

JP-J2	**Employment sites and premises** A diverse range of employment sites and premises, both new and second-hand, will be made available across Greater Manchester in terms of location, scale, type and cost. This will offer opportunities for all kinds and sizes of businesses, including start-ups, firms seeking to expand, and large-scale inward investment.	Likely significant effect. No development areas are planned within or adjacent to any European sites, but potentially harmful effects could arise from increased travel leading to increases in diffuse air pollution
JP-J3	**Office development** Significant new office floor space will be provided in Greater Manchester over the Plan period	Likely significant effect. No development areas are planned within or adjacent to any European sites, but potentially harmful effects could arise from increased travel leading to increases in diffuse air pollution
JP-J4	**Industry and Warehousing Development** Significant areas of new industrial and warehousing floor space will be provided in Greater Manchester over the Plan period.	Likely significant effect. No development areas are planned within or adjacent to any European sites, but potentially harmful effects could arise from increased travel leading to increases in diffuse air pollution
Places for Homes		
JP-H1	**Scale, Distribution and Phasing of new Housing development**	Likely significant effect. Potential harmful effects from increased recreational pressures and possible increased diffuse air pollution (all European sites)

	Aims to deliver a minimum of 201,000 net additional dwellings in the period 2018-37, an annual average of around 10,580	
JP-H 2	**Affordability of New Housing** Aims to ensure a substantial improvement in the affordability of new homes	No likely significant effect. Policy aims to ensure a supply of affordable homes but will not increase the numbers of new dwellings overall
JP-H 3	**Type, Size and design of New Housing**	No likely significant effect. Policy aims to ensure the supply of a range of dwellings of different designs but will not increase the numbers of new dwellings overall.
JP-H 4	**Density of New Housing**	No likely significant effect.
Places for People		
JP-P1	**Sustainable Places** Greater Manchester will aim to become one of the most liveable city-regions in the world, consisting of a series of beautiful, healthy and varied places.	No likely significant effect. Potentially positive effect by reducing the need for people to travel long distances for recreation.

JP-P2	**Heritage** Aims to positively protect and enhance the character, archaeological and historic value of Greater Manchester's designated and non-designated heritage assets and their settings.	No likely significant effect.
JP-P3	**Cultural Facilities** Seeks to develop and support cultural businesses and attractions	No likely significant effect
JP-P4	**New retail and leisure uses in town centres** The existing hierarchy of centres for retail and leisure uses will be maintained and enhanced.	No likely significant effect. Potentially positive effect by reducing the need for people to travel long distances for recreation
JP-P5	**Education, skills and knowledge** Significant enhancements in education, skills and knowledge will be promoted throughout Greater Manchester	No likely significant effect

JP-P6	**Health** New development and Local Plans will be required, as far as practicable, to: A. Maximise its positive contribution to health and wellbeing; B. Support healthy lifestyles, including through the use of active design principles making physical activity an easy, practical and attractive choice; and C. Minimise potential negative impacts of new development on health	No likely significant effect. May have a positive effect by reducing the need for people to travel long distances for recreation
JP-P7	**Sport and Recreation** A network of high quality and accessible sports and recreation facilities will be protected and enhanced, supporting greater levels of activity for all ages.	No likely significant effect. Possible positive effect (by limiting recreational pressure on European sites)
Greener Places		
JP-G1	**Valuing Important Landscapes**	No likely significant effect. Potentially positive effect if off-site net gains are implemented within European sites
JP-G2	**Green Infrastructure Network**	No likely significant effect. Potentially positive effect if off-site net gains are implemented within European sites

JP-G3	**River Valleys and Waterways** Seeks to protect river valleys and waterways	No likely significant effect. Policy will protect the Rochdale Canal SAC
JP-G4	**Lowland Wetlands and Mosslands** Seeks to protect important lowland wetland areas	No likely significant effect. Policy will protect parts of the Manchester Mosses SAC
JP-G5	**Uplands** Seeks to protect important upland areas	No likely significant effect. Policy will protect the South Pennines SAC/SPA
JP-G6	**Urban Green Space** Seeks to protect and enhance urban green space	No likely significant effect. Potentially positive effect by reducing the need for people to travel for outdoor recreation
JP-G7	**Trees and Woodlands** Seeks to protect, enhance and expand tree and woodland cover	No likely significant effect. Positive effect.
JP-G8	**Standards for Greener Places** Seeks to enhance green spaces and create high quality new green spaces	No likely significant effect. Potentially positive effect by reducing the need for people to travel for outdoor recreation
JP-G9	**Net Enhancement for Biodiversity and Geodiversity**	No likely significant effect. Potentially positive effect
JP-G10	**The Green Belt** Provides protection to the Green Belt	No likely significant effect

JP-G11	**Safeguarded Land** Seeks to protect open land	No Likely significant effect
Connected Places		
JP-C1	**Our Integrated Network** Delivering a pattern of development that minimises the need to travel and the distances travelled to access jobs and other key services/opportunities'	No likely significant effect. Positive effect by reducing the need for travel (reduction in air pollution)
JP-C2	**Digital connectivity** Greater Manchester's ten district councils and Combined Authority will support the provision of affordable, high quality, digital infrastructure.	No likely significant effect. Positive effect by reducing the need for travel (reduction in air pollution)
JP-C5	**Walking and Cycling** A higher proportion of journeys made by walking and cycling will be achieved by creating a safe, attractive and integrated walking and cycling network connecting every neighbourhood and community across Greater Manchester.	No likely significant effect. Positive effect by reducing the need for unsustainable travel (reduction in air pollution)

JP-C3	**Public Transport** Major improvements to the public transport network will be delivered (includes support for HS2)	No likely significant effect. Positive effect by reducing reliance on road transport
JP-C7	**Transport requirements of new developments** In making planning decisions Greater Manchester's authorities will require development to support a significant increase in the proportion of journeys made by walking, cycling and public transport, and a reduction in the adverse environmental impacts of transport.	No likely significant effect. Positive effect by reducing the need for travel (reduction in air pollution)
JP-C6	**Freight and logistics** More efficient and sustainable movement of freight will be supported.	No likely significant effect. Positive effect by reducing the need for travel (reduction in air pollution)
JP-C4	**Streets for All** Greater Manchester's streets will be designed and managed to make a significant positive contribution to the quality of place and support high levels of walking, cycling and public transport,	No likely significant effect. Positive effect by reducing road transport (reducing air pollution effects)

Site Allocations		
SDD 1	**Refers to individual strategic site allocations.** **Site allocations are Screened in Table 5.2 below**	
Delivering the Plan		
JP-D 1	**Infrastructure Implementation**	No likely significant effect
JP-D 2	**Developer Contributions** Will require developments to provide, or contribute towards, the provision of mitigation measures to make the development acceptable in planning terms.	No likely significant effect. Potentially positive effect (biodiversity net gain)

PLACES FOR EVERYONE HRA SCREENING –

TABLE 5.2 - STRATEGIC AREAS (ALLOCATIONS)

Note – *following advice from Natural England all allocations are screened into the assessment because of potential cumulative effects from air pollution caused by increased road traffic. The air pollution modelling used in the HRA does not allow for the effects of individual allocations to be screened/assessed.*

Screened out **Screened In for further Assessment**

Site	Type of development proposed	Screening Outcome
Wigan		
GMA42 M6 Jnct 25	**Employment**	Likely significant effect arising from cumulative road traffic increases in turn leading to air pollution impacts
GMA52 Pocket Nook	**Housing**	Likely significant effect. Within 3km of the Manchester Mosses SAC, potential cumulative air pollution effects and recreational impacts
GMA55 West of Gibfield	**Mixed use**	Likely significant effect. Within 5km of the Manchester Mosses SAC, potential cumulative air pollution effects and recreational impacts
GMA43 North of Mosley Common	**Housing**	Likely significant effects. Within 5km of the Manchester Mosses SAC, potential cumulative air pollution effects and recreational impacts
Salford		
GMA29 North of Irlam Station	**Housing**	Within 3km of the Manchester Mosses SAC and Rixton Clay Pits SAC, potential cumulative air pollution effects and recreational impacts

GMA30 Port Salford Extension	**Employment**	Within 5km of the Manchester Mosses SAC, potential cumulative air pollution effects
GMA28 Land East of Boothstown	**Housing**	Within 5km of the Manchester Mosses SAC, potential cumulative air pollution effects and recreational impacts
GMA27 Land at Hazelhurst Farm	**Housing**	Likely significant effect arising from cumulative road traffic increases in turn leading to air pollution impacts
Trafford		
GMA41 New Carrington	**Mixed**	Within 5km of the Manchester Mosses SAC, potential cumulative air pollution effects and recreational impacts
GMA3.2 Timperley Wedge	**Housing**	Likely significant effect arising from cumulative road traffic increases in turn leading to air pollution impacts
Manchester		
GMA3.1 Medipark	**Employment**	Likely significant effect arising from cumulative road traffic increases in turn leading to air pollution impacts
GMA10 Global Logistics	**Employment**	Likely significant effect arising from cumulative road traffic increases in turn leading to air pollution impacts
GMA11Southwick Park	**Housing**	Likely significant effect arising from cumulative road traffic increases in turn leading to air pollution impacts
Tameside		
GMA40 South of Hyde	**Housing**	Likely significant effect arising from cumulative road traffic increases in turn leading to air pollution impacts
GMA 39 Godley Green Garden Village	**Housing**	Large allocation within 10km of the South Pennine Moors SPA/SAC; potential effects from cumulative air pollution effects and increased recreational pressure

GMA38 Ashton Moss West	**Employment**	Likely significant effect arising from cumulative road traffic increases in turn leading to air pollution impacts
Oldham		
GMA15 Chew Brook Vale (Robert Fletchers)	**Housing**	Within 1km of the South Pennine Moors SPA/SAC; potential effects from increased recreational pressure and cumulative air pollution from increased traffic. May also act as Functionally Linked Land
GMA19 Land South of Rosary Road	**Housing**	Likely significant effect arising from cumulative road traffic increases in turn leading to air pollution impacts
GMA18 Land South of Coal Pit Lane (Ashton Road)	**Housing**	Likely significant effect arising from cumulative road traffic increases in turn leading to air pollution impacts
GMA13 Bottom Field Farm (Woodhouses)	**Housing**	Likely significant effect arising from cumulative road traffic increases in turn leading to air pollution impacts
GMA16 Cowlishaw	**Housing**	Likely significant effect arising from cumulative road traffic increases in turn leading to air pollution impacts
GMA14 Broadbent Moss	**Mixed**	Likely significant effect arising from cumulative road traffic increases in turn leading to air pollution impacts
GMA12 Beal Valley	**Housing**	Likely significant effect arising from cumulative road traffic increases in turn leading to air pollution impacts
Rochdale		
GMA2 Stakehill	**Mixed**	Large allocation close to (within 150m) the Rochdale Canal SAC; proximity to the motorway network may lead to potential impacts from cumulative air pollution caused by increased traffic generation, water pollution and shading.

GMA26 Trows Farm	**Housing**	Allocation close to (within 150m) the Rochdale Canal SAC; proximity to the motorway network may lead to potential impacts from cumulative air pollution caused by increased traffic generation and water pollution
GMA21 Castleton Sidings	**Housing**	Allocation close to (within 150m) the Rochdale Canal SAC, potential water pollution effects and air pollution effects
GMA1.2 Simister/Bowlee (Northern Gateway)	**Mixed**	Large allocation on the M62 – potential impacts on the South Pennine Moors from cumulative air pollution caused by increased traffic generation
GMA24 Newhey Quarry	**Housing**	Within 3km of the South Pennine Moors; possible recreational impacts
GMA23 Land North of Smithy Bridge	**Housing**	Immediately adjacent to the Rochdale Canal SAC and within 3km of the South Pennine Moors, potential water pollution, shading and recreation effects. Site may act be Functionally Linked to the SPA
GMA25 Roch Valley	**Housing**	Within 300m of the Rochdale Canal SAC and within 3km of the South Pennine Moors, potential water pollution impacts on the Canal and recreational impacts on the Moors. Site may act as Functionally linked to the SPA
GMA20 Bamford / Norden	**Housing**	Likely significant effect arising from cumulative road traffic increases in turn leading to air pollution impacts
GMA22 Crimble Mill	**Housing**	Likely significant effect arising from cumulative road traffic increases in turn leading to air pollution impacts
GMA1.1 Heywood/Pilsworth Northern Gateway	**Mixed**	Very large mixed allocation close to motorway network; potential for cumulative effects from air pollution and recreational impacts from population uplift on the South Pennine Moors

Bury		
GMA1.1 Heywood/Pilsworth (Northern Gateway)	**Mixed**	Very large mixed allocation close to motorway network; potential for cumulative effects from air pollution and recreational impacts from population uplift on the South Pennine Moors
GMA7 Elton Reservoir Area	**Housing**	Likely significant effect arising from cumulative road traffic increases in turn leading to air pollution impacts
GMA9 Walshaw	**Housing**	Likely significant effect arising from cumulative road traffic increases in turn leading to air pollution impacts
GMA8 Seedfield	**Employment**	Likely significant effect arising from cumulative road traffic increases in turn leading to air pollution impacts
Bolton		
GMA6 West of Wingates	**Employment**	Likely significant effect arising from cumulative road traffic increases in turn leading to air pollution impacts
GMA4 Bewshill Farm	**Employment**	Likely significant effect arising from cumulative road traffic increases in turn leading to air pollution impacts
GMA5 Chequerbent North	**Employment**	Likely significant effect arising from cumulative road traffic increases in turn leading to air pollution impacts

PLACES FOR EVERYONE HRA SCREENING –

TABLE 5.3 - SUMMARY OF AIR QUALITY SCREENING (HRA STAGE 1) RESULTS

Note – *depending on the vegetation present at the site, forest, grassland, or both deposition rates may be applicable. Where forest or grassland deposition rates are not applicable, 'N/A' has been entered.*

Table 6.3 compares the maximum modelled contribution of the Greater Manchester Scenarios to the lowest applicable CL for each site. Values highlighted in yellow exceed the 1% screening threshold, and these sites proceeded to HRA Stage 2: Appropriate Assessment. This screening exercise represents a precautionary approach, as it assumes that the most sensitive qualifying features (with the lowest CLs) are present in the areas with the highest modelled contribution (typically adjacent to the busiest road).

	Airborne NH_3	Airborne NOx	Nutrient nitrogen deposition*		Acid deposition*	
			Grassland	Forest	Grassland	Forest
Manchester Mosses SAC						
Minimum CL	1	30	5	N/A	0.564	N/A
Units	µg/m^3	µg/m^3	kgN/ha-year		kEq/ha-year	
2025 contribution from allocations						
Maximum modelled contribution	0.00079	0.036	0.0068	N/A	0.00049	N/A
% of CL	0.0079	0.12	0.14	N/A	0.086	N/A
2040 contribution from allocations						
Maximum modelled contribution	0.033	0.29	0.19	N/A	0.014	N/A
% of CL	3.3	0.96	3.8	N/A	2.4	N/A
2040 contribution from allocations with link road						

	Airborne NH_3	Airborne NOx	Nutrient nitrogen deposition*		Acid deposition*	
			Grassland	Forest	Grassland	Forest
Maximum modelled contribution	0.18	1.7	1.1	N/A	0.076	N/A
% of CL	18	5.9	21	N/A	13	N/A
Midland Meres and Mosses Phase 1 Ramsar						
Minimum CL	1	30	10	10	0.576	0.576
Units	µg/m³	µg/m³	kgN/ha-year		kEq/ha-year	
2025 contribution from allocations						
Maximum modelled contribution	0.0018	0.058	0.023	0.014	0.0016	0.0010
% of CL	0.18	0.19	0.46	0.27	0.29	0.17
2040 contribution from allocations						
Maximum modelled contribution	0.0038	-0.090	0.016	0.013	0.0011	0.00093
% of CL	0.38	-0.30	0.32	0.26	0.20	0.16
2040 contribution from allocations with link road						
Maximum modelled contribution	0.0041	-0.012	0.030	0.020	0.0021	0.0014
% of CL	0.41	-0.04	0.60	0.41	0.38	0.25
Peak District Moors (South Pennine Moors Phase 1) SPA						
Minimum CL	3	30	5	5	0.428	0.428

	Airborne NH_3	Airborne NOx	Nutrient nitrogen deposition*		Acid deposition*	
			Grassland	Forest	Grassland	Forest
Units	µg/m^3	µg/m^3	kgN/ha-year		kEq/ha-year	
2025 contribution from allocations						
Maximum modelled contribution	0.0044	0.16	0.058	0.035	0.0041	0.0025
% of CL	0.15	0.54	1.2	0.70	0.97	0.58
2040 contribution from allocations						
Maximum modelled contribution	0.021	0.29	0.21	0.13	0.015	0.0094
% of CL	0.71	0.98	4.2	2.6	3.5	2.2
2040 contribution from allocations with link road						
Maximum modelled contribution	0.015	0.17	0.14	0.089	0.010	0.0063
% of CL	0.49	0.56	2.8	1.8	2.3	1.5
Rixton Clay Pits SAC						
Minimum CL	3	30	5	N/A	0.428	N/A
Units	µg/m^3	µg/m^3	kgN/ha-year		kEq/ha-year	
2025 contribution from allocations						
Maximum modelled contribution	-0.00060	-0.015	-0.004	N/A	-0.00031	N/A
% of CL	-0.020	-0.05	-0.09	N/A	-0.072	N/A
2040 contribution from allocations						

	Airborne NH_3	Airborne NOx	Nutrient nitrogen deposition*		Acid deposition*	
			Grassland	Forest	Grassland	Forest
Maximum modelled contribution	0.002	-0.014	0.0068	N/A	0.00049	N/A
% of CL	0.051	-0.047	0.14	N/A	0.11	N/A
2040 contribution from allocations with link road						
Maximum modelled contribution	0.0060	0.015	0.032	N/A	0.0023	N/A
% of CL	0.20	0.050	0.65	N/A	0.54	N/A
Rochdale Canal SAC						
Minimum CL	3	30	3	N/A	No data	N/A
Units	µg/m^3	µg/m^3	kgN/ha-year		kEq/ha-year	
2025 contribution from allocations						
Maximum modelled contribution	0.043	0.84	0.24	N/A	0.017	N/A
% of CL	1.4	2.8	7.9	N/A	N/A	N/A
2040 contribution from allocations						
Maximum modelled contribution	0.18	1.9	0.96	N/A	0.96	N/A
% of CL	6.0	6.2	32	N/A	N/A	N/A
2040 contribution from allocations with link road						

	Airborne NH_3	Airborne NOx	Nutrient nitrogen deposition*		Acid deposition*	
			Grassland	Forest	Grassland	Forest
Maximum modelled contribution	0.17	1.8	0.94	N/A	0.94	N/A
% of CL	5.8	6.2	31	N/A	N/A	N/A
Rostherne Mere Ramsar						
Minimum CL	1	30	10	10	0.576	0.576
Units	µg/m^3	µg/m^3	kgN/ha-year		kEq/ha-year	
2025 contribution from allocations						
Maximum modelled contribution	0.00056	0.048	0.012	0.0066	0.00083	0.00047
% of CL	0.056	0.16	0.23	0.13	0.15	0.082
2040 contribution from allocations						
Maximum modelled contribution	0.0016	0.12	0.030	0.017	0.0021	0.0012
% of CL	0.16	0.38	0.60	0.34	0.38	0.22
2040 contribution from allocations with link road						
Maximum modelled contribution	0.00021	0.085	0.014	0.0069	0.0010	0.00049
% of CL	0.021	0.28	0.27	0.14	0.17	0.086
South Pennine Moors SAC						
Minimum CL	1	30	5	5	0.569	0.569

	Airborne NH_3	Airborne NOx	Nutrient nitrogen deposition*		Acid deposition*	
			Grassland	Forest	Grassland	Forest
Units	µg/m^3	µg/m^3	kgN/ha-year		kEq/ha-year	
2025 contribution from allocations						
Maximum modelled contribution	0.032	0.85	0.37	0.23	0.027	0.016
% of CL	3.2	2.8	7.5	4.6	4.7	2.9
2040 contribution from allocations						
Maximum modelled contribution	0.034	0.58	0.36	0.22	0.025	0.016
% of CL	3.4	1.9	7.1	4.4	4.4	2.8
2040 contribution from allocations with link road						
Maximum modelled contribution	0.042	0.72	0.44	0.27	0.031	0.019
% of CL	4.2	2.4	8.8	5.5	5.5	3.4
South Pennine Moors Phase 2 SPA						
Minimum CL	3	30	5	N/A	0.511	N/A
Units	µg/m^3	µg/m^3	kgN/ha-year		kEq/ha-year	
2025 contribution from allocations						
Maximum modelled contribution	0.032	0.85	0.23	N/A	0.016	N/A
% of CL	1.1	2.8	4.6	N/A	3.2	N/A
2040 contribution from allocations						

	Airborne NH_3	Airborne NOx	Nutrient nitrogen deposition*		Acid deposition*	
			Grassland	Forest	Grassland	Forest
Maximum modelled contribution	0.034	0.58	0.22	N/A	0.016	N/A
% of CL	1.1	1.9	4.4	N/A	3.1	N/A
2040 contribution from allocations with link road						
Maximum modelled contribution	0.042	0.72	0.27	N/A	0.019	N/A
% of CL	1.4	2.4	5.5	N/A	3.8	N/A

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6 In-Combination Assessment

As previously stated in the case of a high-level, very large scale Plan such as the Places for Everyone a very large number of other plans, strategies and projects could act in combination with the Places for Everyone and result in a likely significant effect on European sites where the plan operating in isolation would not.

At all stages of this Assessment potential cumulative impacts have been considered for the PfE.

In particular a precautionary approach which *assumes that in-combination effects will occur has been taken in relation to the Assessment of* –

- Air Pollution Effects
- Recreational Impacts
- Water Pollution effects

And mitigation has been recommended which would address in-combination effects in addition to the effects of the plan alone.

6.1 In-Combination Assessment within the Air Quality HRA

The air dispersion modelling results for the Greater Manchester study area account for air quality impacts associated with road traffic emissions from the allocations in Bolton, Bury, Manchester, Oldham, Rochdale, Salford, Tameside, Trafford, and Wigan. HRA studies from neighbouring authorities were searched in order to extract relevant information concerning other sources of in-combination effects. The National Infrastructure Planning website was investigated to identify any potentially relevant major industrial developments in the study area, and these were considered on a site-by-site basis for the designated habitat sites. The potential for in-combination impacts arising from the construction and operation of High Speed 2 (HS2) was also considered.

6.1.1 Potential for in-combination impacts on the Manchester Mosses SAC

The Air quality HRA identified that the PfE plan is forecast to result in a slight increase in traffic-related pollution across the Manchester Mosses SAC, with the effect reducing with distance away from the M62. The detailed assessment

demonstrated that the PfE plan itself would not have an adverse effect on the integrity of the SAC.

The Warrington Borough Council local plan would have a similar effect, although the Warrington plan is forecast to result in a greater increase in pollutant levels at the SAC than the PfE plan. The Warrington Borough Council local plan and the PfE plan in combination could potentially have an adverse effect on the integrity of the SAC. Most of this effect would result from the Warrington plan, with a smaller contribution from the PfE plan.

The relevant area of the Manchester Mosses SAC, located at Holcroft Moss SSSI, is within the borough of Warrington. As mentioned above, the Warrington Borough local plan would also be responsible for most of any in-combination impacts. Therefore, it is appropriate for Warrington Borough Council to take the lead on developing and implementing mitigation measures. GMCA will work with Warrington Borough Council in this process, in accordance with the authorities' Duty to Co-operate, to ensure that GMCA makes a proportionate contribution to the cost and resource requirements of any identified mitigation.

6.2 In-Combination Assessment within the Recreation Study

The Recreation Study considered all housing allocations within neighbouring authorities within 7 km of the South Pennine Moors SAC and Peak District Moors (South Pennine Moors Phase 1) SPA, within the in-combination assessment.

The use of a zoned approach was adopted within this assessment, given the uncertainty over assigning thresholds for visitor numbers. On the basis that each neighbouring Local Plan Allocation has incremental increases in housing development within 7 km of the South Pennines European sites, giving rise to additional recreational visits, an Adverse Effect on Integrity for the South Pennine Moors SAC and Peak District Moors (South Pennine Moors Phase 1) SPA could not be ruled out. Therefore, mitigation measures are required. These mitigation measures have been set out in Section 4 of the Recreation Study (Appendix 3).

7 APPROPRIATE ASSESSMENT WITH DISCUSSION OF AVAILABLE AVOIDANCE AND MITIGATION MEASURES

This section takes the developments and policies of The Plan as identified as possible effects (amber) within Tables 5.1 and 5.2 above and considers the LSEs in more depth and the measures that might avoid or mitigate these impacts so that a conclusion can be reached of no adverse effect on integrity of the European sites.

Consideration is given to how the measures can be secured as proposals progress down the planning hierarchy to Local Plans and ultimately individual planning applications.

7.1 Air Pollution

As previously discussed, the full Appropriate Assessment of air pollution effects arising from increases in traffic flows in the Plan area is presented in Appendix 2 (Air Quality HRA) of this document.

Notwithstanding this more complete Assessment, what follows is a brief high-level assessment.

The HRA Stage 1 Screening results indicated that further analysis, in the form of an HRA Stage 2 Appropriate Assessment, was required for each of the following European sites for at least one of the three PfE Plan allocation cases described:

- Rochdale Canal (SAC)
- Manchester Mosses (SAC)
- South Pennine Moors (SAC) and the overlapping sites Peak District Moors (South Pennine Moors Phase 1 (SPA) and South Pennine Moors Phase 2 (SPA)

The most likely source of nitrate pollution which could arise from the implementation of Places for Everyone would be from traffic pollution resulting from increased traffic movements. Natural England advise that once it has been confirmed that a European site is sensitive to air quality the first step would be to determine whether any increases in pollutant concentrations due to the

operation of the Plan would exceed 1% of the critical level set for the notable habitats within the European site. Below the 1% threshold any change is considered to have a *de minimis* effect, although In Combination effects still need to be taken into account.

A strategic plan with ambitions to improve important habitats must consider not just the harm that increased air pollution will cause but should aim to reduce air pollution below current levels. For the European sites concerned in this HRA some are known to already exceed critical nitrate loads and are suffering harm as a result. If these sites are to be improved so as to reach favourable condition the aim should be to reduce air pollution to below the critical load for harm so as to contribute to the recovery of these sites.

Places for Everyone includes high-level Polices which aim at improving air quality and improving the natural environment, notably –

- Policies within the Greener Places Chapter of the Plan
- Policy JP-S6 Clean Air

There are also plans (complementary to Places for Everyone) for reducing air pollution and improving air quality across Greater Manchester which take into account the levels of growth planned for in Places for Everyone, most notably the Clean Air Action Plan and Clean Air Zones. The Transport for Greater Manchester Delivery Plan aims to have all journeys in Greater Manchester to be made by walking, cycling and public transport by 2040.

In addition, there are national Plans in place to reduce the emission of greenhouse gases and improve air quality, notably to move the fleet to electric clean air technologies.

7.1.1 Greater Manchester's Clean Air Zone

Greater Manchester is planning to introduce a Clean Air Zone (CAZ) as part of the Clean Air Action Plan (CAP) in 2022 across the whole of Greater Manchester. The CAZ will be consulted on alongside the GMSF consultation and is seen as an important part of overall Strategic Planning for Greater Manchester. The CAZ would cover all local roads, but not motorways or main trunk roads. It would apply to non-compliant buses, coaches and heavy goods

vehicles, taxis and private hire vehicles, and to non- compliant light goods vehicles from 2023.

To summarise the CAZ, the 10 Greater Manchester local authorities have been directed to bring about compliance with the legal limit for Nitrogen Dioxide of 30ugm3 at the roadside, by the introduction of a Clean Air Zone (CAZ) Class C, in the shortest possible time. The 10 Greater Manchester Local Authorities have worked together to consider a wide range of interventions and extensive research has determined that the most appropriate approach is to implement a CAZ across the whole of the Greater Manchester Conurbation, with supporting measures to help owners upgrade to less polluting vehicles, which are contained within the Greater Manchester Clean Air Plan (the CAP). Although not all areas with GM suffer from elevated levels of nitrogen dioxide, above the legal limit, it has been determined that the extensive GM wide CAZ is the most appropriate solution to ensure that affected areas do not merely relocate to adjacent areas under a scenario where individual locations of exceedance are targeted.

It would seem reasonable to suggest that the CAZ will lead to improvements in air quality on local roads located within 200 metres of the designated sites, if there is a reduction in the number of more polluting vehicles on these roads. However, because the quantitative impact of the CAZ on reducing air pollution effects on European sites is uncertain, the CAZ cannot be considered as true mitigation, but it is considered material to the overall Assessment.

7.1.2 Design Manual for Roads and Bridges Volume 11 (Environmental Assessment)

The above document states –

"*The general reduction of emissions per vehicle with time is of great importance in the appraisal of air quality impacts. The numbers of 'low-emission' vehicles in the fleet and the total numbers of vehicles on the road are likely to be more important determinants of emission and pollution levels than factors relating to the design and management of the road network"*

The above statement has implications for any mitigation measures proposed for air pollution effects, i.e. road design and management of the road network, which may be factors in the control of the Plan, are less important than the numbers of low-emission vehicles in the fleet, which is difficult for a land-use planning strategy alone to control.

7.1.3 Covid-19

Measures taken to control the spread of Covid-19 in 2020 and 2021 led to very significant falls in road transport across Greater Manchester. A much higher proportion of people have been working from home, and business and commuting travel has been much reduced. It remains to be seen whether these trends will continue, but there are early indications that remote working and remote business networking will become long-term trends.

If this does happen air quality will very likely improve.

7.1.4 Taken together, higher-tier Policies, Plans and Strategies would be expected to result in a considerable net improvement in air quality in Greater Manchester over the Plan period and beyond, even allowing for growth in population, employment and wealth in the same time period.

Notwithstanding the above there is also the need at a lower tier of the plan hierarchy to ensure that project-level analysis of potential air quality impacts (and, if necessary, project-level mitigation) is undertaken for significant sources of additional traffic generation which may affect European sites.

7.1.5 Air Pollution Impacts on the Rochdale Canal SAC

The traffic modelling has identified a number of potential sites on the road network where nitrate pollution could increase to a level which could potentially cause harm to the special nature conservation interest of the Rochdale Canal SAC as a result of the operation of the Plan.

The Rochdale Canal SAC is designated for the presence of a single feature, the specially protected plant species Floating water plantain, *Luronium natans*

Luronium natans

Luronium natans occurs in a range of freshwater situations, including nutrient-poor lakes in the uplands and slowly-flowing lowland rivers, pools, ditches and canals that are moderately nutrient-rich. The Rochdale Canal has predominantly mesotrophic water. Populations can fluctuate from year-to-year.

Luronium populations are present across a wide range of habitats with a corresponding range of water chemistry. This suggests that its tolerances to most water chemistry parameters are not especially demanding and that it may not be particularly sensitive to changes in water chemistry. It is also notable that *Luronium natans* populations have remained stable in the Canal over the last twenty years (*source* – Canal and River Trust annual monitoring), a period in which traffic has certainly increased on routes close to the Canal.

Nitrogen Critical Loads presented by APIS (which gives a maximum of 24 kg N/ha/yr and a critical load of between 3-10 kg N/ha/yr) are not based on any species-specific studies but are rather based on generic nitrogen loads for the habitat type. There are no studies available which have assessed the impacts of increased nitrate deposition from air pollution specifically on *Luronium natans.* However, the average existing critical load is currently estimated at 19.3 kg/N/ha/yr, so already well above the critical load for the habitat type, although the total nitrogen deposition in the area has shown significant falls in recent years (*source* – APIS).

Luronium natans is known to be susceptible to nutrient enrichment from water-borne pollution, probably because increased nutrient enrichment favours other plant species resulting in increased competition rather than because the plant is directly harmed by the increased pollution levels, although limited research has been carried out on this subject. It seems likely that the Canal waters are phosphate-limited rather than nitrogen-limited, as are most lowland freshwater bodies. This means that to control eutrophication it is more important to control phosphate inputs (which come from agriculture but not atmosphere) rather than nitrogen inputs. Places for Everyone does not control farming activities in the Plan area.

When the ecology of *Luronium natans* and freshwater plant communities in general, and the available evidence of the stability of the *Luronium* population in the Canal, are considered it seems likely that increased traffic movements in the vicinity of the Canal **will not** have a harmful effect on the special interest of the Canal – that is, no likely significant effects will arise.

But this conclusion is uncertain because the response of *Luronium* natans to air pollution levels has not been studied and is therefore not well understood.

A precautionary approach to this potential impact is therefore recommended.

Currently available Mitigation –

The Plan includes Policies to improve air quality, notably Policy JP-S6.

Natural England has advised that measures to maintain the status of Rochdale Canal SAC are being carried out. This is confirmed in Natural England's Supplementary Advice document, which notes that the target for this site is to "*maintain the distribution and continuity of the feature and its supporting habitat*." Measures to achieve this include "*ensure the supporting water bodies are sufficiently free of other competing vegetation to allow space for this early successional species to thrive*."

Suggested Mitigation measures over and above those already being carried out –

A strategic, long-term programme of invasive species control within the canal would constitute an appropriate response in the absence of feasible avoidance and reduction measures.

7.1.6 Air Pollution Impacts on the Manchester Mosses

The Places for Everyone plan is forecast to result in a slight increase in traffic-related pollution across the site, with the effect reducing with distance away from the M62. The detailed assessment demonstrated that the Places for Everyone plan itself would not have an adverse effect on the integrity of the SAC.

The Warrington Borough Council local plan would have a similar effect, although the Warrington plan is forecast to result in a greater increase in pollutant levels at the SAC than the Places for Everyone plan. The Warrington Borough Council local plan and the Places for Everyone plan in combination could potentially have an adverse effect on the integrity of the SAC. Most of this effect would result from the Warrington plan, with a smaller contribution from the Places for Everyone plan.

Currently available Mitigation –

Natural England has advised that measures to improve the status of Holcroft Moss SSSI are under way. This is confirmed in Natural England's Supplementary Advice document, which highlights that bog habitat is being restored through re-wetting of the site with the aim of returning it to "Active Raised Bog" status by 2035.

Suggested Mitigation measures over and above the management-focused measures currently being implemented –

The relevant area of Holcroft Moss SSSI is located in the borough of Warrington. The Warrington Borough local plan would also be responsible for most of any in-combination impacts.

In this situation, it is appropriate for Warrington Borough Council to take the lead on developing and implementing mitigation measures. GMCA will work

with Warrington Borough Council in this process, and will make a proportionate contribution to the cost and resource requirements of any identified mitigation.

7.1.7 Air Pollution Impacts on the South Pennines

More detailed assessment has already been carried out to establish the potential effect of the Places for Everyone plan at these sites. The Places for Everyone plan is forecast to result in a slight increase in airborne ammonia, nitrogen deposition and acid deposition in small parts of these extensive sites lying close to the A6024, the A627 and the A57. A marginal increase in nitrogen deposition with potential to slightly hinder recovery of bog habitat in these small areas is likely to be the most significant potential impact of the plan.

Currently available Mitigation –

Natural England have advised that the blanket bog habitats of the South Pennine Moors are all degraded, but are also all capable of restoration, with restoration programmes under way.

Natural England's Supplementary Advice document for the SAC confirms that an overarching objective is to maintain the existing site area, stating: "*There should be no measurable reduction (excluding any trivial loss) in the extent and area of this feature*."

Suggested Mitigation measures over and above the management-focused measures currently being implemented –

The Places for Everyone plan would have a marginal effect only on nitrogen deposition, and would not result in any measurable reduction in the extent of blanket bog or other specified habitats. Nevertheless, GMCA will implement measures to offset the marginal effects of the proposed Places for Everyone plan at the South Pennine Moors SAC/SPAs.

GMCA will work with an existing partnership body such as Pennine Prospects, or if necessary set up a new conservation body, to identify a programme of work to be supported by GMCA which is considered to be sufficient to mitigate the relatively small increases in nitrogen deposition forecast to result from the Places for Everyone plan.

7.2 Functionally Linked Land

Only 4 potential strategic allocations have been Screened in as potentially being functionally linked to the Peak District Moors / South Pennine Moors SPA. No other allocation areas were considered to have a high degree of landscape connectivity with European sites such that important species were considered likely to make use of the areas on a regular basis

These are -

- Chew Valley (Robert Fletchers)
- Land North of Smithy Bridge
- Roch Valley
- Newhey Quarry

7.2.1 Chew Brook Valley (Robert Fletchers) (Oldham)

Chew Brook Valley (Robert Fletchers) is within 1km of the Peak District Moors (South Pennine Moors Phase 1) SPA which is designated for its breeding Short-eared Owls, Merlins and Golden Plovers.

Most of this site is occupied by buildings surrounded by woodland and with areas of open water. These habitats are unsuitable for all three of the above species even outside of the breeding season.

The fields to the south of the allocation have some (limited) potential to be used for hunting by Short-eared Owl and Merlin and also for feeding by Golden Plover both during and outside of the breeding season. However, given that it is a relatively narrow strip of land, only 100-200m wide, and therefore the carrying capacity of the land is relatively low, it would be unlikely to support significant numbers of these bird species on a regular basis.

Bird records for the site (held by the Greater Manchester Bird Recording Group and the GM Local Biological Records Centre) do not support the idea that the area is functionally linked to the SPA.

Conclusion – This allocation is not functionally linked to the SPA.

7.2.2 Land North of Smithy Bridge (Rochdale)

This area, within 2km of the South Pennines, has recently been surveyed by professional ecologists (*Tyler-Grange 2018, Rochdale pre-application reference PREAPP/00054/19*) in relation to proposals to develop the land. These surveys have shown that habitats present are not generally suitable for supporting important bird species associated with the South Pennines SPA and that during wintering bird surveys no important species associated with the SPA were recorded.

Other bird data for the area held by the GM Local Records Centre do not include records of any significant numbers of important bird species.

Conclusion - This allocation is not functionally linked to the SPA.

7.2.3 Roch Valley (Rochdale)

This area is within 2.5km of the SPA

The area has recently been surveyed by professional ecologists in relation to proposals to develop the land (*Ref. TEP surveys 2019, Rochdale planning application reference 19/00881/FUL*).

These surveys have shown that -

- Habitats present (improved agricultural grassland) are not generally suitable for supporting important bird species associated with the South Pennines SPA
- The area does not support significant numbers of any important bird species associated with the South Pennines SPA.

Conclusion - This allocation is not functionally linked to the SPA.

7.2.4 Newhey Quarry (Rochdale)

This area (within 3km of the South Pennines) has recently been surveyed by ecological consultants working on behalf of site promoters (*ref. Middlewood Ecology March 2020*). Although a single pair of breeding Peregrines were recorded in the Quarry, otherwise the site did not support significant numbers of important bird species associated with the SPA.

Habitats present were not generally suitable for important bird species associated with the SPA.

Conclusion - This allocation is not functionally linked to the SPA.

7.3 Recreational Disturbance

Population increases in areas close to European Protected Sites may lead to increased disturbance to habitats and species arising from recreational use, especially (in the case of birds) from dog walking, but also from fires, trampling, tipping and littering, boating, fishing and other activities.

The assessment of recreational pressures arising from the PfE plan alone and/or in-combination with neighbouring Local Planning Authority (LPA) Local Plans has been undertaken by specialists, and the discussion and results presented in this document represent just a summary of this work. **A more comprehensive discussion of the methodology used in the assessment of whether there would be an Adverse Effect on Integrity (AEoI), are presented in Appendix 3 (Recreation study).**

7.3.1 Recreational Disturbance – Rochdale Canal SAC

Increased development in areas close to the Rochdale Canal have the potential to cause increased disturbance of the Canal by increasing pleasure boat traffic on the Canal. Excessive boat traffic will harm *Luronium natans*.

The Rochdale Canal SAC is closely monitored by the Canal and River Trust and there is a visitor management strategy in place for the Canal. Boat movements are monitored and controlled and there is a threshold of boat movements above which it is considered that harm may be caused to *Luronium natans.*

This threshold has not been reached since monitoring began when the Canal reopened following restoration in 2002. The Trust is able to limit boat movements at levels below the threshold. However, this safeguarding

mechanism is not in the control of the Plan being Assessed. It is therefore recommended that further mitigation for this impact is included in the Plan.

Recommendation – developments of more than 50 housing units within the following allocations in the Plan should be required to carry to site-level HRA, to include assessment of the potential for increased recreational disturbance on the Canal.

Allocations –

- Stakehill

Since the control of boat movements on the Canal is a straightforward mitigation measure, for recreational disturbance it is considered that providing the above recommendation is accepted and incorporated into the Plan, no likely significant effects from this source will arise.

7.3.2 Recreational Disturbance - Rixton Claypits SAC

Rixton Claypits is a site of specialist interest only (for great crested newts) and is not currently subject to high visitor pressures. Visitors to the site tend to be very local (*source – Warrington BC*). There is a comprehensive management plan in place for the site which includes the management of visitor access, and the site is actively managed for visitors by Warrington Council.

Conclusion - there are sufficient safeguards in place to ensure that the Places for Everyone will not cause harm to Rixton Claypits through increases in recreational disturbance.

7.3.3 Recreational disturbance – Manchester Mosses SAC

None of the component parts of the Manchester Mosses SAC are currently a visitor destination. Infrastructure for access is poor and any visitors are considered to be from the local area. Nevertheless, the special interest of the site does suffer from disturbance caused by fires and illegal tipping (both of which are activities which the Plan cannot control) and it is recognised that increases in the local population may lead to increases in these impacts.

In their response to the draft of this HRA, Natural England commented in September 2020 that –

"*We are not concerned about an increase of recreational pressure on these sites as there is a lack of public access. The HRA does not need to try and assess the impacts of possible increased illegal activity*".

7.3.4 Recreational Disturbance – Peak District Moors (South Pennines Phase 1) and South Pennine Moors (Phase 2) SPA/SAC

The open moorlands of the South Pennine Moors SACs and SPAs are accessible and attractive for recreational use. The Site Improvement Plan for the South Pennine Moors SPA identifies public access/disturbance as one of the priority issues for the site which needs to be addressed, and the impacts of wildfire/arson as another, and recognises that these impacts could affect the habitats supporting the SPA.

The South Pennine Moors Integrated Management Strategy and Conservation Action Programme lists popular types of recreation activities on the South Pennine Moors as including walking, horse-riding, cycling/mountain biking, hang gliding, rock climbing, model aircraft flying, orienteering, fell running, off-road driving (including 4x4 and scrambling), grouse shooting and angling. Effects on important habitats and important breeding birds are most likely to result from disturbance from uncontrolled dogs, orienteering, large walking events, model aircraft, hang gliders and uncontrolled fires.

The limited visitor surveys which have been undertaken in the South Pennines indicate that the most popular recreation activity in the area by some way is dog walking. Recent research in other SPA's (*Footprint Ecology 2019*) indicate that dogs on leads do not pose a particular disturbance risk to birds, but dogs off leads do. A simple but effective mitigation measure for this source of disturbance would therefore be to require/encourage dog walkers within the SPA to keep their dogs on leads.

The creation of new and enhanced green infrastructure closer to new developments in Greater Manchester may encourage dog walking closer to

home and deter them from visiting the Moors, but the open space provided through allocations for local and urban green space are unlikely to be comparable in character to the South Pennine Moors and would not provide locations for many of the other activities enjoyed by visitors to the moors such as rock climbing or hang gliding. The effectiveness of this possible mitigation measure is therefore questionable.

The South Pennines SPA/SAC (Phases 1 and 2) cover a very large area and attract visitors from a very wide area of Northern England. But the designated sites are only a part of the total area which could be described as the 'South Pennines'. There is very limited information available concerning the numbers of visitors to the South Pennine Moors SAC/SPA, where these visitors travel from or how they use the area.

The most up to date information available for the whole of the South Pennines area (and not just the SAC/SPA) is work undertaken by Natural England between 2009 and 2012, released in 2014 [*ref.* NERC150 Report 2014]. This work looked at the manner in which people engage with the whole of the South Pennines, from local authority areas bounding the South Pennines as well as from further afield. There is no other more locally relevant up-to-date information which can be used as a data source for this assessment. This study did indicate that 46% of visitors originate from further afield [than the immediate catchment] with large volumes from cities such as Leeds and Manchester. However, the figures quoted for Greater Manchester are rather biased by significant numbers of people visiting from Bolton (4% of total visits); it is assumed that visitors from Bolton predominantly use areas in the western parts of the South Pennines and not the SPA/SAC in the east, because elsewhere in the report it is concluded that the majority of visitors travel less than 8 miles (and particularly people walking dogs) to get to the Moors.

There are a wide range of access points to the South Pennine Moors SPA/SAC and the road and footpath network extends to more than 140 km. Whilst this means on the one hand that there is the opportunity for significant disturbance within the SPA/SAC, on the other hand the wide range of alternative routes means that the disturbance can be more spread out, resulting in potentially

lower overall impacts in any one location. Notably, the core areas of the SPA/SAC site and the most important areas of blanket bog habitat generally do not have foot paths across them (because they are very wet), thus reducing potential impacts on habitats from trampling in those locations.

The distribution of important breeding and wintering bird populations is not understood in great detail because bird records are often taken at large geographic scales (e.g. 1km grid squares), because populations of breeding curlew, dunlin, golden plover and red grouse are often widely dispersed (low density) and because birds can move breeding sites in different years. This means that targeting mitigation measures at particular locations is difficult, more so because most of the SPA is open access land and restricting access to particular locations would not be straightforward.

The lack of empirical data about where people travel from to reach the Moors and lack of evidence about the level of harm which recreational impacts cause requires that a precautionary approach is taken to this potential effect.

As indicated in the Natural England monitoring report around 68% of visitors to the South Pennines are “walking with a dog”, by far the most popular recreational activity. The survey also identified that people walking with a dog travelled no more than 8 km to reach their dog walking location.

For the purposes of this assessment, 7km has therefore been taken to be the threshold distance at which development within allocated areas could result in impacts upon the SPA/SAC. This distance threshold has been used in HRAs prepared to inform the Bradford Core Strategy and has been reaffirmed in the HRA supporting the Kirklees Local Plan (March 2017), the Burnley Local Plan (2018), and the Calderdale Local Plan (2019). It is the distance that encompasses most of the trips made to the South Pennines identified in the Natural England NERC150 Report 2014.

This distance threshold would include the following allocations within Tameside, Oldham and Rochdale –

- Godley Green
- Roch Valley

- Newhey Quarry
- Broadbent Moss
- Chew Brook Valley (Robert Fletchers)
- Land North of Smithy Bridge

Given the overall numbers of visitors to the South Pennines (20 million + visits per year) and the fact that most visitors do not visit the core areas of the European site it is considered unlikely that significant increases in adverse effects on the European sites will arise simply from local population increases arising from these allocations in isolation, or indeed in combination with one another, although it is accepted that accurately predicting the number of visits to the SPA/SAC which may arise from residential development within these allocations is impossible.

However, when considered cumulatively with all allocations for new housing in places within 7km of the SPA/SAC (including local allocations within GM and allocations in neighbouring authorities) it would be reasonable to assume that a cumulative impact arising from disturbance may arise.

Available Mitigation and Recommendations

There are specific Policies in the Plan aimed at improving local Green Infrastructure protecting and improving designated nature conservation sites and upland habitats and a specific Policy addressing the need to avoid harm to European designated sites from the operation of the Plan (Policies JP-G1, JP-G2, JP-G3, JP-G5, JP-G6).

These Policies will act to mitigate for any ‘diffuse’ recreational impacts.

In addition, it is **recommended** that as additional mitigation –

- That developments of more than 50 housing units within the above allocations are required to provide local, high quality and meaningful green infrastructure for public recreation in order to deter people from using the Moors for recreation.

- That residents of new houses in developments of more than 50 units within the above allocations are required to be supplied with information

concerning the importance of the South Pennine Moors and of the need to protect the special interest of the Moors

- That the Greater Manchester Combined Authority contribute to the development of a regional (cross-boundary) Nature Recovery Network including the South Pennines, to be completed within three years of the adoption of the Plan. This work has begun.

- That as part of the above Nature Recovery Network a visitor management strategy is developed for the South Pennines, in partnership with surrounding relevant authorities, to be completed within three years of the adoption of the Plan.

7.4 Water Pollution

7.4.1 Mersey Estuary

Diffuse water pollution arising from sources in Greater Manchester could potentially have an effect on the Mersey Estuary SPA/Ramsar, since most of the major rivers in Greater Manchester (*e.g.* Irwell, Medlock & Irk) are all effectively tributaries of the River Mersey (via the Manchester Ship Canal) and eventually discharges into the Estuary; water flows in Greater Manchester are primarily from the east and north towards the south and west. The most important source of increased water pollution would be an increase in the discharge of untreated and partially treated sewage into water courses resulting from population increases. Given that a very large area of Greater Manchester eventually drains into the Mersey potentially *all* of the allocations under consideration in this Plan could contribute to increased water pollution.

But prior to discharging into the Estuary the watercourses pass through large areas of Greater Manchester and other Metropolitan areas (Warrington and Greater Merseyside), and the Estuary itself is adjacent to the very large Merseyside conurbation and receives inputs from many disparate sources. It would therefore be very difficult to establish whether any water pollution arising

from any particular development in Greater Manchester was responsible for a significant effect on pollution in the Estuary.

However, given the scale of development under consideration in this Plan, and the need to take a precautionary approach when preparing an HRA, the Mersey Estuary has been 'Screened In' to this assessment.

Individual allocation areas have not been specifically identified as being sources of water pollution, but an assumption is made that the Plan in total may contribute to diffuse water pollution in the Estuary.

As such, United Utilities Water Limited, operators of the existing drainage network in Greater Manchester, were approached for their views. **United Utilities Water Limited's response is presented in full in Appendix 4 (Statement on behalf of United Utilities Water Limited in response to infrastructure capacity query).**

Available Mitigation and Recommendations

Mitigation for any effects on the Mersey SPA relies on the application of general policies, plans and strategies for reducing water pollution from any/all developments, since it is practically impossible to measure the impact on pollution in the Estuary from any more specific measures that could be included in the Places for Everyone. Policy JP-S5 of the Plan refers specifically to the need to reduce water pollution and protect and enhance rivers and waterways.

In addition, the body responsible for the treatment of waste water in North West England is United Utilities and the regulating body for water pollution issues is the Environment Agency, and not in the control of the Plan.

As further mitigation for potential water pollution effects It is strongly recommended that the Councils concerned in the preparation of the Places for Everyone liaise with United Utilities (the local water service provider) to confirm that there is sufficient capacity in the existing discharge consent (or any

changes to the consent that are already planned), in order to accommodate the growth planned for Greater Manchester over the entire Plan period. If United Utilities confirm any constraints, it may be necessary to introduce a more explicit statement into general Infrastructure Policies in the Plan which specify that the development trajectory (particularly for housing) needs to keep in line with the wastewater treatment infrastructure. If necessary, this may require a phased delivery of development.

In addition, large scale site allocation Policies in the Local Plan should include policy wording to state that developments will not be permitted if they would have an unacceptable effect on water quality or cause significant run-off and the requirement to demonstrate mitigation measures have been incorporated through a mitigation scheme.

7.4.2 Rochdale Canal SAC

The aquatic plant *Luronium natans* which is the primary designating feature for the Rochdale Canal is known to be susceptible to water pollution.

Currently no direct hydrological connections between any of the allocations and the Rochdale Canal SAC have been identified, but detailed analysis of hydrological linkages are outside of the scope of the Plan and this Assessment, and there are allocations within a few hundred metres of the Canal (notably Stakehill, Castleton Sidings and Land North of Smithy Bridge).

Significant development has been permitted alongside the Canal in recent years and it has been conclusively demonstrated that water pollution prevention measures are readily available which effectively mitigate any risks of water pollution. Specific mitigation measures for particular developments need to be considered in detail at the planning application stage of the planning hierarchy, but is concluded that this risk can be mitigated.

It is **recommended** that applications for development of over 50 housing units* and 1,000m2 of business or industrial use within the Stakehill, Castleton

Sidings and Land North of Smithy Bridge allocation are required to prepare site-level HRAs which include an assessment of water pollution effects.

**figure derived from SSSI Impact Risk Zones prepared by Natural England*

7.5 Light Spillage and Shading

This impact only applies to developments very close (within 100m) of the Rochdale Canal SAC, because *Luronium natans* is sensitive to light levels. Whether or not the impacts will arise depend on the design details of particular schemes, best controlled at planning application stage.

Available Mitigation and Recommendations

It is recommended that developments within 100m of the Rochdale Canal within the following allocations should be subject to project-level HRA, to include an assessment of possible shading impacts.

- Stakehill
- Land north of Smithy Bridge

8 Statement of Common Ground

The Places for Everyone Statement of Common Ground is available to view at the following link:

https://www.greatermanchester-ca.gov.uk/what-we-do/planning-and-housing/places-for-everyone/supporting-documents/?folder=%5C01%20Duty%20to%20Co-operate#fList

9 Conclusions

9.1 Summary of HRA results

9.1.1 Initial screening assessment

All policies in the PfE, including thematic and development allocation policies, were subject to an initial screening assessment to determine if they would have a 'likely significant effect' on European protected habitat sites and as a consequence require further assessment to determine effects in more detail. The initial screening assessment indicated that harmful effects on European protected sites could potential arise from air and water pollution, recreational disturbances and interference with functionally linked land as a result the scale of housing and economic growth in the plan. Consequently, the HRA includes a more detailed assessment of these impacts including mitigation options where required.

9.1.2 Functionally linked land

Four PfE allocations were 'screened-in' as potentially being functionally linked to the Peak District Moors / South Pennine Moors SPA. These are:

- Chew Valley (Robert Fletchers)
- Land North of Smithy Bridge
- Roch Valley
- Newhey Quarry

However, the assessment in Section 7 of the HRA concluded that the sites were not functionally linked to the Peak District Moors / South Pennine Moors SPA.

9.1.3 Water quality

The HRA considered the impact on the Mersey Estuary SPA from diffuse water pollution across Greater Manchester, as most rivers in Greater Manchester drain into the River Mersey and discharge into the estuary. The most important source of potential water pollution would be the discharge of untreated or partially treated sewage into the watercourses resulting from population increases across Greater Manchester, as a result of the scale of development proposed across the plan. United Utilities who operate the drainage network in

Greater Manchester have confirmed their commitment to deliver water quality improvements in collaboration with partners and deliver investment in their drainage infrastructure in line with their investment programme. Furthermore, PfE Policy JP-S5 Flood Risk and the Water Environment expects developers to incorporate sustainable drainage systems into development proposals and the PfE allocations have policy requirements prioritising sustainable drainage systems on the sites.

9.1.4 Rochdale Canal SAC – recreational disturbance

The HRA considered whether development in close proximity to the Rochdale Canal SAC could harm Luronium natan from increases in boat traffic in the canal. Luronium natan is the plant species for which the canal is designated for. The Canal and Rivers Trust monitor boat movements in the canal and can limit the number of movements to below the threshold that is tolerable to the plant. Nevertheless, this threshold has not been reached since monitoring began in 2002. To mitigate any potential impacts from the PfE, the HRA has recommended that developments on the PfE allocations at Stakehill, Castleton Sidings and Land North of Smith Bridge should be required to carry out site-level HRAs that include nan assessment of the potential for increased recreational disturbance on the canal.

9.1.5 Rochdale Canal SAC – light spillage and shading

Luronium natans is sensitive to light levels, therefore the HRA has recommended that developments within 100m of the Rochdale Canal at Stakehill and Land North of Smithy Bridge PfE allocations should be subject to a project level HRA to assess potential shading on the canal.

9.1.6 Recreational disturbance – Rixton Clay Pits SAC and Manchester Mosses SAC

The HRA assessed if the PfE would cause recreational disturbances to Rixton Clay Pits SAC and Manchester Mosses SAC from visitors. However, the HRA found that the level of visitors to Rixton Clay Pits SAC was very low and vistors were typically from the local area, the site is also managed. Manchester Mosses SAC is not accessible to the public. Therefore, the HRA found that the PfE

would not have a detrimental impact on these sites from increased visitor pressure.

9.2 Conclusions from the Air Quality Habitats Regulations Assessment

The Air Quality Habitats Regulations Assessment has evaluated the potential effects of changes in air quality for three cases:

- 2025 contribution from allocations: the air quality impacts associated with the PfE Plan allocations in 2025.
- 2040 contribution from allocations: the air quality impacts associated with the PfE Plan allocations in 2040.
- 2040 contribution from allocations with link road: the air quality impacts associated with the PfE Plan allocations in 2040 combined with the air quality impacts associated with a new link road between the A57 and M62.
- The study has evaluated the increases in airborne concentrations of oxides of nitrogen; in airborne concentrations of ammonia; in deposition of nitrogen from the atmosphere; and in deposition of acid from the atmosphere to the designated habitat sites within 10 km of the PfE plan boundary.

9.2.1 HRA Screening

The HRA Stage 1 Screening results indicated that there are no Likely Significant Effects related to air quality for the following European sites, for all three of the cases considered in this assessment. These sites were screened out of requiring further analysis:

- Midland Meres & Mosses – Phase 1 (Ramsar site)
- Rostherne Mere (Ramsar Site)
- Rixton Clay Pits (SAC)

The HRA Stage 1 Screening results indicated that further analysis, in the form of an HRA Stage 2 Appropriate Assessment, was required for each of the following European sites for at least one of the three cases described above, and at least one of the four potential impacts:

- Manchester Mosses (SAC)

- Rochdale Canal (SAC)
- South Pennine Moors (SAC) and the overlapping sites Peak District Moors (South Pennine Moors Phase 1 (SPA) and South Pennine Moors Phase 2 (SPA)

9.2.2 Further Analysis

For the designated sites requiring further analysis and Appropriate Assessment, this process included the following steps:

1. Calculation of the total predicted pollution levels (baseline pollution levels + contribution from allocations) and comparison with the applicable Critical Loads and Critical Levels. This step also considers in-combination effects associated with other plans and projects. Where the total predicted pollution levels are predicted to be below the applicable Critical Loads and Critical Levels, adverse effects on the designated site can be ruled out and no further analysis is necessary. These results are included in this report, whereas the rest of the steps described below will be undertaken during the consultation phase for the PfE Plan.
2. For designated sites where the total pollution levels are predicted to exceed the applicable Critical Loads and/or Critical Levels, further Appropriate Assessment has been undertaken. The aim of the Appropriate Assessment was to determine whether the air quality impacts from the allocations, alone or in combination with other plans and projects, could have an adverse effect on the designated site. The approach included considerations such as: the distribution of sensitive qualifying features within the designated site and their predicted exposure to air pollution; the current status of the site (favourable or unfavourable); the conservation objectives for the site; and whether there are plans to increase or restore the distribution of sensitive qualifying features within the site.
3. For designated sites where the Appropriate Assessment indicated that there are adverse effects related to air pollution, mitigation measures were investigated and recommended, as set out in Chapter 5 of the Air Quality Habitats Regulation Assessment (presented in Appendix 2 of this

report). These will be discussed further with Natural England, and measures which meet the appropriate regulatory requirements for classification as mitigation measures will be recommended.

9.2.3 Summary of Air Quality HRA results

The overall results of the HRA are summarised in Table 9.1.

TABLE 9.1 – SUMMARY OF AIR QUALITY HABITATS REGULATIONS ASSESSMENT RESULTS

Designated Site	Airborne NOx	Airborne NH_3	Nitrogen deposition	Acid deposition
Manchester Mosses (SAC)	HRA Stage 2 indicates no adverse effects (total predicted concentration does not exceed the CL).	HRA Stage 2 indicates no adverse effects in isolation (when detailed modelling of the tree belt within the Holcroft Moss portion of the SAC is included, the model results do not predict an exceedance of the screening thresholds, where the qualifying features are present, or could be present).	HRA Stage 2 indicates no adverse effects in isolation (when detailed modelling of the tree belt within the Holcroft Moss portion of the SAC is included, the model results do not predict an exceedance of the screening thresholds, where the qualifying features are present, or could be present).	HRA Stage 2 indicates no adverse effects in isolation (when detailed modelling of the tree belt within the Holcroft Moss portion of the SAC is included, the model results do not predict an exceedance of the screening thresholds, where the qualifying features are present, or could be present).
Midland Meres & Mosses - Phase 1 (Ramsar)	Screened out at HRA Stage 1. The model results do not predict an exceedance of the screening thresholds for any of the modelled scenarios.	Screened out at HRA Stage 1. The model results do not predict an exceedance of the screening thresholds for any of the modelled scenarios.	Screened out at HRA Stage 1. The model results do not predict an exceedance of the screening thresholds for any of the modelled scenarios.	Screened out at HRA Stage 1. The model results do not predict an exceedance of the screening thresholds for any of the modelled scenarios.
Peak District Moors (South Pennine Moors Phase 1) (SPA)	HRA Stage 2 indicates no adverse effects (total predicted concentration does not exceed the CL).	HRA Stage 2 indicates no adverse effects (total predicted concentration does not exceed the CL).	HRA Stage 2 indicates potential for Golden plover, Merlin, and Short-eared owl to be present in limited areas along the A6024 where screening thresholds are exceeded. Mitigation measures investigated.	HRA Stage 2 indicates potential for Golden plover, Merlin, and Short-eared owl to be present in limited areas along the A6024 where screening thresholds are exceeded. Mitigation measures investigated.
Rixton Clay Pits (SAC)	Screened out at HRA Stage 1. The model results do not predict an exceedance of the screening thresholds for any of the modelled scenarios.	Screened out at HRA Stage 1. The model results do not predict an exceedance of the screening thresholds for any of the modelled scenarios.	Screened out at HRA Stage 1. The model results do not predict an exceedance of the screening thresholds for any of the modelled scenarios.	Screened out at HRA Stage 1. The model results do not predict an exceedance of the screening thresholds for any of the modelled scenarios.
Rochdale Canal (SAC)	HRA Stage 2 indicates no adverse effects (total predicted	HRA Stage 2 indicates no adverse effects (total predicted concentration does not exceed the CL).	HRA Stage 2 indicates no clear body of evidence to confirm that elevated nutrient nitrogen deposition directly affects the conservation of *L. natans.*	HRA Stage 2 indicates no clear body of evidence to confirm that elevated nutrient nitrogen deposition directly affects the conservation of *L. natans.*

Designated Site	Airborne NOx	Airborne NH_3	Nitrogen deposition	Acid deposition
	concentration does not exceed the CL).		However, indirect impacts may occur. Mitigation measures investigated.	However, indirect impacts may occur. Mitigation measures investigated.
Rostherne Mere (Ramsar)	Screened out at HRA Stage 1. The model results do not predict an exceedance of the screening thresholds for any of the modelled scenarios.	Screened out at HRA Stage 1. The model results do not predict an exceedance of the screening thresholds for any of the modelled scenarios.	Screened out at HRA Stage 1. The model results do not predict an exceedance of the screening thresholds for any of the modelled scenarios.	Screened out at HRA Stage 1. The model results do not predict an exceedance of the screening thresholds for any of the modelled scenarios.
South Pennine Moors (SAC)	HRA Stage 2 indicates no adverse effects (total predicted concentration does not exceed the CL).	HRA Stage 2 indicates no adverse effects along the A6024 (total predicted concentration does not exceed the CL). HRA Stage 2 indicates no adverse effects along the M62/A672 for all sensitive features except Blanket bogs (features are not likely to be present within areas of exceedance). HRA Stage 2 indicates potential for adverse effects for Blanket bogs in limited areas along the M62/A672. Mitigation measures investigated.	HRA Stage 2 indicates no adverse effects along the A57 (areas of exceedance are only on or within 2m of the road surface). HRA Stage 2 indicates no adverse effects along the A6024 for all sensitive features except Blanket bogs (features are not likely to be present within areas of exceedance). HRA Stage 2 indicates no adverse effects along the M62/A672 for all sensitive features except Blanket bogs (features are not likely to be present within areas of exceedance). HRA Stage 2 indicates potential for adverse effects for Blanket bogs in limited areas along the M62/A672. Mitigation measures investigated.	HRA Stage 2 indicates no adverse effects along the A57 (areas of exceedance are only on or within 2m of the road surface). HRA Stage 2 indicates no adverse effects along the A6024 for all sensitive features except Blanket bogs (features are not likely to be present within areas of exceedance). HRA Stage 2 indicates no adverse effects along the M62/A672 for all sensitive features except Blanket bogs (features are not likely to be present within areas of exceedance). HRA Stage 2 indicates potential for adverse effects for Blanket bogs in limited areas along the M62/A672. Mitigation measures investigated.
South Pennine Moors Phase 2 (SPA)	HRA Stage 2 indicates no adverse effects (total predicted concentration does not exceed the CL).	HRA Stage 2 indicates no adverse effects (total predicted concentration does not exceed the CL).	HRA Stage 2 indicates no adverse effects along the M62/A672 for Merlin (suitable breeding habitats are not present within areas of exceedance). HRA Stage 2 indicates potential for adverse effects for Golden plover and Short-eared owl in limited areas along the M62/A672. Mitigation measures investigated.	HRA Stage 2 indicates no adverse effects along the M62/A672 for Merlin (suitable breeding habitats are not present within areas of exceedance). HRA Stage 2 indicates potential for adverse effects for Golden plover and Short-eared owl in limited areas along the M62/A672. Mitigation measures investigated.

9.3 Conclusions from the Recreation Study

Three zones were applied to the housing allocations within the PfE plan and existing housing land supply to determine the potential for AEoI on the South Pennine Moors SAC, Peak District Moors (South Pennine Moors Phase 1) SPA and South Pennine Moors Phase 2 SPA; an exclusion zone with exceptions (within 400m), consideration of functionally linked habitat (within 2.5km) and recreational pressure from increases in visitor numbers (within 7km).

Within 400m of the SAC/SPA boundary, an exclusion zone would apply, where no net increase in the number of houses is permitted unless a sequential approach is followed, for example development on previously developed land and conversation of existing properties buildings. There are no housing allocations within this zone in the PfE plan and only a small number of existing housing land supply sites in Oldham and Rochdale. Housing allocations within 2.5km of the European site boundary could cause the loss of offsite habitats that have a functional or structural role in maintaining the populations of the SPA qualifying features. As such, survey work and project-level HRAs (if necessary) should be undertaken as developments come forward within this zone to determine use of the site and requirements for mitigation. Developments within the 7km zone could give rise to increased recreational pressure on the European site, through increases in visitor numbers, both from the PfE plan alone and in-combination with other LPA plans. Mitigation is therefore required to ensure development can proceed without an AEoI. A policy approach to the wording of the PfE or district Local Plans could be utilised which sets out a mechanism by which significant effects on the SAC and SPAs can be avoided or mitigated base on the three zones of influence outlined above. Also, a Strategic Access Management and Monitoring Strategy (SAMMS) and the provision of Suitable Alternative Natural Greenspace (SANG) could be utilised.

The SAMMS and SANG will require coordination with other statutory and non-statutory bodies already involved in the management of the South Pennine

Moors. Further work should be undertaken to develop the mitigation options in the SAMMS and SANG and the proposed delivery mechanism.

APPENDIX 1

The Nature Conservation Interests of the "Screened In" European Sites

The following details are derived from information available from Natural England and the Joint Nature Conservation Committee and from information held by GMEU.

Manchester Mosses SAC

Description of the Manchester Mosses SAC

Mossland formerly covered a very large part of low-lying Greater Manchester, Merseyside and southern Lancashire, and provided a severe obstacle to industrial and agricultural expansion. While most has been converted to agriculture or lost to development, several examples have survived as degraded raised bog, such as Astley & Bedford Mosses (Wigan), Risley Moss (Warrington) and Holcroft Moss (Warrington) on the Mersey floodplain. Their surfaces are now elevated above surrounding land due to shrinkage of the surrounding tilled land, and all except Holcroft Moss have been cut for peat at some time in the past. While past drainage has produced dominant purple moor grass (*Molinia caerulea)*, bracken (*Pteridium aquilinum)* and birch (*Betula)* spp. scrub or woodland, wetter pockets have enabled the peat-forming species to survive. Recent rehabilitation management on all three sites has caused these to spread.

Primary Reason For Designation of the Manchester Mosses SAC

The site supports degraded bog still capable of natural regeneration (JNCC code 7120), which has the potential to be restored to active raised bog (JNCC code 7110).

SAC sites have been selected on a site-by-site basis and according to the *Interpretation manual of European habitats* (European Commission DG Environment 1999); "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".

Conservation Objective of the Manchester Mosses

The Conservation Objective for the Manchester Mosses SAC is to maintain the bog habitat, subject to natural change, in favourable condition (Natural England 2018).

On this site favourable condition requires the maintenance of the extent of each designated habitat type. Maintenance implies restoration if evidence from a condition assessment suggests a reduction in extent. A series of site-specific standards defining favourable condition has been produced by Natural England. However these relate to management of the habitats on the site and are not particularly applicable to assessing the effects of thematic policies in the Plan on the SAC. Therefore in order to consider these potential impacts the operations that may damage the special interest of the SAC have to be considered. These include:

- Cultivation
- Grazing
- Mowing or cutting
- Application of manure, fertilisers or lime
- Application of pesticides
- Burning
- Drainage, both within and outside the boundaries of the site
- Extraction of minerals including peat, topsoil and subsoil
- Construction or removal of roads, tracks, walls, fences, hardstands, banks, ditches or other earthworks or the laying or removal of pipelines and cables
- Erection of permanent structures
- Use of vehicles likely to damage the vegetation
- Pollution including atmospheric pollutants and NOx
- Recreational activities
- Diffuse water pollution
- Climate change

(Adapted from information available from Natural England)

Rixton Clay Pits SAC

Description of Rixton Clay Pits SAC

Situated east of Warrington town centre and to the west of Salford, this site comprises Parts of an extensive disused brickworks excavated in glacial boulder clay. The excavation has left a series of hollows, which have filled with water since workings ceased in the 1960s, leading to a variety of pond sizes. New ponds have also been created more recently for wildlife and amenity purposes. **Great crested newt *Triturus cristatus*** are known to occur in at least 20 ponds across the site. The site also supports species-rich grassland, scrub and mature secondary woodland.

Primary Reason for Designation of Rixton Clay Pits

The primary reason for the designation of Rixton Clay Pits is its population of great crested newts (*Triturus cristatus)*. Sites are selected as SACs where there is evidence of a relatively large and robust population of great crested newts based on reliable recent survey data.

Conservation Objective for Rixton Clay Pits

The draft conservation objective for this site is to maintain the designated species, great crested newt, in favourable condition. On this site favourable condition requires the maintenance of the population of the newts and maintenance implies restoration if evidence from condition assessment suggests a reduction in size of the population (Natural England 2018).

The operations that may damage the special interest of the SAC which have to be considered include:

- Cultivation
- Grazing
- Mowing or cutting
- Application of manure, fertilisers or lime

- Application of pesticides
- Burning
- Drainage, both within and outside the boundaries of the site
- Extraction of minerals including peat, topsoil and subsoil
- Construction or removal of roads, tracks, walls, fences, hardstands, banks, ditches or other earthworks or the laying or removal of pipelines and cables
- Erection of permanent structures
- Use of vehicles likely to damage the vegetation
- Diffuse air pollution
- Diffuse water pollution
- Climate change

Rochdale Canal SAC

Description of the Rochdale Canal SAC

The Rochdale Canal SAC extends approximately 20 km from Littleborough at Ben Healey Bridge to Failsworth, passing through urban and industrialised parts of the Metropolitan Boroughs of Rochdale and Oldham and the intervening areas of agricultural land (mostly pasture). Water supplied to the Rochdale Canal in part arises from the Pennines. This water is acidic and relatively low in nutrients, while water from other sources is mostly high in nutrients. The aquatic flora of the canal is thus indicative of a mesotrophic waterbody (i.e. is moderately nutrient-rich) although there is evidence of some local enrichment. The canal continues through Failsworth and terminates at Castlefield in Manchester City, although this section of the canal is not included within the SAC.

Primary reason for designation of the Rochdale Canal as a European protected site

The Rochdale Canal supports a significant population of **floating water-plantain (*Luronium natans)*** in a botanically diverse waterplant community which also holds a

wide range of pondweeds *Potamogeton* spp. The canal has predominantly mesotrophic water. This population of *Luronium* is representative of the formerly more widespread canal populations of north-west England, although the Rochdale Canal supports unusually dense populations of the plant.

The Site Conservation Objectives for the Rochdale Canal are to –

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 the habitats of qualifying species
- The structure and function of the habitats of qualifying species
- The supporting processes on which the habitats of qualifying species rely
- The populations of the qualifying species, and
- The distribution of the qualifying species within the site.

The main qualifying feature for the site is the presence of Floating water-plantain.

Floating water-plantain; description and ecological characteristics

Floating water-plantain (*Luronium natans*) occurs in a range of freshwater situations, including nutrient-poor lakes in the uplands (mainly referable to 3130 Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea*) and slowly-flowing lowland rivers, pools, ditches and canals that are moderately nutrient-rich.

Luronium natans occurs as two forms: in shallow water with floating oval leaves, and in deep water with submerged rosettes of narrow leaves. The plant thrives best in open situations with a moderate degree of disturbance, where the growth of emergent vegetation is held in check. Populations fluctuate greatly in size, often increasing when water levels drop to expose the bottom of the water body. Populations fluctuate from year to year, and at many sites records of *L. natans* have been infrequent, suggesting that only small populations occur, in some cases possibly as transitory colonists of the habitat. Populations tend to be more stable at natural sites than artificial ones, but approximately half of recent (post-1980) records are from canals

and similar artificial habitats. Its habitat in rivers has been greatly reduced by channel-straightening, dredging and pollution, especially in lowland situations.

The operations that may damage the special interest of the SAC which have to be considered include:

- Application of pesticides
- Dredging
- Drainage, both within and outside the boundaries of the site
- Construction or removal of roads, tracks, walls, fences, hardstands, banks, ditches or other earthworks or the laying or removal of pipelines and cables
- Erection of permanent structures next to the Canal (shading)
- Diffuse air pollution
- Diffuse water pollution
- Increased boat movements (recreation)
- Climate change

South Pennine Moors SAC/SPA (Phases 1 and 2)

Description of the South Pennine Moors SAC

This very large site forms part of the Southern Pennines lying between Ilkley in the north and the Peak District National Park boundary in the south. The majority of the site is within West Yorkshire, but it also covers areas of Lancashire, Greater Manchester and North Yorkshire. The largest moorland blocks are Ilkley Moor, the Haworth Moors, Rishworth Moor and Moss Moor. The underlying rock is Millstone Grit which outcrops at Boulsworth Hill and on the northern boundary of Ilkley Moor. The moorlands are on a rolling dissected plateau between 300m and 450m AOD with a high point of 517m at Boulsworth Hill. The greater part of the gritstone is overlain by blanket peat with the coarse gravely mineral soils occurring only on the lower slopes. The site is the largest area of unenclosed moorland within West Yorkshire and contains the most diverse and extensive examples of upland plant communities in the county. Extensive areas of blanket bog occur on the upland plateaux and are

punctuated by species rich acidic flushes and mires. There are also wet and dry heaths and acid grasslands. Three habitat types which occur on the site are rare enough within Europe to be listed on Annex 1 of the EC habitats and Species Directive (92/43) EEC. These communities are typical of and represent the full range of upland vegetation classes found in the South Pennines.

This mosaic of habitats supports a moorland breeding bird assemblage which, because of the range of species and number of breeding birds it contains, is of regional and national importance. The large numbers of breeding merlin (*Falco columbarius*), golden plover (*Pluvialis apricaria*) and twite (*Carduelis flavirostris*) are of international importance.

Description of the South Pennine Moors SPAs

Special Protection Areas (SPAs) are strictly protected sites classified in accordance with Article 4 of the EC Directive on the conservation of wild birds, also known as the Birds Directive, which came into force in April 1979. They are classified for rare and vulnerable birds, listed in Annex I to the Birds Directive, and for regularly occurring migratory species. The South Pennine Moors SPA includes the major moorland blocks of the South Pennines from Ilkley in the north to Leek and Matlock in the south. It covers extensive tracts of semi-natural moorland habitats including upland heath and blanket mire. The site is of European importance for several upland breeding bird species including birds of prey and waders.

Primary reason for designation of the South Pennine Moors SAC

The site supports the following important habitats:

European Dry Heath

The site is representative of upland dry heath at the southern end of the Pennine range, the habitat's most south-easterly upland location in the UK. Dry heath covers extensive areas, occupies the lower slopes of the moors on mineral soils or where peat is thin, and occurs in transitions to acid grassland, wet heath and blanket bogs. The upland heath of the South Pennines is strongly dominated by heather *Calluna*

vulgaris. Its main NVC types are H9 *Calluna vulgaris – Deschampsia flexuosa* heath and H12 *Calluna vulgaris – Vaccinium myrtillus* heath. More rarely H8 *Calluna vulgaris – Ulex gallii* heath and H10 *Calluna vulgaris – Erica cinerea* heath are found. On the higher, more exposed ground H18 *Vaccinium myrtillus – Deschampsia flexuosa* heath becomes more prominent. In the cloughs, or valleys, which extend into the heather moorlands, a greater mix of dwarf shrubs can be found together with more lichens and mosses. The moors support a rich invertebrate fauna, especially moths, and important bird assemblages.

Blanket Bog

This site represents blanket bog in the south Pennines, the most south-easterly occurrence of the habitat in Europe. The bog vegetation communities are generally botanically poor. Hare's-tail cotton-grass *Eriophorum vaginatum* is often overwhelmingly dominant, although bog-building *Sphagnum* mosses are present. Where the blanket peats are slightly drier, heather *Calluna vulgaris*, crowberry *Empetrum nigrum* and bilberry *Vaccinium myrtillus* become more prominent. The uncommon cloudberry *Rubus chamaemorus* is locally abundant in bog vegetation. Bog pools provide diversity and are often characterised by common cotton-grass *E. angustifolium*. Substantial areas of the bog surface are eroding, and there are extensive areas of bare peat. In some areas erosion may be a natural process reflecting the great age (9000 years) of the south Pennine peats.

Old Sessile Oak Woods

Around the fringes of the upland heath and bog of the south Pennines are blocks of old sessile oak woods, usually on slopes. These tend to be dryer than those further north and west, such that the bryophyte communities are less developed (although this lowered diversity may in some instances have been exaggerated by the effects of 19th century air pollution). Other components of the ground flora such as grasses, dwarf shrubs and ferns are common. Small areas of alder woodland along stream-sides add to the overall richness of the woods.

Primary reason for the designation of the South Pennine Moors SPAs

The site qualifies for the designation by supporting populations of European importance of the following species listed on Annex I of the Directive:

For Phase 1 during the breeding season:

- Golden plover (*Pluvialis apricaria*), at least 3.3% of the breeding population in Great Britain
- Merlin (*Falco columbarius*), at least 5.9% of the breeding population in Great Britain
- Peregrine (*Falco peregrinus*), at least 1.4% of the breeding population in Great Britain
- Short-eared owl (*Asio flammeus*), at least 2.5% of the breeding population in Great Britain

The SPA supports an internationally important assemblage of birds. During the breeding season the area regularly supports:

Common sandpiper (*Actitis hypoleucos*), Dunlin (*Calidris alpina schinzii*), Twite (*Carduelis flavirostris*), Snipe (*Gallinago gallinago*), Curlew (*Numenius arquata*), Wheatear (*Oenanthe oenanthe*), Redshank (*Tringa totanus*), Ring ouzel (*Turdus torquatus*), Lapwing (*Vanellus vanellus*)

For Phase 2 during the breeding season:

- Golden plover (*Pluvialis apricaria*), at least 1.9% of the breeding population in Great Britain
- Merlin (*Falco columbarius*), at least 2.3% of the breeding population in Great Britain
- Breeding Bird Assemblage

Conservation Objectives of the South Pennine Moors

Natural England lists the conservation objectives for the South Pennine Moors as follows:

To maintain*, in favourable condition, the habitats for the populations of Annex 1 species[+] of European importance, with particular reference to:

- blanket mire
- dwarf shrub heath
- acid grassland
- gritstone edges

[+] *golden plover, merlin, short-eared owl*

To maintain*, in favourable condition, the:

- blanket bog (active only)
- dry heaths
- Northern Atlantic wet heaths with *Erica tetralix*
- transition mires and quaking bogs
- old oak woods with *Ilex* and *Blechnum* in the British Isles

*maintenance implies restoration if the feature is not currently in favourable condition.

The operations that may damage the special interest of the SPA which have to be considered include:

- Cultivation
- Grazing
- Mowing or cutting
- Application of manure, fertilisers or lime
- Application of pesticides
- Burning
- Drainage, both within and outside the boundaries of the site
- Extraction of minerals including peat, topsoil and subsoil
- Construction or removal of roads, tracks, walls, fences, hardstands, banks, ditches or other earthworks or the laying or removal of pipelines and cables
- Erection of permanent structures
- Use of vehicles likely to damage the vegetation
- Diffuse air pollution
- Diffuse water pollution

- Climate change

The Mersey Estuary SPA/Ramsar

Description

The Mersey Estuary is located on the Irish Sea coast of north-west England. It is a large, sheltered estuary which comprises large areas of saltmarsh and extensive intertidal sand- and mud-flats, with limited areas of brackish marsh, rocky shoreline and boulder clay cliffs, within a rural and industrial environment. The intertidal flats and saltmarshes provide feeding and roosting sites for large populations of water birds. During the winter, the site is of major importance for ducks and waders. The site is also important during the spring and autumn migration periods, particularly for wader populations moving along the west coast of Britain.

Conservation Objectives for the Mersey Estuary SPA/Ramsar

To ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring;

- The extent and distribution of the habitats of the qualifying features
- The structure and function of the habitats of the qualifying features
- The supporting processes on which the habitats of the qualifying features rely
- The population of each of the qualifying features, and
- The distribution of the qualifying features within the site.

Primary reasons for designation of the Mersey Estuary SPA

Qualifying species

This site qualifies under **Article 4.1** of the Habitats Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive:

Over winter;

Golden Plover *Pluvialis apricaria*, 3,070 individuals representing at least 1.2% of the wintering population in Great Britain (5 year peak mean 1991/2 - 1995/6)

This site also qualifies under **Article 4.2** of the Directive (79/409/EEC) by supporting populations of European importance of the following migratory species:

On passage;

Redshank *Tringa totanus*, 3,516 individuals representing at least 2.0% of the Eastern Atlantic - wintering population (5 year peak mean, 1987-1991)

Ringed Plover *Charadrius hiaticula*, 1,453 individuals representing at least 2.9% of the Europe/Northern Africa - wintering population (Count, as at 1989)

Over winter;

Dunlin *Calidris alpina*, 44,300 individuals representing at least 3.2% of the wintering Northern Siberia/Europe/Western Africa population (5 year peak mean 1991/2 - 1995/6)

Pintail *Anas acuta*, 2,744 individuals representing at least 4.6% of the wintering Northwestern Europe population (5 year peak mean 1991/2 - 1995/6)

Redshank *Tringa totanus*, 4,689 individuals representing at least 3.1% of the wintering Eastern Atlantic - wintering population (5 year peak mean 1991/2 - 1995/6)

Shelduck *Tadorna tadorna*, 5,039 individuals representing at least 1.7% of the wintering Northwestern Europe population (5 year peak mean 1991/2 - 1995/6)

Teal *Anas crecca*, 11,667 individuals representing at least 2.9% of the wintering Northwestern Europe population (5 year peak mean 1991/2 - 1995/6)

Assemblage qualification: A wetland of international importance.

The area qualifies under **Article 4.2** of the Directive (79/409/EEC) by regularly supporting at least 20,000 waterfowl

Over winter, the area regularly supports 99,467 individual waterfowl (5 year peak mean 1991/2 - 1995/6) including: Curlew *Numenius arquata*, Black-tailed Godwit *Limosa limosa islandica*, Lapwing *Vanellus*, Grey Plover *Pluvialis squatarola*, Wigeon *Anas penelope*, Great Crested Grebe *Podiceps cristatus*, Redshank *Tringa totanus*, Dunlin *Calidris alpina alpina*, Pintail *Anas acuta*, Teal *Anas crecca*, Shelduck *Tadorna tadorna*, Golden Plover *Pluvialis apricaria*.

Operations which may damage the special interest of the SPA include **-**

- Diffuse air pollution
- Diffuse water pollution
- Climate change
- Recreational disturbance

Rostherne Mere Ramsar / NNR

Rostherne Mere forms part of a series of open water peatland these include peat bog and marsh areas. It is one of the deepest and largest meres within the Cheshire area. Due to the depth of the mere there is little submerged vegetation, however, there is vegetation communities that fringe the circumference of the lake. Species that can be found here include Common reed *Phragmites australis*, with Lesser reedmace *Typha angustifolia* and sweet flag *Acorus calamus*. Features of European Interest

The Rostherne Mere Ramsar qualities for its Annex II species. This includes:

- Great cormorant Phalacrocorax carbo carbo - 273 individuals, representing an average of 1.1% of the GB population;
- Great bittern Botaurus stellaris stellaris - 1 individuals, representing an average of 1% of the GB population; and
- Water rail Rallus aquaticus - 6 individuals, representing an average of 1.3% of the GB population.

Conservation objectives

At the time of writing the management plan for the Ramsar site is under preparation. As such, there are no clear conservation objectives that have been produced. However, there are current scientific research areas that are under investigation.

These include:

- Catchment management planning;
- Peatland restoration and monitoring;
- Fen rehabilitation;
- Limnology and hydrology;
- Water chemistry;
- Trophic status;
- Peat paleo-ecology; and
- Impacts of fish.

Historic trends and pressures

The site is vulnerable to air pollution and water quality issues via eutrophication and the introduction of non-native plant species

APPENDIX 2

Air Quality Habitat Regulations Assessment Study

Air Quality Habitat Regulations Assessment (HRA) study for the Greater Manchester "Places for Everyone" Plan

Report for Greater Manchester Combined Authority

ED 15193100 | Issue Number 4 | Date 26/01/2022

Customer:

Systra Ltd on behalf of Greater Manchester Combined Authority

Contact:

Jessica Virdo
Ricardo Energy & Environment
Gemini Building, Harwell, Didcot, OX11 0QR,
United Kingdom

t: +44 (0) 1235 75 3489
e: jessica.virdo@ricardo.com

Ricardo-AEA Ltd is certificated to ISO9001 and ISO14001

Authors:

Jessica Virdo, Rohan Patel, Victoria Thomson, Robert Benney, Mark Broomfield, Charlotte Day, Eve Loxham and Jekabs Jursins

Approved By:

Mark Broomfield

Date:

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Executive Summary

Greater Manchester, a combined authority in North West England, is home to more than 2.8 million people. The Places for Everyone Plan (PfE Plan) is a joint plan of nine local authorities in Greater Manchester, consisting of Bolton, Bury, Manchester, Oldham, Rochdale, Salford, Tameside, Trafford, and Wigan. The PfE Plan provides a spatial interpretation of the growth and development envisioned in the Greater Manchester Strategy. This report contains the results of an Air Quality Habitat Regulations Assessment (HRA) of road traffic emissions associated with the allocations in the PfE Plan. Specifically, this report includes the results of HRA Stage 1 Screening as well as some preliminary results and a description of next steps for HRA Stage 2 Appropriate Assessment.

Greater Manchester spans 1276 km^2 and includes numerous nature conservation areas of national and international significance. These sites may be adversely affected by increases in air concentrations of pollutants, particularly oxides of nitrogen and ammonia, and the deposition of these pollutants within the habitats. The study area for this assessment contains the designated sites with European (or equivalent international) designation, namely Ramsar sites, Special Areas of Conservation (SACs), and Special Protection Areas (SPAs) within a 10 km buffer area around Greater Manchester.

For all European-designated sites contained in the study area, a sub-regional air dispersion model (RapidAIR) was used to model predicted air quality impacts at a resolution of 3m x 3m. Traffic growth within the study area was provided by the Greater Manchester Variable Demand Model (GMVDM). The air quality impacts associated with the PfE Plan allocations were assessed for three cases:

- 2025 contribution from allocations: assesses the air quality impacts associated with the PfE Plan allocations in 2025.
- 2040 contribution from allocations: assesses the air quality impacts associated with the PfE Plan allocations in 2040.
- 2040 contribution from allocations with link road: assesses the air quality impacts associated with the PfE Plan allocations in 2040, as well as the air quality impacts associated with a new link road between the A57 and M62.

For HRA Stage 1 Screening, air quality impacts on designated sites were assessed based on predicted annual average airborne concentrations of oxides of nitrogen (NOx) and ammonia (NH_3), as well as annual deposition of nutrient nitrogen and acid. The contributions attributable to the allocations in each of the three cases described above were compared to screening thresholds, where the screening threshold for each pollutant / designated site combination was set to 1% of the Critical Load or Critical Level applicable for that pollutant at that designated site. Likely Significant Effects (LSEs) can be discounted where the model results and analysis indicate that the contribution from the allocations, alone and in-combination with other applicable plans and projects, is below the 1% screening threshold.

The HRA Stage 1 Screening results indicated that there are no LSEs related to air quality for the following European sites, for all three of the cases described above. These sites have been screened out of requiring further analysis:

- Midland Meres & Mosses – Phase 1 (Ramsar site)
- Rostherne Mere (Ramsar Site)
- Rixton Clay Pits (SAC)

The HRA Stage 1 Screening results indicated that further analysis, in the form of an HRA Stage 2 Appropriate Assessment, is required for each of the following European sites for at least one of the three cases described above:

- Manchester Mosses (SAC)
- Rochdale Canal (SAC)
- South Pennine Moors (SAC) and the overlapping sites Peak District Moors (South Pennine Moors Phase 1 (SPA) and South Pennine Moors Phase 2 (SPA)

For the designated sites requiring further analysis and Appropriate Assessment, this process included the following steps.

6. Calculation of the total predicted pollution levels (baseline pollution levels + contribution from allocations) and comparison with the applicable Critical Loads and Critical Levels. This step also considers in-combination effects associated with other plans and projects. Where the total predicted pollution levels are predicted to be below the applicable Critical Loads and Critical Levels, adverse effects on the designated site can be ruled out and no further analysis is necessary.

7. An Appropriate Assessment was undertaken to identify whether the identified impacts from the PfE Plan could affect the integrity of these sites, alone or in combination with other plans and projects. The scope and approach of the Appropriate Assessment was determined in consultation with Natural England. The approach considered the distribution of sensitive qualifying features within the designated site and their predicted exposure to air pollution; the current status of the site (favourable or unfavourable); the conservation objectives for the site; and current plans to increase or restore the distribution of sensitive qualifying features within the site.

8. Limited potential for in-combination impacts has been identified in relation to proposed strategic highways development, and development plans being brought forward or implemented by neighbouring authorities. In one case, it was identified as appropriate for the Greater Manchester Combined Authority to work collaboratively with Warrington Borough Council under the Duty to Cooperate to address the limited potential for in-combination impacts.

9. For the small parts of designated sites where the Appropriate Assessment indicated that there could potentially be adverse effects related to air pollution, mitigation measures were investigated and recommended.

10. Discussions between representatives of Greater Manchester Combined Authority and Natural England[47] have demonstrated that an effective partnership can be developed in order to identify any potentially significant impacts, and to put appropriate mitigation in place, if this should be needed. These will be developed further during the plan consultation process.

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Abbreviations

Abbreviation	Explanation
AADT	Annual Average Daily Traffic
APIS	Air Pollution Information System
ASR	Annual Status Report
AURN	Automatic Urban and Rural Network
BEIS	UK Department for Business, Energy & Industrial Strategy
BL	Baseline (a future-year model scenario)
CAZ	Clean Air Zone
CL	Critical Limit/Level
EEA	European Environment Agency
EFT	Emissions Factor Toolkit
EMEP	European Monitoring and Evaluation Programme
GDM	Gateway Demand Model
GIS	Geographic Information System
GMCA	Greater Manchester Combined Authority
HGV	Heavy Goods Vehicle
HRA	Habitat Regulations Assessment
IAQM	Institute of Air Quality Management
LAQM	Local Air Quality Management
LEIM	Local Economic Impact Model
LES	Low Emission Strategy
LGV	Light Goods Vehicle
MDM	Main Demand Model
NAEI	National Atmospheric Emissions Inventory
NH_3	Ammonia
NO_2	Nitrogen dioxide
NOx	Nitrogen oxides (NO + NO_2)
NTEM	National Trip End Model
NTS	National Travel Survey
NVC	National Vegetation Classification
PfE	Places for Everyone
PHI	Priority Habitat Inventory, a GIS dataset from Natural England
$PM_{2.5}$	Particulate matter 2.5 micrometres or less in diameter
PM_{10}	Particulate matter 10 micrometres or less in diameter
PTM	Public Transport Model
RMSE	Root Mean Square Error
RTM	Road Traffic Model
SAC	Special Area of Conservation
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest

1. Introduction

Greater Manchester Combined Authority in North West England is home to more than 2.8 million people. The Places for Everyone Plan (PfE Plan) is a joint plan of nine local authorities in Greater Manchester, consisting of Bolton, Bury, Manchester, Oldham, Rochdale, Salford, Tameside, Trafford, and Wigan. The PfE Plan provides a spatial interpretation of the growth and development envisioned in the Greater Manchester Strategy. This report contains the results of an Air Quality Habitat Regulations Assessment (HRA) of road traffic emissions associated with the allocations in the PfE Plan. Specifically, this report includes the results of HRA Stage 1 Screening and HRA Stage 2 Appropriate Assessment.

Greater Manchester spans 1276 km^2 and includes numerous nature conservation areas of national and international significance. These sites may be adversely affected by increases in air concentrations of pollutants, particularly oxides of nitrogen and ammonia, and the deposition of these pollutants within the habitats. The study area for this assessment contains the designated sites with European (or equivalent international) designation, namely Ramsar sites, Special Areas of Conservation (SACs), and Special Protection Areas (SPAs) within a 10 km buffer area around Greater Manchester. The following internationally designated sites were identified within the study area, and hence included in the assessment:

- Manchester Mosses SAC
- Rixton Clay Pits SAC
- Rochdale Canal SAC
- South Pennine Moors SAC
- Peak District Moors (South Pennine Moors Phase 1) SPA
  This site is coincident with part of the South Pennine Moors SAC
- South Pennine Moors Phase 2 SPA
  This site is coincident with part of the South Pennine Moors SAC
- Midland Meres & Mosses - Phase 1 Ramsar
- Rostherne Mere Ramsar

These sites may potentially be adversely affected by increases in air concentrations of pollutants, particularly oxides of nitrogen and ammonia, and the deposition of these pollutants within the identified habitat sites resulting from the PfE Plan allocations. Air quality impacts on designated sites were assessed based on predicted annual average airborne concentrations of oxides of nitrogen (NOx) and ammonia (NH_3), together with annual deposition rates of nutrient nitrogen and acid.

This report contains the results of an Air Quality Habitat Regulations Assessment (HRA) of road traffic emissions associated with the proposed PfE plan. This assessment forms part of the robust evidence base supporting the PfE Plan developed by Greater Manchester Combined Authority (GMCA).

For all European-designated sites contained in the study area, a sub-regional air dispersion model (RapidAIR) was used to model predicted air quality impacts at locations within the site at a resolution of 3m x 3m. Traffic growth within the study area was provided by the Greater Manchester Variable Demand Model (GMVDM). The traffic modelling analysis is described separately. Information was taken from six traffic model scenarios, in order to assess the potential air quality impacts of development in the Greater Manchester area:

1. 2017 Base Year

2. 2025 Reference Year
3. 2025 With Plan
4. 2040 Reference Year
5. 2040 With Plan
6. 2040 With Plan and Link Road

Using this information, the air quality impacts associated with the PfE Plan allocations were assessed for three cases:

- 2025 contribution from allocations: assesses the air quality impacts associated with the PfE Plan allocations in 2025.
- 2040 contribution from allocations: assesses the air quality impacts associated with the PfE Plan allocations in 2040.
- 2040 contribution from allocations with link road: assesses the air quality impacts associated with the PfE Plan allocations in 2040, as well as the air quality impacts associated with a new link road between the A57 and M62.

The contributions attributable to the allocations in each of the three cases described above were compared to screening thresholds, where the screening threshold for each pollutant / designated site combination was set to 1% of the Critical Load or Critical Level applicable for that pollutant at that designated site. Likely Significant Effects (LSEs) can be discounted where the model results and analysis indicate that the contribution from the allocations, alone and in-combination with other applicable plans and projects, is below the 1% screening threshold.

Where the screening analysis indicated that Likely Significant Effects (LSEs) on a designated site could not be ruled out, further analysis was undertaken in the form of an HRA Stage 2 Appropriate Assessment. For the small parts of designated sites where the Appropriate Assessment indicated that there could potentially be adverse effects related to air pollution, mitigation measures were investigated and recommended.

2. Method Statement

2.1 Study Overview

This study has been carried out using air dispersion modelling to predict the air quality impacts of increased vehicle emissions arising from the PfE plan in 2025 and 2040. To account for in-combination impacts from development within multiple local authorities, the air dispersion modelling is underpinned by a transport model which explicitly includes in-combination impacts from housing development throughout the Greater Manchester Combined Authority region.

This chapter begins by describing the transport modelling upon which the air quality modelling was based, using information from the traffic model developers (Systra Ltd). It then goes on to describe the transport model projection and air quality modelling methodology used for the six traffic model scenarios used in this project, as well as the methodology for the assessment of impacts on designated sites.

2.2 Greater Manchester Variable Demand Model (GMVDM)

The transport modelling datasets for this study are based on outputs from the Greater Manchester Variable Demand Model (GMVDM), a multi-modal transport model developed by Systra following the Department for Transport guidance set out in TAG Unit M2. The GMVDM provides estimates of future year transport demand. The transport model also provides estimates of travel behaviour changes and new patterns that the Plan is likely to produce, including changes in choices of routes, travel mode, time of travel and changes in journey destinations for some activities such as work and shopping.[1]

The GMVDM is a suite of linked models including the following components:

- Greater Manchester Voyager Public Transport Assignment Model (GMPTM), in which the aims are to estimate rail, bus and metrolink choices, along with route choices, travel costs and revenue incurred through use of public transport.
- Greater Manchester SATURN highway Model (GMSM), where estimates are made for highway route choices, travel costs and congestion.

The model components interact as demonstrated in **Figure 2-1**.

The transport models have been developed, calibrated and validated against 2017 data and conditions. The forecast year models are 2025 and 2040.

The model was used to develop forecast traffic flows for the following six scenarios:

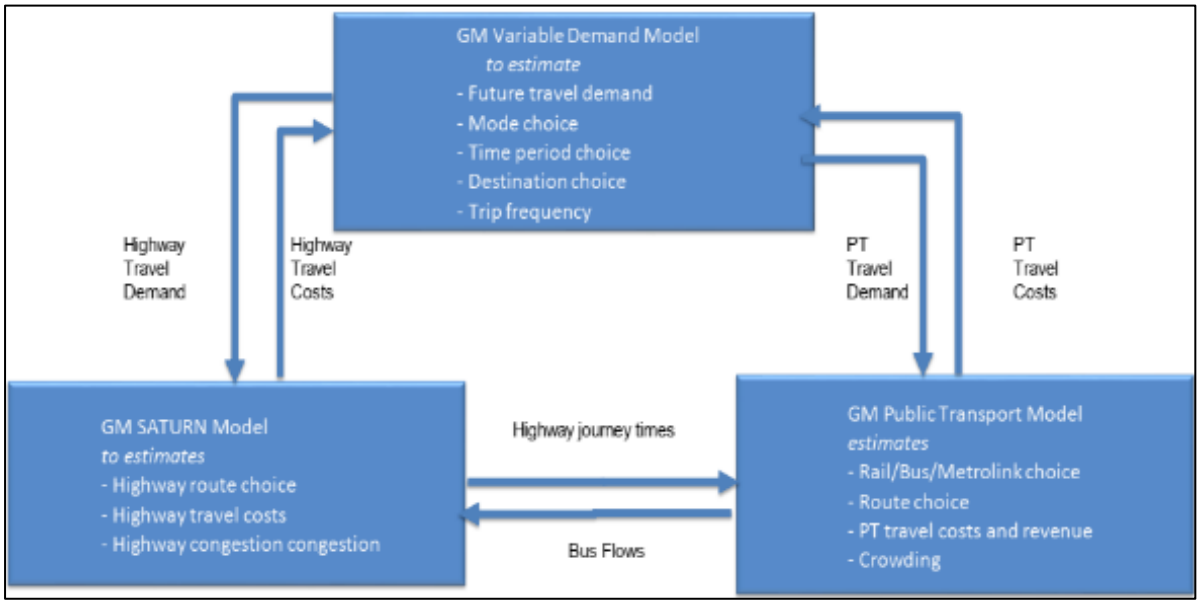
1. 2017 Base Year
2. 2025 Reference Year
3. 2025 With Plan
4. 2040 Reference Year
5. 2040 With Plan
6. 2040 With Plan and Link Road

The transport model includes core and buffer model regions. The core region corresponds to the Greater Manchester area, and the buffer areas extend approximately 30km from the Greater Manchester county boundary. The core area has been modelled at the highest resolution and with the

[1] SYSTRA, "GMSF Allocations Strategic Modelling Technical Note", October 2020.

greatest amount of detail; the transport model resolution and detail decrease in zones further away from the model core.

Figure 2-1 Interaction of models included in the GMVDM[1]



2.3 Air dispersion modelling methodology

2.3.1 Air quality modelling system

The RapidAIR Urban Air Quality Modelling Platform was used to predict air pollutant concentrations for this study. This is Ricardo Energy & Environment's proprietary modelling system developed for urban air pollution assessment.

RapidAIR has been developed to provide graphic and numerical outputs which are comparable with other models used widely in the United Kingdom. The model approach is based on loose-coupling of three elements:

- Road traffic emissions model conducted using fleet specific COPERT 5 (via the Defra EfT) algorithms to prepare grams/kilometre/second (g km^{-1} s^{-1}) emission rates of air pollutants originating from traffic sources.
- Convolution of an emissions grid with dispersion kernels derived from the USEPA AERMOD[2] model, at resolutions ranging from 1m to 20m. AERMOD provides the algorithms which govern the dispersion of the emissions and is an accepted international model for road traffic studies.
- The kernel based RapidAIR model running in GIS software to prepare dispersion fields of concentration for further analysis with a set of decision support tools coded by Ricardo in Python/arcpy.

RapidAIR includes an automated meteorological processor based on AERMET which obtains and processes meteorological data of a format suitable for use in AERMOD. Surface meteorological data is obtained from the NOAA online repository[3] and upper air data is downloaded from the NOAA Radiosonde database.[4]

[2] https://www3.epa.gov/ttn/scram/dispersion_prefrec.htm#aermod

[3] ftp://ftp.ncdc.noaa.gov/pub/data/noaa

[4] https://www.esrl.noaa.gov/roabs/

The model produces high resolution concentration fields at the city scale (down to a 1m scale) so is ideal for spatially detailed compliance modelling. The combination of an internationally recognised model code and careful parameterisation matching international best practice makes RapidAIR ideal for this study. A validation study has been conducted in London using the same datasets as the 2011 Defra air quality model inter-comparison study.[5] Using the LAEI (London Atmospheric Emissions Inventory) 2008 data and the measurements for the same time period the model performance is consistent (and across some metrics performs better) than other modelling solutions currently in use in the UK.[6] This validation study has been published in *Environmental Modelling and Software*, in partnership with the University of Strathclyde.[7]

2.3.2 Model domain

Dispersion modelling was carried out to forecast levels of air pollutants at a 3m x 3m grid resolution across the entire Greater Manchester (GM) study area. This includes all designated sites that fall the GM administrative boundary. There are three types of internationally designated sites that fall within or across the GM study area boundary (Ramsar, SPA and SAC). A description of the location of each designated site relative to the study area is provided in Table 1. A grid height of 0.5m was modelled to represent habitat exposure at an intermediate height to represent ground level and low-lying habitats. Dispersion modelling was carried out for six future scenarios which are summarised in Table 2. The required data was then extracted from the 3m x 3m grid results to provide a detailed evaluation of air quality impacts at locations within the relevant designated sites.

Table 1: Designated sites within the GM boundary

Site name and designation	Description
Peak District Moors (South Pennine Moors Phase 1) (SPA)	Parts of the designated site fall within the GMCA, however parts to the north and south-east fall outside the boundary, and some parts are outside the extended 10 km study area
South Pennine Moors Phase 2 (SPA)	Parts of the designated site fall within the GMCA, however parts to the north fall outside the boundary, and some parts are outside the extended 10 km study area
Manchester Mosses (SAC)	All designated sites fall fully within the GMCA boundary.
Rixton Clay Pits (SAC)	This site lies outside the GMCA area, but within the extended 10 km study area
Rochdale Canal (SAC)	This site lies entirely within the GMCA boundary
South Pennine Moors (SAC)	Parts of the designated site fall within the GMCA, however parts to the north and south-east fall outside the boundary, and some parts fall outside the extended 10 km study area
Midland Meres & Mosses Phase 1 (Ramsar)	The designated site lies outside the GMCA, however parts to the north are within the extended 10 km study area, with parts further south outside the study area
Rostherne Mere (Ramsar)	The designated site lies outside the GMCA, but within the extended 10 km study area

[5] https://uk-air.defra.gov.uk/research/air-quality-modelling?view=intercomparison
[6] The 2008 LAEI dataset was used in this context as a benchmarking study, to compare the performance of RapidAIR to other modelling systems. The 2008 LAEI dataset was not used as an input in the current modelling study.

[7] Masey, Nicola, Scott Hamilton, and Iain J. Beverland. "Development and evaluation of the RapidAIR® dispersion model, including the use of geospatial surrogates to represent street canyon effects." *Environmental Modelling & Software* (2018). DOI: https://doi.org/10.1016/j.envsoft.2018.05.014

Table 2: List of modelling scenarios carried out

Scenario	Scenario description
2017 Base Year	This represents conditions in 2017, and was used to verify that the dispersion model was working as expected.
2025 Reference Year	This represents a future scenario (in 2025) which does not include allocations associated with the Plan but does include all committed developments associated with the existing land supply. It also includes only those transport interventions that are committed and funded.
2025 With Plan	This represents a future scenario which includes all committed developments and transport interventions as in the "2025 Reference Year" scenario above. The With Plan scenario also includes allocations associated with the Plan and any additional transport interventions which are required to make the Plan acceptable in planning terms.
2040 Reference Year	This represents a future scenario (in 2040) which does not include allocations associated with the Plan but does include all committed developments associated with the existing land supply. It also includes only those transport interventions that are committed and funded.
2040 With Plan	This represents a future scenario which includes all committed developments and transport interventions as in the "2040 Reference Year" scenario above. The With Plan scenario also includes allocations associated with the Plan and any additional transport interventions which are required to make the Plan acceptable in planning terms.
2040 With Plan and Link Road	This scenario includes all of the development and transport interventions included in the "2040 With Plan" scenario above. It also includes a link road between the A57 and M62, to investigate potential air quality impacts on ecological receptors.

2.3.3 Traffic activity data

Annual average daily traffic (AADT) vehicle numbers and average vehicle speeds were extracted from the transport model datasets provided by Systra for the six model scenarios.

The transport model includes core and buffer model regions. The core region corresponds to the Greater Manchester area, and the buffer areas extend approximately 30km from the Greater Manchester county boundary. The core area has been modelled at the highest resolution and with the greatest amount of detail; the transport model resolution and detail decrease in zones further away from the model core.

2.3.4 Supplementary traffic data for air quality modelling

The transport model underpinning the transport datasets used in this study include core and buffer regions, as described in Section 2.2. The core regions of the transport model were modelled at higher resolution and in greater detail. The core region contains the Southern Pennine Moors in part, however, certain important road links crossing the entirety of the site (such as the B6138) were only included in

the buffer region of the transport model and the transport model did not include traffic flow information for these road links. The links travelling through the Southern Pennine Moors are important because they are likely to represent scenic route journeys. Thus, following the extension of the modelling domain to include the Southern Pennine Moors, the transport model data was supplemented with local traffic counts from Calderdale Council data to ensure that robust information was used for these road links.

Data from count points (at which total AADT was taken from manual counts by Calderdale Council) were used for relevant roads which did not have data in the original core transport model. The local council traffic count data did not provide a fleet breakdown but did provide a total vehicle flow for the respective roads. For this specific use of supplementary data, count data from the B6138 and A646 was used to calculate a scaling factor to determine the total flow for the B6138. The fleet split for the B6138 was calculated using the roads provided by the Systra transport model immediately to the north and south of the B6138.

Some further gap-filling was performed on links in the 2025 and 2040 Reference scenarios around the central part of the Rochdale Canal. In this case a scaling factor was derived by using a road nearby the missing link which has been deemed representative and which had transport data available for both the 'With Plan' and 'Reference Year' scenarios. Once a scaling factor had been derived it was applied to the 'With Plan' scenario to provide a relevant traffic volume for the link with the missing data.

2.3.5 Traffic speed data

A 24-hour averaged speed was provided from the transport model which was applied to the road links and a sense-check completed to ensure there were no unrealistic road speeds. In the case of some links unrealistic speed data was found; these were either capped at the highest speed for which emission factors are available, or gap-filled by using the speed from the adjacent link.

2.3.6 Fleet composition

The transport model provides a fleet composition breakdown into cars, light goods vehicles (LGVs), heavy goods vehicles (HGVs) and buses. NAEI (National Atmospheric Emissions Inventory) fleet split information can be used to further split cars into petrol and diesel categories, and HGVs into rigid HGV and articulated HGV categories, based on national average fleet composition information and depending on whether the road link is categorized as rural, urban or motorway. For this study, transport model AADT numbers for cars and HGVs were further categorized based on mapping the transport model road types onto the NAEI road types as shown in **Table 3**, **Table 4** and **Table 5**. Non-motorway road types were categorized as either rural or urban based on their location as compared to the 2011 Area Classifications for Output Areas (2011 OAC).[8]

The current NAEI does not project to 2040; instead 2035 has been used to represent the fleet composition for these scenarios.

Table 3 Matching transport model fleet composition to EFT vehicle types for 2017 model scenarios

NAEI Road Type	Petrol Car	Diesel Car	Electric Car	Rigid HGV	Articulated HGV
Urban (not London)	57.11%	42.75%	0.14%	68.70%	31.30%
Rural	51.67%	48.33%	–	50.77%	49.23%
Motorway	42.88%	57.12%	–	30.33%	69.67%

[8] The National Archives, "2011 Area Classifications", http://www.ons.gov.uk/ons/guide-method/geography/products/area-classifications/ns-area-classifications/ns-2011-area-classifications/index.html , accessed 01/07/2019.

Table 4 Matching transport model fleet composition to EFT vehicle types for 2025 model scenarios

NAEI Road Type	Petrol Car	Diesel Car	Electric Car	Rigid HGV	Articulated HGV
Urban (not London)	60.76%	36.69%	2.55%	66.95%	33.05%
Rural	56.96%	40.49%	2.55%	49.37%	50.63%
Motorway	50.54%	46.91%	2.55%	29.25%	70.75%

Table 5 Matching transport model fleet composition to EFT vehicle types for 2035 model scenarios

NAEI Road Type	Petrol Car	Diesel Car	Electric Car	Rigid HGV	Articulated HGV
Urban (not London)	56.93%	25.59%	17.48%	65.24%	34.76%
Rural	54.55%	27.97%	17.48%	48.23%	51.77%
Motorway	50.86%	32.67%	17.48%	28.81%	71.19%

The fleet composition in the tables above were calculated using the most recent set of NAEI fleet projection information available at the time the study was commissioned (base year 2019, published May 2019).[9] The UK government has recently (November 2020) brought forward the intention to ban the sale of all new conventional petrol and diesel cars and vans by 2030, brought forward from 2040. Secondly, all new cars and vans on the road by 2035 will be a zero-tailpipe emission vehicle.[10] If the UK government is to achieve these objectives, by 2025 and 2035 the proportion of full plug-in electric vehicles in the national fleet would be greater than the current fleet projection data indicates. Hence if the government is successful in its strategy, and the proportion of electric vehicles in the national fleet is greater in 2025 and 2035 than indicated in **Table 4** and **Table 5**, the transport pollutant emissions and resulting pollutant concentrations modelled in this study for the 2025 and 2040 scenario are likely to be overpredicted to some extent.

2.3.7 Emission factors

Vehicle emission factors for oxides of nitrogen (NOx) were obtained from COPERT v5 emission functions.[9] Vehicle emission factors for ammonia (NH_3) were obtained from the EMEP/EEA air pollutant emission inventory guidebook.[11] Link specific emission factors were calculated with our in-house emission calculation tool RapidEMS, which links directly to our RapidAIR dispersion modelling system.

The input for RapidEMS consists of a basic fleet split based on vehicle categories (diesel cars, petrol cars, LGVs, articulated HGVs, rigid HGVs, and buses) according to the traffic activity information specified in Section 2.3.3. RapidEMS is used to provide a more detailed parameterization of vehicle fleets in 2017, 2025 and 2040, including all vehicles up to and including Euro 6/VI.

2.3.8 Meteorological data

RapidAIR includes an automated meteorological processor based on AERMET which obtains and processes meteorological data of a format suitable for use in AERMOD. Surface meteorological data is obtained from the NOAA online repository[12] and upper air data is downloaded from the NOAA

[9] National Atmospheric Emissions Inventory, "Emission factors for transport", http://naei.beis.gov.uk/data/ef-transport , accessed 17/05/2021.

[10] Government takes historic step towards net-zero with end of sale of new petrol and diesel cars by 2030 - GOV.UK (www.gov.uk), accessed 01/07/2021

[11] European Environment Agency, "EMEP/EEA air pollution emission inventory guidebook 2016", https://www.eea.europa.eu/publications/emep-eea-guidebook-2016, accessed 01/07/2019.

[12] ftp://ftp.ncdc.noaa.gov/pub/data/noaa

Radiosonde database[13]. Meteorological data for 2017 was used in the study in order to enable the model validation for this study.

For this study, 2017 surface meteorological data was obtained from two stations (Manchester Airport and Rostherne) and upper air meteorological data was obtained from two stations (Nottingham and Albermarle). RapidMET was used to carry out data filling where necessary according to the methodology provided by the USEPA in their "Meteorological Monitoring Guidance for Regulatory Modelling Applications" guidance document[14]. Data gaps from the primary meteorological stations (Manchester Airport and Nottingham) are first filled using data from the other nearby stations (Rostherne for the surface station and Albermarle for the upper air station). Table 6 presents statistics for each of the meteorological parameters used in the modelling. Finally, the wind rose in Figure 2-2 illustrates the number of hours each wind direction and wind speed are present.

Table 6: Statistics for each of the meteorological parameters used in the modelling

Statistic	Wind speed (m/s)	Wind direction (degrees)	Temperature (K)	Cloud cover (Oktas)
Count	8709 (99.4%)	8554 (97.7%)	8713 (99.5%)	8760 (100%)
Mean	3.37	204.68	283.68	7.57
Std Dev	2.01	72.97	5.31	7.56
Min	0.5	8.0	266.1	0.0
25%ile	1.8	165.0	280.1	5.0
50%ile	3.1	205.0	284.1	9.0
75%ile	4.3	265.0	287.6	9.0
Maximum	16.8	360.0	301.1	99.0

2.3.9 Reference year modelling and model verification

This section provides a summary of the model verification process and the derivation of linear adjustment factors to improve model performance. A more detailed description of the model verification process is presented in Appendix 1.

Verification of the model involves comparison of the modelled results with any local monitoring data at relevant locations; this helps to identify how the model is performing and if any adjustments should be applied. The verification process involves checking and refining the model input data with the aim of reducing uncertainties and produce model outputs that are in better agreement with the monitoring results. This can be followed by adjustment of the modelled results if required to reproduce measured levels as accurately as possible. The relevant procedures are set out in Defra's LAQM.TG(16) guidance.[15] This recommends making the adjustment to the road contribution of the pollutant only and not the background concentration these are combined with.

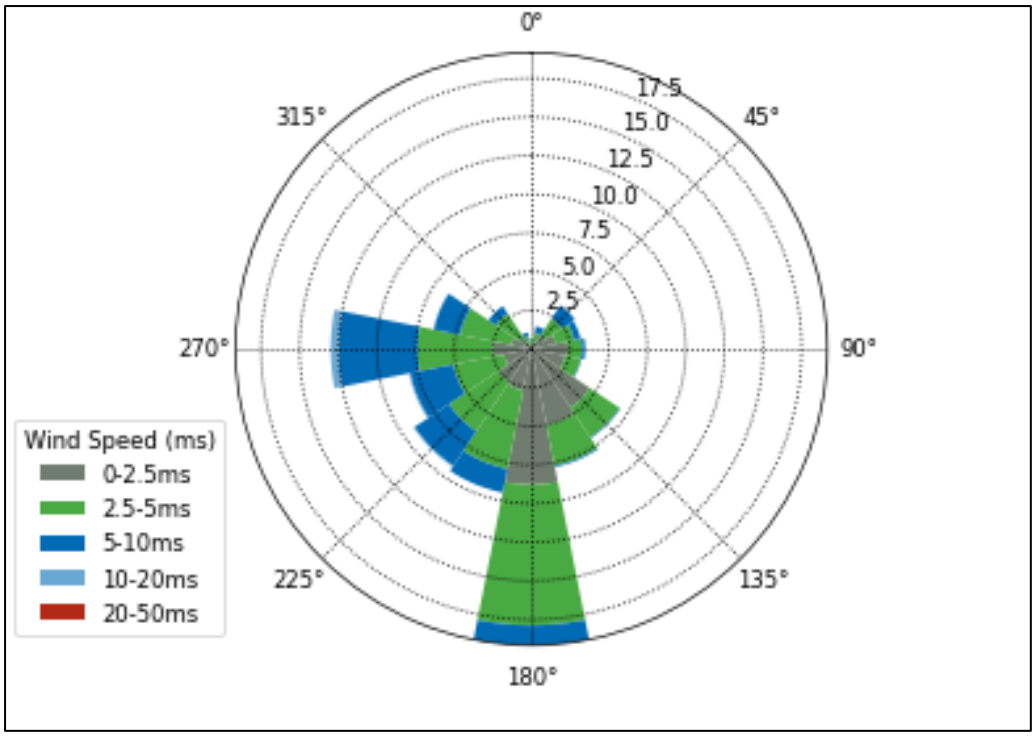
The approach outlined in LAQM.TG(16) section 7.508 – 7.534 (also in Box 7.14 and 7.15) has been used in this case. To verify the model, the predicted annual mean Road NOx concentrations were compared with concentrations measured at the various monitoring sites during 2017.

[13] https://www.esrl.noaa.gov/roabs/

[14] United States Environmental Protection Agency, "Meteorological Monitoring Guidance for Regulatory Modelling Applications" available via https://www3.epa.gov/scram001/guidance/met/mmgrma.pdf , accessed June 2019.

[15] https://laqm.defra.gov.uk/documents/LAQM-TG16-February-18-v1.pdf

Figure 2-2: Wind rose for the meteorological data used in the model



The Greater Manchester Combined Authority cites 16 automatic monitoring stations and 272 non-automatic (diffusion tubes) in the 2017 Annual Status Report (ASR)[16]. Prior to conducting the model verification, a review of each monitoring site was conducted to ensure that it was relevant to include within the verification; examples of why a monitoring site has been removed can be found below:

- Data capture less than 75%
- Monitoring sites within street canyons; street canyons were not included as this study is primarily interested in habitats and therefore monitoring sites situated within street canyons were not included.
- Duplicate and triplicate sites in same location have been removed so the verification isn’t weighted towards those locations. Automatic monitoring sites are kept preferentially to the co-located diffusion tubes.
- A monitoring site used to derive the linear adjustment factor might be located in an area where not all of the road sources contributing to pollutant concentrations have been modelled, i.e. at a junction. This would have the effect of artificially inflating the calculated adjustment factor, resulting in an over-prediction of impacts.
- A monitoring site used to derive the linear adjustment factor might be located next to a large car park, bus stop, petrol station, or taxi rank that has not been explicitly modelled due to unknown activity data. This would have the effect of artificially inflating the calculated adjustment factor, resulting in an over-prediction of impacts. Where we have identified such locations, we have removed these from the model verification process.
- Kerbside sites which are less than 1m from the kerb have also been removed as to not lead to an over-adjustment of modelling at roadside sites.

[16] Monitoring reports | Clean Air Greater Manchester (cleanairgm.com)

2.3.9.1 Oxides of nitrogen (NOx) and nitrogen dioxide (NO_2) model verification and adjustment

A combination of automatic monitoring and diffusion tube NO_2 measurements (71 sites in total) were used for model verification. The modelled vs measured concentrations at each of the monitoring locations were compared. Refinements were subsequently made to the model inputs to improve model performance where possible, and a linear adjustment factor of 2.8457 was calculated for the road emissions component of the NOx model (see Appendix 1).

Total NOx was calculated as the sum of the adjusted NOx road contribution from RapidAIR and the Defra 2018 background maps (with primary, trunk and motorway sources removed from the background map). Total NO_2 concentrations were derived using the following equation (see Appendix 1 for further details):

$$(NO_2 \text{ in } \mu g/m^3) = -0.0007(NOx \text{ in } \mu g/m^3)^2 + 0.5465(NOx \text{ in } \mu g/m^3) + 4.5019$$

To evaluate model performance and uncertainty, the Root Mean Square Error (RMSE) for the observed vs predicted NO_2 annual mean concentrations was calculated, as detailed in Technical Guidance LAQM.TG(16). This guidance indicates that an RMSE of up to 4 $\mu g/m^3$ is ideal, and an RMSE of up to 10 $\mu g/m^3$ is acceptable. In this case the RMSE was calculated at 9.9 $\mu g/m^3$, which is acceptable, and reasonable for a modelling study over such a large geographical region.

2.3.9.2 Ammonia (NH_3) model verification and adjustment

There are no monitoring locations for NH_3 located within the Greater Manchester study area, and it was therefore not possible to compare measured vs modelled concentrations for NH_3. We have adopted an approach based on Section 7.527 of the Technical Guidance LAQM.TG(16)[17] which suggests that, in the absence of measured data for model verification of a traffic pollutant, it may be appropriate to apply the adjustment factor derived from another traffic pollutant to the pollutant that does not have any monitoring data available.

In order to adopt a precautionary approach, and as particulate matter (PM_{10}) monitoring data was available for the Greater Manchester study area, the adjustment factor for PM_{10} in the study area was also determined and compared to the adjustment factor derived for NOx/NO_2.

Automatic particulate matter (PM_{10}) monitoring measurements were used for model verification. A total of six PM_{10} measurements were obtained from the Annual Status Reports (ASRs) of Manchester, Bury, Tameside and Trafford.

The initial comparison between modelled and measured PM_{10} concentrations indicated that the model was under-predicting the PM_{10} arising from road emissions at most locations. Refinements were subsequently made to the model inputs to improve model performance where possible, and a linear adjustment factor of 3.7894 was calculated for the road emissions component of the PM_{10} model (see Appendix 1).

To evaluate model performance and uncertainty, the Root Mean Square Error (RMSE) for the observed vs predicted PM_{10} annual mean concentrations was calculated, as detailed in Technical Guidance LAQM.TG(16). In this case the RMSE was calculated at 3.3 $\mu g/m^3$, which is acceptable, and reasonable for a modelling study over this large of a geographical region.

Of the two linear bias adjustment factors derived above, the adjustment calculated for PM_{10} (3.7894) is larger and therefore more conservative. RapidAIR was used to generate a map of NH_3 concentrations arising from road traffic sources across the Greater Manchester study area at a 3m x 3m resolution, and these values were subsequently multiplied by 3.7894 to obtain an adjusted NH_3 road contribution value.

[17] https://laqm.defra.gov.uk/documents/LAQM-TG16-February-18-v1.pdf

2.3.10 Future scenario modelling

2.3.10.1 Airborne pollutant concentrations

For the six future scenarios (see Table 2), RapidAIR was used to generate pollutant concentration maps across the entire Greater Manchester study area at a 3m x 3m resolution. These maps were generated using transport model traffic activity data from the appropriate future scenario, emission factors calculated using RapidEMS, and 2017 meteorological data.

Pollutant concentration maps for road-only contributions (NOx, NO_2, and NH_3) were calculated using the adjustment factors described in Section 2.3.9. Maps for total pollutant concentrations (NOx and NO_2) were calculated by adding the road-only concentration maps to the appropriate pollutant background map from the LAQM website.

2.3.10.2 Pollutant deposition

Dry deposition rates of nutrient nitrogen and acid were calculated by multiplying the 0.5m height level air concentration of the appropriate pollutants by the appropriate deposition velocity, followed by multiplication with a conversion factor.

Deposition velocities and conversion factors were obtained from Environment Agency guidance,[18] and are provided in Table 7 and **Table 8** respectively.

Table 7 Deposition velocities for NO_2 and NH_3

Pollutant	Vegetation type	Deposition velocity (m/s)
NO_2	Grassland (sites with short vegetation)	0.0015
	Woodland (sites with tall vegetation)	0.003
NH_3	Grassland (sites with short vegetation)	0.02
	Woodland (sites with tall vegetation)	0.03

Table 8 Dry deposition conversion factors

Pollutant	Conversion factor for nitrogen deposition (from µg/m²-s to kgN/ha-year)	Conversion factor for acid deposition (from µg/m²-s to kEq/ha-year)
NO_2	95.9	6.84
NH_3	260	18.5

2.3.11 Model years and considerations

This study assesses air pollution concentrations across the Greater Manchester study area for future scenarios in 2025 and 2040. It is important to consider the model results for future scenarios in the context of declining NOx emissions. Figure 2-3 presents projected road emissions of NOx for approximately 9,000 major UK roads from 2018 to 2030. The emissions in this figure are extracted from Defra's Streamlined Pollution Climate Mapping model (SL-PCM)[19] for the baseline projection scenario, which assumes no further action beyond air quality measures that were committed across the UK by 2015. The decrease in annual NOx emissions is indicative of the expected trend in NOx road emissions going forward, reflecting anticipated improvements in Euro emissions standards as well as changing vehicle fleet composition.

[18] Environment Agency, "AQTAG06: Technical guidance on detailed modelling approach for an appropriate assessment for emissions to air," March 2014

[19] SL-PCM has been developed specifically to model the effect of changes in fleet composition on NO_X emissions and NO_2 concentrations. See https://uk-air.defra.gov.uk/library/no2ten/2017-no2-projections-from-2015-data , accessed 01/07/2019.

Indeed, reductions are already being realised. In the study "Nitrogen Dioxide and Nitrogen Oxides Trends in the UK 2005 to 2016"[20] an analysis of NO_2 and NOx concentrations measured across the UK showed that a reduction in concentrations of approximately 1.7% per year has been seen on average between 2005 and 2016.

Figure 2-3 Projected road emissions of nitrogen oxides (NOx) in ktonnes per year for major UK roads

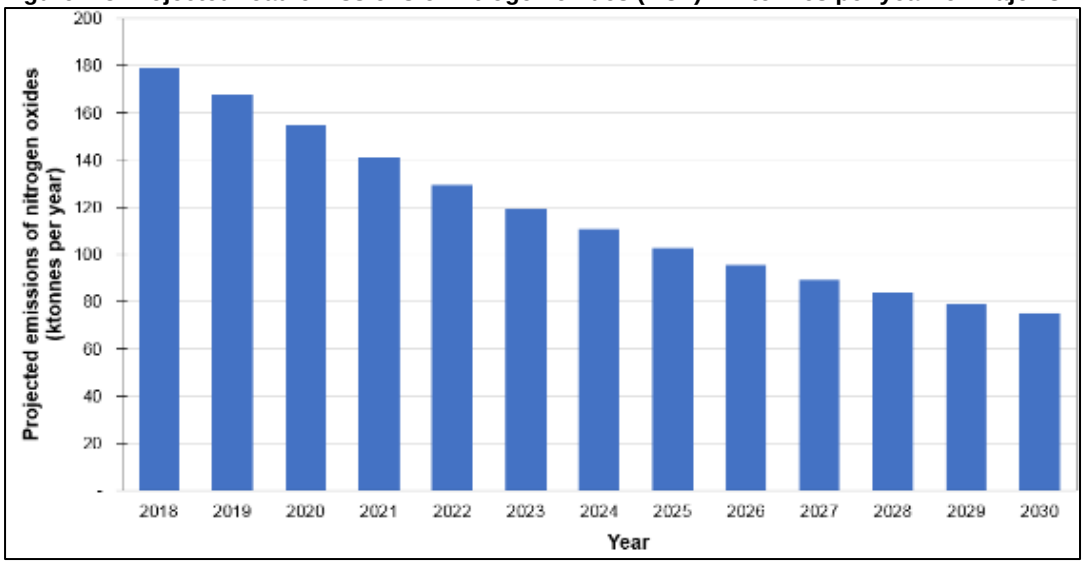


Figure 2-4 Overall NO_2 Trend across All Sites in Southern England and Southern Wales

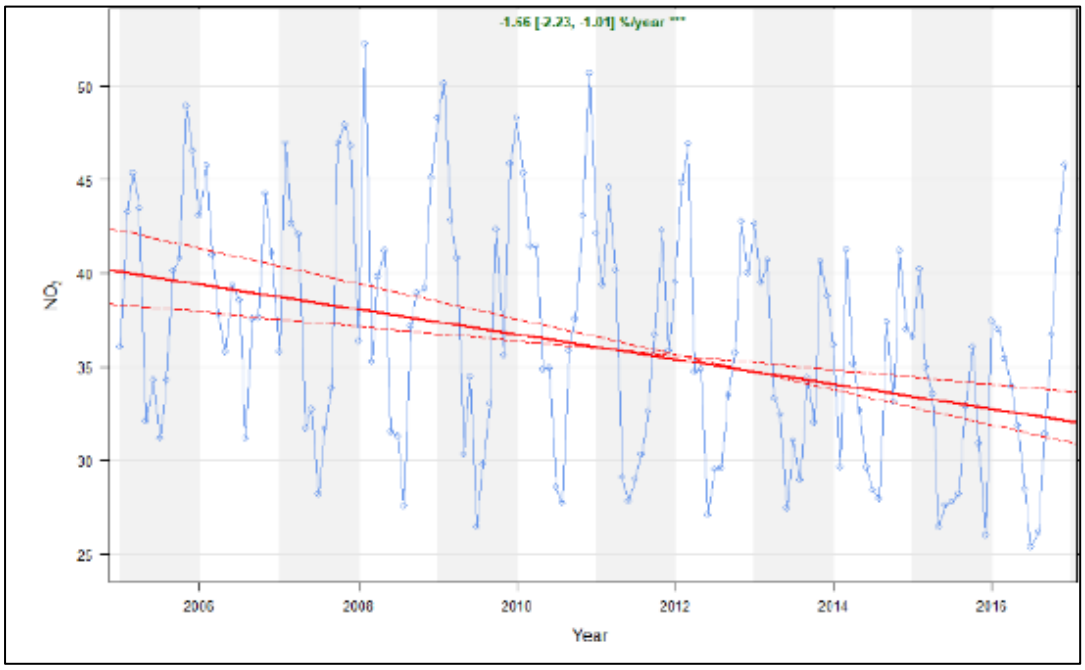


Figure 2-4 presents results for monitoring sites in Southern England and Wales. The plot shows the best fit linear trend line, together with the lines representing the 90% confidence interval. The figure demonstrates a 1.66% reduction per year.

[20] Nitrogen Dioxide and Nitrogen Oxides Trends in the UK 2005 to 2016, Air Quality Consultants, 2018.
http://www.aqconsultants.co.uk/AQC/media/Reports/NO2-NOx-Trend-Report.pdf

Hence, it is appropriate to base future decisions on anticipated reductions in baseline air pollutant concentrations with a high degree of confidence, as these are based on firm policy commitments, are technically achievable, and are already being observed in practice.

2.3.12 Sources of model uncertainty

There are a number of sources of model uncertainty inherent in this type of study, as discussed below:

- Uncertainties in the amount and distribution of development accounted for in the transport modelling. Household projections are revised from time to time and may vary from the values included in the transport model. Additionally, the transport model accounts for development growth and associated increases in background traffic within the core and buffer regions of the model (see Section 2.2). However, there will also be future development in the 'external' region which has not been modelled explicitly by the transport. Furthermore, the amount and distribution of development described in the PfE Plan will be subject to refinement as individual local plans are developed in further detail.
- Uncertainties introduced by the need to extend the transport model data to cover the full area of potential concern, particularly with gap-filling for some road links in the South Pennine Moors area.
- Uncertainties in the traffic model outputs on modelled road links, with regards to number of vehicles, type of vehicles and vehicle speed. The number of low emission vehicles in the future development scenarios may be underestimated if the UK government is successful in ending the sale of all conventional diesel and petrol cars and vans by 2030, which could result in a systematic over-estimation of future air quality impacts.
- Uncertainties in the real-world emissions from Euro 6/VI vehicles. Early real-world emission test results of Euro 6 vehicles indicate mixed results, ranging from vehicles which met the Euro 6 standards under real-world driving emissions to vehicles which displayed NOx emissions up to 12 times higher than the Euro 6 standard.[21,22] However, the increasing use of real-world emissions tests is likely to intensify pressure on vehicle manufacturers to comply with more stringent Euro standards. If real-world emissions do not decrease as anticipated, Greater Manchester may wish to review the current study in the context of updated emission parameters at some point in the future.
- Uncertainties in the background maps used to develop model adjustment factors and predict total modelled concentrations, with regards to other sources of pollution, such as industrial sources, domestic heating, port activity and forest fires.
- Uncertainties resulting from the lack of monitoring data for ammonia (NH_3). We have adopted a conservative approach in our analysis by using the higher of the two model adjustment factors we derived. This is expected to result in an over-prediction of the impacts associated with NH_3, including airborne NH_3 concentrations, nitrogen deposition and acid deposition. The incorporation of monitoring data for NH_3 would result in a more robust model.
- Uncertainties in the dispersion modelling process. These are accounted for so far as possible through the model verification process, but there inevitably remain some differences between modelled concentrations and the levels that would be measured in practice.

[21] The Real Urban Emissions Initiative, https://www.trueinitiative.org/.

[22] Emissions Analytics, EQUA Index, https://equaindex.com/equa-air-quality-index/.

2.4 Assessment of impacts on designated sites

The assessment of impacts on sites designated for nature conservation was carried out in a stepwise process, designed to comply with Natural England's emerging requirements and good practice for evaluation of the impacts of air pollution on nature conservation sites. The requirements from Natural England were developed primarily for the assessment of designated sites with European (or equivalent international) designation, namely Ramsar sites, Special Areas of Conservation (SACs) and Special Protection Areas (SPAs).

2.4.1 Consideration of whether the proposed development could give rise to emissions which are likely to reach a designated site

Established guidance from Natural England and Highways England indicates that protected sites falling within 200 metres of the edge of a road affected by a plan or project need to be considered further.

This assessment avoids the need for relying on the assumption of a 200-metre zone of influence by including dispersion modelling of emissions from all roads with modelled traffic flows within the Greater Manchester study area, whether or not they are located within 200m of a designated site. All potentially relevant designated sites located within 10km of Greater Manchester were included in the subsequent stage. This approach ensured a robust assessment without relying on a distance-based screening criterion, and provided a more detailed and complete assessment for each relevant designated site.

Designated sites located within the Greater Manchester study area are presented in **Figure 2-5**, Figure 2-6 and Figure 2-7.

Figure 2-5 Ramsar sites located within the Greater Manchester study area

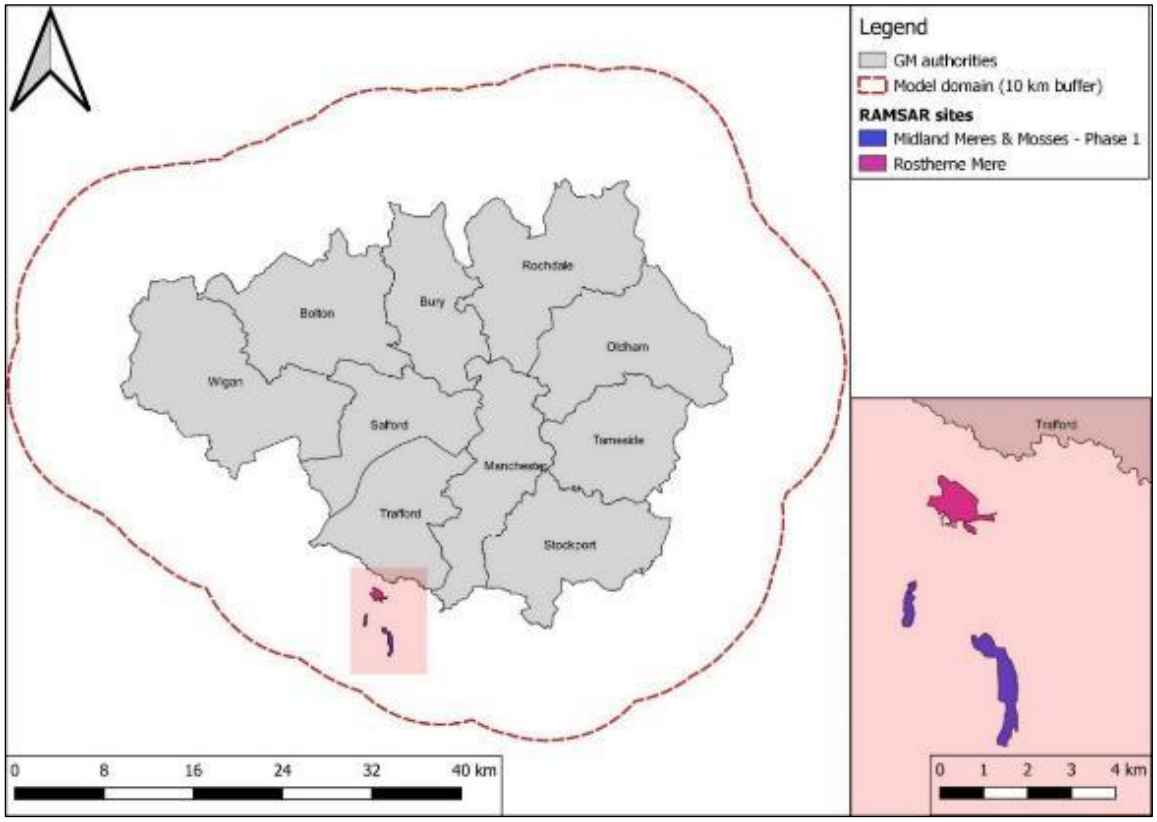


Figure 2-6 SPAs located within the Greater Manchester study area

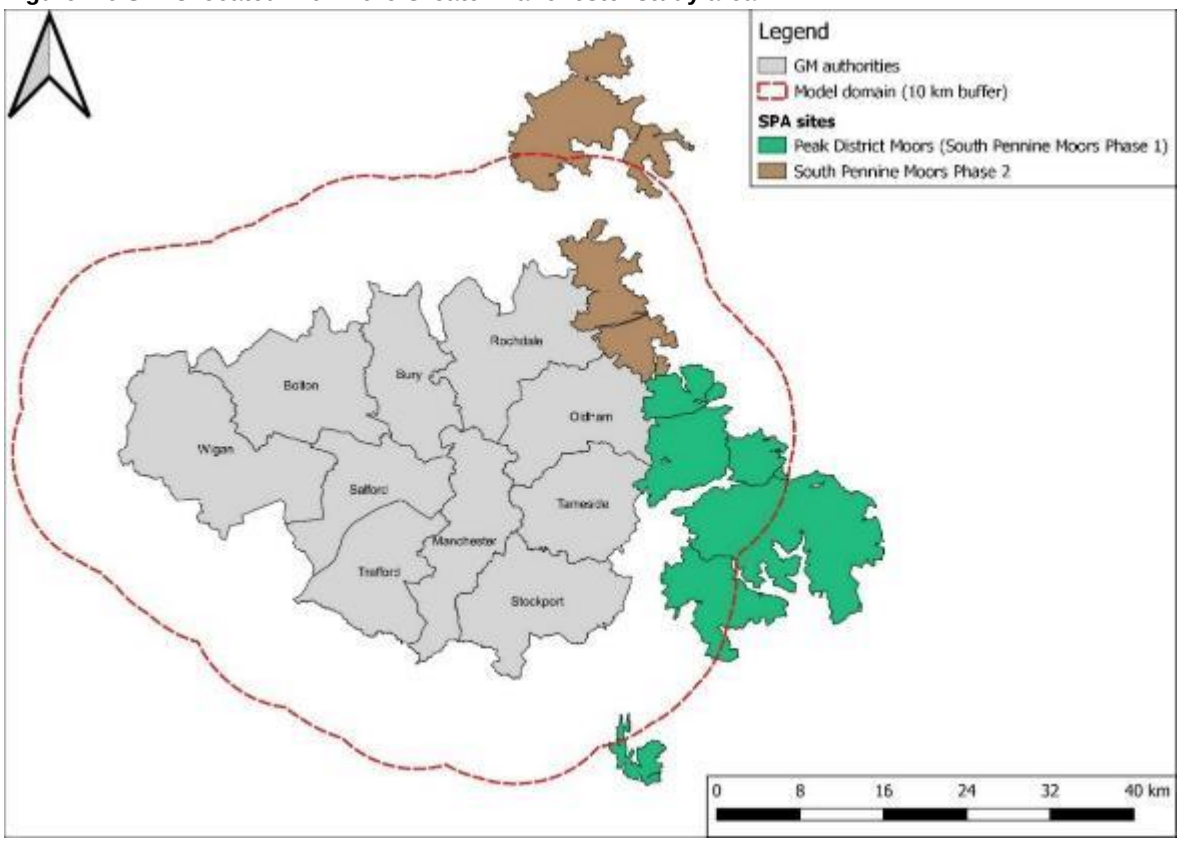
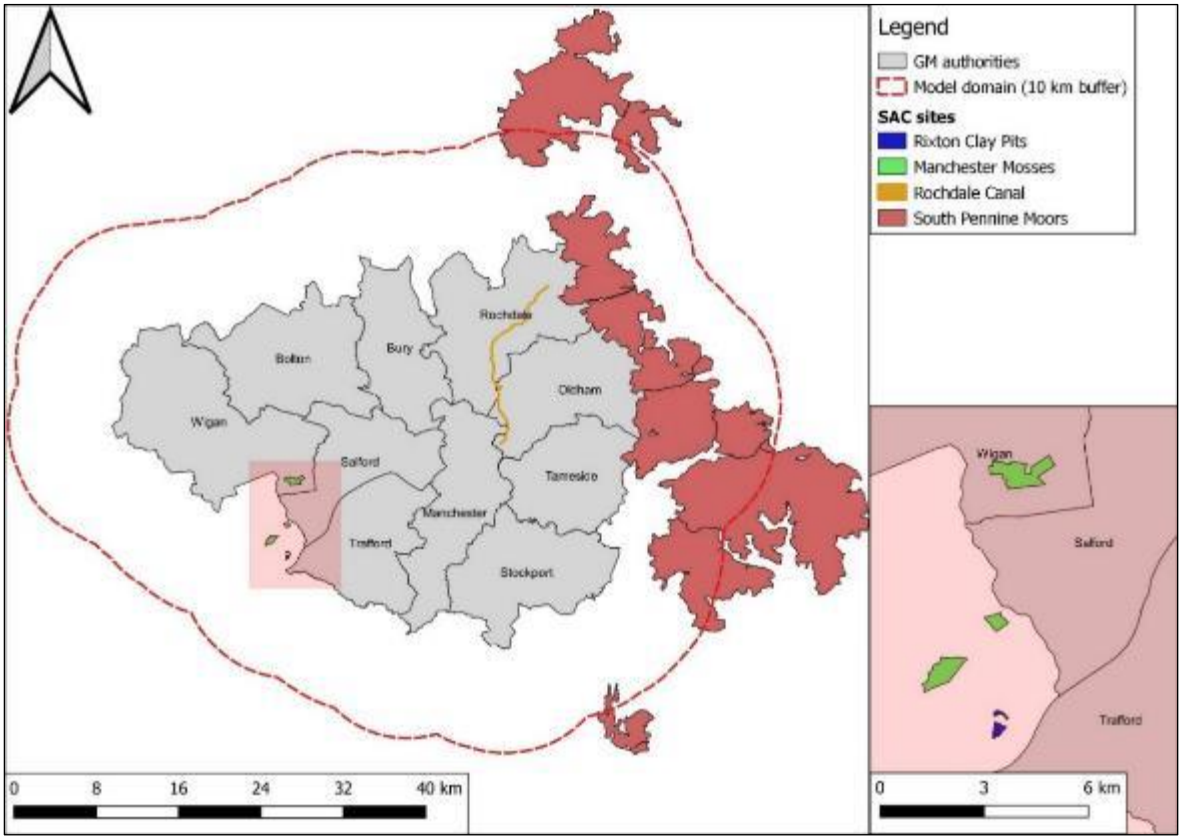


Figure 2-7 SACs located within the Greater Manchester study area



2.4.2 Consideration of whether the qualifying features of the designated site are sensitive to air pollution impacts

Consideration was given to whether the designated site contains qualifying features that are sensitive to the emissions associated with the planned development. For increased road traffic resulting from the proposed development, the associated emissions include nutrient nitrogen deposition, acid deposition, airborne oxides of nitrogen (NOx) and airborne ammonia (NH_3).

Site screening was carried out by searching for information on the UK Air Pollution Information System (APIS, www.apis.co.uk) and identifying potential sensitivity to air pollution impacts. At this stage, the spatial distribution of qualifying features within each designated site was not considered. If a potentially sensitive feature was identified at the designated site, as determined by APIS listing a critical load or critical level for at least one pollutant associated with road traffic at that site, it was included in the subsequent stages of the study. Otherwise, the site was screened out of requiring further assessment. The results of this analysis are summarised in Table 9.

Table 9 European-designated sites: Assessment of sensitivity to emissions from road traffic

Site name	Ramsar site code	SPA site code	SAC site code	Does the site contain qualifying features that are sensitive to emissions from road traffic?
Peak District Moors (South Pennine Moors Phase 1) (SPA)		UK9007021		Yes – include in study
South Pennine Moors Phase 2 (SPA)		UK9007022		Yes – include in study
Manchester Mosses (SAC)			UK0030200	Yes – include in study
Rixton Clay Pits (SAC)			UK0030265	Yes – include in study
Rochdale Canal (SAC)			UK0030266	Yes – include in study
South Pennine Moors (SAC)			UK0030280	Yes – include in study
Midland Meres & Mosses Phase 1 (Ramsar)	UK11043			Yes – include in study
Rostherne Mere (Ramsar)	UK11060			Yes – include in study

2.4.3 HRA Stage 1: Assessment of air quality impacts of the development against screening thresholds

The next step was to use the dispersion modelling results to predict the air quality impacts associated with changes in traffic flow resulting from allocations in Greater Manchester. For each set of model results (nutrient nitrogen deposition, acid deposition, airborne NOx and airborne NH_3), the contribution attributable to the Greater Manchester 2025 allocations was calculated as follows:

(2025 Contribution from Allocations) = (2025 With Plan) – (2025 Reference Year)

Similarly, the contribution to the Greater Manchester 2040 allocations was calculated as follows:

(2040 Contribution from Allocations) = (2040 With Plan) – (2040 Reference Year)

(2040 Contribution from Allocations with Link Road) = (2040 With Plan and Link Road) – (2040 Reference Year)

The contribution attributable to the scenario was then compared to a screening threshold, where the screening threshold for each pollutant / habitat combination was set to 1% of the applicable Critical Load or Critical Level. This approach is supported by online guidance published by Defra and the Environment Agency,[23] a position statement published by the Institute of Air Quality Management (IAQM), [24] and guidance previously received from Natural England.[25]

According to the position statement published by the IAQM, the 1% threshold *"was originally set at a level that was considered to be so low as to be unequivocally in the 'inconsequential' category. In other words, this can be reasonably taken to mean that an impact of this magnitude will have an insignificant effect. This would be determined as part of the HRA screening stage. Such a conclusion would eliminate the requirement to proceed to 'appropriate assessment.'*[24] The position statement indicates that the 1% criterion is intended to be a threshold below which the impact should be considered insignificant and screened out; impacts above 1% do not necessarily correspond to the onset of damage to a designated site. Impacts above 1% should be treated as potentially significant and undergo further detailed assessment.

In view of this guidance, a threshold of a contribution of 1% of the applicable Critical Load or Critical Level was used to screen out any areas where short-term development in Greater Manchester, alone or in-combination, would have an insignificant impact on the relevant designated site.

2.4.3.1 Consideration of in-combination effects

Guidance from Natural England[26], developed following the requirements of the Wealden Judgment, advises that the screening thresholds should be applied with consideration to impacts from individual proposed developments and with consideration to in-combination effects.

The NOx pollutant background maps[27] used in the air dispersion model account for existing industrial activity, including large combustion installations, airports and shipping activity. Known industrial sources are modelled explicitly in the baseline year of the background maps, and future-year background maps are derived by incorporating datasets from the UK Department for Business, Energy & Industrial Strategy (BEIS) regarding projected energy and economic activity data for various industrial sectors. The background maps therefore account for future growth in industrial sector emissions, within the limits of current government growth projections.

The dispersion modelling results for the GM study area account for air quality impacts associated with road traffic emissions from the allocations in Bolton, Bury, Manchester, Oldham, Rochdale, Salford, Tameside, Trafford, and Wigan. HRA studies from neighbouring authorities were searched in order to extract relevant information concerning other sources of in-combination effects; the results of this exercise are summarised within the sub-sections of this report concerning each designated site (see individual site sub-sections in section 3).

The National Infrastructure Planning website[28] was investigated to identify any potentially relevant major industrial developments in the study area. This highlighted three potentially relevant projects:

[23] Department for Environment, Food and Rural Affairs and Environment Agency, "Air emissions risk assessment for your environmental permit", February 2016.

[24] Institute for Air Quality Management, "Position Statement: Effect of Air Quality Impacts on Sensitive Habitats," January 2016

[25] Email communication with Natural England, 12/01/2018.

[26] Natural England, "Natural England's approach to advising competent authorities on the assessment of road traffic emissions under the Habitats Regulations", June 2018.

[27] https://uk-air.defra.gov.uk/data/laqm-background-home

[28] https://infrastructure.planninginspectorate.gov.uk/

- A556 Knutsford to Bowdon improvement scheme. This Highways England scheme is a 4 mile (6.5 km) dual carriageway road from M6 Junction 19 at Knutsford to M56 Junction 7 at Bowdon. This new length of highway was first open to public traffic on 6 March 2017[29], and its effects would therefore already be accounted for in all of the scenarios modelled as part of this study.
- Keuper Gas Storage Project. This project, proposed by Keuper Gas Storage Limited (KGSL), is for the development of a new gas storage facility and associated development, adjacent to existing gas storage facilities. The proposed site is located approximately 2.5 km west of Byley, the nearest village, and 9 km south west of Tatton Meres SSSI, which is part of the Midland Meres and Mosses Phase 1 Ramsar site. A Development Consent Order was granted by the Secretary of State for Business, Energy and Industrial Strategy in March 2017. KGSL has begun the process of starting development of the project[30]. Potential in-combination impacts from this project on the Midland Meres and Mosses Phase 1 Ramsar site are considered in Section 3.2.
- A57 Link Roads (previously known as the Trans Pennine Upgrade Programme). The aim of this proposed Highways England scheme is to improve connectivity between Manchester and Sheffield, by upgrading the Westwood roundabout new Sheffield and creating two new link roads connected to the A57 near Mottram Moor[31]. If planning permission is secured, construction of the new link roads could begin in spring 2023. Potential in-combination impacts from this scheme on the Peak District Moors (South Pennine Moors Phase 1) SPA and the South Pennine Moors SAC are considered in Section 3.3 and Section 3.7 respectively.

The potential for in-combination impacts arising from the construction and operation of High Speed 2 (HS2) was also considered. There were no identified impacts on designated habitat sites, attributed to air pollution, included in any of the available working drafts of the HS2 Phase 2b Environmental Statements.[32] No quantified impacts on air quality are provided in any of the available documents, in the context of designated habitat sites. As such, the air quality impacts from traffic, following the operation of HS2, on designated habitat sites are either considered as negligible, or have not yet been considered and therefore cannot be included in this HRA. A summary of the information provided within various HS2 Phase 2b Environmental Statements for the following sites, is provided in the chapter for each site: Manchester Mosses (SAC), Midland Meres and Mosses Phase 1 (Ramsar), Rixton Clay Pits (SAC), Rochdale Canal (SAC), and Rostherne Mere (Ramsar). There was no mention of the following designated sites in any of the HS2 Phase 2b Environmental Statement documentation: Peak District Moors (South Pennine Moors Phase 1 SPA), South Pennine Moors SAC, and South Pennine Moors Phase 2 SPA.

Other new industrial plans and projects seeking planning permission will need to carry out their own in-combination assessment of effects, where applicable, as part of the HRA process.

2.4.4 HRA Stage 2: Appropriate assessment

Where the screening analysis indicated that Likely Significant Effects (LSEs) on a designated site could not be ruled out, further analysis must be undertaken in the form of an HRA Stage 2 Appropriate Assessment. This report includes some preliminary results and a description of next steps for HRA Stage 2 Appropriate Assessment.

[29] Highways England, "Notice: A556 Knutsford to Bowdon improvement scheme", https://www.gov.uk/government/publications/part-i-claim-a556-knutsford-to-bowdon-improvement-scheme/a556-knutsford-to-bowdon-improvement-scheme, March 2017.

[30] INEOS Enterprises, "Keuper Gas Storage Project", http://www.kgsp.co.uk/, visited 01/07/2021.

[31] Highways England, "A57 Link Roads", https://highwaysengland.co.uk/our-work/north-west/a57-link-roads/, 30/03/2021.

[32] High Speed Two (HS2) Limited, HS2 Phase 2b working draft Environmental Statement, https://www.gov.uk/government/consultations/hs2-phase-2b-working-draft-environmental-statement , last updated June 2019.

2.4.4.1 Consultation

Consultation, via meetings and correspondence, was undertaken with Natural England during the screening stage of this HRA (HRA Stage 1). This has helped to determine which potential effects require more detailed, appropriate assessment provided by HRA Stage 2, as presented in this report. Confirmation of the approaches used in Stage 2 will also been sought from Natural England as the appropriate assessment is carried out.

2.4.4.2 NOx forecast background maps

For some designated sites considered in this HRA, forecast NOx concentrations were included in the Stage 2 appropriate assessment. These air pollution concentration maps are published by Defra and the Devolved Administrations.[33] Their main purpose is to provide estimates of background concentrations for specific pollutants, which can then be used in air quality assessments to better understand the contribution of local sources to total pollutant concentrations. The background maps and related tools are updated periodically by Defra due to updates to the underlying data, including emissions factors.

The total concentration of a pollutant is a combination of those from local emission sources (such as roads) as well as those transported into an area from further away (by the wind). If all the local sources were removed, the concentration remaining would be that from further away – this component is defined as the 'background concentration'. In many situations, the background concentration represents a significant proportion of the total pollutant concentration.

The sources included in background maps for each pollutant can be found in the 'Background Maps User Guide' published by Defra.[34] For NOx, these include: motorway sources; trunk A and primary A road sources; minor roads and cold start sources; industry sources (e.g. combustion; energy production, fossil fuel extraction); domestic sources (e.g. heating); aircraft sources; rail sources; 'other' sources (e.g. ships, off-road, other); and point sources. The source sectors are split into those emitted from within a grid square and those entering the grid square from outside. This allows the individual sectors to be subtracted from the total background, if a more detailed local assessment is required for that sector.

The UK background maps are available from UK-AIR.[35] Background pollution maps at 1km x 1km resolution are modelled by European Union (EU) Member States as part of ambient air quality directives. The modelling methodology is based on the UK Pollution Climate Mapping (PCM) approach, which is used to model the annual mean background and roadside concentrations for the whole of the UK. These background pollution maps form the basis of the local authority background maps.

The most up-to-date background maps use 2018 as the reference year and are based on monitoring and meteorological data for 2018. The main source of input data is the UK National Atmospheric Emissions Inventory (NAEI) 2017. Emissions projections for non-road traffic sources in the 2018 reference year background maps are based on energy projections from the Department for Business, Energy and Industrial Strategy (BEIS). COPERT 5 NOx emission factors for road emissions are taken from the European Environment Agency (EEA). Outside London, a set of traffic activity projections from the Department for Transport (DfT) are used, whereas inside London bespoke vehicle fleet information for London provided by Transport for London (TfL) is used.

Various Supporting Tools and Processes are available to support the use of the air pollution background concentration maps in air quality assessment. These include "NO_2 Adjustment for NOx Sector Removal"

[33] https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html

[34] https://laqm.defra.gov.uk/documents/2015-based-background-maps-user-guide-v1.0.pdf

[35] https://uk-air.defra.gov.uk/data/laqm-background-home

(e.g. for removing road traffic sectors from NOx and NO_2 background maps) and "NOx to NO_2 Calculator" (e.g. to derive NO_2 from NOx when NOx is predicted by modelling emissions from roads).

The maps are based on a combination of validated emission inventory data, validated dispersion modelling methods, and quality assured national air quality monitoring data. As well as being used for Habitats Regulations Assessments, the maps and their supporting data are used as inputs to national and international policy development, and to demonstrate compliance with national and European regulatory requirements, and with international treaty obligations. Consequently, the data in the maps are considered to be robust and not subject to significant scientific doubt. The maps are particularly robust when used to determine background levels away from individual sources, and when considering pollutants other than airborne PM_{10} and $PM_{2.5}$, as is the case for this study.

When considering forward projections to 2025 and 2030, some additional uncertainty is introduced. In order to make these projections, the technical analysis process takes into account:

- BEIS annually updated Energy Projections;
- National (Emission Factor Toolkit) and European (COPERT) projections for vehicle exhaust emissions;
- Traffic projections produced by Department for Transport and Transport for London; and
- Foreseeable changes in industrial activity and emissions, having regard to European directives on industrial process emissions.

As with the mapped data, all these inputs to the projections are also used as inputs to national and international policy development, and to ensure future compliance with national and European regulatory requirements, and international treaty obligations. Consequently, the data in the mapped projections are considered to be robust and not subject to significant scientific doubt.

2.4.4.3 Conservation objectives

The Habitats Regulations require that the Appropriate Assessment is of "the implications for the site in view of that site's conservation objectives." The development of conservation objectives is required by the 1992 'Habitats' Directive (92/43/EEC).

The generic conservation objectives coving all the European sites assessed in this report are:

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 and habitats of qualifying species;*
- *The structure and function (including typical species) of qualifying natural habitats;*
- *The structure and function of the habitats of qualifying species;*
- *The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely;*
- *The populations of qualifying species; and*
- *The distribution of qualifying species within the site.*

Site-specific conservation objectives are summarized for each designated site in Section 3.

2.5 Limitations

Information provided by third parties, including publicly available information and databases, is considered correct at the time of publication. Due to the dynamic nature of the environment, conditions may change in the period between the preparation of this report, and the beginning of the development of the allocations considered in this report.

The HRA has been undertaken in as detailed a way as possible, using all available data sources where they exist. However, the conclusions drawn from this is necessarily limited by the age, type, coverage and availability of data.

Any uncertainties and the limitations of the assessment process are acknowledged and highlighted.

3. Assessment of air quality impacts on designated sites

3.1 Manchester Mosses SAC (UK0030200)

3.1.1 Background information and qualifying features

Underlying Sites of Special Scientific Interest (SSSI): Astley & Bedford Mosses SSSI, Holcroft Moss SSSI, Risley Moss SSSI.

Qualifying and notifiable features associated with this site comprise: **7120 Degraded raised bogs still capable of natural regeneration.**

The Site Improvement Plan (SIP130) states that nitrogen deposition has been identified as a threat to this European site.

The conservation objectives stated for this are to 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.

3.1.2 HRA Stage 1: Assessment of air quality impacts against screening thresholds

This section comprises the outcome of the screening assessment described in Section 2.4.

Table 10 summarizes all of the critical loads for nutrient nitrogen deposition (kgN/ha-year) and acid deposition (kEq/ha-year), as well as the critical levels for airborne ammonia (µg/m^3), applicable to this designated site. The most stringent critical load or critical level (CL) for each pollutant is indicated in bold. The critical level for airborne NOx is set at 30 µg/m^3 across all designated sites.

Table 10 Minimum Critical Load and Critical Level (CL) values and associated sensitive features for Manchester Mosses SAC

Sensitive feature	Minimum nutrient nitrogen deposition CLs (kgN/ha-year)	Minimum acid deposition CLs (MinCLMaxN, kEq/ha-year)	Minimum airborne NH_3 CLs (µg/m^3)
Degraded raised bogs still capable of natural regeneration	**5**	**0.564**	**1**

Consideration of in-combination effects

The Manchester Mosses is contained within the GM study area. The dispersion modelling results for the GM study area account for air quality impacts associated with road traffic emissions from the allocations in Bolton, Bury, Manchester, Oldham, Rochdale, Salford, Tameside, Trafford, and Wigan.

The Habitats Regulations Assessment[36] for the emerging Warrington Borough Council Local Plan noted that the M62, which passes adjacent to Manchester Mosses, is a strategic route and that "all policies that promote new housing and employment in the borough will collectively result in an increase in vehicle movements on the M62 past the SAC". The HRA concluded that:

[36] Warrington Borough Council, "Proposed Submission Version Local Plan: Habitat Regulations Assessment," 15 March 2019

- Traffic modelling for the Local Plan HRA indicates that the Local Plan housing and employment growth, coupled with the M6 Smart Motorways project being delivered by Highways England, is likely to result in a net increase in two-way traffic on the stretch of M62 past Holcroft Moss of c. 45,000 AADT (i.e. c. 30% compared to the end of plan period without the Local Plan growth or the Highways England scheme).
- Air quality modelling undertaken for the HRA indicates that at the closest area of bog to the M62 within Holcroft Moss (approximately 64m from the motorway) total nitrogen deposition rates are forecast to be approximately 0.1 kgN/ha/yr higher in 2036 with the Local Plan than they would be without the Local Plan (i.e. the difference between a deposition rate of 18.44 kgN/ha/yr without the Local Plan and 18.54 kgN/ha/yr with the Local Plan).
- There is also the need to ensure that project-level analysis of potential air quality impacts (and if necessary, project-level mitigation) is undertaken for significant sources of additional traffic past the M62 at Manchester Mosses SAC. This will require particular projects that are likely to result in a substantial increase in traffic flows to devise project-specific mitigation beyond the strategic air quality improvement measures being included in the Local Plan. If the change in flows on a the M62 past Manchester Mosses SAC due to a given scheme is likely to exceed 200 Heavy Duty Vehicles per day or 1,000 Average Annual Daily Traffic then this would be the trigger for project-level air quality modelling and, depending on the outcome of that modelling, the need for scheme-specific mitigation. Warrington Borough Council incorporated this text to Policy ENV8, as a policy mechanism to enable the delivery of measures associated with new development to ensure that any contribution to atmospheric nitrogen deposition (and thus acid deposition) is minimised.

The Habitats Regulations Assessment[37] for the Warrington Borough Council Draft Updated Proposed Submission Version Local Plan provides an update on the impacts described above, as a result of the changes to the Local Plan. In the latest draft of the updated Warrington Local Plan, agricultural and industrial sources were stated as being included in the assessment of NOx and ammonia concentration and nitrogen deposition, though no details were given.

- The closest location of Holcroft Moss SSSI (part of the Manchester Mosses SAC) to roads, that is likely to be affected by the Warrington Local Plan, is adjacent to the south side of the M62 between Junctions 11 and 12. The HRA and Appropriate Assessment for the latest draft of the updated Warrington Local Plan determined that developments are likely to have a significant effect at this location, as follows:
  - An increase in nitrogen deposition of 0.18 kgN/ha/yr by 2038 from a modelled baseline of 33.23 kgN/ha/yr to 33.41 kgN/ha/yr from both NOx and NH_3 sources (3.6% of the lower critical load value);
  - An increase in ammonia concentration of 0.04 µg/m^3 (4% of the critical level for the site);
  - An increase in acid deposition of 0.013 keq/ha/yr (2.3% of the critical load for the site). The contribution of the Local Plan drops below 1% of the critical load after a distance of 180m from the road.[37]
- Modelling of the Draft Updated Proposed Submission Version Local Plan forecasts that other developments (M62 Smarter Motorways scheme and surrounding Local Plans) will contribute:
  - An increase in nitrogen deposition of 2.90 kgN/ha/yr;
  - An increase in ammonia concentration 0.83 µg/m^3 (80% of the critical level);
  - An increase in acid deposition to 2.59 kEq/ha/yr (well above the critical load), with the total acid deposition (taking account of all sources) deteriorating from 2.37 keq/ha/yr in

[37] Warrington Borough Council, "Draft Updated Proposed Submission Version Local Plan Habitat Regulations Assessment," December 2021

the theoretical situation of no traffic growth by 2038, to 2.59 kEq/ha/yr with all traffic growth.[37]

- At high background rates of nitrogen deposition for bog habitats, the Warrington Local Plan HRA indicates that an additional dose of 3.3 kgN/ha/yr is typically required to reduce species richness by the equivalent of 1 species.[38] The modelling from the latest draft update of the Warrington Local Plan forecasts that when all growth (including in-combination effects) is added, nitrogen deposition at the nearest area of the habitat will increase by 3.1 kgN/ha/yr (62% of the critical load)**.** [37]

- It is argued that with the traffic measures in the Warrington Local Plan, the NOx emissions on the M62 will reduce as AADT is anticipated to reduce by 2% by 2038 (compared to a 2016 baseline). The UK government's policy to end the sale of new petrol and diesel cars and vans from 2030 is also expected to considerably accelerate this reduction to below the 1% critical load for the habitat by 2040.[37]

- There is no evidence in the updated draft of the Warrington Local Plan that separates out the in-combination effects of different plans and projects (such as the M62 Smart Motorway Scheme and each separate surrounding Local Authority's Local Plans) into their discrete contributions.[37]

An Environmental Assessment[39] for the M62 Smart Motorway Scheme (Junctions 20 to 25) states that the proposed scheme will not have likely significant air quality effects on any designated sites, however Manchester Mosses and Holcroft Moss were not considered explicitly.

An Environmental Assessment Report for the M6 Smart Motorways Scheme between Junctions 21a to 26 included an assessment of air quality effects at Holcroft Moss SSSI. A 2015 baseline was used with modelled projections for 2020.

- The "closest point to (the) road (M62)" was identified to be 19m from the carriageway. At this point, the forecast impact was:
    - An increase in nitrogen deposition of 0.3 kgN/ha/y; and
    - An increase in NOx concentration of 5.6 µg/m^3.[40]
- From the modelled profile, the point 59m from the road (most analogous to the point included in the modelling for the Warrington Local Plan, identified as "the closest area of bog to the M62 within Holcroft Moss") for the same base year and projected year, was forecast to experience the following impacts:
    - An increase in nitrogen deposition of approximately 0.1 kgN/ha/y; and
    - An increase in NOx concentration of approximately 2.4 µg/m^3.[41]
- The assessment concluded there are no Likely Significant Effects on any European Designated Habitat Sites during operation of the Proposed Scheme. It is also forecast to have a negligible effect on annual average daily traffic movements on the M62, resulting in a neutral contribution to the overall 'in combination' effect of the Northwest Smart Motorways schemes together.[42]

[38] Caporn, S., Field, C., Payne, R., Dise, N., Britton, A., Emmett, B., Jones, L., Phoenix, G., S Power, S., Sheppard, L. & Stevens, C. 2016. Assessing the effects of small increments of atmospheric nitrogen deposition (above the critical load) on semi-natural habitats of conservation importance. Natural England Commissioned Reports, Number 210.

[39] Highways England, "Smart Motorways Programme Environmental Assessment Report M62 Junctions 20 to 25 (Preliminary Design – PCF Stage 3)", July 2020

[40] AECOM-WSP, "M6 Junction 21A to 26 Smart Motorway: Environmental Assessment Report", November 2020, Volume 1

[41] AECOM-WSP, "M6 Junction 21A to 26 Smart Motorway: Environmental Assessment Report Appendices", November 2020, Volume 3

[42] AECOM-WSP, "M6 Junction 21A to 26 Smart Motorway: Environmental Assessment Report", November 2020, Volume 1

- From this and the Warrington Local Plan, the effects of the operation of the M6 Smart Motorways Scheme on Holcroft Moss SSSI due to air pollution pathways appear to be negligible.

In the Stockport Core Strategy documentation,[43] an amber rating was assigned to Manchester Mosses for potential atmospheric pollution. In this documentation, an amber rating corresponds to "minor impacts with some level of potential significance – policy writers noted issues for policy development."

Manchester Mosses SAC is considered in HRA documentation[44] for the Cheshire East Council Local Plan Strategy 2010-2030. The HRA report noted that "The potential for adverse effects on Manchester Mosses SAC due to air pollution from increased vehicles associated with the potential site allocations using the local road and motorway network is unlikely. This is due to the distance of the SAC from the main road network, as pollutant levels can be expected to fall substantially at a distance less than 50m from the source and can be expected to fall to background levels at a distance of more than 200m (DMRB LA 105)." The report concluded that there would be no Likely Significant Effects for air quality.

The HRA documentation for the St. Helens Borough Local Plan 2020-2035[45] indicated that "Due to the distance of the relevant part of the SAC (Holcroft Moss) from the borough boundary (6.5km) and the evidence that the route plays a small role in journeys to work for Halton residents, it is therefore considered that the Plan will not result in adverse effects alone upon the integrity of the SAC as a result of atmospheric pollution. However, there is potential for impacts from the Plan's growth proposals, in combination with those of surrounding plans and projects (particularly those in the Greater Manchester area), to result in a likely significant effect."

The potential for in-combination impacts arising from the construction and operation of High Speed 2 (HS2) was also considered. The following information was provided within HS2 Phase 2b Environmental Statement Volume 3: "*A study to inform a HRA undertaken in 2012 concluded that the route alignment that has now been adopted for the Proposed Scheme had the potential to cause significant effects to the Holcroft Moss element of this SAC due to its proximity and the sensitivity of the site to hydrological changes. Further assessment will be undertaken prior to submission of the hybrid Bill, and an appropriate design will be developed.*"[46] As there is no information available regarding these potential impacts until the further assessment has been completed, there is no need to further consider the potential for in-combination impacts of HS2 with the Places for Everyone plan in relation to Manchester Mosses (SAC).

Screening results

Table 11 compares the maximum modelled contribution of the Greater Manchester Scenarios to the lowest applicable CL. Values highlighted in yellow exceed the 1% screening threshold. This screening exercise represents a precautionary approach, as it assumes that the most sensitive qualifying features (with the lowest CLs) are present in the areas with the highest modelled contribution (typically adjacent to the busiest road).

The screening results indicate that the 2025 contribution from allocations is predicted to be well below the 1% screening threshold, with maximum modelled values of approximately 0.1% of the CL. However, three pollutants (NH_3, nitrogen and acid deposition) exceeded the 1% screening threshold for 2040 contribution from allocations. All four pollutants exceed the 1% screening threshold for the 2040

[43] Stockport Metropolitan Borough Council, "Local Development Framework Core Strategy DPD: Habitats Regulations Assessment Screening Report," June 2010

[44] Cheshire East Local Plan Site Allocations and Development Policies Document, "Habitats Regulations Assessment: Revised Publication Draft," Final Report (August 2020)

[45] St Helens Borough Local Plan 2020-2035 – Submission Draft, "Habitats Regulations Assessment," December 2018

[46] High Speed Two (HS2) Limited, High Speed Rail (Crewe to Manchester and West Midlands to Leeds) Working Draft Environmental Statement Volume 3: Route-wide effects, October 2018.

contribution from allocations with link road. On the basis of available evidence and agreed thresholds, Likely Significant Effects from air quality impacts cannot be ruled-out, either for the GM "With Plan" scenarios in isolation or in-combination with anticipated development from neighbouring local authorities. Therefore, a Stage 2 Appropriate Assessment is required, with the results provided in the next subsection of this report.

Table 11 Screening results based on dispersion modelling of Greater Manchester Scenarios:

	Airborne NH_3	Airborne NOx	Nutrient nitrogen deposition* Grassland	Acid deposition* Grassland
CL	1	30	5	0.564
Units	µg/m^3	µg/m^3	kgN/ha-year	kEq/ha-year
2025 contribution from allocations				
Maximum modelled contribution	0.00079	0.036	0.0068	0.00049
% of CL	0.0079	0.12	0.14	0.086
2040 contribution from allocations				
Maximum modelled contribution	0.033	0.29	0.19	0.014
% of CL	3.3	0.96	3.8	2.4
2040 contribution from allocations with link road				
Maximum modelled contribution	0.18	1.7	1.1	0.076
% of CL	18	5.9	21	13

* Natural England have advised that grassland deposition rates should be used for this site.[47]

3.1.3 HRA Stage 2: Appropriate Assessment – preliminary considerations

All pollutants were identified as exceeding 1% of their respective critical loads and critical levels where a precautionary approach was undertaken, considering the possible presence of both qualifying feature habitats within the areas of identified exceedances. As an initial consideration for Stage 2 Appropriate Assessment, this section considers the modelled contributions within the context of existing and forecast background pollution levels for the SAC.

Figure 3-8 provides an overview of the Manchester Mosses SAC, with its component SSSIs labelled for ease of reference.

3.1.3.1 Airborne NOx

Figure 3-9 illustrates the areas where the modelled contribution from the GM "With Plan" scenarios are predicted to exceed 1% of the CL.

Current background levels of NOx do not exceed 30 µg/m^3 within the Manchester Mosses SAC, and it is anticipated that future concentrations of NOx will decrease significantly from current levels. As discussed in the methodology section, the NOx background maps are produced by Defra on a periodic basis and are considered the best available information for future background levels of airborne NOx. There is no basis for reasonable scientific doubt in the forecast NOx levels. Additionally, the background map for the year 2030 (the latest year for which a NOx background map is available) is considered

[47] Advice provided by Natural England at a meeting with Greater Manchester CA, Ricardo Energy & Environment and others, and follow-up emails, July 2021

likely to over-predict NOx concentrations in 2040, which is the end year for the GM “With Plan” scenarios.

Figure 3-10 presents the total modelled NOx concentration for the 2040 GM “With Plan and Link Road” Scenario. These concentrations were calculated by adding the “2040 contribution from allocations with link road” to the 2030 NOx background maps. The total NOx concentration is predicted to be less than 15 µg/m^3 (50% of the CL) throughout the SAC.

On the basis of available evidence and agreed thresholds, there are no adverse effects on this SAC site arising from increased airborne NOx concentrations associated with any of the GM “With Plan” development scenarios, alone or in combination with other plans and projects, and therefore no further assessment is required for NOx.

Figure 3-8: Manchester Mosses overview

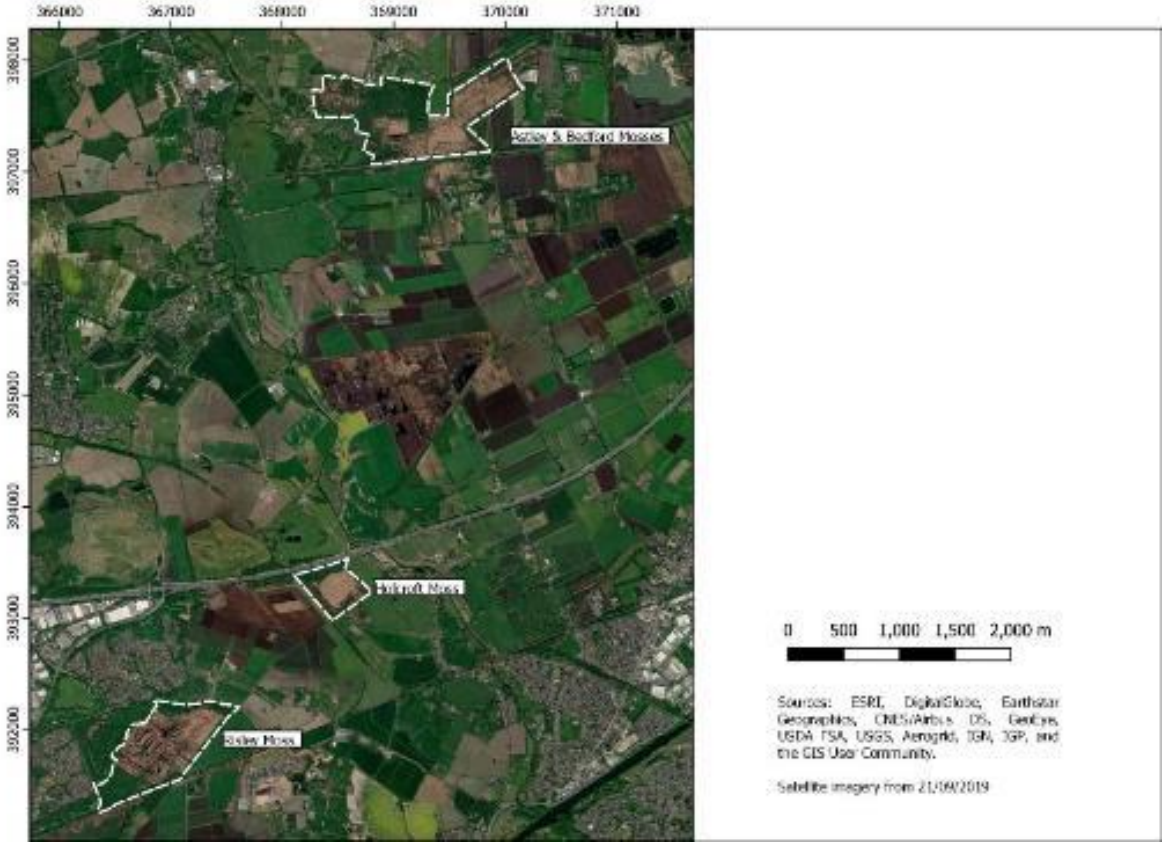
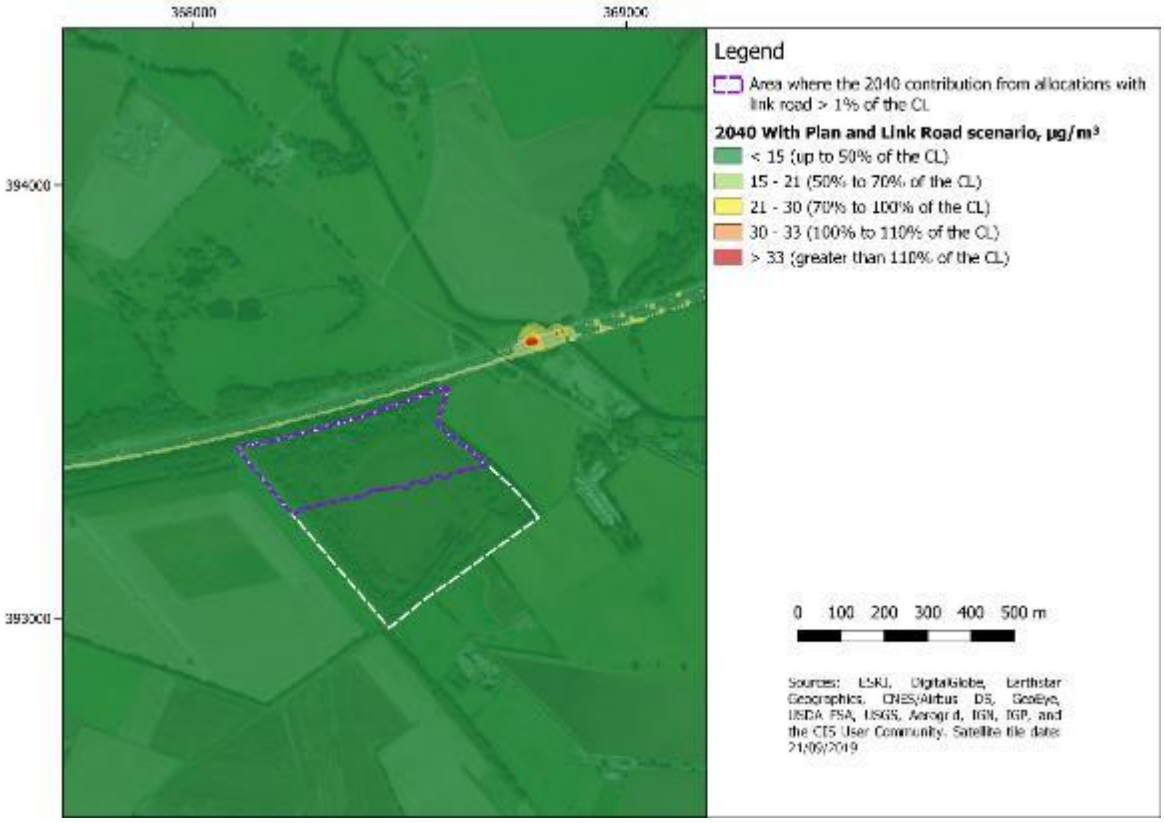


Figure 3-9 Overview of screening results for oxides of nitrogen (NOx) at Manchester Mosses SAC

Figure 3-10 Total modelled concentration for NOx at Manchester Mosses SAC, using background NOx concentrations for 2030; for 2040 contributions from allocations with link road



3.1.3.2 Airborne NH_3

Figure 3-11 illustrates the areas where the modelled contribution from the GM “With Plan” scenarios are predicted to exceed 1% of the CL.

Figure 3-12 and Figure 3-13 present the total modelled NH_3 concentration for the two 2040 GM “With Plan” scenarios. These concentrations were calculated by adding the “2040 contribution from allocations” and “2040 contribution from allocations with link road” to the 2017-2019 NH_3 background concentrations from APIS. For both scenarios, the total NH_3 concentration is predicted to be greater than 1 µg/m^3 (100% of the CL) throughout the SAC, due to background NH_3 concentrations that currently exceed the CL. Adverse effects from NH_3 on this SAC cannot be ruled out on the basis of a comparison of the total predicted concentration with the critical level. An Appropriate Assessment for NH_3 impacts on this site was undertaken, in consultation with Natural England. The results of this assessment are summarised in Section 3.1.3.5, and the detailed modelling report is presented in Appendix 2.

Figure 3-11 Overview of screening results for ammonia (NH_3) at Manchester Mosses SAC

Figure 3-12 Total modelled concentration for NH_3 at Manchester Mosses SAC, using background NH_3 concentrations for 2017-2019; for 2040 contributions from allocations

Figure 3-13 Total modelled concentration for NH_3 at Manchester Mosses SAC, using background NH_3 concentrations for 2017-2019; for 2040 contributions from allocations with link road

3.1.3.3 Nitrogen deposition

Figure 3-14 illustrates the areas where the modelled contribution from the GM “With Plan” scenarios are predicted to exceed 1% of the CL.

Figure 3-15 and Figure 3-16 present the total predicted nitrogen deposition rates for the two 2040 GM “With Plan” scenarios. These deposition rates were calculated by adding the “2040 contribution from allocations” and “2040 contribution from allocations with link road” to the 2017-2019 background nitrogen deposition rates from APIS. For both scenarios, the total nitrogen deposition rate is predicted to be greater than 100% of the CL, due to background nitrogen deposition rates that currently exceed the CL. Adverse effects from nitrogen deposition on this SAC cannot be ruled out on the basis of a comparison of the total predicted nitrogen deposition rate with the critical load. An Appropriate Assessment for nitrogen deposition impacts on this site was undertaken, in consultation with Natural England. The results of this assessment are summarised in Section 3.1.3.5, and the detailed modelling report is presented in Appendix 2.

Figure 3-14 Overview of screening results for nitrogen deposition at Manchester Mosses SAC, based on grassland deposition rates

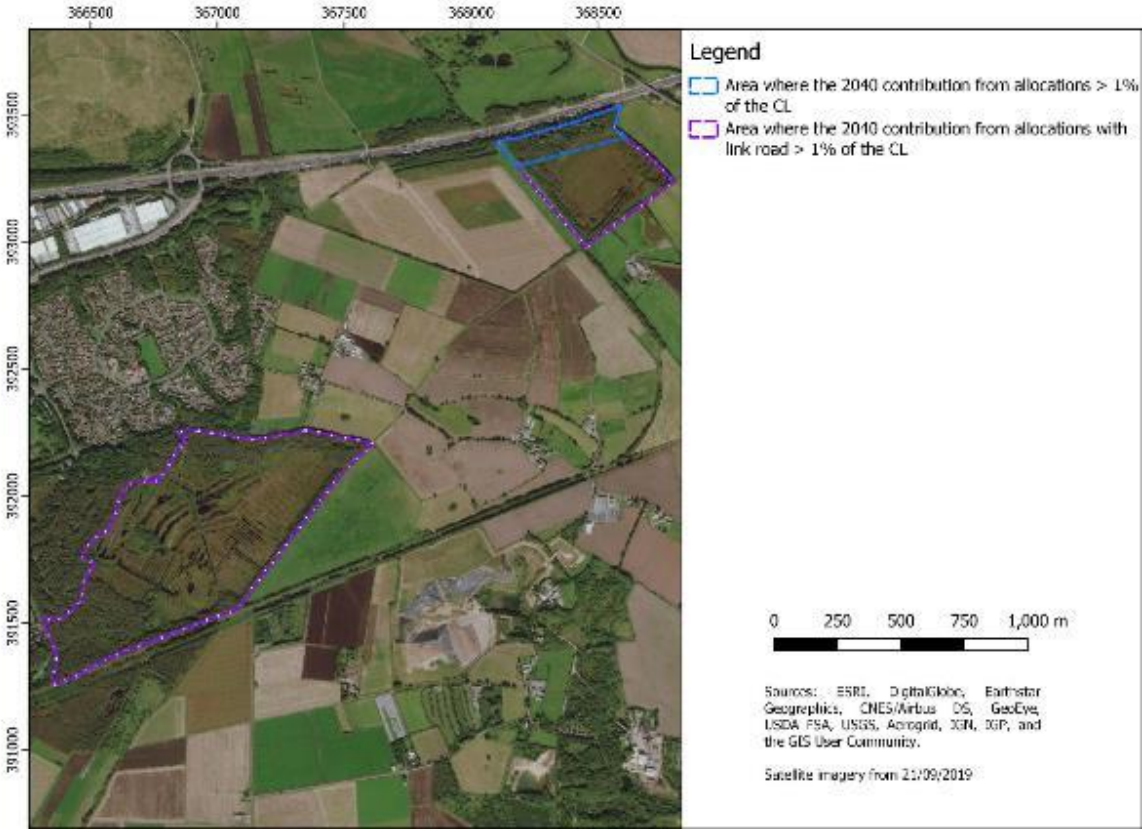


Figure 3-15 Total predicted nitrogen deposition at Manchester Mosses SAC, using background deposition rates for 2017-2019; for 2040 contributions from allocations

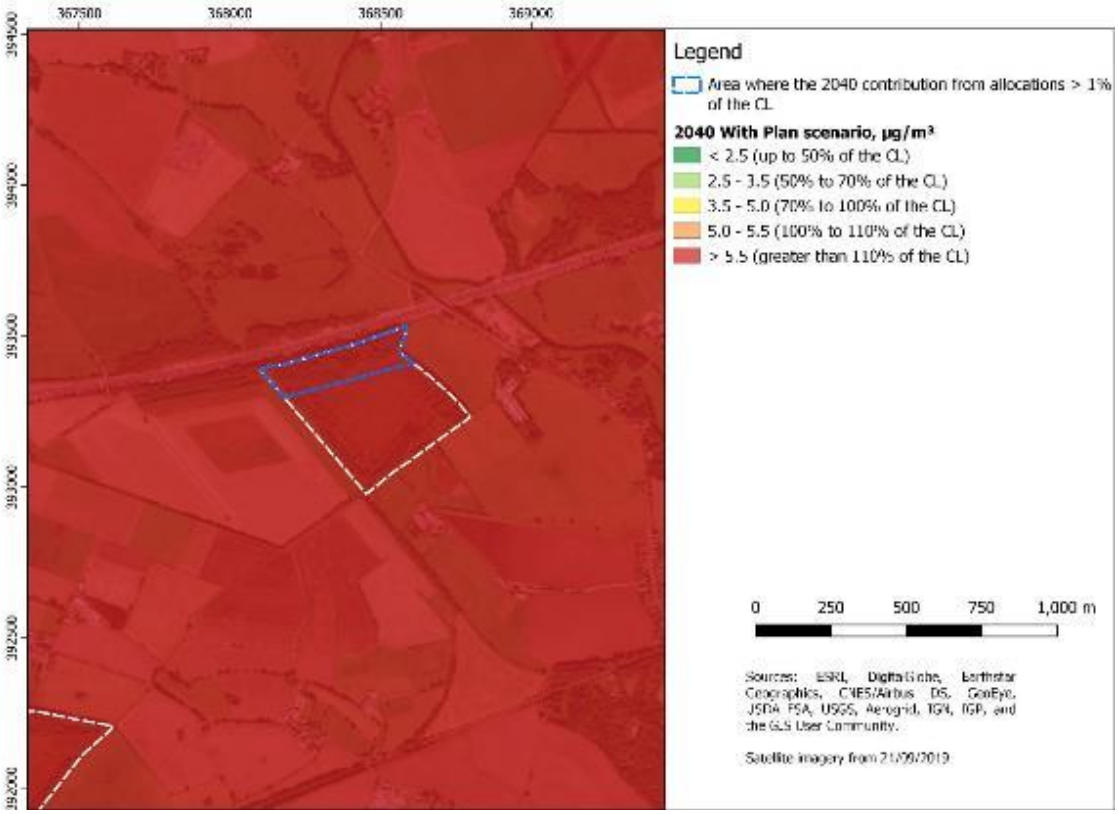


Figure 3-16 Total predicted nitrogen deposition at Manchester Mosses SAC, using background deposition rates for 2017-2019; for 2040 contributions from allocations with link road

3.1.3.4 Acid deposition

Figure 3-17 illustrates the areas where the modelled contribution from the GM “With Plan” scenarios are predicted to exceed 1% of the CL.

Figure 3-18 and Figure 3-19 present the total predicted acid deposition rates for the two 2040 GM “With Plan” scenarios. These deposition rates were calculated by adding the “2040 contribution from allocations” and “2040 contribution from allocations with link road” to the 2017-2019 background acid deposition rates from APIS. For both scenarios, the total acid deposition rate is predicted to be greater than 100% of the CL, due to background acid deposition rates that currently exceed the CL. Adverse effects from acid deposition on this SAC cannot be ruled out on the basis of a comparison of the total predicted acid deposition rate with the critical load. An Appropriate Assessment for acid deposition impacts on this site was undertaken, in consultation with Natural England. The results of this assessment are summarised in Section 3.1.3.5, and the detailed modelling report is presented in Appendix 2.

Figure 3-17 Overview of screening results for acid deposition at Manchester Mosses SAC, based on grassland deposition rates

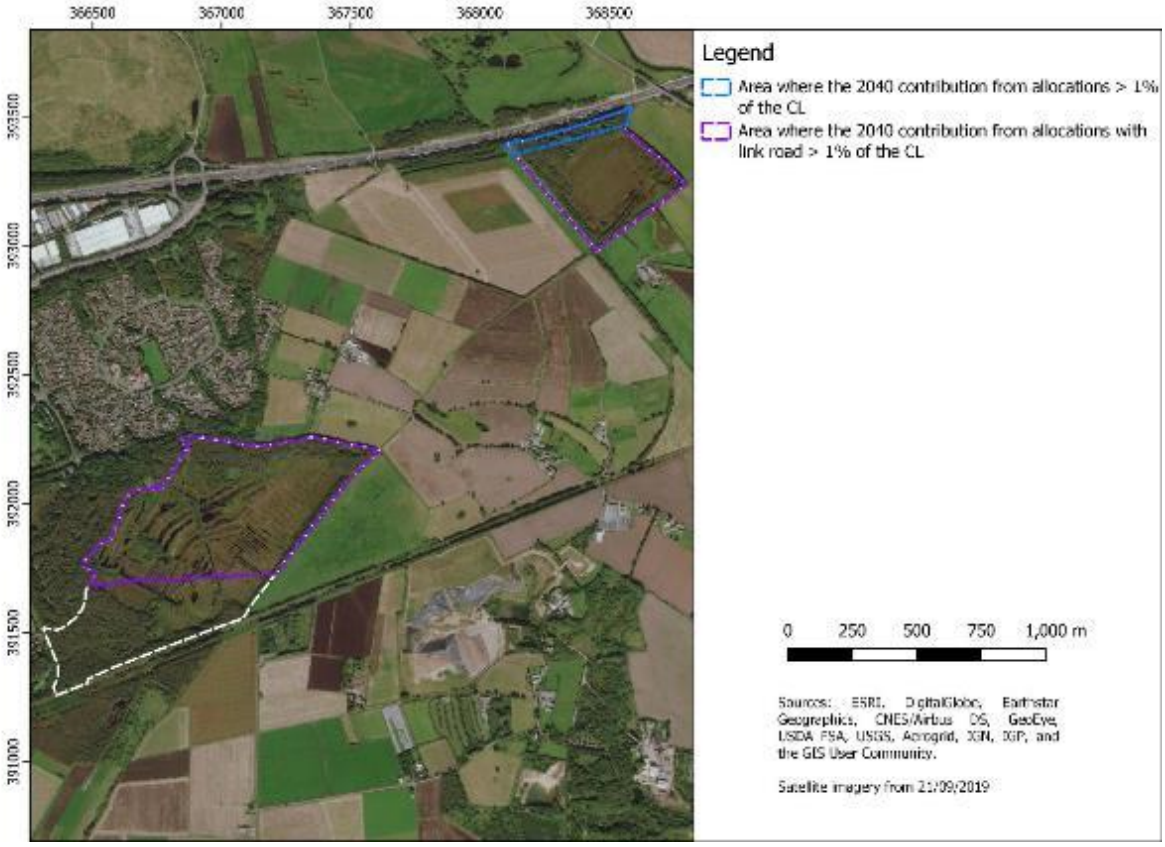


Figure 3-18 Total predicted acid deposition at Manchester Mosses SAC, using background deposition rates for 2017-2019; for 2040 contributions from allocations

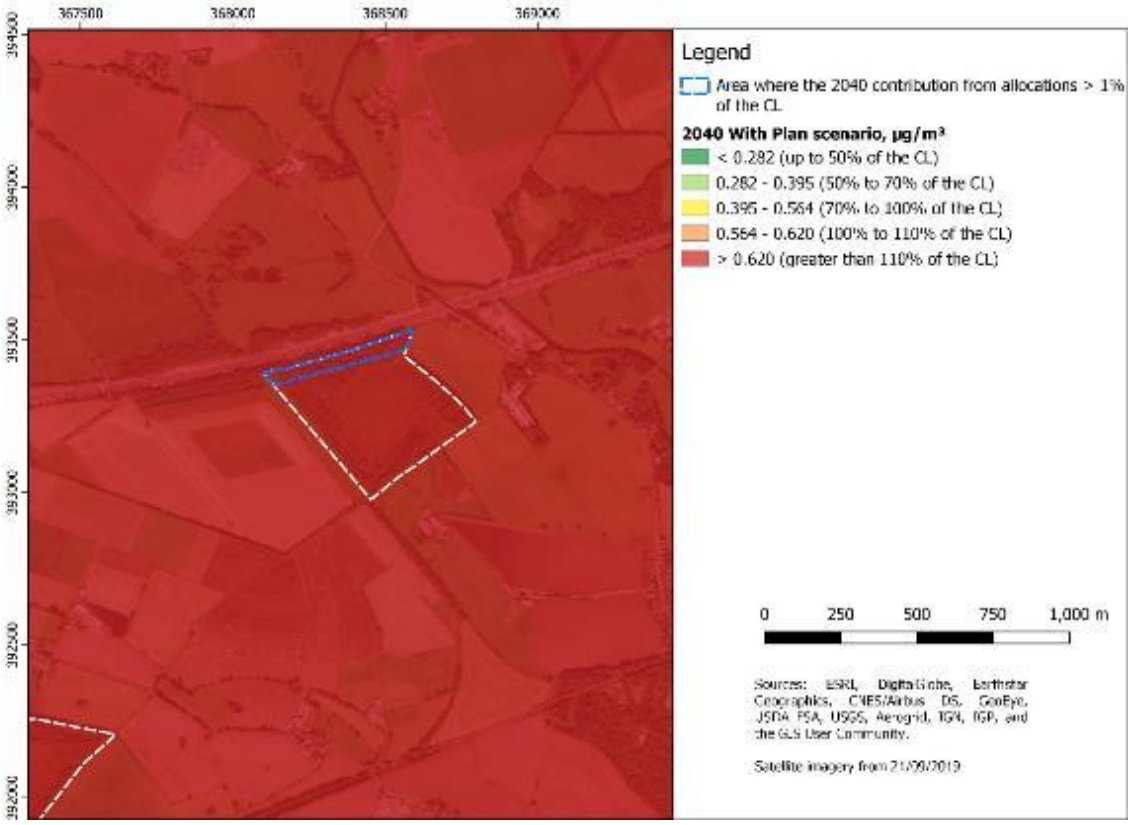


Figure 3-19 Total predicted acid deposition at Manchester Mosses SAC, using background deposition rates for 2017-2019; for 2040 contributions from allocations with link road

3.1.3.5 Accounting for tree belt

Following HRA Stage 1 screening and the first part of Stage 2 Appropriate Assessment, Likely Significant Effects (LSE) at Manchester Mosses were identified for airborne NOx, airborne NH_3, nitrogen deposition and acid deposition (pre-mitigation).

The Holcroft Moss portion of the Manchester Mosses SAC is particularly vulnerable to air pollution arising from increased traffic, due to its close proximity to the M62. However, the northern portion of Holcroft Moss consists of a tree belt measuring approximately 60-70m across. Natural England has advised[47] that this tree belt can be treated as site fabric and there is no need to consider the impacts of air pollution in this area. The tree belt would reduce the impact of emissions from traffic associated with the plan on the M62 by restricting dispersion of pollutants to the south of the motorway towards Holcroft Moss, and also by absorbing some of the ammonia and nitrogen dioxide emitted from vehicles on the M62. These effects were not included in the modelling described above.

An update of the modelling study to account for the tree belt was carried out to refine the assessment of air pollution levels forecast to be experienced at the bog components of the SAC by accounting for the effect of the existing tree belt on the north side of the site. The modelling carried out to assess these effects is set out in Appendix 2.

The conclusions of this component of the Appropriate Assessment are as follows:

> *The increases in modelled concentrations and deposition rates are forecast to be below 1% of the relevant Critical Loads and Critical Levels across the parts of Holcroft Moss SSSI (a component of Manchester Mosses SAC) where the qualifying features are present, or could be present.*
>
> *From the updated modelling study, it is concluded that the Greater Manchester Combined Authorities “Places for Everyone” plan would not have a likely significant adverse effect on the Holcroft Moss component of the Manchester Mosses SAC due to emissions to air from road traffic associated with the plan.*

As set out in Section 3.1.2, there is the possibility that the Places for Everyone plan could have an in-combination effect with the Warrington Borough Council Local Plan at this site.

3.2 Midland Meres and Mosses Phase 1 Ramsar (UK11043)

3.2.1 Ramsar background information and qualifying features

Underlying Sites of Special Scientific Interest (SSSI): The Mere, Mere SSSI; Tatton Meres SSSI.

Qualifying and notifiable features associated with this site include:

Ramsar Criterion 1: The site comprises a diverse range of habitats from open water to raised bog.

Ramsar Criterion 2: Supports a number of rare species of plants associated with wetlands including five nationally scarce species together with an assemblage of rare wetland invertebrates (three endangered insects and five other British Red Data Book species of invertebrates).

3.2.2 HRA Stage 1: Assessment of air quality impacts against screening thresholds

This section comprises the outcome of the assessment described in 2.4.

Table 12 summarizes all of the critical loads for nutrient nitrogen deposition (kgN/ha-year) and acid deposition (kEq/ha-year), as well as the critical levels for airborne ammonia (µg/m^3), applicable to this designated site. APIS does not list critical load or critical level information for this Ramsar site, or for the underlying SSSIs. Natural England advised[47] that the same critical load and critical level values as for Oak Mere SSSI should be used for the analysis, as the Oak Mere SSSI has comparable habitats (fen / mires). The most stringent critical load or critical level (CL) for each pollutant is indicated in bold. The critical level for airborne NOx is set at 30 µg/m^3 across all designated sites.

Table 12 Minimum Critical Load and Critical Level (CL) values and associated sensitive features for Midland Meres and Mosses Phase 1 Ramsar, based on the values for Oak Mere SSSI

Sensitive feature	Minimum nutrient nitrogen deposition CLs (kgN/ha-year)	Minimum acid deposition CLs (MinCLMaxN, kEq/ha-year)	Minimum airborne NH_3 CLs (µg/m^3)
Fen, marsh and swamp (*Hypericum elodes - Potamogeton polygonifolius* soakway)	**10**	**0.576**	**1**
Fen, marsh and swamp	**10**	**0.576**	**1**

Consideration of in-combination effects

The Midland Meres and Mosses Phase 1 Ramsar site is contained within the GM study area. The dispersion modelling results for the GM study area account for air quality impacts associated with road traffic emissions from the allocations in Bolton, Bury, Manchester, Oldham, Rochdale, Salford, Tameside, Trafford, and Wigan.

Midland Meres and Mosses Phase 1 Ramsar site, and its underlying SSSIs, are considered in HRA documentation for the Cheshire East Council Local Plan Strategy 2010-2030.[44] The HRA report noted that "With the exception of sections of the road network around Tatton Meres SSSI (discussed further below), all component sites of the Ramsar are further than 200m from the main road network. Air quality impacts from increased vehicles associated with the potential site allocations using the local road and motorway network are therefore unlikely because pollutant levels can be expected to fall to background levels at a distance of more than 200m (DMRB LA 105)." For Tatton Meres SSSI, the report states "TS 1 is currently a lorry depot. Heavy good vehicles cause greater impacts upon air quality compared to individual cars (Natural England, 2018). The conversion of this site to a GTTS site from a Lorry Park, as well as the overall small size of this proposed site (3 plots), means that it is unlikely that there will be any increases from the baseline in air quality impacts (no increase in AADT) resulting in traffic on the

Mobberley Road, where it falls within 200m of Tatton Meres SSSI." The report concluded that there would be no Likely Significant Effects for air quality.

In the Stockport Core Strategy documentation,[43] an amber rating was assigned to Midland Meres & Mosses Phase 1 for potential eutrophication impacts from air and road traffic and development impacting on air quality and hydrology. In this documentation, an amber rating corresponds to "minor impacts with some level of potential significance – policy writers noted issues for policy development."

The Habitats Regulations Assessment[36] for the emerging Warrington Borough Council Local Plan considered that the Midland Meres & Mosses Phase 1 Ramsar site is "either too remote from the borough and/or more than 200m from significant journey to work routes for residents of Warrington" for there to be impact pathways related to air quality.

The Habitats Regulations Assessment of the Cheshire West and Chester Local Plan (Part Two)[48] noted that further development at Oulton Park could have potential air quality effects on the Midland Meres and Mosses Ramsar sites, depending on the nature of the development. The report indicated: "However, that impact pathway cannot be explored in further detail until specific proposals come forward. To address this, the policy text states that "*where appropriate, impacts on air quality must be assessed and adequately mitigated*" and paragraph 11.43 of the supporting text states that "*there are a number of local wildlife sites that are in close proximity to the site and impacts of the development on the ecological network should be considered.*" Given this, it is considered that the policy creates an adequate protective framework to ensure that a conclusion of no adverse effect on integrity can be drawn. If it emerges that any proposals at Oulton Park would have an adverse effect on any European sites that could not be mitigated they would not be permitted as they would conflict with other policies in LPP2."

The Habitats Regulations Screening Assessment for the Keuper Gas Storage Project[49] included dispersion modelling to assess potential air quality impacts on this site arising from emissions to air of NOx. The maximum modelled air quality impacts on the Midland Meres and Mosses Phase 1 Ramsar Site, associated with the operation of the proposed project, were:

- 1.52×10^{-4} keq/ha-year (0.03% of the applicable critical load) for acid deposition
- 0.002 kgN/ha-year (0.04% of the applicable critical load) for nutrient nitrogen deposition
- 0.02 µg/m^3 (0.05% of the applicable critical level) for NOx

The potential for in-combination impacts arising from the construction and operation of High Speed 2 (HS2) was also considered. The following information was provided within HS2 Phase 2b Environmental Statement Volume 2: "*The Midland Meres and Mosses Phase 2 Ramsar Site was scoped out from the HRA screening process during the Appraisal of Sustainability stage of project development. This was on the basis that Black Firs and Cranberry Bog SSSI, the nearest component of the Ramsar Site, was sufficiently distant from the Proposed Scheme that there would be no significant effects. This conclusion was reached for HS2 Phase 2a, where Black Firs and Cranberry Bog SSSI is located 1.1km away. Black Firs and Cranberry Bog SSSI is 2.2km from the land required for the Proposed Scheme in the Hough to Walley's Green area. On this basis no further HRA assessment has been undertaken for this site.*"[50] In view of the conclusion that there would be no significant effects due to HS2 Phase 2b, there is no need to further consider the potential for in-combination impacts of HS2 with the Places for Everyone plan, in relation to Midland Meres and Mosses Phase 1 (Ramsar).

[48] Cheshire West and Chester Council, "Habitats Regulations Assessment, (including appropriate assessment) of the Cheshire West and Chester Local Plan (Part Two) – Land Allocations and Detailed Policies," July 2018

[49] Environmental Resources Management, "Keuper Gas Storage Project: Habitats Regulations Screening Assessment", November 2015.

[50] High Speed Two (HS2) Limited, High Speed Rail (Crewe to Manchester and West Midlands to Leeds) Working Draft Environmental Statement Volume 2: Community Area report MA01: Hough to Walley's Green, October 2018.

Screening results

Table 13 compares the maximum modelled contribution of each of the three GM "With Plan" scenarios to the lowest applicable CL. This screening exercise represents a precautionary approach, as it assumes that the most sensitive qualifying features (with the lowest CLs) are present in the areas with the highest modelled contribution (typically adjacent to the busiest road). Negative values in this table indicate that the "With Plan" scenario is predicted to improve (lessen) the air pollution at that site, e.g. by redistributing the traffic in the area, leading to a difference in vehicle speed, etc.

The screening results indicate that air quality impacts associated with the GM "With Plan" scenarios, in isolation, are well below the 1% screening threshold, with maximum modelled values ranging from 0.2% to 0.6% of the CL. Based on the small modelled contribution of the GM "With Plan" scenarios to air quality impacts on this site, the modelled contribution from the Keuper Gas Storage Project HRA, and the qualitative findings of the HRAs summarized in the preceding section, Likely Significant Effects can be discounted for the GM "With Plan" in-combination with anticipated development from neighbouring local authorities and the Keuper Gas Storage Project.

Table 13 Screening results based on dispersion modelling of Greater Manchester Scenarios:

	Airborne NH_3	Airborne NOx	Nutrient nitrogen deposition*		Acid deposition*	
			Forest	Grassland	Forest	Grassland
CL	1	30	10	10	0.576	0.576
Units	µg/m^3	µg/m^3	kgN/ha-year	kgN/ha-year	kEq/ha-year	kEq/ha-year
2025 contribution from allocations						
Maximum modelled contribution	0.0018	0.058	0.023	0.014	0.0016	0.0010
% of CL	0.18	0.19	0.46	0.27	0.29	0.17
2040 contribution from allocations						
Maximum modelled contribution	0.0038	-0.090	0.016	0.013	0.0011	0.00093
% of CL	0.38	-0.30	0.32	0.26	0.20	0.16
2040 contribution from allocations with link road						
Maximum modelled contribution	0.0041	-0.012	0.030	0.020	0.0021	0.0014
% of CL	0.41	-0.04	0.60	0.41	0.38	0.25

*The site is a mixture of areas with tall and short vegetation; both grassland and forest deposition rates may apply, to different areas.

3.3 Peak District Moors (South Pennine Moors Phase 1) SPA (UK9007021)

3.3.1 Background information and qualifying features

Underlying Sites of Special Scientific Interest (SSSI): South Pennine Moors SSSI, Dark Peak SSSI, Goyt Valley SSSI.

The site qualifies under **Article 4.1** of the Directive (79/409/EEC) as it is used regularly by 1% or more of the Great Britain population of a species listed in Annex I, in any season:

Annex I species	Estimated population & season	Period	% GB pop.
Merlin *Falco columbarius*	30 - 36 pairs - breeding	1990/1998	2.3 - 2.8%
Golden Plover *Pluvialis apricaria*	435 - 445 pairs - breeding	1990/1998	1.9 - 2.0%
Short-eared Owl *Asio flammeus*	22 - 25 pairs - breeding	1990/1998	2.2 - 2.5%

The Site Improvement Plan (SIP225) states that nitrogen deposition has been identified as a threat to this European site.

The conservation objectives for this site are to ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring;

- The extent and distribution of the habitats of the qualifying features,
- The structure and function of the habitats of the qualifying features,
- The supporting processes on which the habitats of the qualifying features rely,
- The population of each of the qualifying features, and,
- The distribution of the qualifying features within the site.

3.3.2 HRA Stage 1: Assessment of air quality impacts against screening thresholds

This section comprises the outcome of the assessment described in Section 2.4.

Table 14 summarizes all of the critical loads for nutrient nitrogen deposition (kgN/ha-year) and acid deposition (kEq/ha-year), as well as the critical levels for airborne ammonia (µg/m^3), applicable to this designated site. In this table, the most stringent critical load or critical level (CL) for each pollutant is indicated in bold. The critical level for airborne NOx is set at 30 µg/m^3 across all designated sites.

Table 14 Minimum Critical Load and Critical Level (CL) values and associated sensitive features for Peak District Moors (South Pennine Moors Phase 1) SPA

Sensitive feature	Minimum nutrient nitrogen deposition CLs (kgN/ha-year)	Minimum acid deposition CLs (MinCLMaxN, kEq/ha-year)	Minimum airborne NH_3 CLs (µg/m^3)
*Pluvialis apricaria (*North-western Europe) - European golden plover	**5**	**0.428**	**3**
Falco columbarius - Merlin	10	0.749	**3**
Asio flammeus - Short-eared owl	10	0.749	**3**

Consideration of in-combination effects

The Places for Everyone Plan could have a potentially significant impact in this area in isolation. In this case, there would be no requirement for further consideration of in-combination impacts in this area.

The Peak District Moors (South Pennine Moors Phase 1) SPA is within the GM study area, although mainly outside the authority boundaries. The dispersion modelling results for the GM study area account for air quality impacts associated with road traffic emissions from the allocations in Bolton, Bury, Manchester, Oldham, Rochdale, Salford, Tameside, Trafford, and Wigan.

The potential for impacts to arise at this site due to emissions of air pollutants was screened out for the following authorities:

- Stockport Metropolitan Borough Council
- Cheshire East Council
- West Lancashire Borough Council
- St Helens Council
- Warrington Borough Council
- Trafford Council
- Calderdale Metropolitan Borough Council
- Rossendale Borough Council

The Habitats Regulations Assessment for the High Peak Borough Council Local Plan[51] indicated a potential for significant adverse impacts at the Peak District Moors (South Pennine Moors Phase 1) SPA due to the High Peak Local Plan. No specific roads within the SAC requiring further assessment were identified, and additional policies to strengthen protection of the Peak District Moors (South Pennine Moors Phase 1) SPA were added to the High Peak Local Plan. Following further assessment, no risk of significant impacts at this SAC due to High Peak Local Plan were identified.

The HRA for Kirklees Metropolitan Borough Council Local Plan[52] highlighted potential increases in road traffic flows on the M62 and A635 resulting from the Kirklees Local Plan, but did not highlight any specific issues in the Peak District Moors (South Pennine Moors Phase 1) SPA. It was concluded that: "*there will be no adverse effect on the integrity of the South Pennine Moors SPA (Phases 1 and 2) in respect of air pollution.*" No further evaluation is needed in relation to potential in-combination impacts with the Kirklees Local Plan.

The HRA for Blackburn with Darwen Borough Council Local Plan[53] concluded as follows: "*it is considered unlikely that this or any other site will be impacted upon in regard to air quality.*" No further evaluation is needed in relation to potential in-combination impacts with the Blackburn with Darwen Local Plan.

The HRA for Highways Agency A57 Link Roads scheme[54] highlighted a potential impact at the Peak District Moors (South Pennine Moors Phase 1) SPA. The potential impact amounted to an increase of more than 1% of the Critical Load for nitrogen deposition. This impact was then screened out as it was below a further threshold set to represent the "*potential theoretical loss of 1 species*." It was concluded

[51] High Peak Borough Council, "High Peak Local Plan Habitats Regulations Assessment: Addendum to the Submission Version," August 2014

[52] Kirklees Metropolitan Borough Council, Kirklees Local Plan Submission Documents SD10, "Publication Draft Kirklees Local Plan: Habitats Regulation Assessment Report," (March 2017)

[53] Blackburn with Darwen Borough Council, "Core Strategy Publication Report: Habitats Regulations Assessment Screening Report," July 2009

[54] Highways England, "A57 Link Roads TR010034: 5.3 Habitats Regulations Assessment Screening Report," June 2021

that the proposed A57 Link Roads scheme would not result in a Likely Significant Effect on this SAC. The area above the 1% threshold was limited to the immediate vicinity of the A57, which is not one of the roads highlighted as a potential concern with regard to the potential impact of the "Places for Everyone" Plan. Nevertheless, it is recommended that further assessment and mitigation of impacts due to the "Places for Everyone" plan should take account of potential in-combination effects with the Highways Agency A57 Link Roads scheme.

The potential for in-combination impacts arising from the construction and operation of High Speed 2 (HS2) was also considered. No information was provided within HS2 Phase 2b Environmental Statement documentation regarding South Pennine Moors Phase 1 (SPA). In view of the exclusion of the South Pennine Moors SPA from the HS2 Phase 2b environmental assessment, there is no need to further consider the potential for in-combination impacts of HS2 with the Places for Everyone plan in relation to South Pennine Moors Phase 1 (SPA).

Screening results

Table 15 compares the maximum modelled contribution of each of the three GM "With Plan" scenarios to the lowest applicable CL. Values highlighted in yellow exceed the 1% screening threshold. This screening exercise represents a precautionary approach, as it assumes that the most sensitive qualifying features (with the lowest CLs) are present in the areas with the highest modelled contribution (typically adjacent to the busiest road).

Table 15 Screening results based on dispersion modelling of Greater Manchester Scenarios:

	Airborne NH_3	Airborne NOx	Nutrient nitrogen deposition		Acid deposition	
			Forest	Grassland	Forest	Grassland
CL	3	30	5	5	0.428	0.428
Units	µg/m^3	µg/m^3	kgN/ha-year	kgN/ha-year	kEq/ha-year	kEq/ha-year
2025 contribution from allocations						
Maximum modelled contribution	0.0044	0.16	0.058	0.035	0.0041	0.0025
% of CL	0.15	0.54	1.2	0.70	0.97	0.58
2040 contribution from allocations						
Maximum modelled contribution	0.021	0.29	0.21	0.13	0.015	0.0094
% of CL	0.71	0.98	4.2	2.6	3.5	2.2
2040 contribution from allocations with link road						
Maximum modelled contribution	0.015	0.17	0.14	0.089	0.010	0.0063
% of CL	0.49	0.56	2.8	1.8	2.3	1.5

*The site is a mixture of areas with water and tall vegetation; both grassland and forest deposition rates may apply, to different areas

The screening results indicate that the maximum modelled contribution of NH_3 in each of the GM "With Plan" scenarios is below 1% of the CL. The maximum modelled contribution of NH_3 corresponds to 0.021 µg/m^3 (0.71% of the CL) for the 2040 contribution from allocations. This (0.71% of the CL) is close enough to the 1% screening threshold that these results should be considered in the context of background NH_3 concentrations to determine if development associated with the GM Plan allocations may lead to an adverse effect; this analysis has been undertaken in the following section of this report.

Likewise, the screening results indicate that the maximum modelled contribution of NOx in each of the GM "With Plan" scenarios is below 1% of the CL. The maximum modelled contribution of NOx corresponds to 0.29 µg/m^3 (0.98% of the CL) for the 2040 contribution from allocations. This (0.98% of the CL) is close enough to the 1% screening threshold that these results should be considered in the context of background NOx concentrations to determine if development associated with the GM Plan allocations may lead to an adverse effect; this analysis has been undertaken in the following section of this report.

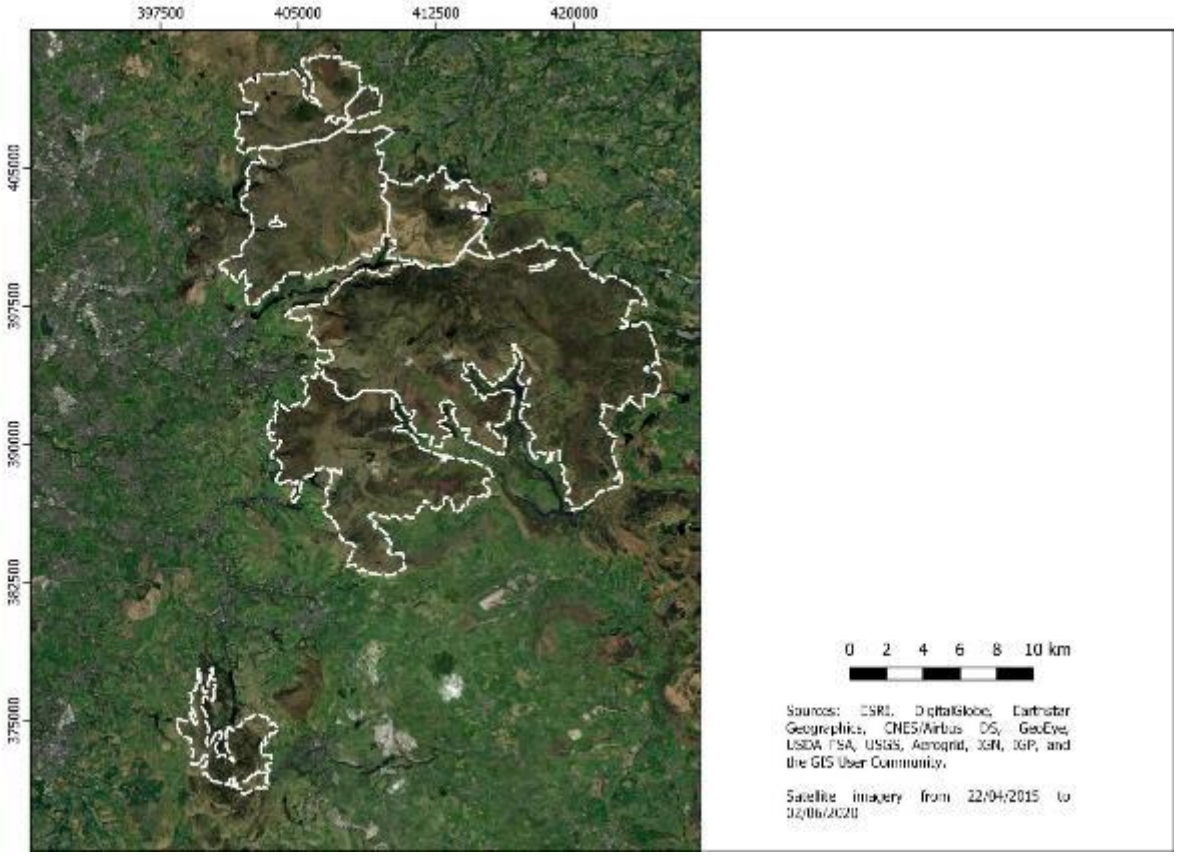
The remaining two pollutants (nitrogen deposition and acid deposition) exceeded the 1% screening threshold for at least one of the GM "With Plan" scenarios. On the basis of available evidence and agreed thresholds, Likely Significant Effects from air quality impacts cannot be ruled-out, either for the GM "With Plan" scenarios in isolation or in-combination with anticipated development from neighbouring local authorities. Therefore, a Stage 2 Appropriate Assessment is required for nitrogen deposition and acid deposition. The results are provided in the next subsection of this report.

3.3.3 HRA Stage 2: Appropriate Assessment

As an initial consideration for Stage 2 Appropriate Assessment, this section considers the modelled contributions within the context of existing and forecast background pollution levels for the SPA.

Figure 3-20 provides an overview of the Peak District Moors (South Pennine Moors Phase 1) SPA.

Figure 3-20 Peak District Moors (South Pennine Moors Phase 1) SPA



3.3.3.1 Airborne NOx

The Peak District Moors (South Pennine Moors Phase 1) SPA is contained within the larger boundary of the South Pennine Moors SAC. The SPA and SAC share the same critical level (30 µg/m^3) for NOx. A detailed analysis of the total predicted NOx concentrations within the SAC can be found in Section 3.7.3.1.

On the basis of available evidence and agreed thresholds, there are no adverse effects on this SPA site arising from increased airborne NOx concentrations associated with any of the GM "With Plan" development scenarios, in isolation or in combination with anticipated development from neighbouring local authorities. No further assessment is required for NOx.

3.3.3.2 Airborne NH_3

The maximum modelled contribution of NH_3 in any of the GM "With Plan" scenarios 0.021 µg/m^3 (0.71% of the CL) for the 2040 contribution from allocations. The maximum 2017-2019 background concentration for NH_3 within this SPA, as obtained from APIs, is 1.7 µg/m^3. The maximum total predicted concentration for NH3 therefore does not exceed the critical level of 3 µg/m^3 anywhere within the SPA.

On the basis of available evidence and agreed thresholds, there are no adverse effects on this SPA site arising from increased airborne NH_3 concentrations associated with any of the GM "With Plan" development scenarios, in isolation or in combination with anticipated development from neighbouring local authorities. No further assessment is required for NH_3.

3.3.3.3 Nitrogen deposition

The Peak District Moors (South Pennine Moors Phase 1) SPA is contained within the larger boundary of the South Pennine Moors SAC. The SPA and SAC share the same minimum critical load (5 kgN/ha-year) for nitrogen deposition. A detailed analysis of the total predicted nitrogen deposition concentrations within the SAC can be found in Section 3.7.3.3.

An Appropriate Assessment for nitrogen deposition impacts on this site has been undertaken for the areas adjacent to the A57 and A6024, in consultation with Natural England.

A57

In the "2040 with allocations" scenario, two small areas, each measuring 3m x 3m, are predicted to exceed the screening threshold along the A57. One of the areas corresponds to a section of the road surface. The other area is along the road edge and extends less than 2m from the edge of the road. Guidance from the Institute of Air Quality Management advises that predicted concentrations within 2m of the edge of a road are not considered reliable and may not represent areas relevant to the assessment.[55] We therefore conclude that there are no LSE from nitrogen deposition impacts along the A57, as the areas that are predicted to exceed the screening threshold are very small and correspond to areas that are unlikely to be relevant for the assessment, i.e. on and within 2m of the road surface.

A6024

As part of the appropriate assessment, a desk-based assessment of the distribution of sensitive features and supporting habitats along the A6024 was carried out by ecologists at Ricardo Energy and Environment. The following information has been used to determine the likelihood of each of the sensitive features being present in the areas of exceedance identified for airborne ammonia:

- The underpinning SSSI unit mapping (using a shapefile in GIS) – the SSSI units within the areas of interest were looked up to determine the main habitats and/or species listed
- Priority habitat inventory (PHI) mapping (using a shapefile in GIS) – the priority habitats present in the PHI shapefile (classified as Biodiversity Action Plan Priority Habitats) were compared to the habitats given in the corresponding SSSI unit information (classified as a combination of Phase 1 Habitat Classification, National Vegetation Classification, and best judgement based on the species listed) using JNCC's "Spreadsheet of Habitat Correspondences"[56] that shows how the main UK Habitat Classifications relate to / correspond with each other

[55] Institute of Air Quality Management, "A guide to the assessment of air quality impacts on designated nature conservation sites", May 2020.

[56] Spreadsheet of Habitat Correspondences, JNCC, 2008, https://hub.jncc.gov.uk/assets/9e70531b-5467-4136-88f6-3b3dd905b56d

- Satellite imagery was examined to consider the colours / textures / densities of known areas of the habitats
- SPA supplementary advice for lists of bird species and their habitat preferences were considered (see **Table 16**); information was taken from the supplementary advice document for the South Pennine Moors Phase 1 SPA[57]

Table 16 Inferred breeding habitats for sensitive features of the South Pennine Moors Phase 1 SPA

Sensitive feature	Breeding habitat mentioned specifically in Phase 1 SPA
Pluvialis apricaria (North-western Europe) - European golden plover	Nest in shallow scrape on the ground hidden by moorland vegetation. Blanket bog habitat, and more common on higher ground and more remote bogs. Most breeding pairs are found within dark peak, also in northern sections of the SW peak and eastern moors. Variety of vegetation types from high heather cover to high sedge cover. Avoid deep vegetation. Wet blanket bog. Remote, open moors. **Inferred suitable priority habitats for breeding = blanket bog**
Falco columbarius - Merlin	Nest in shallow scrape on the ground. Scrape is lined with twigs, heather, bracken and concealed by mature/ over mature heather. Return to the same areas each year. Large areas of open terrain. Unobstructed line of sight between roosting and feeding habitats. **Inferred suitable priority habitats for breeding = heathland**
Asio flammeus - Short-eared owl	Long heather and tall rushes. Require structural diversity and includes stands of bracken, rushbeds and tall dwarf shrub. **Inferred suitable priority habitats for breeding = heathland, bracken, rushes**

Table 17 below provides a summary of the evidence available to determine the likelihood of each feature being present.

Table 17 Likelihood of the presence of sensitive features of the Peak District Moors (South Pennine Moors Phase 1) SPA, within areas where 1% of the minimum critical load for nitrogen deposition (5 kgN/ha-year) is exceeded (A6024)

Sensitive feature	Geographical area	Feature likely to be present?	Evidence from priority habitat inventory	Evidence from SSSI unit(s) underpinning the SPA
Pluvialis apricaria (North-western Europe) - European golden plover	Extending either side of the A6024 (Woodhead Rd) and by Holme Moss Car Park	Yes – species mentioned in the SSSI units and suitable supporting habitats for the species are present.	Blanket bog is present along the western and eastern A6024 and the area extending opposite Holme Moss Car Park. Wet heath or dry heath is present along the eastern A6024 from the Holme Moss Car Park and to the north of the section (upland heathland). No evidence of acid grassland.	Golden plover is mentioned as present in the comments of Dark Peak SSSI unit 5, 8 and 58. These units are present within the mapped area of exceedances. Dark Peak SSSI includes, within the main habitat type or comments, 'bog', 'blanket bog', 'heath' or 'acid grassland' within units 5, 61, 58, 239, 8 and 6. These units are present within the mapped areas of exceedances.
Falco columbarius - Merlin	Extending either side of the A6024	Yes - species mentioned in	Wet heath or dry heath is present along the eastern A6024 from the Holme	Merlin is mentioned as present in the comments of Dark Peak SSSI unit 58. This unit is present within

[57] European Site Conservation Objectives: Supplementary advice on conserving and restoring site features Peak District Moors (South Pennine Moors Phase 1) Special Protection Area (SPA), Natural England, 2019.

Sensitive feature	Geographical area	Feature likely to be present?	Evidence from priority habitat inventory	Evidence from SSSI unit(s) underpinning the SPA
	(Woodhead Rd) and by Holme Moss Car Park	the SSSI units and suitable supporting habitats for the species are present.	Moss Car Park and to the north of the section (upland heathland).	the mapped area of exceedances. Dark Peak SSSI underpinning the SAC includes, within the main habitat type or comments, 'wet heath' or ' heath' within units 61 and 8. These units are present within the mapped areas of exceedances.
Asio flammeus - Short-eared owl	Extending either side of the A6024 (Woodhead Rd) and by Holme Moss Car Park	Yes - species mentioned in the SSSI units and suitable supporting habitats for the species are present.	Wet heath or dry heath is present along the eastern A6024 from the Holme Moss Car Park and to the north of the section (upland heathland).	Short eared owl is mentioned as present in the comments of Dark Peak SSSI unit 8. This unit is present within the mapped area of exceedances. Dark Peak SSSI underpinning the SAC includes, within the main habitat type or comments, 'wet heath' or ' heath' within units 61 and 8. These units are present within the mapped areas of exceedances.

The desk-based assessment of the distribution of sensitive features and supporting habitats along the A6024 suggests that all three of the sensitive features are likely to be present in the areas of exceedance identified.

Adverse effects resulting from nitrogen deposition along the A6024 cannot be ruled out for Golden plover, Merlin, and Short-eared owl, as there are indicators from the desk-based assessment that suggest these sensitive features may be present in the areas of exceedance identified when the critical load of 5 kgN/ha/yr is considered (up to approximately 3m from the edge of the A6024, and a triangular area measuring approximately 37m x 21m located near Holme Moss Car Park).

Breeding Bird Surveys for the Peak District Moors[58] were examined, to establish if the areas of exceedance identified for nitrogen deposition include areas used for the Golden plover, Merlin, or Short-eared owl, for breeding. The survey data for 2018 demonstrated that all three sensitive features favoured the Dark Peak, which includes the areas of exceedance adjacent to the A6024. Despite the areas of exceedance being smaller when the critical load of 10 kgN/ha/yr (set for the Merlin and Short-eared owl) is considered, the presence of these species at the triangular area of exceedance located near Holme Moss Car Park cannot be ruled out. Therefore, all three bird species may be present in this area, and LSE arising from nitrogen deposition in this part of the SPA cannot be ruled out.

3.3.3.4 Acid deposition

The Peak District Moors (South Pennine Moors Phase 1) SPA is contained within the larger boundary of the South Pennine Moors SAC. A detailed analysis of the total predicted acid deposition concentrations within the SAC can be found in Section 3.7.3.4.

Figure 3-21 illustrates the areas where the acid deposition contribution from the GM "With Plan" scenarios are predicted to exceed 1% of the CL, when grassland deposition rates are considered. Most of the areas predicted to exceed 1% of the CL are characterised by short vegetation, and grassland

[58] Peak District Moors Breeding Bird Survey 2018, Waterman Infrastructure & Environment Limited, prepared for Moors for the Future Partnership and Natural England, March 2021.

deposition rates are applicable in these areas. There is also a small area of the site where trees are present near the A6024 and where forest deposition rates are applicable; this area is predicted to exceed 1% of the CL in the two 2040 cases, and is presented in **Figure 3-22**. As the SPA has a slightly lower critical load for acid deposition (0.428 kEq/ha-year) than the SAC (0.569 kEq/ha-year), the areas within the SPA predicted to exceed the screening thresholds for acid deposition are similar but slightly larger than those areas predicted to exceed the screening thresholds within the SAC.

An Appropriate Assessment for acid deposition impacts on this site has been undertaken for the areas adjacent to the A57 and the A6024, in consultation with Natural England. For this SPA, the critical loads related to acid deposition are based on the same bird species and supporting habitats as the critical loads related to nitrogen deposition. The areas predicted to exceed the screening thresholds for acid deposition are slightly smaller than the areas predicted to exceed the screening thresholds for nitrogen deposition. Therefore, the same conclusions apply.

Figure 3-21 Overview of screening results for acid deposition at South Pennine Moors SAC, based on grassland deposition rates

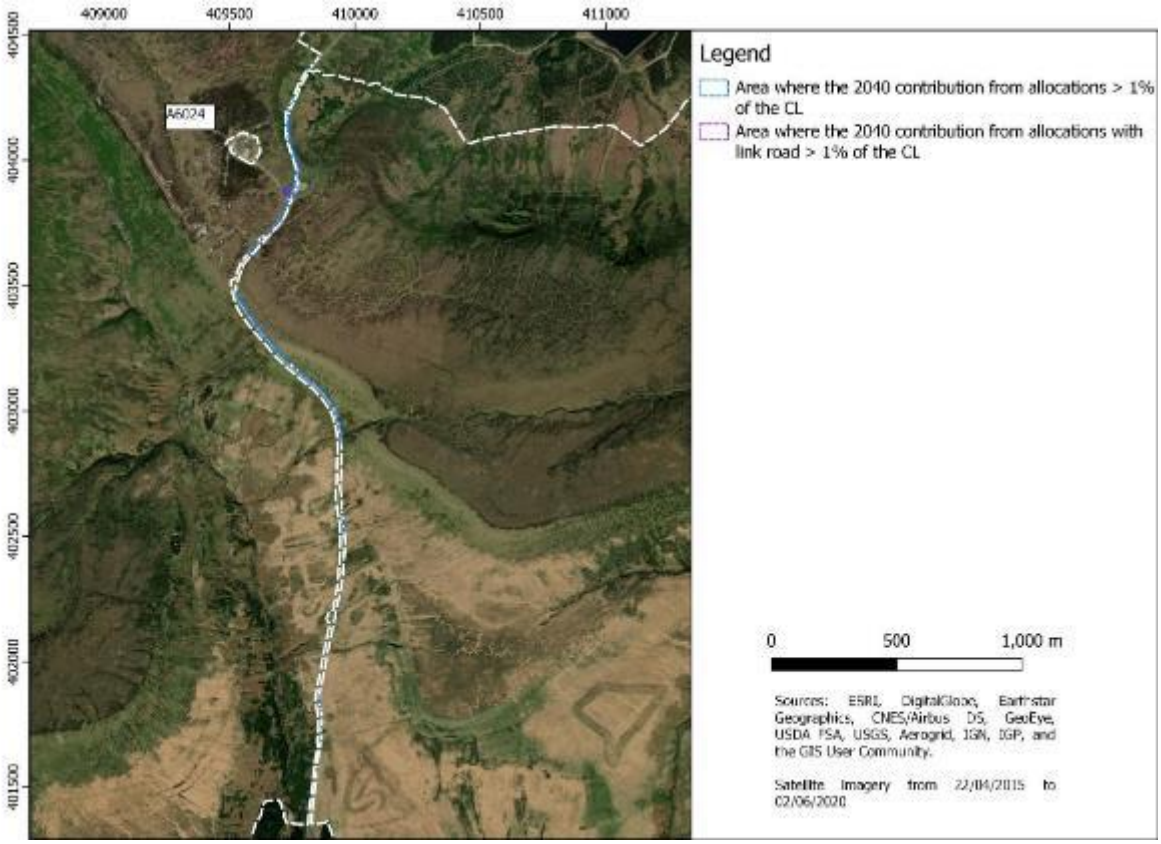
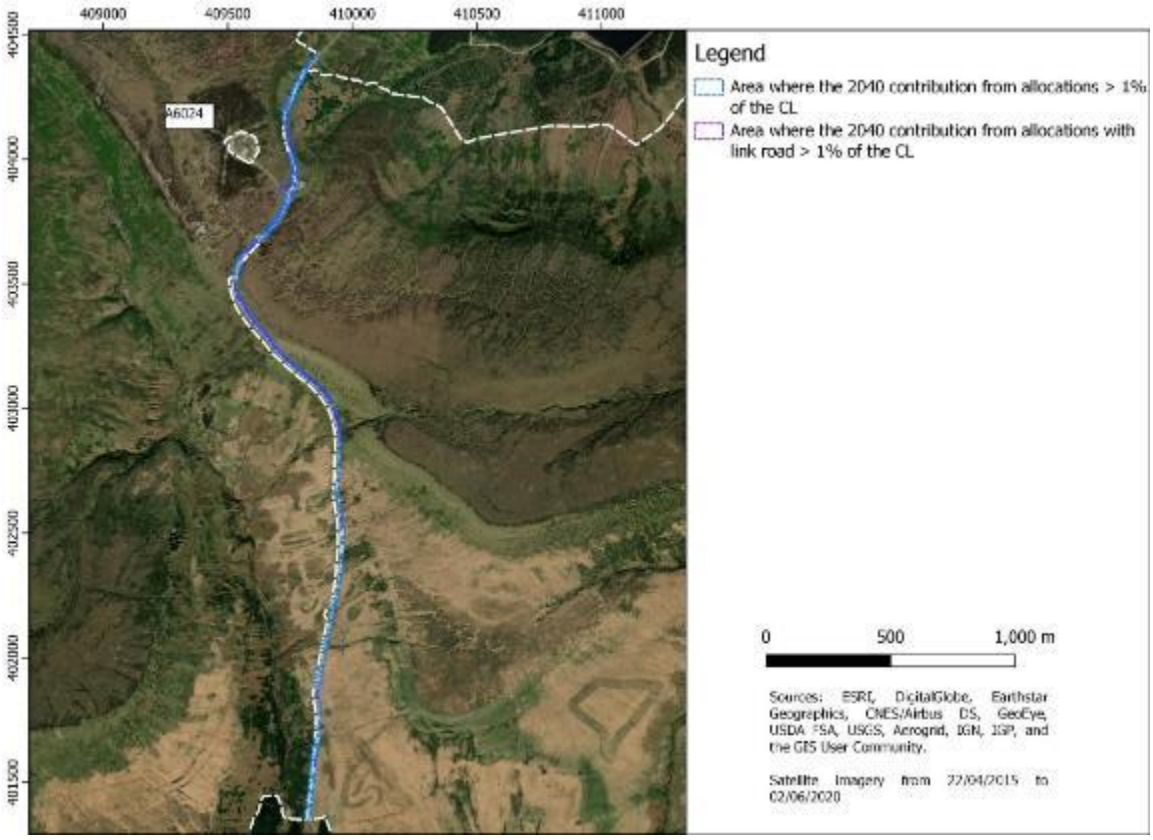


Figure 3-22 Overview of screening results for acid deposition at South Pennine Moors SAC, based on forest deposition rates



3.3.3.5 Assessment summary and conclusions

Following HRA Stage 1 screening, Likely Significant Effects (LSE) at Peak District Moors (South Pennine Moors Phase 1) SPA were identified for nitrogen deposition and acid deposition (pre-mitigation). LSE can be discounted for airborne NOx and airborne NH_3.

An Appropriate Assessment has been undertaken to determine whether the air quality impacts from the allocations, alone or in combination with other plans and projects, will have an adverse effect on the designated site. The focus of the assessment was on nitrogen and acid deposition, having ruled out LSEs from airborne NOx and airborne NH_3 at Stage 1. The Appropriate Assessment considered the likelihood of the presence of Golden plover, Merlin, and Short-eared owl within the exceedance areas identified, and determined that LSEs arising from nitrogen and acid deposition in limited areas along the A6024 could not be ruled out.

On the basis that there could potentially be adverse effects related to air pollution in limited areas close to the A6024, mitigation measures have been investigated (see Chapter 5). Potential mitigation measures can be further discussed with Natural England, and measures which meet the appropriate regulatory requirements will be implemented as required to offset any potentially significant adverse impacts of the Places for Everyone plan.

3.4 Rixton Clay Pits SAC (UK0030265)

3.4.1 Background information and qualifying features

Underlying Sites of Special Scientific Interest (SSSI): Rixton Clay Pits SSSI.

Qualifying and notifiable features associated with this site comprise: **1166 Triturus cristatus; Great crested newt.**

The Site Improvement Plan (SIP200) does not indicate that nitrogen deposition has been identified as a threat to this European site.

The conservation objectives stated for this are to 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 the habitats of qualifying species
- The structure and function of the habitats of qualifying species
- The supporting processes on which the habitats of qualifying species rely
- The populations of qualifying species, and,
- The distribution of qualifying species within the site.

3.4.2 HRA Stage 1: Assessment of air quality impacts against screening thresholds

This section comprises the outcome of the screening assessment described in Section 2.4.

Table 18 summarizes all of the critical loads for nutrient nitrogen deposition (kgN/ha-year) and acid deposition (kEq/ha-year), as well as the critical levels for airborne ammonia (µg/m^3), applicable to this designated site. The most stringent critical load or critical level (CL) for each pollutant is indicated in bold. The critical level for airborne NOx is set at 30 µg/m^3 across all designated sites.

For this site, APIS does not list critical load information for nitrogen deposition or acid deposition. As a cautious approach, and as agreed through discussion with Natural England,[47] we have used low CLs of 5 and 0.428 respectively for nitrogen and acid deposition. These low CL values were adopted from the Peak District Moors (South Pennine Moors Phase 1) SPA site, and were selected as they represent the most stringent CLs associated with any of the sites included in this study.

Table 18 Minimum Critical Load and Critical Level (CL) values and associated sensitive features for Rixton Clay Pits SAC

Sensitive feature	Minimum nutrient nitrogen deposition CLs (kgN/ha-year)	Minimum acid deposition CLs (MinCLMaxN, kEq/ha-year)	Minimum airborne NH_3 CLs (µg/m^3)
Triturus cristatus - Great crested newt	**5**	**0.428**	**3**

Consideration of in-combination effects

The Rixton Clay Pits SAC is contained within the GM study area. The dispersion modelling results for the GM study area account for air quality impacts associated with road traffic emissions from the allocations in Bolton, Bury, Manchester, Oldham, Rochdale, Salford, Tameside, Trafford, and Wigan.

Rixton Clay Pits is considered in HRA documentation[44] for the Cheshire East Council Local Plan Strategy 2010-2030. The HRA report noted that "The potential for adverse effects due to air quality changes from increased traffic associated with new development at the potential site allocations is

highly unlikely due to the distance of the SAC (more than 13km) from any site being considered for potential allocation within Cheshire East." The report concluded that there would be no Likely Significant Effects for air quality.

In the Stockport Core Strategy documentation,[43] an amber rating was assigned to Rixton Clay Pits for some potential impacts and pathways associated with traffic, for example: "improved retail offer could increase traffic movements around the Borough attracting non-resident visitors using private vehicle option" and "traffic accessing airport could add to impacts." In this documentation, an amber rating corresponds to "minor impacts with some level of potential significance – policy writers noted issues for policy development."

The HRA documentation for the St. Helens Borough Local Plan 2020-2035[45] excluded Rixton Clay Pits SAC from further analysis on the basis that the SAC is located 7.6km south east of the borough and that "there are no impact pathways present linking to the Plan."

The Habitats Regulations Assessment[36] for the emerging Warrington Borough Council Local Plan considered air quality impacts on the Rixton Clay Pits SAC. The HRA notes that "much of the Rixton Clay Pits SAC consists of standing water supporting a large population of great crested newts" and "of the three species of newts native to the UK the Great crested newt is least sensitive to acidification of water bodies." The report provides some literature references with evidence suggesting that great crested newts are tolerant of acidic to alkaline conditions. With regards to nitrogen deposition, the HRA indicates that "traffic modelling suggests that AADT on the A57 past this SAC will only be slightly (347 AADT) greater with the Local Plan in place than it would be without the Local Plan" and "at the closest point of the SAC to the A57 the Local Plan is expected to result in a negligible increase in nitrogen deposition compared to a situation without the plan: a nitrogen 'dose' of 0.04 kgN/ha-year." The HRA report concludes "when the day-to-day fluctuations in deposition rate are taken into consideration this is effectively zero" and "it is therefore considered that an adverse effect on the integrity of the SAC would not result from those policies that will lead to increased housing, minerals and employment development (and thus increased traffic on the A57)."

The potential for in-combination impacts arising from the construction and operation of High Speed 2 (HS2) was also considered. The following information was provided within HS2 Phase 2b Environmental Statement Volume 3: "*Rixton Clay Pits SAC is located to the east of Warrington, near the village of Hollins Green. It is immediately adjacent to a proposed construction traffic route on the A57 Manchester Road. However, due to the distance from the land required for the construction of the Proposed Scheme it has been agreed with Natural England that there would be no likely significant effect on the qualifying features of Rixton Clay Pits SAC.*"[59] In view of the conclusion that there would be no significant effects due to HS2 Phase 2b, there is no need to further consider the potential for in-combination impacts of HS2 with the Places for Everyone plan, in relation to Rixton Clay Pits (SAC).

Screening results

Table 19 compares the maximum modelled contribution of each of the three GM "With Plan" scenarios to the lowest applicable CL. This screening exercise represents a precautionary approach, as it assumes that the most sensitive qualifying features (with the lowest CLs) are present in the areas with the highest modelled contribution (typically adjacent to the busiest road). Negative values in this table indicate that the "With Plan" scenario is predicted to improve (lessen) the air pollution at that site, e.g. by redistributing the traffic in the area, leading to a difference in vehicle speed, etc.

The screening results indicate that the 2025 contribution from allocations and the 2040 contribution from allocations are predicted to be well below the 1% screening threshold, with maximum modelled values of approximately 0.1% of the CL. The model results for the 2040 contribution from allocations

[59] High Speed Two (HS2) Limited, High Speed Rail (Crewe to Manchester and West Midlands to Leeds) Working Draft Environmental Statement Volume 3: Route-wide effects, October 2018.

with link road is predicted to be higher, with a maximum modelled value of approximately 0.7% of the CL for nitrogen deposition.

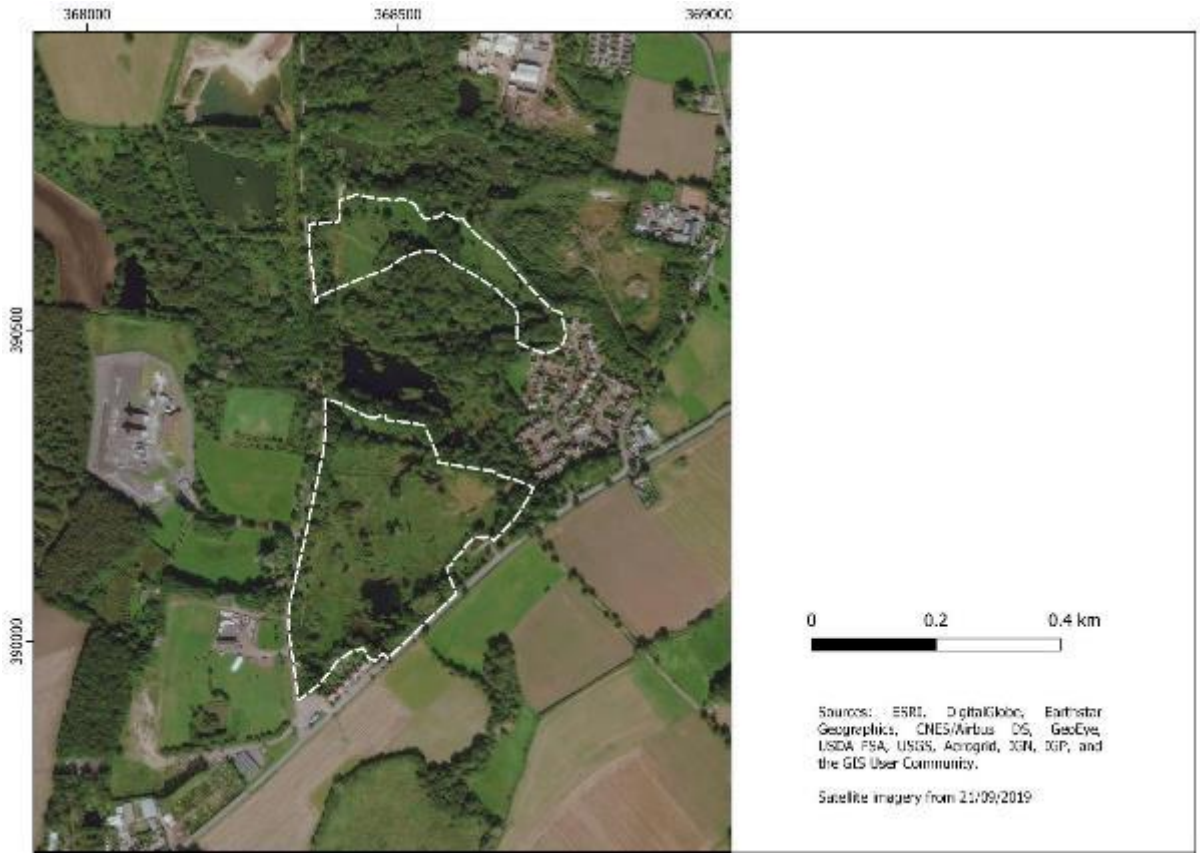
In all three of these scenarios, the model results predict a net improvement for air quality along the southern edge of the site (see **Figure 3-23**), as a result of reduced traffic along the A57. The highest modelled concentrations are at the northern end of the site and result from increased traffic along the M62, located approximately 2.7 km to the north of the SAC. In interpreting the results at the northern end of the SAC, it is important to note that the dispersion modelling approach used in this study includes some conservative assumptions and methods. Specifically, deposition has been calculated using a simple equation, by multiplying the airborne concentration at a particular point in space by a deposition velocity and conversion factor. This approach, although in line with current standard practice,[24] does not account for the effects of plume depletion, whereby airborne concentrations decrease with distance as pollutants are deposited. The modelled concentration and deposition results are therefore likely to represent conservative, worst-case scenarios, particularly at increasing distances from roads.

Table 19 Screening results based on dispersion modelling of Greater Manchester Scenarios:

	Airborne NH_3	Airborne NOx	Nutrient nitrogen deposition* Grassland	Acid deposition* Grassland
CL	3	30	5	0.428
Units	µg/m^3	µg/m^3	kgN/ha-year	kEq/ha-year
2025 contribution from allocations				
Maximum modelled contribution	-0.00060	-0.015	-0.004	-0.00031
% of CL	-0.020	-0.05	-0.09	-0.072
2040 contribution from allocations				
Maximum modelled contribution	0.002	-0.014	0.0068	0.00049
% of CL	0.051	-0.047	0.14	0.11
2040 contribution from allocations with link road				
Maximum modelled contribution	0.0060	0.015	0.032	0.0023
% of CL	0.20	0.050	0.65	0.54

*The feature of interest for this SAC is *Triturus cristatus* - Great crested newt, associated with standing open water habitats; Natural England have advised that grassland deposition rates are more applicable than forest deposition rates.[47]

Figure 3-23 Rixton Clay Pits SAC



The screening results indicate that air quality impacts from the three GM “With Plan” scenarios are all below the 1% screening threshold. Where other HRA studies for local authority development plans, such as for the emerging Warrington Borough Council Local Plan, have indicated a negative air quality impact on the SAC, these impacts have been predicted to occur in close proximity to the A57. The model results have also predicted that the “With Plan” scenarios contribute a net improvement to air quality in the southern portion of the SAC, closest to the A57. Based on the modelled contributions of the GM scenarios to air quality impacts, as well as the quantitative and qualitative findings of the HRAs summarized in the preceding section, Likely Significant Effects can be discounted for the GM “With Plan” scenarios in-combination with anticipated development from neighbouring local authorities.

3.5 Rochdale Canal SAC (UK0030266)

3.5.1 Background information and qualifying features

Underlying Sites of Special Scientific Interest (SSSI): Rochdale Canal SSSI.

Qualifying and notifiable features associated with this site comprise: **1831 Luronium natans; Floating water-plantain.**

The Site Improvement Plan (SIP201) states that nitrogen deposition has been identified as a threat to this European site.

The conservation objectives stated for this are to 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 the habitats of qualifying species
- The structure and function of the habitats of qualifying species
- The supporting processes on which the habitats of qualifying species rely
- The populations of the qualifying species, and,
- The distribution of the qualifying species within the site.

3.5.2 HRA Stage 1: Assessment of air quality impacts against screening thresholds

This section comprises the outcome of the screening assessment described in Section 2.4.

Table 20 summarizes all of the critical loads for nutrient nitrogen deposition (kgN/ha-year) and acid deposition (kEq/ha-year), as well as the critical levels for airborne ammonia (µg/m^3), applicable to this designated site. The most stringent critical load or critical level (CL) for each pollutant is indicated in bold. The critical level for airborne NOx is set at 30 µg/m^3 across all designated sites.

Table 20 Minimum Critical Load and Critical Level (CL) values and associated sensitive features for Rochdale Canal SAC

Sensitive feature	Minimum nutrient nitrogen deposition CLs (kgN/ha-year)	Minimum acid deposition CLs (MinCLMaxN, kEq/ha-year)	Minimum airborne NH_3 CLs (µg/m^3)
Luronium natans - Floating water-plantain	**3**	**No data**	**3**

Consideration of in-combination effects

The Places for Everyone Plan could have a potentially significant impact in this area in isolation. In this case, there would be no requirement for further consideration of in-combination impacts in this area.

The Rochdale Canal SAC is contained within the GM study area and extends through the urban area from the north-east towards central Manchester. The dispersion modelling results for the GM study area account for air quality impacts associated with road traffic emissions from the allocations in Bolton, Bury, Manchester, Oldham, Rochdale, Salford, Tameside, Trafford, and Wigan.

The potential for impacts to arise at this site due to emissions of air pollutants was screened out for the following authorities:

- Cheshire East Council
- High Peak Borough Council

- West Lancashire Borough Council
- St Helens Council
- Warrington Borough Council
- Trafford Council
- Highways England A57 Link Roads scheme

In the Stockport Core Strategy documentation,[43] an amber rating was assigned to Rochdale Canal SAC for potential atmospheric pollution. In this documentation, an amber rating corresponds to "*minor impacts with some level of potential significance – policy writers noted issues for policy development.*"

The HRA for Kirklees Metropolitan Borough Council Local Plan[52] highlighted potential increases in road traffic flows on the M62 and A627(M) resulting from the Kirklees Local Plan. These were screened out as unlikely to have a significant impact on this SAC. The area of habitats within the SAC that might be affected by any increases in nitrogen deposition was identified as less than 2% of the overall area of the SAC. As these findings were based on distance and flow screening criteria, it is recommended that further assessment and mitigation of impacts due to the "Places for Everyone" plan should take account of potential in-combination effects with the Kirklees Local Plan.

The preliminary HRA for Calderdale Metropolitan Borough Council Local Plan[60] concluded as follows: "*adverse effects on the integrity to the Rochdale Canal SAC as a result of air pollution arising from the allocation and policies screened in from the Calderdale Local Plan and in combination with other plans cannot be ruled out. However it is important to state that traffic modelling is being undertaken to inform the Calderdale Local Plan, when available this conclusion will be reviewed in line with the up-to-date evidence to make sure the assessment is accurate.*" It is recommended that further assessment and mitigation of impacts due to the "Places for Everyone" plan should take account of potential in-combination effects with the Calderdale Local Plan.

The HRA for Rossendale Borough Council Local Plan[61] concluded as follows: "*since the main arterial road routes lie beyond the 200m zone from the European sites, no adverse effects arising from air pollution from vehicles are likely to occur.*" This conclusion is not reflected in the location of roads including the M62 and A627(M) in relation to the Rochdale Canal SAC. As a result, it is recommended that further assessment and mitigation of impacts due to the "Places for Everyone" plan should take account of potential in-combination effects with the Rossendale Local Plan.

The HRA for Blackburn with Darwen Borough Council Local Plan[53] concluded as follows: "*it is considered unlikely that this or any other site will be impacted upon in regard to air quality.*" No further evaluation is needed in relation to potential in-combination impacts with the Blackburn with Darwen Local Plan.

The M62 Motorway crosses over Rochdale Canal SAC between Junctions 19 and 20, and lies within 2km of it up to Junction 21. No significant air quality effects are identified in the Environmental Assessment of the M62 Smart Motorway Scheme between Junctions 20 to 25 for Rochdale Canal SAC.[62]

The potential for in-combination impacts arising from the construction and operation of High Speed 2 (HS2) was also considered. The following information was provided within HS2 Phase 2b Western Leg Design Refinement Consultation: "*Under both options (of construction of Manchester Piccadilly Station),*

[60] Calderdale Metropolitan Borough Council, "Habitats Regulations Assessment (HRA) – Calderdale Local Plan: Screening Methodology," February 2017

[61] Rossendale Borough Council, "Habitats Regulations Assessment of the Rossendale Local Plan HRA Screening Document," 2016

[62] Highways England, "Smart Motorways Programme Environmental Assessment Report M62 Junctions 20 to 25 (Preliminary Design – PCF Stage 3)", July 2020

there is likely to be construction phase impacts to residential properties in the vicinity and further construction traffic on top of existing traffic in the city centre. During the operation of the railway, it is likely that both options would have an impact on habitats within and around the Rochdale and Ashton Canals. Work will continue to minimise these impacts via design development and the inclusion of suitable mitigation. However, the smaller station footprint under Option 2 would have a lower permanent landscape impact than Option 1 and would have greater potential to create areas of the public realm around the station. Following consideration of the two options, Option 2 was selected as the preferred option due to its lower impact on the Strategic Regeneration Framework, its operational benefits, its lower cost and reduced impacts."[63] As there is no quantitative information available regarding these potential impacts, there is no need to further consider the potential for in-combination impacts of HS2 with the Places for Everyone plan, in relation to Rochdale Canal (SAC).

Screening results

Table 21 compares the maximum modelled contribution of each of the three GM "With Plan" scenarios to the lowest applicable CL. Values highlighted in yellow exceed the 1% screening threshold. This screening exercise represents a precautionary approach, as it assumes that the most sensitive qualifying features (with the lowest CLs) are present in the areas with the highest modelled contribution (typically adjacent to the busiest road).

Airborne NH_3, airborne NOx and nitrogen deposition exceeded the 1% screening threshold for all three GM "With Plan" scenarios. On the basis of available evidence and agreed thresholds, Likely Significant Effects from air quality impacts cannot be ruled-out for these pollutants, either for the GM "With Plan" scenarios in isolation or in-combination with anticipated development from neighbouring local authorities. Therefore, a Stage 2 Appropriate Assessment will be required, with the results provided in the next subsection of this report.

The GM "With Plan" scenarios were also used to predict acid deposition rates for the Rochdale Canal SAC, however APIS does not provide a numerical critical load for acid deposition. Natural England were consulted to determine the approach to use for assessing potential impacts of acid deposition on the SAC (see Section 3.5.4).

Table 21 Screening results based on dispersion modelling of Greater Manchester Scenarios:

	Airborne NH_3	Airborne NOx	Nutrient nitrogen deposition* Grassland	Acid deposition* Grassland
CL	3	30	3	No data
Units	µg/m^3	µg/m^3	kgN/ha-year	kEq/ha-year
2025 contribution from allocations				
Maximum modelled contribution	0.043	0.84	0.24	0.017
% of CL	1.4	2.8	7.9	TBC
2040 contribution from allocations				
Maximum modelled contribution	0.18	1.9	0.96	0.069
% of CL	6.0	6.2	32	TBC
2040 contribution from allocations with link road				

[63] High Speed Two (HS2) Limited, High Speed Rail (Crewe to Manchester and West Midlands to Leeds) Working Draft Environmental Statement HS2 Phase 2b Western Leg Design Refinement Consultation, October 2020.

	Airborne NH_3	Airborne NOx	Nutrient nitrogen deposition* Grassland	Acid deposition* Grassland
Maximum modelled contribution	0.17	1.8	0.94	0.067
% of CL	5.8	6.2	31	TBC

*The SAC mainly consists of canals, and therefore grassland deposition rates are applicable.

3.5.3 HRA Stage 2: Appropriate Assessment (Modelling)

As an initial consideration for Stage 2 Appropriate Assessment, this section considers the modelled contributions within the context of existing and forecast background pollution levels for the SAC.

Figure 3-24 provides an overview of the Rochdale Canal SAC.

3.5.3.1 Airborne NOx

Figure 3-25 illustrates the areas where the modelled contribution from the GM “With Plan” scenarios are predicted to exceed 1% of the CL.

As discussed in the methodology section, the NOx background maps are produced by Defra on a periodic basis and are considered the best available information for future background levels of airborne NOx. There is no basis for reasonable scientific doubt in the forecast NOx levels. Additionally, the background map for the year 2030 (the latest year for which a NOx background map is available) is considered likely to over-predict NOx concentrations in 2040, which is the end year for the GM “With Plan” scenarios.

Figure 3-24 Rochdale Canal SAC

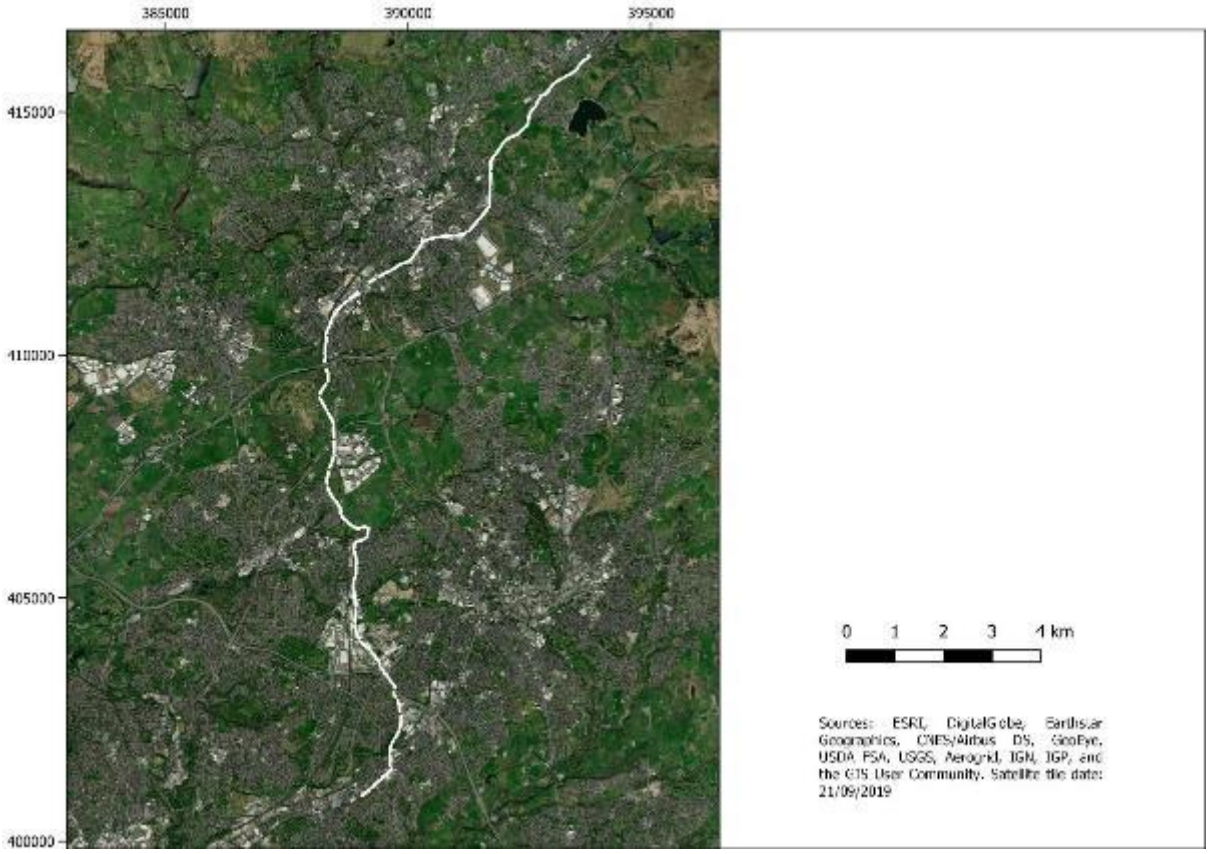


Figure 3-25 Overview of screening results for oxides of nitrogen (NOx) at Rochdale Canal SAC

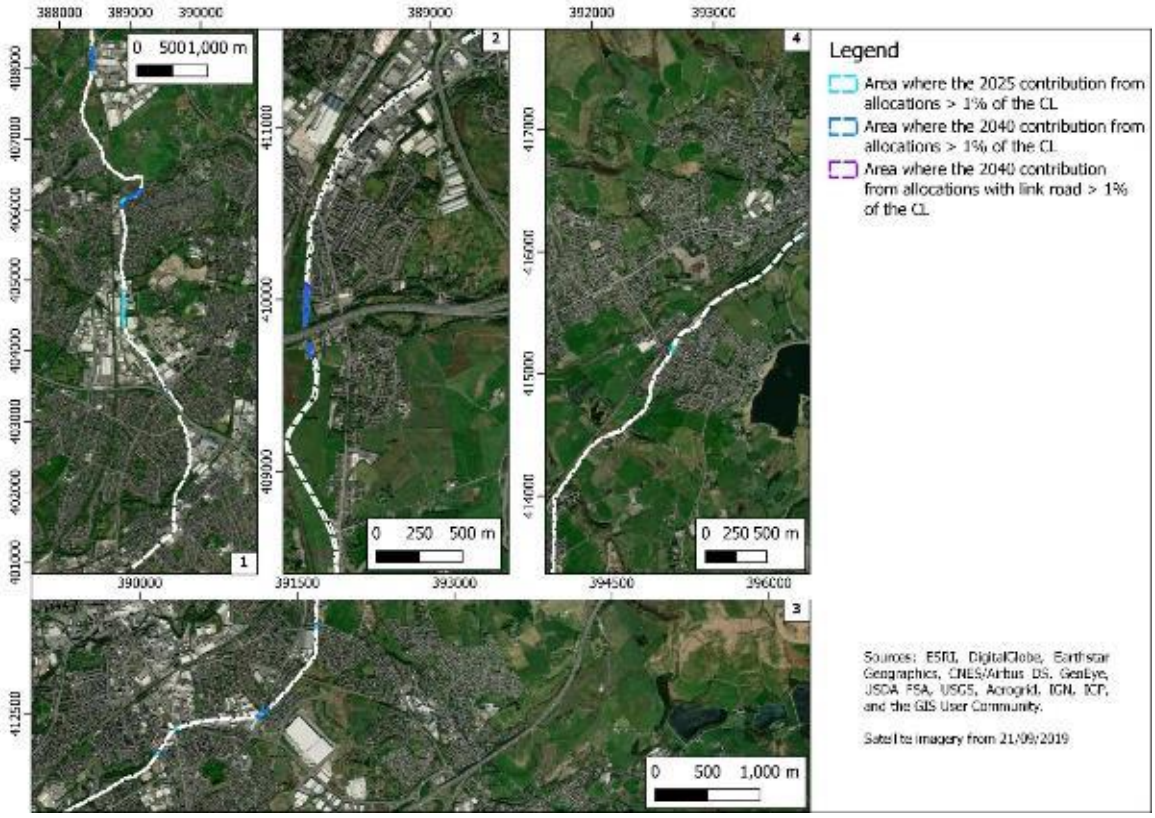


Figure 3-26 Total modelled concentration for NOx at Rochdale Canal SAC, using background NOx concentrations for 2025; for 2025 contributions from allocations

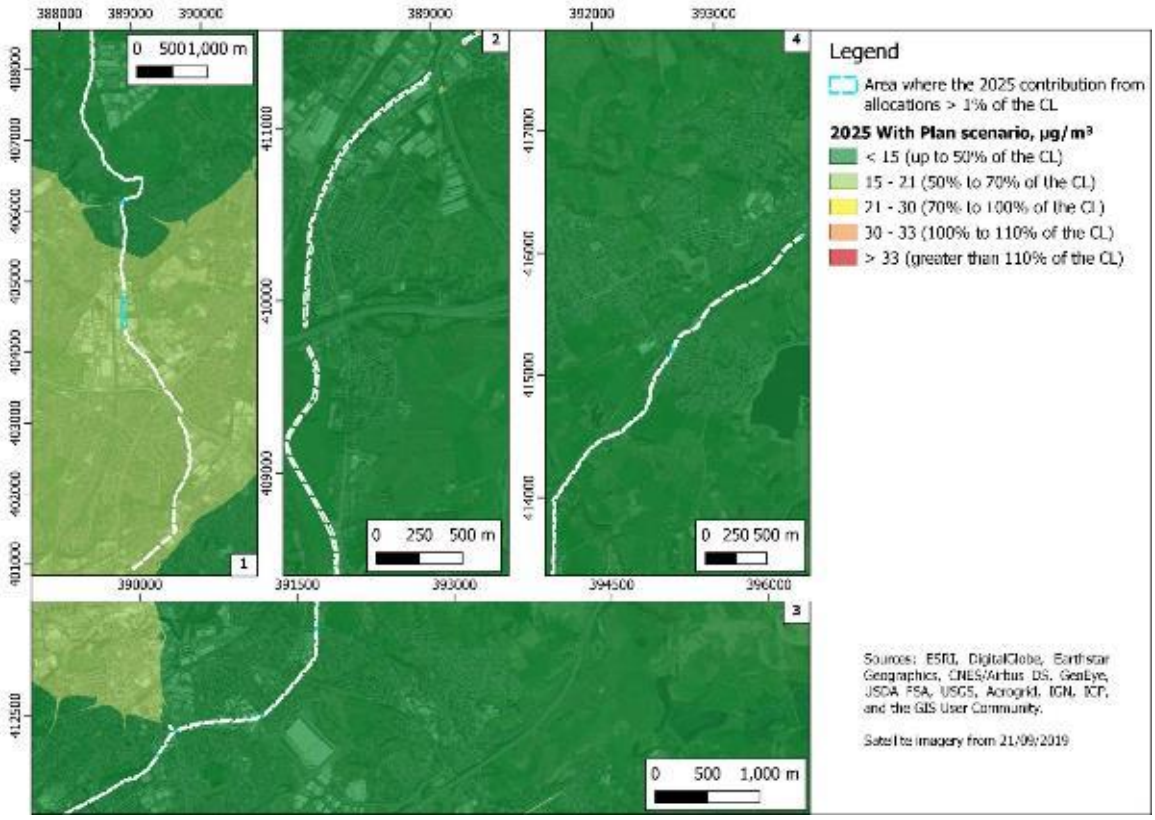


Figure 3-27 Total modelled concentration for NOx at Rochdale Canal SAC, using background NOx concentrations for 2030; for 2040 contributions from allocations

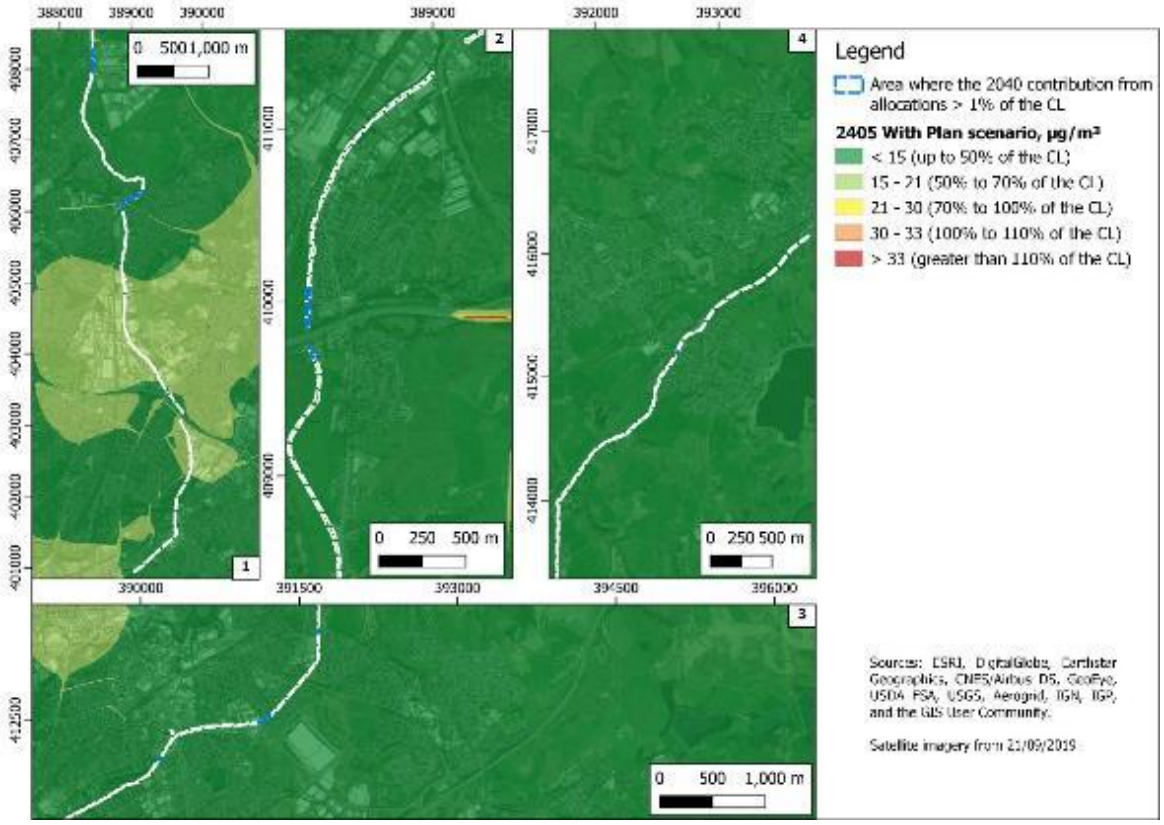


Figure 3-28 Total modelled concentration for NOx at Rochdale Canal SAC, using background NOx concentrations for 2030; for 2040 contributions from allocations with link road

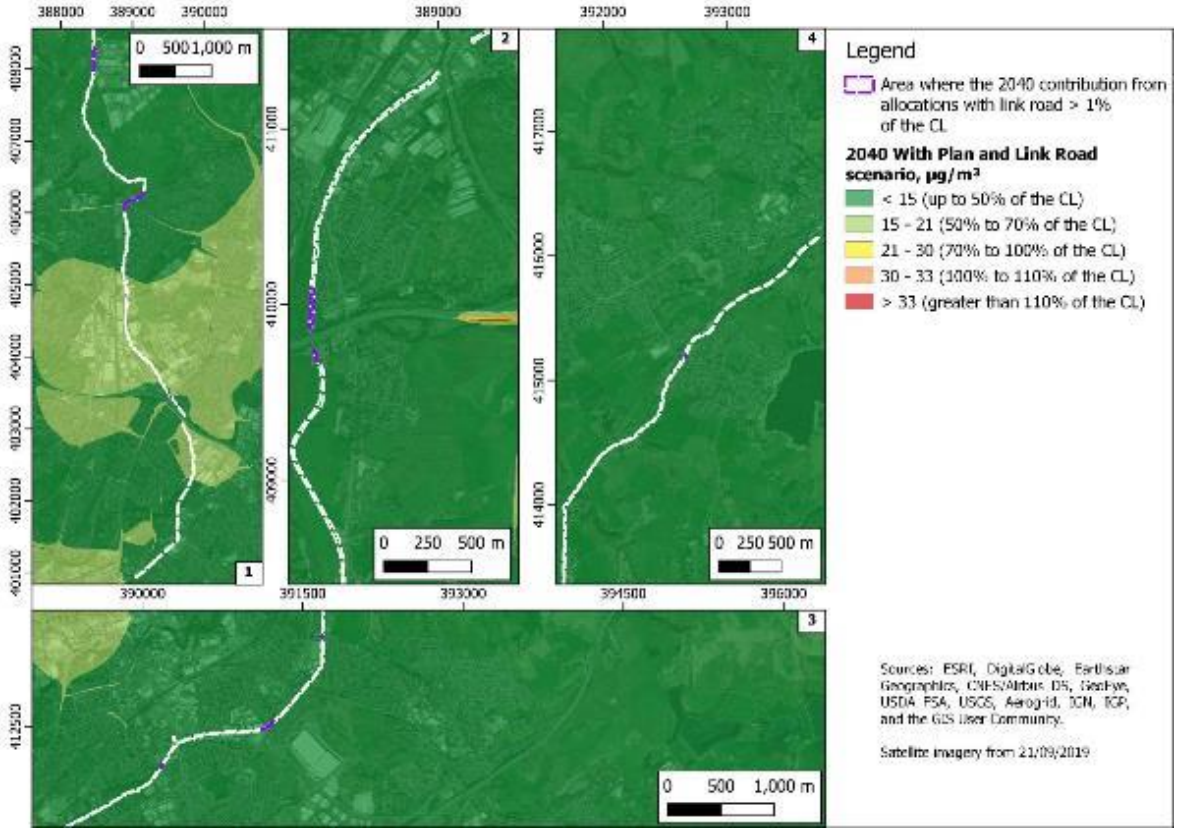


Figure 3-26, Figure 3-27, and Figure 3-28 present the total modelled NOx concentration for the three GM "With Plan" scenarios. These concentrations were calculated by adding the "2025 contribution from allocations", "2040 contribution from allocations", and "2040 contribution from allocations with link road" results to the NOx background maps. The 2025 NOx background map was paired with the 2025 contribution results while the 2030 NOx background map was paired with the two 2040 contribution results. In all three cases, the total NOx concentration is predicted to be less than 21 µg/m^3 (70% of the CL) throughout the areas where the model results exceed 1% of the CL.

On the basis of available evidence and agreed thresholds, there are no adverse effects on this SAC site arising from increased airborne NOx concentrations associated with any of the GM "With Plan" development scenarios, and therefore no further assessment is required for NOx.

3.5.3.2 Airborne NH_3

Figure 3-29 illustrates the areas where the modelled contribution from the GM "With Plan" scenarios are predicted to exceed 1% of the CL.

Figure 3-30, Figure 3-31, and Figure 3-32 present the total modelled NH_3 concentration for the three GM "With Plan" scenarios. These concentrations were calculated by adding the GM contribution results to the 2017-2019 NH_3 background concentrations from APIS. The NH_3 concentrations from APIS are on a 5km x 5km grid, hence the total NH_3 concentrations appear to have large pixels where the background concentrations change based on the boundaries of the 5km grid.

In all three cases, the total NH_3 concentration is predicted to be less than 2.28 µg/m^3 (76% of the CL) throughout the areas where the model results exceed 1% of the CL. On the basis of available evidence and agreed thresholds, there are no adverse effects on this SAC site arising from increased airborne NH_3 concentrations associated with any of the GM "With Plan" development scenarios, and therefore no further assessment is required for NH_3.

Figure 3-29 Overview of screening results for ammonia (NH_3) at Rochdale Canal SAC

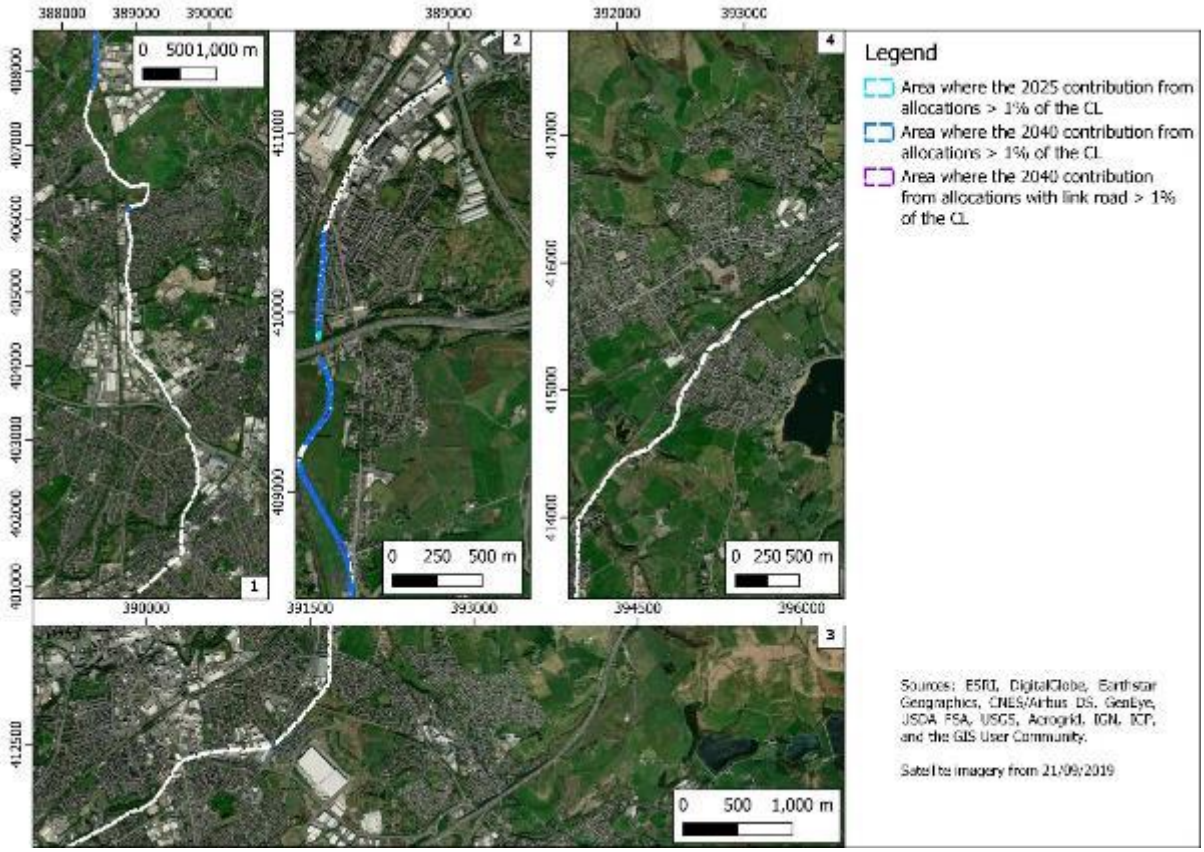


Figure 3-30 Total modelled concentration for NH_3 at Rochdale Canal SAC, using background NH_3 concentrations for 2017-2019; for 2025 contributions from allocations

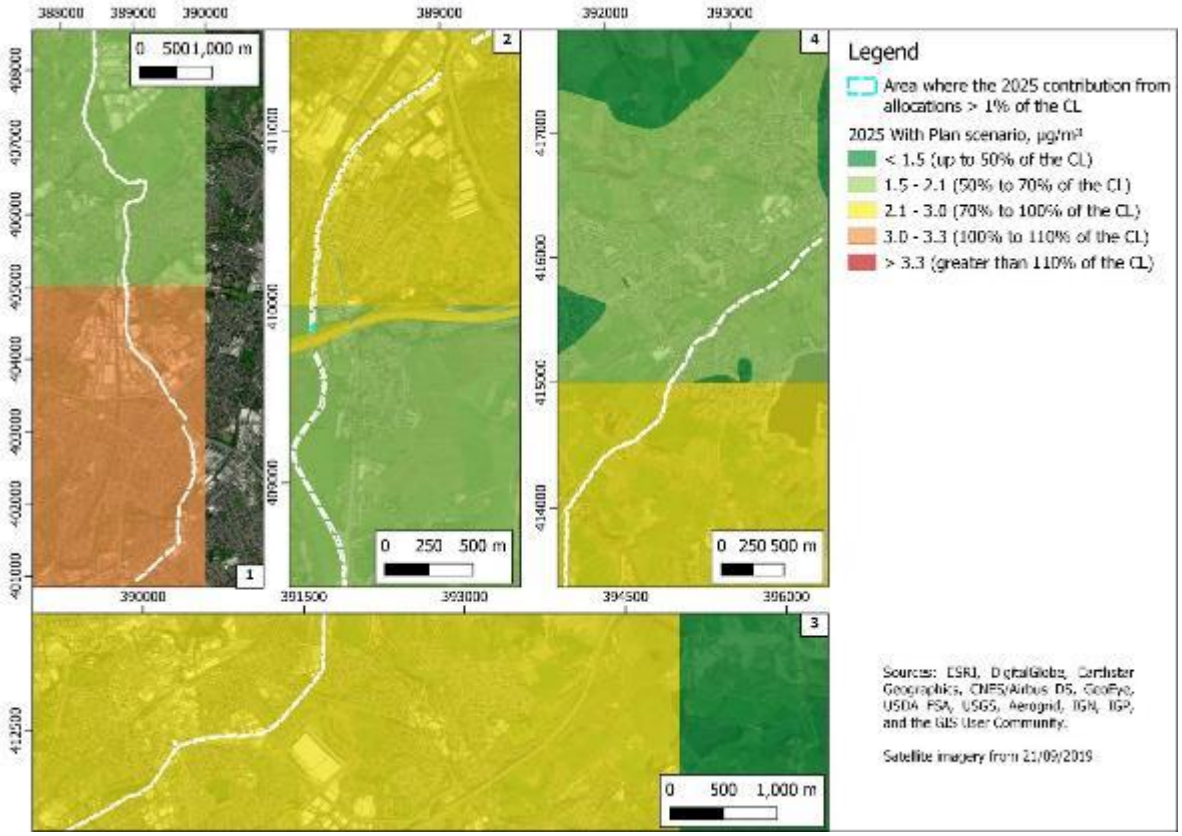


Figure 3-31 Total modelled concentration for NH_3 at Rochdale Canal SAC, using background NH_3 concentrations for 2017-2019; for 2040 contributions from allocations

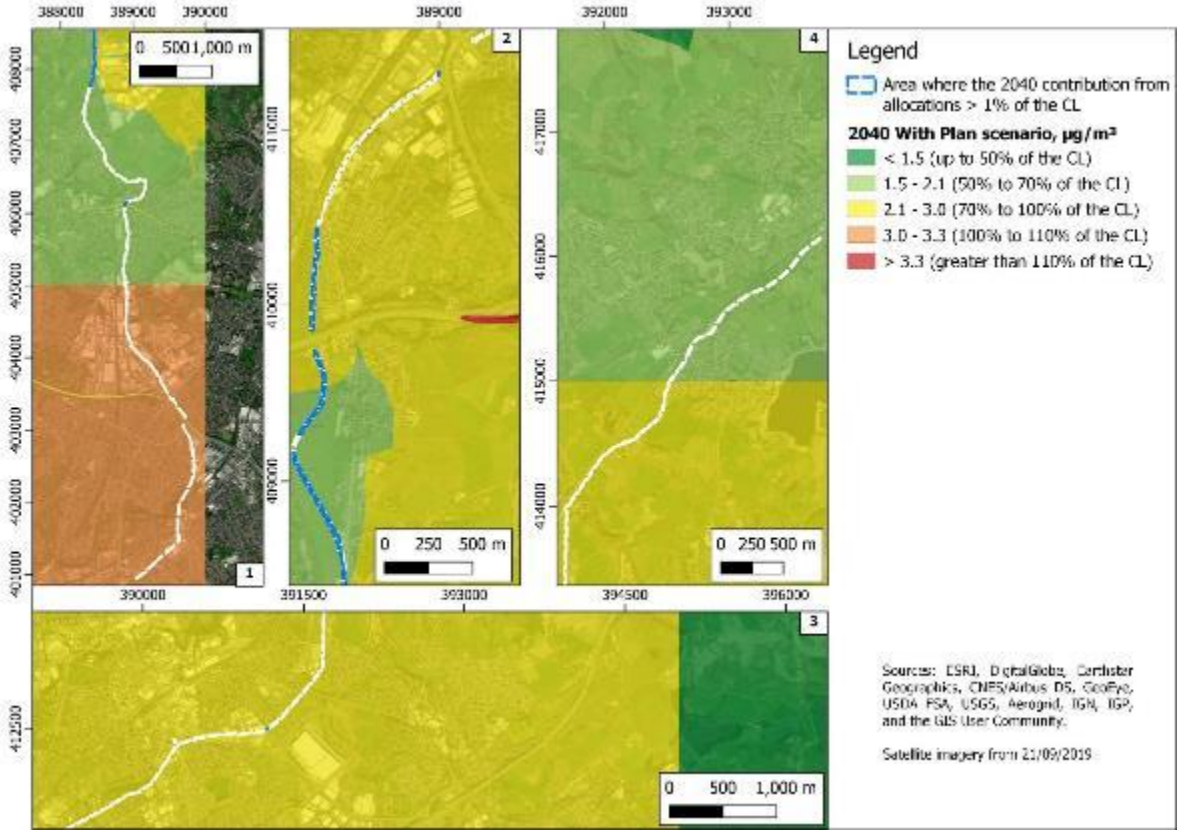
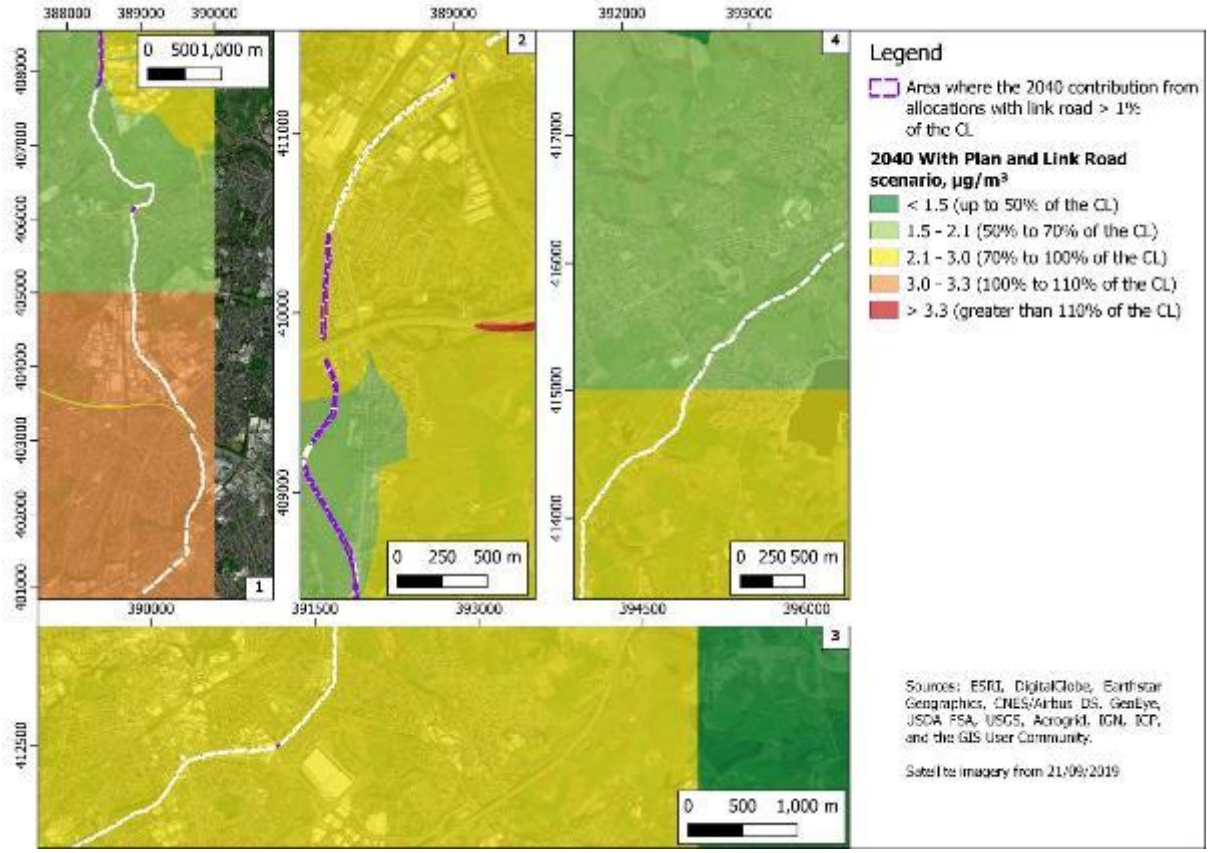


Figure 3-32 Total modelled concentration for NH_3 at Rochdale Canal SAC, using background NH_3 concentrations for 2017-2019; for 2040 contributions from allocations



3.5.3.3 Nitrogen deposition

Figure 3-33 illustrates the areas where the nitrogen deposition contribution from the GM “With Plan” scenarios are predicted to exceed 1% of the CL, when grassland deposition rates are considered.

Figure 3-34, Figure 3-35, and Figure 3-36 present the total predicted nitrogen deposition rates for the three GM “With Plan” scenarios, using grassland deposition rates. These deposition rates were calculated by adding the GM contribution results to the 2017-2019 background deposition rates from APIS. The background nitrogen deposition rates from APIS are on a 5 km x 5 km grid, hence the total deposition rates appear to have large pixels where the background deposition changes based on the boundaries of the 5 km grid.

In all three scenarios, the total nitrogen deposition rate is predicted to be greater than 100% of the CL, due to background nitrogen deposition rates that currently exceed the CL. Adverse effects from nitrogen deposition on this SAC cannot be ruled out on the basis of a comparison of the total predicted nitrogen deposition rate with the critical load. An Appropriate Assessment for nitrogen deposition impacts on this site has been undertaken, in consultation with Natural England.

Figure 3-33 Overview of screening results for nitrogen deposition at Rochdale Canal SAC, based on grassland deposition rates

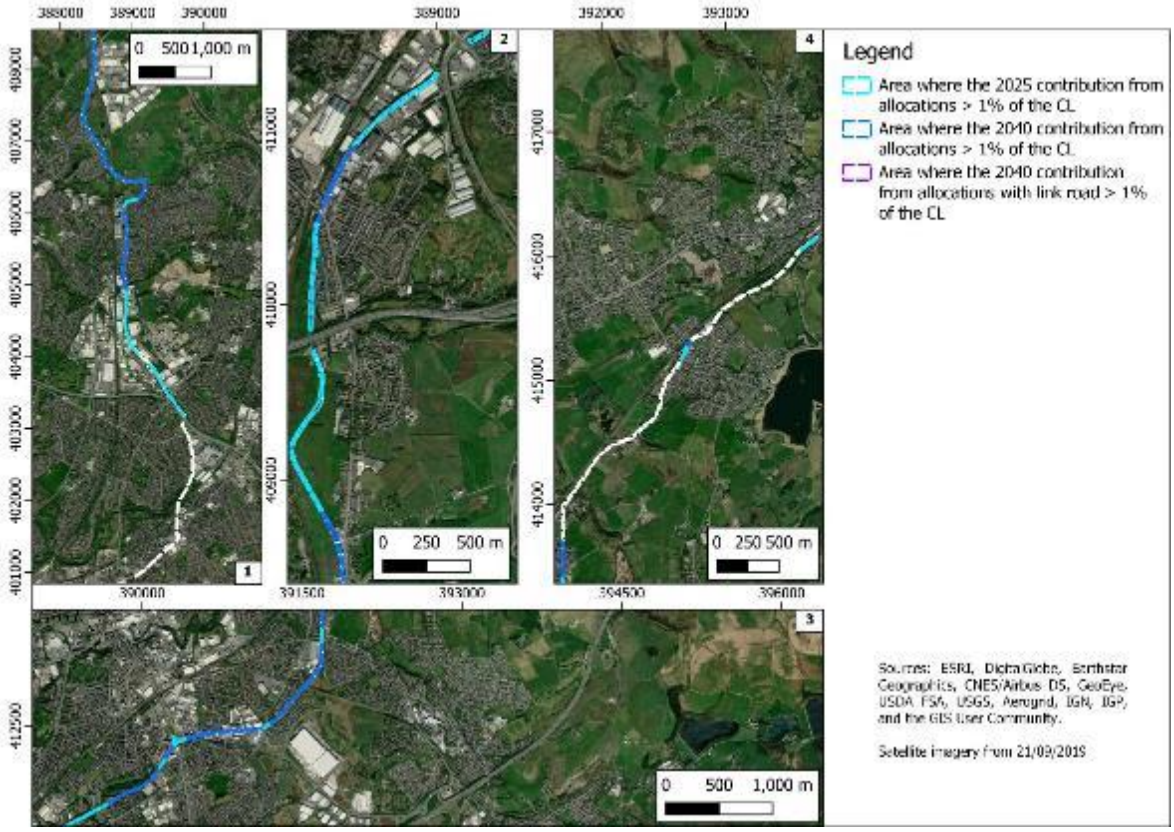


Figure 3-34 Total predicted nitrogen deposition at Rochdale Canal SAC, based on grassland deposition rates, using background deposition rates for 2017-2019; for 2025 contributions from allocations

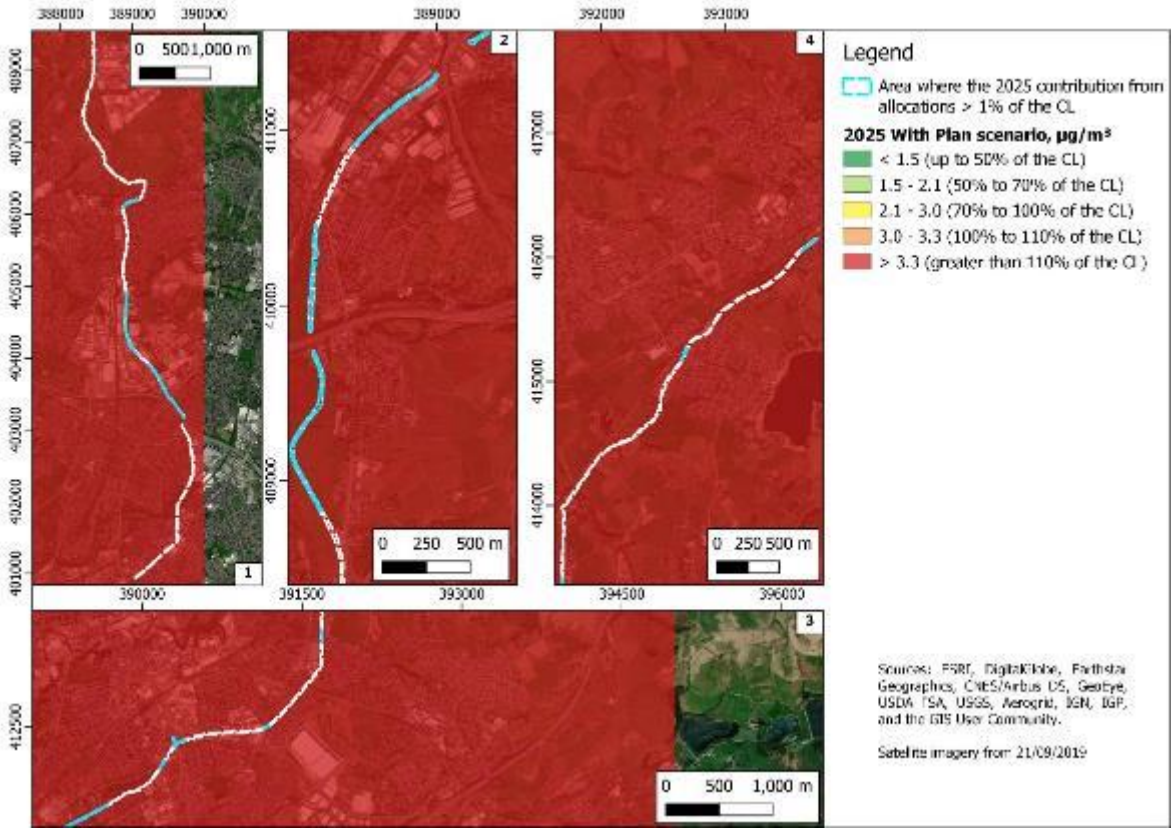


Figure 3-35 Total predicted nitrogen deposition at Rochdale Canal SAC, based on grassland deposition rates, using background deposition rates for 2017-2019; for 2040 contributions from allocations

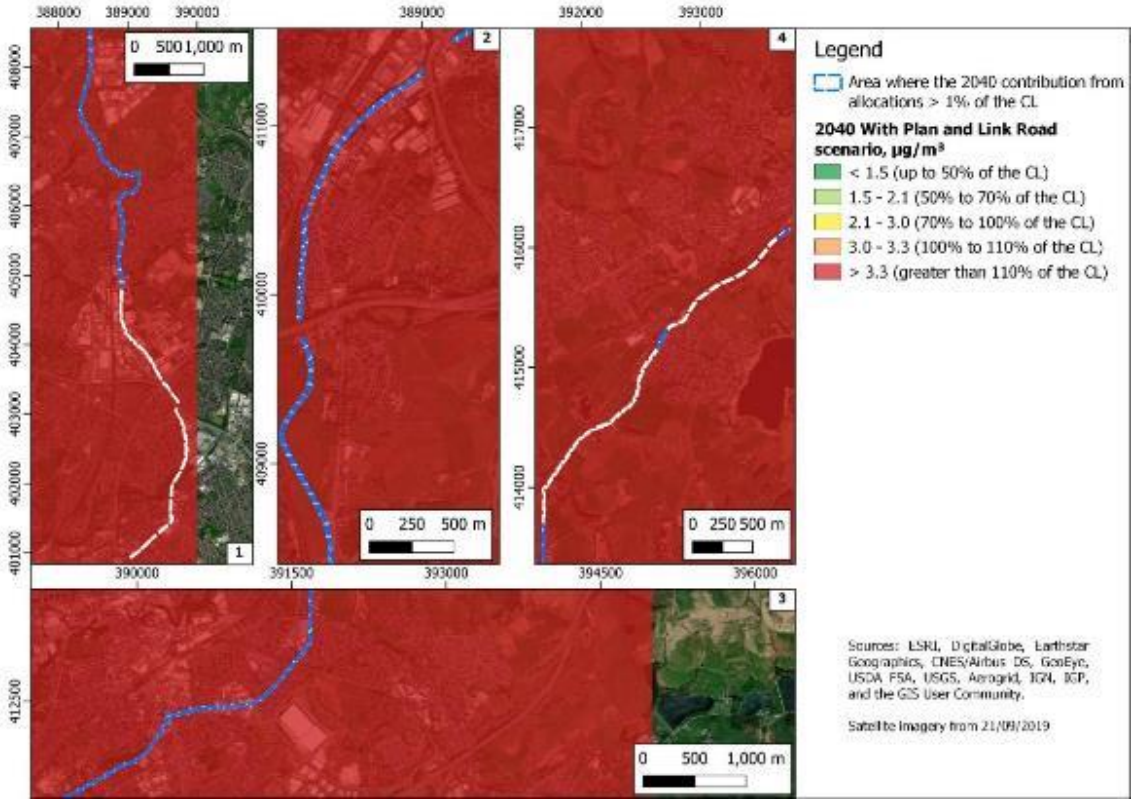
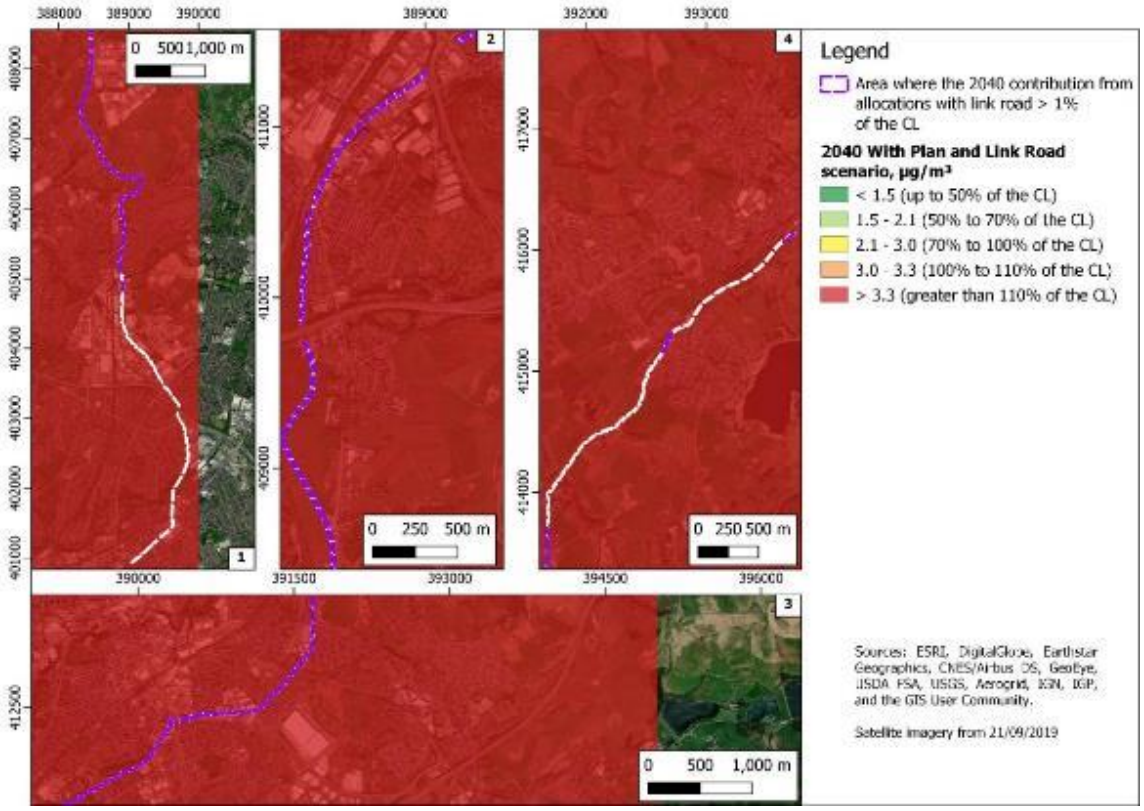


Figure 3-36 Total predicted nitrogen deposition at Rochdale Canal SAC, based on grassland deposition rates, using background deposition rates for 2017-2019; for 2040 contributions from allocations with link road



3.5.3.5 Modelling assessment summary and conclusions

Following HRA Stage 1 screening, Likely Significant Effects (LSE) at Rochdale Canal SAC have been identified for nitrogen deposition. LSE can be discounted for airborne NOx and NH_3.

3.5.4 HRA Stage 2: Appropriate Assessment (ecological evaluation)

3.5.4.1 Rochdale Canal SAC

The following text is taken directly from: European Site Conservation Objectives: Supplementary advice on conserving and restoring site features - Rochdale Canal Special Area of Conservation (SAC) UK0030266.Natural England (2019).[64]

Situated within the Greater Manchester area, the Rochdale Canal contains important habitats for submerged aquatic plants and emergent vegetation, including extensive colonies of the nationally scarce floating water-plantain Luronium natans, which is the SAC's qualifying feature.

The site also supports a diverse assemblage of aquatic flora, in particular nine species of pondweed Potomogeton spp. The plant communities found in the Rochdale Canal are characteristic of mesotrophic water bodies, i.e. those which are moderately nutrient-rich.

Floating water-plantain occurs in a range of freshwater situations, including nutrient-poor lakes in the uplands, slowly-flowing lowland rivers, pools, ditches and canals that are moderately nutrient-rich. The floating water-plantain is an aquatic plant endemic to Europe. It has a complex life history and ecology and is notoriously difficult to identify. Rochdale Canal supports a significant population of floating water-plantain in a botanically diverse water-plant community. This population is representative of the formerly more widespread canal populations of north-west England.

Floating water-plantain occurs as two forms: in shallow water with floating oval leaves, and in deep water with submerged rosettes of narrow leaves. The plant thrives best in open situations[65] with a moderate degree of disturbance, where the growth of emergent vegetation is held in check. Populations fluctuate greatly in size, often increasing when water levels drop to expose the bottom of the water body. Populations fluctuate from year to year, and at many sites records have been infrequent, suggesting that only small populations occur, in some cases possibly as transitory colonists of the habitat. Populations tend to be more stable at natural sites than artificial ones[66], but approximately half of recent (post-1980) records are from canals and similar artificial habitats. Its habitat in rivers has been greatly reduced by channel-straightening, dredging and pollution, especially in lowland situations.

3.5.4.2 Ecology of floating water-plantain

The following text is taken directly from Lansdown & Wade (2003)[67] which is considered likely to be the most complete published work on the species. That document should be consulted for the full references cited below.

[64] Natural England (2019). European Site Conservation Objectives: Supplementary advice on conserving and restoring site features - Rochdale Canal Special Area of Conservation (SAC) UK0030266

[65] According to Tom King at Canal & River Trust, *Luronium* seems to tolerate partial shade, and this may even help to reduce competition in some places (Canal & River Trust , pers. comm.). However the NE supplementary advice on SAC Conservation objectives state that "over-shading and leaf drop from developing bank-side trees denies opportunity for floating water plantain to establish on large and growing sections of the canal. Bankside tree removal is often required to reduce shading effects and leaf litter input."

[66] However, the Canal & River Trust contends that it tends to be quite static on their canals, with the populations being quite similar each year that they survey. (Canal & River Trust , pers. comm.)

[67] Lansdown RV & Wade PM (2003). Ecology of the Floating Water-plantain, Luronium natans. Conserving Natura 2000 Rivers Ecology Series No. 9. English Nature, Peterborough.

Edaphic factors (potential direct effects)

By their nature, environmental influences upon habitat are interlinked and the interactions complex. The following accounts are taken directly from the literature with varying and often unspecified degrees of experimental support.

The floating water-plantain is often described as being typical of, or even an indicator of, acid water (Cook 1983, Weeda et al. 1991). However, it has been recorded from water with a wide range of pH values, from 3.6–6.1 (Arts et al. 1990a, Arts et al. 1990b), pH 5 (Smits et al. 1990 a, b), 5–6.5 (Szmeja & Clément 1990), and 5.8–7.2 (Hanspach & Krausch 1987). Similarly, the solid geology underlying populations varies from mildly acid (Libbert 1940), to circumneutral (Willby & Eaton 1993), mildly alkaline (Willby & Eaton 1993, J Bruinsma pers. comm. 2001) and even relatively base-rich (Willby & Eaton 1993, Greulich et al. 2000a), although the base status is not directly related to calcium content or alkalinity.

In a study in backwaters of the Rhône and Ain rivers, a site supporting natural populations had a sediment pH of 7.0, while interstitial water had a pH of 7.4 (Greulich et al. 2000b). The Dombes fishponds, which support a number of populations, characteristically have naturally nutrient-poor sediment and are generally limed, resulting in an elevated pH of water with an average of 8 (range 7.1–9.4) (Broyer et al. 1997). Although disputed by Cook (1983), L. natans has been shown to tolerate calcium (Greulich et al. 2000b).

Tolerance of a range of pH values from 3.6–8 would suggest that acidity is not a determining factor in habitat suitability for floating water-plantain. A number of authors have noted that acidification of waterbodies can lead to a decline and eventual loss of populations (Plate 1985). Schaminee et al. (1995) suggest that a decline in pH from 5.5 to 4.4 can result in loss of stands of the Littorelletalia. However, experimental studies have shown that plants can remain viable in culture solutions as acid as pH 4 (Maessen et al. 1992).

L. natans is associated with a number of soil types, including sand (Van Ooststrom et al. 1964; Smits et al. 1990a; Arts & den Hartog 1990a), sand with gravel (Arts & den Hartog 1990a), silt (Arts & den Hartog 1990a) and peat (Van Ooststrom et al. 1964, Weeda et al. 1991). However, an important factor appears to be an absence of layers of deep organic sediment (Schaminee et al.1995, J Bruinsma pers. comm. 2001).

The floating water-plantain is often described as being characteristic of oligotrophic waters (Fritz 1989, Willby & Eaton 1993; Lockton & Whild 1995; van den Munckhoff 2000). However, it is also recorded from meso-oligotrophic (Mériaux & Wattez 1981; Cook 1983; Arts & den Hartog 1990a), mesotrophic and meso-eutrophic (J Bruinsma pers. comm. 2001) to eutrophic waters (Willby & Eaton 1993). Similarly, it has been described as occurring on moderately nutrient-rich soils (Arts & Den Hartog 1990, Smits et al. 1990a).

There are also claims that it does not occur in polluted water (Mennema et al. 1985). In the south of the Netherlands L. natans appears to have its most important strongholds in regions with iron-rich seepage, and it has been described as being limited to nutrient- and phosphate-poor waters (van den Munckhoff 2000). Conversely, in Denmark, Mikkelsen (1943) considered the species to require relatively nutrient-rich conditions, hence its presence in the River Vorgod and in the mouth of the River Skjern. This view is also put forward by Køie (1944) describing the occurrence of L. natans in the River Skjern.

The main conclusion that can be reached from the literature is that floating water-plantain appears to have a very wide range of chemical and substrate tolerances. If all the above statements are accepted, then it would appear unlikely that these parameters can be regarded as limiting distribution or abundance. However, the level of disagreement suggests that they should be treated with caution.

Causes of decline (potential indirect effects)

L. natans has been shown to be intolerant of competition (Willby & Eaton 1993, Greulich et al. 2000b). The cause of this intolerance is not yet clear, but there are three possible causes:

- *Physical suppression.*
- *Competition for light or nutrients.*
- *Chemical suppression (such as allelotoxins).*

Competition and succession are probably major influences limiting the distribution and abundance of the floating water-plantain, which must, to some extent, depend upon factors suppressing colonisation by more aggressive plant species. These factors will operate in different ways in relation to the various growth and reproductive strategies of L. natans.

In permanent, shallow, lowland meso-eutrophic waterbodies, there are few processes that will suppress succession. In larger waterbodies wave action is certainly an important factor, and if connected to a river, scour may have a similar effect. However, it is notable that in part of the Vieux Rhône, floating water-plantain disappeared in 1991 after floods of exceptional intensity (Henry et al. 1996). This may have been linked to lowering of groundwater levels after major incision of the Rhône riverbed caused by gravel extraction (Bornette & Heiler 1994). Where the species is able to develop a dense floating leaf canopy, its competitive ability may be enhanced (Greulich et al. 2001).

In permanent, deep or upland, meso-oligotrophic or oligotrophic waterbodies, the main factors appear to be lack of light at depth, wave action and poor nutrient status. It is also possible that colonisation by an alien species, such as swamp stonecrop (Crassula helmsii) or floating pennywort (Hydrocotyle ranunculoides), could pose a threat.

In many sites that currently support the floating water-plantain, factors suppressing succession are artificial and include disturbance of sediment by light boat traffic (Willby & Eaton 1993) and dredging (Hanspach & Krausch 1987, Willby & Eaton 1993).

The species involved in succession will depend upon habitat. In larger, lowland mesotrophic or eutrophic waterbodies, typical species will include Carex elata, C. rostrata, Glyceria maxima, Phalaris arundinacea, Phragmites australis (Dierssen 1981, Kaplan 1993), Sparganium emersum (Greulich et al. 2001) and Typha latifolia (Dierssen 1981, Kaplan 1993). In these conditions, natural processes of nutrient enrichment may be exacerbated by eutrophication from agriculture (Dierssen 1981; Mériaux 1981; Wittig & Potts 1982; Plate 1985; Schaminée et al. 1992; Kaplan 1993). In upland and other oligotrophic waterbodies, if succession occurs it appears to be often associated with an anthropogenic change in nutrient status or water acidity and similar species to those involved in the lowlands.

Another possible cause of loss could involve the spread of invasive alien aquatic plants. While this has not yet been proven, the spread of Crassula helmsii in the British Lake District is encroaching upon L. natans populations, and it is unlikely that the latter will be able to compete (A Darwell pers. comm.).

It is notable that: "The principal threat in Britain is now from restoration of waterways and the expansion of recreational boating, while acidification of upland lakes represents a remote but potentially significant long-term risk" (English Nature in prep.).

3.5.4.2 Site-specific threats

The Site Improvement Plan (SIP) for Rochdale Canal SAC[68] lists atmospheric nitrogen deposition as one of two perceived threats to the SAC (the other being over-shading and leaf drop from bank-side trees, which could itself, in theory, be exacerbated by nitrogen deposition). The SIP makes no mention of acid deposition.

[68] Natural England (2014). Site Improvement Plan, Rochdale Canal SAC.

In the SIP, it is stated that: "Nitrogen deposition exceeds site-relevant critical loads for the supporting habitat which is in unfavourable condition." However, the Air Pollution Information System (APIS) does not appear to provide a site-relevant critical load for *L. natans* at this SAC. Instead it states:

> "*This critical load only applies if the interest feature is associated with softwater oligotrophic or dystrophic lakes at the site. If the feature is not depending on these lake types, there is no comparable critical load available… The lower end of the [stated* critical load*] range is intended for boreal and alpine lakes, and the higher end of the range for Atlantic softwaters. Site specific advice should be sought from the conservation agencies as to which part of the range is relevant. Note that the critical load should only be applied to oligotrophic waters with low alkalinity with no significant agricultural or other human inputs*."

Therefore, it is not clear how the SIP has reached its conclusion of critical load exceedance. As the preceding sections above show, *L. natans* appears to have a very wide tolerance of nutrient levels, which reinforces the lack of any relevant critical load given in APIS.

Furthermore, the supplementary advice on the SAC's Conservation objectives in relation to air quality simply sates: "*Restore as necessary the concentrations and deposition of air pollutants to at or below the site-relevant Critical Load or Level values given for this feature of the site on the Air Pollution Information System".* But as has been shown above, the Air Pollution Information System (APIS) does not appear to provide a site-relevant critical load for *L. natans* at this SAC. Instead it states the critical load only applies if the interest feature is associated with softwater oligotrophic or dystrophic lakes, and if the feature is not depending on these lake types, there is no comparable critical load available.

The last condition assessment of the SAC's underpinning SSSI undertaken by Natural England (in 2010), makes no mention of airborne nitrogen or any other emissions being responsible for the unfavourable-recovering condition of the SSSI. Rather, its condition appears to be linked to the restoration of the site to a functioning navigation. This would seem to accord with the English Nature (now Natural England) statement quoted in *Lansdown & Wade (2003)* that: "*The principal threat in Britain is now from restoration of waterways and the expansion of recreational boating…*".

So, in summary, it would seem that the only indication that nitrogen deposition may be an issue for the SAC comes from the SIP, but no evidential basis is currently apparent, and the SIP may have misconstrued APIS.

3.5.4.3 Consultation

The above review of published documents relating to *L. natans* the Rochdale Canal SAC and SSSI has been supplemented with consultation with:

- Natural England – Janet Baguley and Petula Neilson
- Dr Ben Goldsmith – a leading national expert on aquatic macrophytes
- Tom King – ecologist and invasive species lead for Canals & Rivers Trust

Natural England commented via email (13/10/21) that *L. natans* is considered to have a relatively wide tolerance to nutrient levels and that above-water impacts (due to direct deposition) are unlikely, as much of the plant remains submerged beneath the water surface. They suggest that whilst water chemistry could be potentially altered by increased nutrients in the water column, there is limited evidence regarding the interactions and species/complexes which occur when nitrogen reaches a water body, how these behave in the water column or how the characteristics of a water body (i.e. size, flow etc.) may influence this. They also suggest that there will be more significant sources of nutrient input to the canal from other, non-aerial sources.

No mention of acidity issues was made by Natural England and subsequent discussion with Natural England appears to confirm that there is no information on this potential impact.

Dr Ben Goldsmith commented via email (13/12/21) that he has worked for many years on *L. natans* populations and is amazed just how tolerant it can be of water quality, occurring as it does in really oligotrophic lakes right through to relatively enriched canal systems. It can also be a very dynamic species, coming and going from sites as conditions change. In terms of air pollution, he stated that from the autecology, acidification does not appear to be much of a problem in buffered sites and suspects it to be relatively tolerant to nitrates. He refers to Lansdown & Wade (2003) (see extracts above) as probably the most complete piece of work on the species.

Dr Goldsmith concludes that threats are therefore more likely related to indirect impacts, and particularly competition from other species. In the Rochdale Canal, the non-native invasive species *Elodea nuttallii* and *Crassula helmsii* are present. Both species which do well in elevated nitrogen and therefore could be a potential threat, but he hasn't any data to qualify this.

Tom King (Ecologist, Canal & River Trust) states that *Elodea* is widespread on Rochdale Canal and does cause issues in some locations. *Crassula* is present from Slattocks down towards Manchester, being very common near the M60 motorway. Another species group, which he believes has a greater link to nitrogen levels are algae. 'Blanket weeds' are a real problem in some locations, which has a direct impact upon *Luronium,* according to Mr King. Finally, he also highlights that excessive growth of trees (native) and the resulting shading issue for SAC condition should be considered.

3.5.4.4 Assessment of likely effects on site integrity without mitigation

The preceding sections of this report demonstrate that there is no clear body of evidence to confirm that elevated nutrient nitrogen deposition or acidity directly affect the conservation of *L. natans.* However, professional opinion and some evidence suggests that elevated nutrients might increase the spread of competitors of *L. natans*, both native and non-native, thus having an indirect impact on its abundance and distribution and therefore site integrity. For this reason, precautionary mitigation is required to address the potential consequences of increased competition with other species arising from nutrient enrichment of the canal.

3.5.4.5 Mitigation measures

Avoidance and reduction

Preference should always be given to preventing or avoiding exposure to any pollutant in the first place by eliminating or isolating potential sources, moving sources away from sensitive receptors or by replacing sources or activities with alternatives. However, in many cases the need to integrate with the existing highways network may limit where the additional traffic can be directed.

Options might include traffic management measures to limit the effects of vehicle emissions on ecological receptors. For example, it may be possible to include measures to discourage the use of roads near the SAC by targeting improvements elsewhere or even closing certain routes to motorised vehicles. Strategic options may also include measures to promote the use of more sustainable transport options to reduce vehicle emissions through 'modal shift'.

If avoidance is not possible or sufficient, preference should be given first to:

- mitigation measures that act on the source; before
- mitigation measures that act on the pathway; which in turn should take preference over
- mitigation measures at or close to the point of exposure that address the impacts upon the receptor: those which are designed or engineered to operate passively rather than active measures that require continual intervention.

Habitat management with monitoring

In cases where the above measures are not possible, options exist to manage the habitat within the SAC to prevent adverse effects from occurring despite an increase in nitrogen deposition (see: Stevens

et al 2013[69] and CIEEM 2021).[70] In the case of Rochdale Canal, the likely effects of nitrogen deposition have been shown to come indirectly from its role in increasing the growth of native and non-native species that may compete with *L. natans* under nutrient-enriched conditions (referred to here as 'invasive species'). Therefore a strategic, long-term programme of invasive species control within the canal would constitute an appropriate response in the absence of feasible avoidance and reduction measures.

This would entail the physical removal of invasive species (including thinning of invasive, over-hanging trees), at appropriate times of year, for safe disposal away from the SAC; but only where such plants would not have other negative impacts on the natural environment. Physical removal is important because it would not only remove the invasive competitive species, but it would also gradually reduce some nitrogen from the canal in the form of invasive plant tissue which would otherwise be re-released into the water during decomposition. It is partly for this reason that herbicide treatment is not recommended (as well as the herbicide's potential toxic effects on *L. natans*).

It will be equally important to undertake an effective monitoring (regular survey) programme to ensure adequate implementation each year and to assess the effects on *L. natans*. This monitoring would allow for the control programme to be adapted in response to the information gained to improve and maintain its effectiveness.

It is important to note that monitoring is not being recommended here to overcome any uncertainty of the ability of such mitigation to avoid an adverse effect on the SAC. There can be no reasonable doubt that the physical removal of invasive plants from the canal (and its banks) will reduce competition and dissolved nutrients if it is done at scale, regularly, long-term and integrated into the management of the site as a whole.

Normally such control programmes are best delivered through existing site managers. A suitable delivery partner will need to be identified.

The funding of such work could come from developer contributions secured on a per-unit tariff basis, similar to other strategic mitigation and monitoring solutions to population growth effects elsewhere in the UK. That way, the resources available for such habitat management are in direct proportion to the scale of impacts arising from implementation of the Local Plan.

3.5.4.6 Residual effects on site integrity

If the above mitigation measures can be implemented, the residual effects of the Plan are unlikely to be adverse to Rochdale Canal SAC's site integrity. However, the mitigation measures will need to be developed further and the delivery mechanism confirmed before there is enough certainty for legally-compliant adoption of the Plan.

[69] Stevens, C., Jones, L., Rowe, E., Dale, S., Payne, R., Hall, J., Evans, C., Caporn, S., Sheppard, L., Menichino, N., Emmett, B. (2013). Review of the effectiveness of on-site habitat management to reduce atmospheric nitrogen deposition impacts on terrestrial habitats. CCW Science Series Report No: 1037 (part A), 186pp, CCW, Bangor.

[70] CIEEM (2021). Advice on Ecological Assessment of Air Quality Impacts. Chartered Institute of Ecology and Environmental Management. Winchester, UK.

3.6 Rostherne Mere Ramsar (UK11060)

3.6.1 Ramsar background information and qualifying features

Underlying Sites of Special Scientific Interest (SSSI): Rostherne Mere SSSI.

Qualifying and notifiable features associated with this site include:

Ramsar Criterion 1: Rostherne Mere is one of the deepest and largest of the meres of the Shropshire-Cheshire Plain. Its shoreline is fringed with common reed *Phragmites australis*.

3.6.2 HRA Stage 1: Assessment of air quality impacts against screening thresholds

This section comprises the outcome of the assessment described in Section 2.4.

Table 22 summarizes the critical loads for nutrient nitrogen deposition (kgN/ha-year) and acid deposition (kEq/ha-year), as well as the critical levels for airborne ammonia (µg/m^3), applicable to this designated site. APIS does not list critical load or critical level information for this Ramsar site. Natural England advised[47] that the same critical load and critical level values as for Oak Mere SSSI should be used for the analysis, as the Oak Mere SSSI has comparable habitats (fen / mires). The most stringent critical load or critical level (CL) for each pollutant is indicated in bold. The critical level for airborne NOx is set at 30 µg/m^3 across all designated sites.

Table 22 Minimum Critical Load and Critical Level (CL) values and associated sensitive features for Rostherne Mere Ramsar, based on the values for Oak Mere SSSI

Sensitive feature	Minimum nutrient nitrogen deposition CLs (kgN/ha-year)	Minimum acid deposition CLs (MinCLMaxN, kEq/ha-year)	Minimum airborne NH_3 CLs (µg/m^3)
Fen, marsh and swamp (*Hypericum elodes - Potamogeton polygonifolius* soakway)	**10**	**0.576**	**1**
Fen, marsh and swamp	**10**	**0.576**	**1**

Consideration of in-combination effects

The Rostherne Mere Ramsar site is contained within the GM study area. The dispersion modelling results for the GM study area account for air quality impacts associated with road traffic emissions from the allocations in Bolton, Bury, Manchester, Oldham, Rochdale, Salford, Tameside, Trafford, and Wigan.

Rostherne Mere is considered in HRA documentation for the Cheshire East Council Local Plan Strategy 2010-2030.[44] The HRA report noted that "Some sections of road within the vicinity of Rostherne Mere fall within 200m of the Ramsar site and therefore may impact on air quality at the Ramsar should vehicle usage increase associated with the potential allocated sites (DMRB LA 105). However, any potential increase in traffic on the A556 or other roads within 200m of Rostherne Mere as a direct result of TS 1 is considered to be negligible." The report concluded that there would be no Likely Significant Effects for air quality.

In the Stockport Core Strategy documentation,[43] an amber rating was assigned to Rostherne Mere for potential eutrophication impacts from air and road traffic and development impacting on air quality and hydrology. It was noted that "in-commuting and airport traffic could potentially contribute to species migration and eutrophication issues." In this documentation, an amber rating corresponds to "minor impacts with some level of potential significance – policy writers noted issues for policy development."

The Habitats Regulations Assessment[36] for the emerging Warrington Borough Council Local Plan considered air quality impacts on the Rostherne Mere Ramsar site, and included the text: "Rostherne Mere is located 170m from the A556 at its closest (and well over 300m from the M56) which are the two roads most likely to be used as journey to work routes by residents of Warrington. Given these distances any additional nitrogen deposition due to these two roads will have fallen to background levels by the time the SAC is reached. Moreover, the aforementioned provisions of Policy INF1 will ensure that emissions associated with increased housing and employment in Warrington are minimised. As a result it is considered that a conclusion of no adverse effect on integrity can be made."

In summary, modelled data were not available in relation to Local Plans published by neighbouring authorities. The assessment of in-combination effects for Rostherne Mere was based on modelled data for the PfE Plan allocations and qualitative findings published by these authorities.

The potential for in-combination impacts arising from the construction and operation of High Speed 2 (HS2) was also considered. The following information was provided within HS2 Phase 2b draft Environmental Statement Volume 3: "*Rostherne Mere Ramsar Site is located south-west of Altrincham, and adjacent to the village of Rostherne. A study to inform a HRA undertaken in consultation with Natural England and the Environment Agency concluded that there were no likely significant effects.*"[71] In view of the conclusion that there would be no significant effects due to HS2 Phase 2b, there is no need to further consider the potential for in-combination impacts of HS2 with the Places for Everyone plan, in relation to Rostherne Mere (Ramsar).

Screening results

Table 23 compares the maximum modelled contribution of each of the three GM "With Plan" scenarios to the lowest applicable CL. This screening exercise represents a precautionary approach, as it assumes that the most sensitive qualifying features (with the lowest CLs) are present in the areas with the highest modelled contribution (typically adjacent to the busiest road).

The screening results indicate that air quality impacts associated with the GM "With Plan" scenarios, in isolation, are well below the 1% screening threshold, with maximum modelled values ranging from 0.1% to 0.6% of the CL. Based on the small modelled contribution of the GM "With Plan" scenarios to air quality impacts on this site and the qualitative findings of the HRAs summarized in the preceding section, Likely Significant Effects can be discounted for the GM "With Plan", in isolation and in-combination with anticipated development from neighbouring local authorities.

Table 23 Screening results based on dispersion modelling of Greater Manchester Scenarios:

	Airborne NH_3	Airborne NOx	Nutrient nitrogen deposition*		Acid deposition*	
			Forest	Grassland	Forest	Grassland
CL	1	30	10	10	0.576	0.576
Units	µg/m^3	µg/m^3	kgN/ha-year	kgN/ha-year	kEq/ha-year	kEq/ha-year
2025 contribution from allocations						
Maximum modelled contribution	0.00056	0.048	0.012	0.0066	0.00083	0.00047
% of CL	0.056	0.16	0.23	0.13	0.15	0.082
2040 contribution from allocations						

[71] High Speed Two (HS2) Limited, High Speed Rail (Crewe to Manchester and West Midlands to Leeds) Working Draft Environmental Statement Volume 3: Route-wide effects, October 2018.

	Airborne NH_3	Airborne NOx	Nutrient nitrogen deposition*		Acid deposition*	
			Forest	Grassland	Forest	Grassland
Maximum modelled contribution	0.0016	0.12	0.030	0.017	0.0021	0.0012
% of CL	0.16	0.38	0.60	0.34	0.38	0.22
2040 contribution from allocations with link road						
Maximum modelled contribution	0.00021	0.085	0.014	0.0069	0.0010	0.00049
% of CL	0.021	0.28	0.27	0.14	0.17	0.086

*The site is a mixture of areas with water and tall vegetation; both grassland and forest deposition rates may apply, to different areas

3.7 South Pennine Moors SAC (UK0030280)

3.7.1 Background information and qualifying features

Underlying Sites of Special Scientific Interest (SSSI): South Pennine Moors SSSI, Dark Peak SSSI, Goyt Valley SSSI.

Qualifying and notifiable features associated with this site comprise: **4010 Northern Atlantic wet heaths with Erica tetralix; 4030 European dry heaths; 7130 Blanket bogs; 7140 Transition mires and quaking bogs; 91A0 Old sessile oak woods with Ilex and Blechnum in the British Isles.**

The Site Improvement Plan (SIP225) states that nitrogen deposition has been identified as a threat to this European site.

The conservation objectives stated for this are to 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 the qualifying natural habitats
- The structure and function (including typical species) of the qualifying natural habitats, and,
- The supporting processes on which the qualifying natural habitats rely.

3.7.2 HRA Stage 1: Assessment of air quality impacts against screening thresholds

This section comprises the outcome of the screening assessment described in Section 2.4.

Table 24 summarizes all of the critical loads for nutrient nitrogen deposition (kgN/ha-year) and acid deposition (kEq/ha-year), as well as the critical levels for airborne ammonia (µg/m^3), applicable to this designated site. The most stringent critical load or critical level (CL) for each pollutant is indicated in bold. The critical level for airborne NOx is set at 30 µg/m^3 across all designated sites.

Table 24 Minimum Critical Load and Critical Level (CL) values and associated sensitive features for South Pennine Moors SAC

Sensitive feature	Minimum nutrient nitrogen deposition CLs (kgN/ha-year)	Minimum acid deposition CLs (MinCLMaxN, kEq/ha-year)	Minimum airborne NH_3 CLs (µg/m^3)
Blanket bogs	**5**	**0.569**	**1**
Transition mires and quaking bogs	10	**0.569**	**1**
Old sessile oak woods with Ilex and Blechnum in the British Isles	10	0.713	**1**
Northern Atlantic wet heaths with Erica tetralix	10	0.749	**1**
European dry heaths	10	0.749	Site specific advice should be sought

Consideration of in-combination effects

The Places for Everyone Plan could have a potentially significant impact in this area in isolation. In this case, there would be no requirement for further consideration of in-combination impacts in this area.

The South Pennine Moors SAC is within the GM study area, although mainly outside the authority boundaries. The dispersion modelling results for the GM study area account for air quality impacts

associated with road traffic emissions from the allocations in Bolton, Bury, Manchester, Oldham, Rochdale, Salford, Tameside, Trafford, and Wigan.

The potential for impacts to arise at this site due to emissions of air pollutants was screened out for the following authorities:

- Stockport Metropolitan Borough Council
- Cheshire East Council
- West Lancashire Borough Council
- St Helens Council
- Warrington Borough Council
- Trafford Council

The Habitats Regulations Assessment for the High Peak Borough Council Local Plan[51] indicated a potential for significant adverse impacts at the South Pennine Moors SAC due to the High Peak Local Plan. No specific roads within the SAC requiring further assessment were identified, and additional policies to strengthen protection of the South Pennine Moors SAC were added to the High Peak Local Plan. Following further assessment, no risk of significant impacts at this SAC due to High Peak Local Plan were identified.

The HRA for Kirklees Metropolitan Borough Council Local Plan[52] highlighted potential increases in road traffic flows on the M62 and A635 resulting from the Kirklees Local Plan. These could result in an increase of more than 1% of the Critical Level for airborne NOx at a distance of up to 20m from the M62. Impacts due to nitrogen deposition, and impacts in the vicinity of the A635 would be lower still. It was concluded that "*the Publication Draft Local Plan alone will not result in adverse effects on the integrity of the South Pennine Moors SAC as a result of increased air pollution.*" In the light of these findings, it is recommended that further assessment and mitigation of impacts due to the "Places for Everyone" plan should take account of potential in-combination effects with the Kirklees Local Plan.

The HRA for Calderdale Metropolitan Borough Council Local Plan[60] concluded as follows: "*adverse effects on the integrity to the South Pennine Moors (phase 2) SPA and SAC as a result of air pollution arising from the allocation and policies screened in from the Calderdale Local Plan and in combination with other plans can be ruled out.*" No further evaluation is needed in relation to potential in-combination impacts with Calderdale Local Plan.

The HRA for Rossendale Borough Council Local Plan[61] concluded as follows: "*since the main arterial road routes lie beyond the 200m zone from the European sites, no adverse effects arising from air pollution from vehicles are likely to occur.*" This conclusion is not reflected in the location of the M62 and A650 in relation to the South Pennine Moors SAC. As a result, it is recommended that further assessment and mitigation of impacts due to the "Places for Everyone" plan should take account of potential in-combination effects with the Rossendale Local Plan.

The HRA for Blackburn with Darwen Borough Council Local Plan[53] concluded as follows: "*it is considered unlikely that this or any other site will be impacted upon in regard to air quality.*" No further evaluation is needed in relation to potential in-combination impacts with the Blackburn with Darwen Local Plan.

The HRA for the Highways England A57 Link Roads scheme[54] highlighted a potential impact at the South Pennine Moors SAC. The potential impact amounted to an increase of more than 1% of the Critical Load for nitrogen deposition. This impact was then screened out as it was below a further threshold set to represent the "*potential theoretical loss of 1 species*." It was concluded that the proposed A57 Link Roads scheme would not result in a Likely Significant Effect on this SAC. The area above the 1% threshold was limited to the immediate vicinity of the A57, which is not one of the roads

highlighted as a potential concern with regard to the potential impact of the "Places for Everyone" Plan. Nevertheless, it is recommended that further assessment and mitigation of impacts due to the "Places for Everyone" plan should take account of potential in-combination effects with the Highways Agency A57 Link Roads scheme.

The M62 Motorway passes through the South Pennine Moors between Junctions 21 to 23. The Environmental Assessment of the Proposed M62 Smart Motorway Scheme (Junctions 20 to 25) includes modelling of NOx concentration and nitrogen deposition for a projected year of 2024. However, it was announced in January 2022 that smart motorway schemes would not be progressed for five years, due to road safety concerns.

With the Proposed M62 Smart Motorway Scheme, the area of the site which both exceeds the critical level, and where the impact with the Proposed Scheme is greater than 1% of the critical level, is approximately 1.2ha (~0.002% of the area of the site). This area lies primarily along the A672 carriageway to the north of Junction 22, with small areas to the southwest of Junction 22 and at the SAC boundary adjacent to the M62. The impacts of the Proposed Scheme on nitrogen deposition fall below 1% of the lower critical load within the first 10m from the SAC boundary alongside the M62. These impacts occur in an area of the SAC amounting to around 4ha or 0.006% of the area of the site. No significant air quality effects are identified in the Environmental Assessment of the M62 Smart Motorway Scheme between Junctions 20 to 25 for the South Pennine Moors Phase 2 SAC. [72]

The potential for in-combination impacts arising from the construction and operation of High Speed 2 (HS2) was also considered. No information was provided within HS2 Phase 2b Environmental Statement documentation regarding South Pennine Moors (SAC). In view of the absence of potential significant effects due to HS2 Phase 2b, there is no need to further consider the potential for in-combination impacts of HS2 with the Places for Everyone plan in relation to South Pennine Moors (SAC).

Screening results

Table 25 compares the maximum modelled contribution of the Greater Manchester Scenarios to the lowest applicable CL. Values highlighted in yellow exceed the 1% screening threshold. This screening exercise represents a precautionary approach, as it assumes that the most sensitive qualifying features (with the lowest CLs) are present in the areas with the highest modelled contribution (typically adjacent to the busiest road).

All four pollutants exceeded the 1% screening threshold for all three GM "With Plan" scenarios. On the basis of available evidence and agreed thresholds, Likely Significant Effects from air quality impacts cannot be ruled-out, either for the GM "With Plan" scenarios in isolation or in-combination with anticipated development from neighbouring local authorities. Therefore, a Stage 2 Appropriate Assessment is required, with the results provided in the next subsection of this report.

Table 25 Screening results based on dispersion modelling of Greater Manchester Scenarios:

	Airborne NH_3	Airborne NOx	Nutrient nitrogen deposition*		Acid deposition*	
			Forest	Grassland	Forest	Grassland
CL	1	30	5	5	0.569	0.569
Units	µg/m^3	µg/m^3	kgN/ha-year	kgN/ha-year	kEq/ha-year	kEq/ha-year
2025 With Plan Scenario						
Maximum modelled contribution	0.032	0.85	0.37	0.23	0.027	0.016

[72] Highways England, "Smart Motorways Programme Environmental Assessment Report M62 Junctions 20 to 25 (Preliminary Design – PCF Stage 3)", July 2020

	Airborne NH_3	Airborne NOx	Nutrient nitrogen deposition*		Acid deposition*	
			Forest	Grassland	Forest	Grassland
% of CL	3.2	2.8	7.5	4.6	4.7	2.9
2040 With Plan A Scenario						
Maximum modelled contribution	0.034	0.58	0.36	0.22	0.025	0.016
% of CL	3.4	1.9	7.1	4.4	4.4	2.8
2040 With Plan B Scenario						
Maximum modelled contribution	0.042	0.72	0.44	0.27	0.031	0.019
% of CL	4.2	2.4	8.8	5.5	5.5	3.4

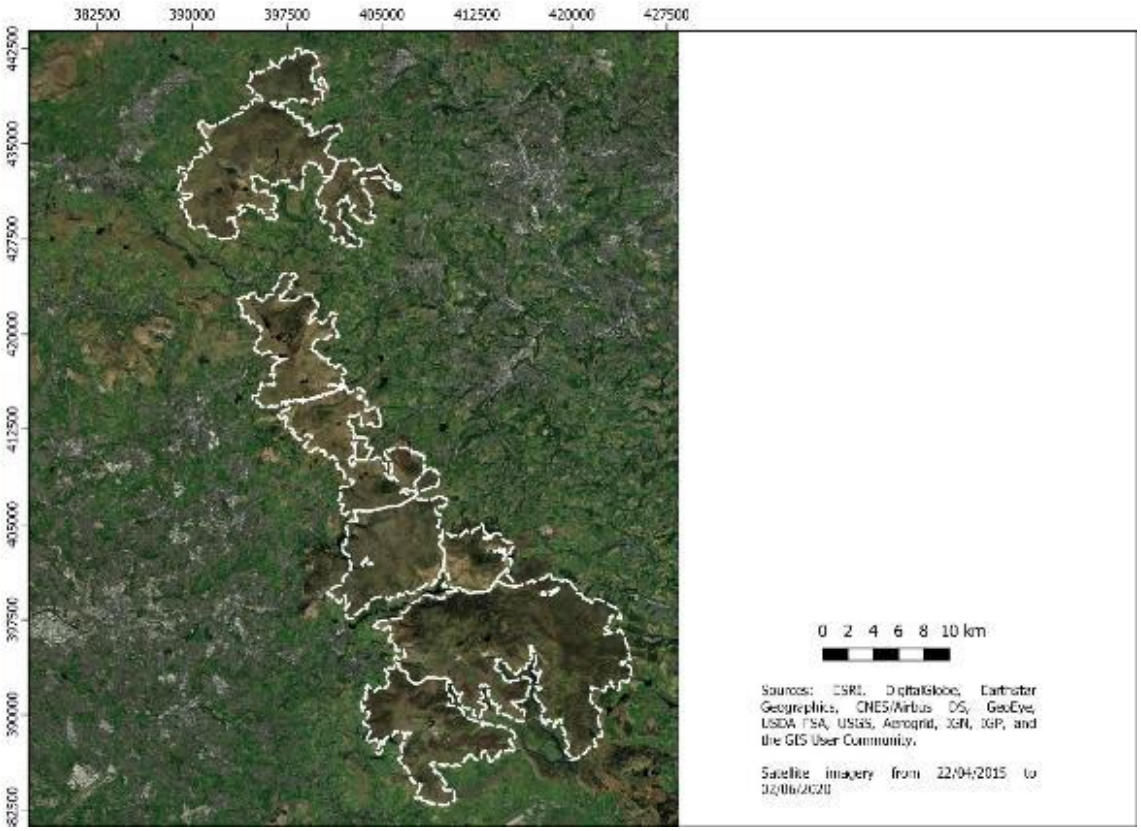
*The site is a mixture of areas with water and tall vegetation; both grassland and forest deposition rates may apply, to different areas

3.7.3 HRA Stage 2: Appropriate Assessment

All pollutants were identified as exceeding 1% of their respective critical loads and critical levels where a precautionary approach was undertaken, considering the possible presence of all qualifying feature habitats within the areas of identified exceedances. As an initial consideration for Stage 2 Appropriate Assessment, this section considers the modelled contributions within the context of existing and forecast background pollution levels for the SAC.

Figure 3-37 provides an overview of the South Pennine Moors SAC.

Figure 3-37 South Pennine Moors SAC



3.7.3.1 Airborne NOx

Figure 3-38 illustrates the areas where the modelled contribution from the GM “With Plan” scenarios are predicted to exceed 1% of the CL.

As discussed in the methodology section, the NOx background maps are produced by Defra on a periodic basis and are considered the best available information for future background levels of airborne NOx. There is no basis for reasonable scientific doubt in the forecast NOx levels. Additionally, the background map for the year 2030 (the latest year for which a NOx background map is available) is considered likely to over-predict NOx concentrations in 2040, which is the end year for the GM “With Plan” scenarios.

Figure 3-39, Figure 3-40 and Figure 3-41 present the total modelled NOx concentration for the three GM “With Plan” scenarios. These concentrations were calculated by adding the “2025 contribution from allocations”, “2040 contribution from allocations”, and “2040 contribution from allocations with link road” results to the NOx background maps. The 2025 NOx background map was paired with the 2025 contribution results while the 2030 NOx background map was paired with the two 2040 contribution results. In all three cases, the total NOx concentration is predicted to be less than 15 µg/m^3 (50% of the CL) throughout the areas where the model results exceed 1% of the CL.

On the basis of available evidence and agreed thresholds, there are no adverse effects on this SAC site arising from increased airborne NOx concentrations associated with any of the GM “With Plan” development scenarios, and therefore no further assessment is required for airborne NOx.

Figure 3-38 Overview of screening results for oxides of nitrogen (NOx) at South Pennine Moors SAC

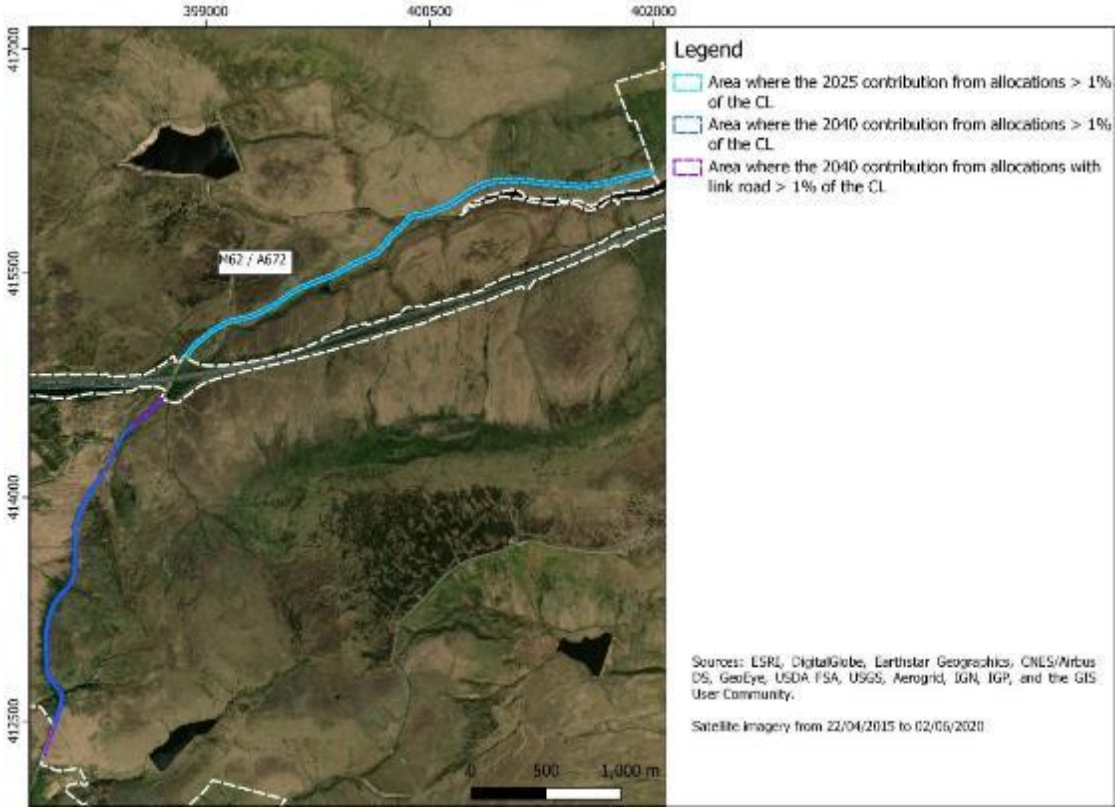


Figure 3-39 Total modelled concentration for NOx at South Pennine Moors SAC, using background NOx concentrations for 2025; for 2025 contributions from allocations

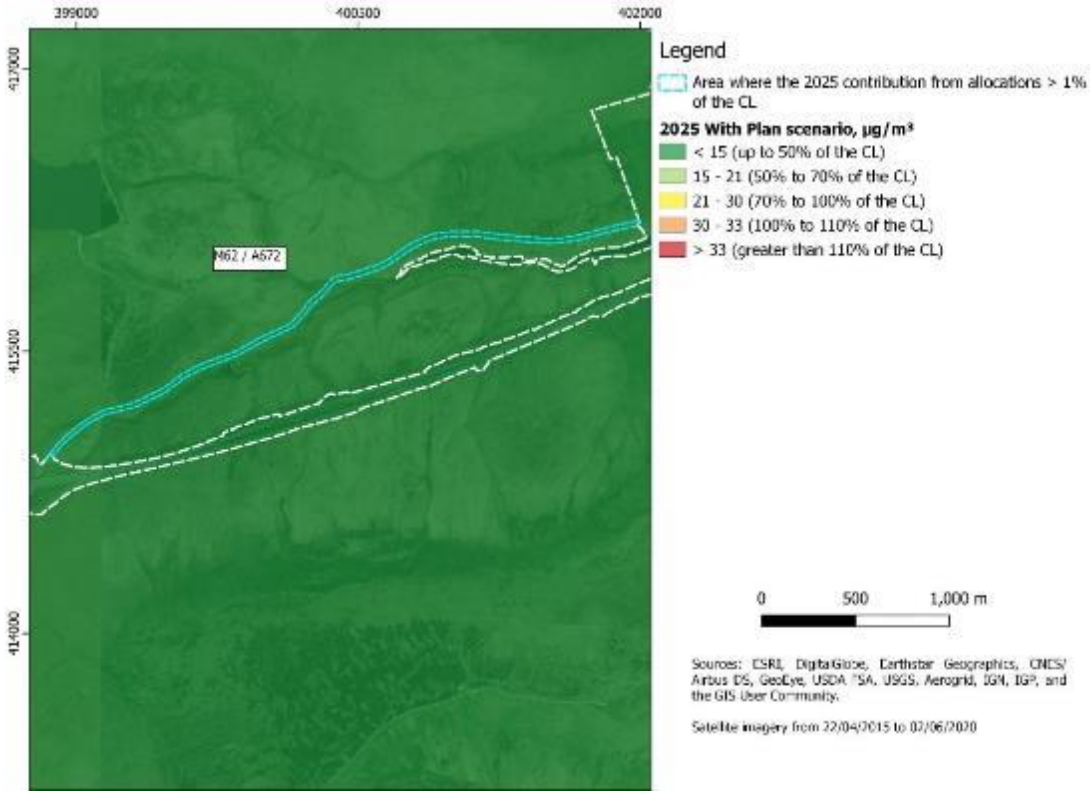


Figure 3-40 Total modelled concentration for NOx at South Pennine Moors SAC, using background NOx concentrations for 2030; for 2040 contributions from allocations

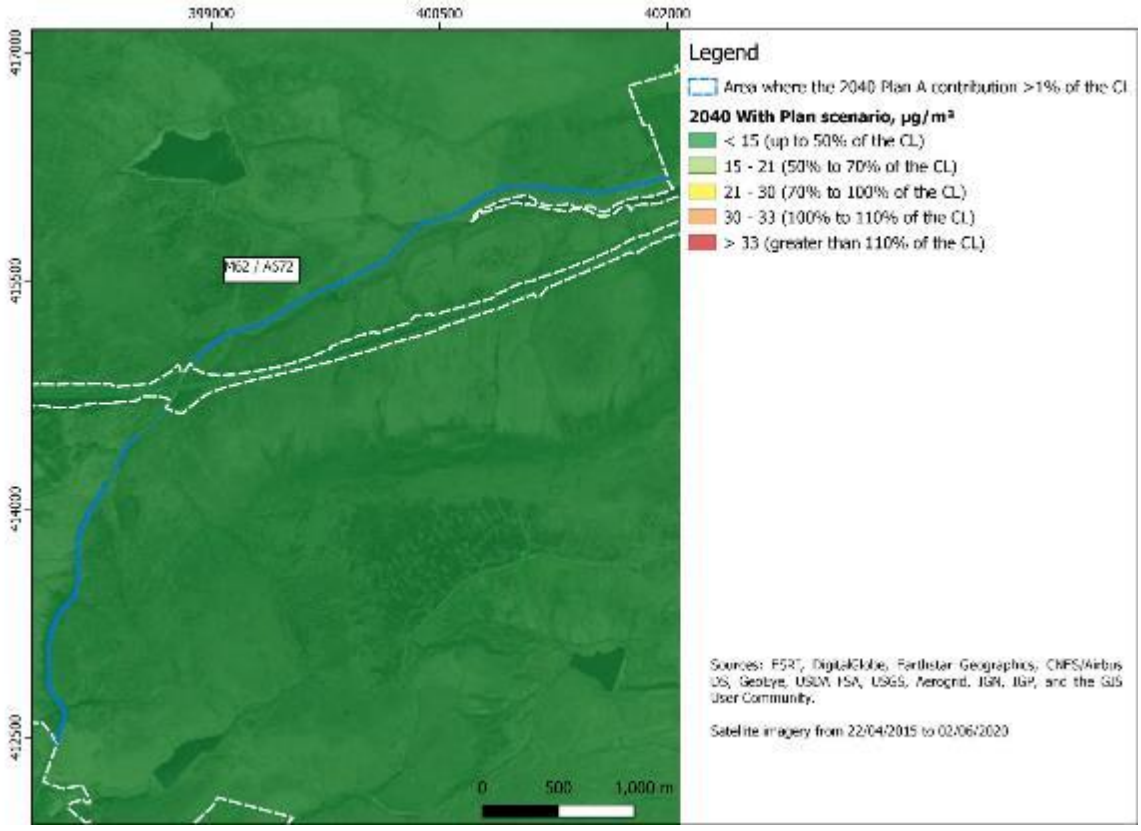
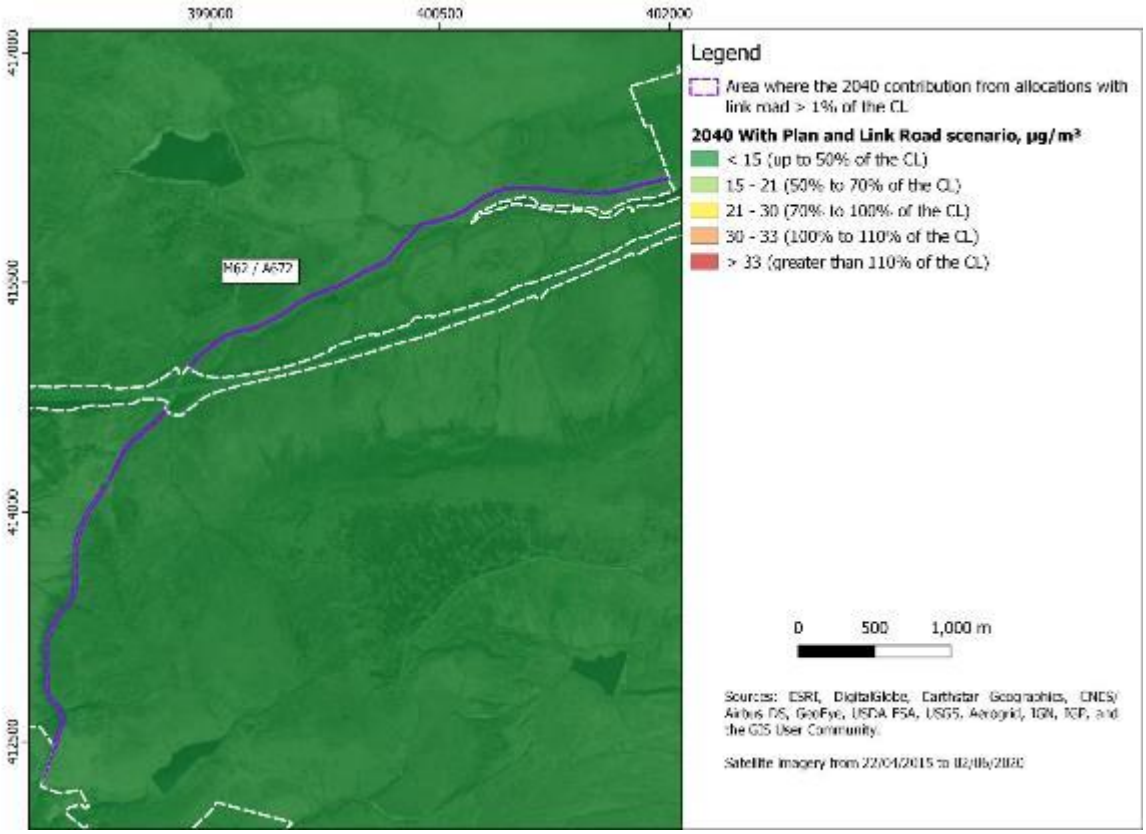


Figure 3-41 Total modelled concentration for NOx at South Pennine Moors SAC, using background NOx concentrations for 2030; for 2040 contributions from allocations with link road



3.7.3.2 Airborne NH_3

Figure 3-42 illustrates the areas where the modelled contribution from the GM "With Plan" scenarios are predicted to exceed 1% of the CL.

Figure 3-43, Figure 3-44 and Figure 3-45 present the total modelled NH_3 concentration for the three GM "With Plan" scenarios. These concentrations were calculated by adding the GM contribution results to the 2017-2019 NH_3 background concentrations from APIS. The NH_3 concentrations from APIS are on a 5km x 5km grid, hence the total NH_3 concentrations appear to have large pixels where the background concentrations change based on the boundaries of the 5 km grid.

A6024

For the two 2040 scenarios, there is an area along the A6024 that is predicted to exceed the 1% screening threshold. However, the total NH_3 concentration along the A6024 is not predicted to exceed 1 µg/m^3 (100% of the CL) and therefore LSE can be discounted from NH_3 concentrations in this area of the SAC.

A672 (M62/A672)

For all three scenarios, the total NH_3 concentration is predicted to be greater than 1 µg/m^3 (100% of the CL) throughout in the vicinity of the M62/A672, due to background NH_3 concentrations that currently exceed the CL. Adverse effects from NH_3 on this SAC cannot be ruled out in these areas on the basis of a comparison of the total predicted concentration with the critical level. An Appropriate Assessment for NH_3 impacts on this site has been undertaken for the areas adjacent to the M62/A672, in consultation with Natural England. The area along the M62/A672 predicted to exceed the screening threshold for NH_3 extends up to approximately 20m, 23m and 29m from the edge of the road for the 2025 contribution

from allocations, 2040 contribution from allocations, and 2040 contribution from allocations with link road cases, respectively.

Figure 3-42 Overview of screening results for ammonia (NH_3) at South Pennine Moors SAC

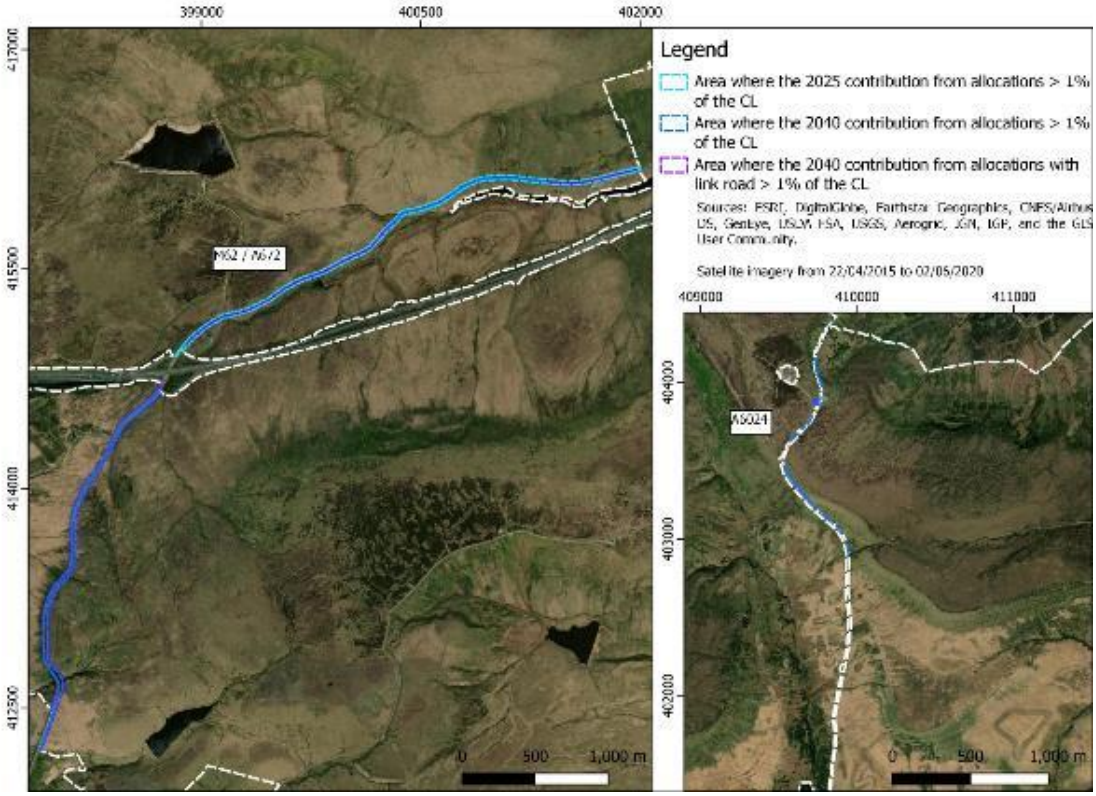


Figure 3-43 Total modelled concentration for NH_3 at South Pennine Moors SAC, using background NH_3 concentrations for 2017-2019; for 2025 contributions from allocations

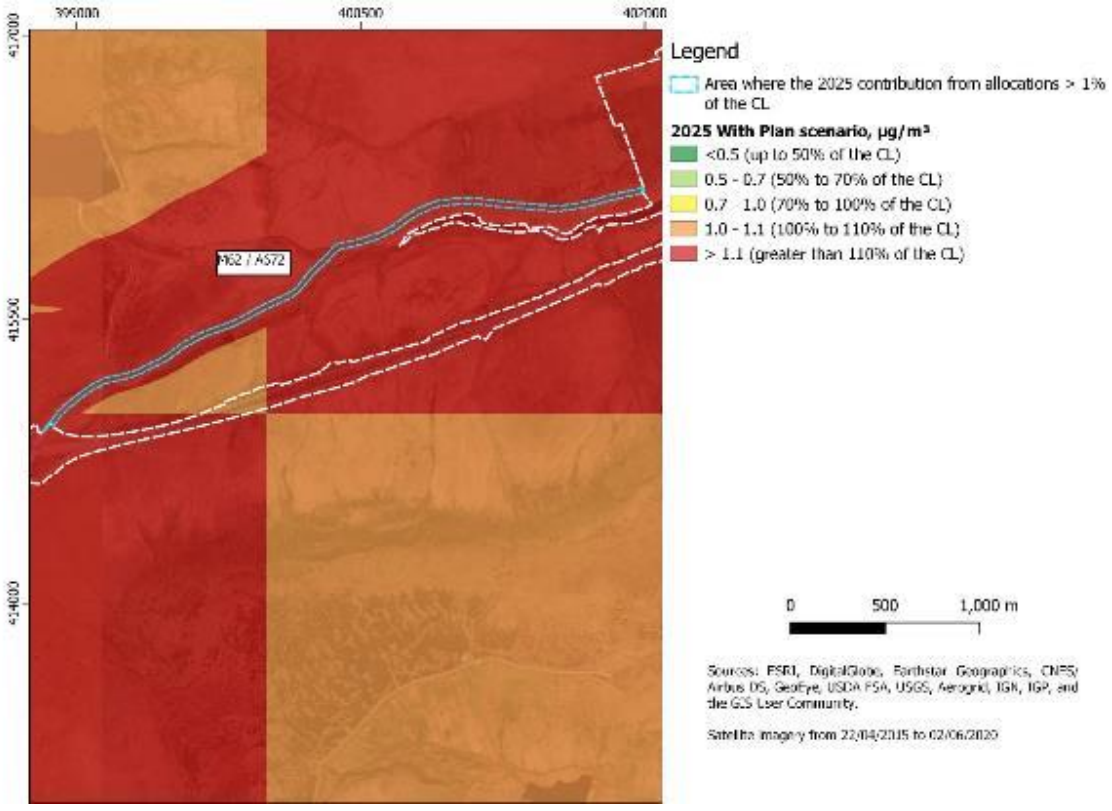


Figure 3-44 Total modelled concentration for NH_3 at South Pennine Moors SAC, using background NH_3 concentrations for 2017-2019; for 2040 contributions from allocations

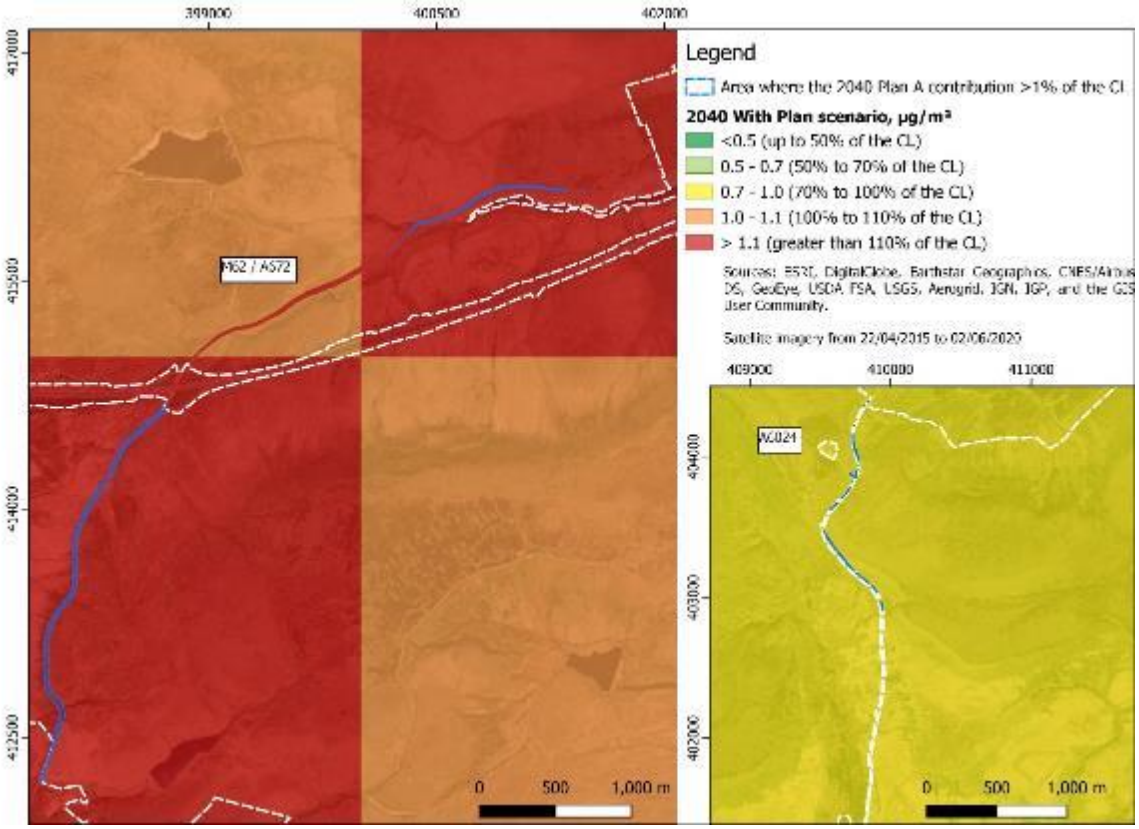
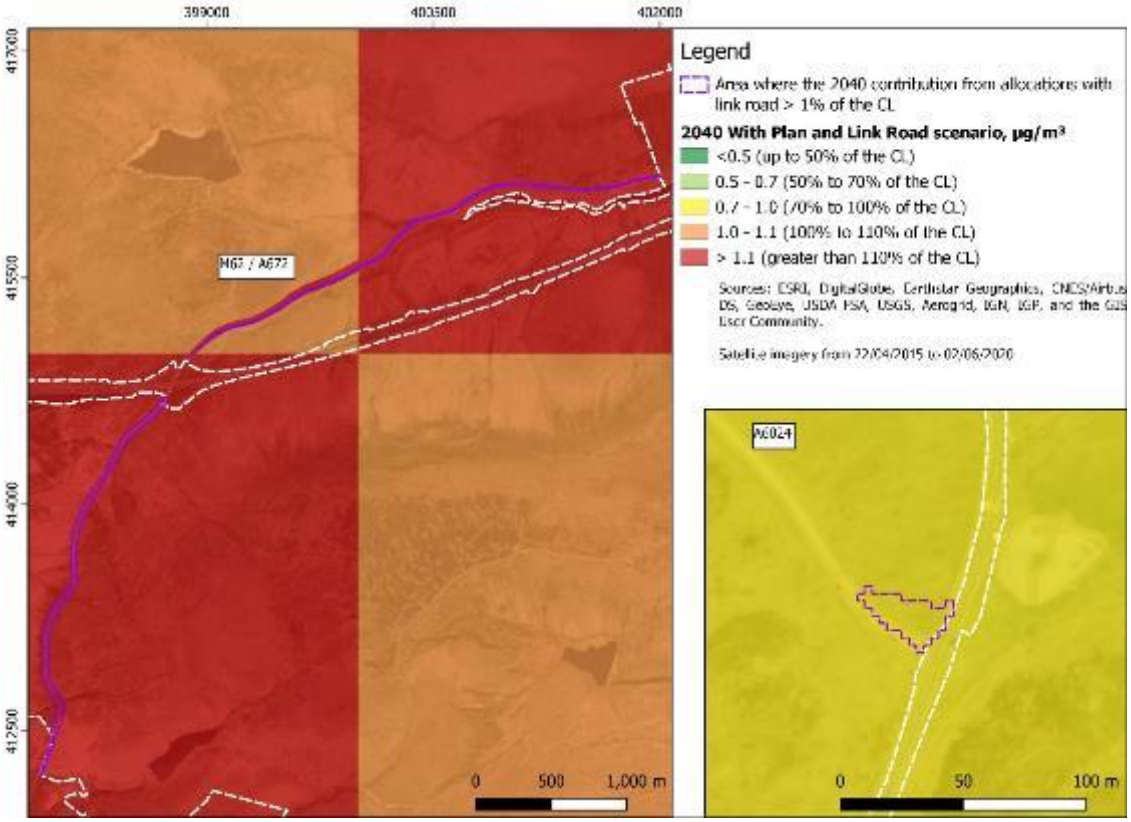


Figure 3-45 Total modelled concentration for NH_3 at South Pennine Moors SAC, using background NH_3 concentrations for 2017-2019; for 2040 contributions from allocations



As part of the appropriate assessment, a desk-based assessment of the distribution of sensitive features and supporting habitats along the A672 was carried out by ecologists at Ricardo Energy and Environment. The following information has been used to determine the likelihood of each of the sensitive features being present in the areas of exceedance identified for airborne ammonia:

- The underpinning SSSI unit mapping (using a shapefile in GIS) – the SSSI units within the areas of interest were looked up to determine the main habitats and/or species listed
- Priority habitat inventory (PHI) mapping (using a shapefile in GIS) – the priority habitats present in the PHI shapefile (classified as Biodiversity Action Plan Priority Habitats) were compared to the habitats given in the corresponding SSSI unit information (classified as a combination of Phase 1 Habitat Classification, National Vegetation Classification, and best judgement based on the species listed) using JNCC's "Spreadsheet of Habitat Correspondences"[73] that shows how the main UK Habitat Classifications relate to / correspond with each other
- Satellite imagery was examined to consider the colours / textures / densities of known areas of the habitats

Table 26 below provides a summary of the evidence available to determine the likelihood of each feature being present.

Table 26 Likelihood of the presence of sensitive features of the South Pennine Moors SAC, within areas where 1% of the minimum critical load for airborne NH_3 (1 μg/m^3) is exceeded

Sensitive feature	Geographical area	Feature likely to be present?	Evidence from priority habitat inventory	Evidence from SSSI unit(s) underpinning the SPA
Blanket bogs	Extending either side of the A672 & M62 (where they intersect)	Yes	Small sections along the western A672 south of the M62 and north of the car park. Large section along the eastern A672 roughly from the M62 junction to the end of the area of exceedance.	South Pennine Moors SSSI underpinning the SAC includes, within the main habitat type or comments, bog or blanket bog within units 137, 136, 129, 130, 132, 131, 110, 135, 138 and 139. These units are present within the mapped areas of exceedances.
	Along the A672 (Manchester Rd)	Inconclusive – aerial imagery and priority habitat boundary with the road slightly differs. If present then in small areas that overlap.	Small sections overlapping with the modelled areas of exceedance along the northern A672.	South Pennine Moors SSSI underpinning the SAC includes, within the main habitat type or comments, bog or blanket bog within units 117 and 145. These units are present within the mapped areas of exceedances.
Transition mires and quaking bogs[74]	Extending either side of the A672 & M62 (where they intersect)	Inconclusive – bogs are present within priority habitat mapping and also mentioned within	Small sections along the western A672 south of the M62 and north of the car park (blanket bog).	South Pennine Moors SSSI underpinning the SAC includes, within the main habitat type or comments, bog within units 137, 136, 129, 130, 132, 131, 110, 135,

[73] Spreadsheet of Habitat Correspondences, JNCC, 2008, https://hub.jncc.gov.uk/assets/9e70531b-5467-4136-88f6-3b3dd905b56d

[74] Ecologist note: This doesn't correspond directly to one PHI type, so using the Habitat-correspondence-2008 spreadsheet, this habitat could refer to priority habitat types "blanket bog", "fens", and "fens, marsh and swamp" which translates to "lowland raised bog", "blanket bog", "upland flushes fens and swamp", "purple moor grass and rush pastures", "lowland fens" and "reedbeds" in the PHI layer.

Sensitive feature	Geographical area	Feature likely to be present?	Evidence from priority habitat inventory	Evidence from SSSI unit(s) underpinning the SPA
		the underpinning SSSI units but there isn't enough detail to conclude H7140.	Large section along the eastern A672 roughly from the M62 junction to the end of the area of exceedance (blanket bog).	138 and 139. These units are present within the mapped areas of exceedances.
	Along the A672 (Manchester Rd)	Inconclusive – aerial imagery and priority habitat boundary with the road slightly differs. If present then in small areas that overlap. Not enough detail within priority habitat mapping or SSSI units to conclude if H7140.	Small sections overlapping with the modelled areas of exceedance along the northern A672 (blanket bog).	South Pennine Moors SSSI underpinning the SAC includes, within the main habitat type or comments, bog within units 117 and 145. These units are present within the mapped areas of exceedances.
Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles[75]	Extending either side of the A672 & M62 (where they intersect)	No.	No evidence suggesting that the feature is present.	No evidence suggesting that the feature is present.
	Along the A672 (Manchester Rd)	No.	No evidence suggesting that the feature is present.	No evidence suggesting that the feature is present.
Northern Atlantic wet heaths with *Erica tetralix*[76]	Extending either side of the A672 & M62 (where they intersect)	No.	No evidence suggesting that the feature is present.	South Pennine Moors SSSI underpinning the SAC includes, within the main habitat type or comments, 'wet heath' or ' heath' within unit 129, however this is listed as being in the north, and not within the area of mapped exceedance.
	Along the A672 (Manchester Rd)	Inconclusive – heath not mentioned in priority habitats but is mentioned in SSSI units, although no specific location data. If present will	No evidence suggesting that the feature is present.	South Pennine Moors SSSI underpinning the SAC includes, within the main habitat type or comments, 'wet heath' or ' heath' within units 117 and 145. These units are present within the mapped areas of exceedances.

[75] Ecologist note: Examined for any area in the PHI layer that corresponded to "deciduous woodland".

[76] Ecologist note: This does not correspond directly to one PHI type, so using the Habitat-correspondence-2008 spreadsheet, this habitat could refer to priority habitat types "upland heathland" and "lowland heathland".

Sensitive feature	Geographical area	Feature likely to be present?	Evidence from priority habitat inventory	Evidence from SSSI unit(s) underpinning the SPA
		be small areas directly adjacent to the road. Not enough detail to conclude H4010.		
	Extending either side of the A672 & M62 (where they intersect)	No.	No evidence suggesting that the feature is present.	South Pennine Moors SSSI underpinning the SAC includes, within the main habitat type or comments, 'dry heath' or ' heath' within units 137 and 129, however these are listed as being in the north of the units and therefore not in the location of the mapped exceedances.
European dry heaths[77]	Along the A672 (Manchester Rd)	Inconclusive – heath not mentioned in priority habitats but is mentioned in SSSI units, although no specific location data. If present will be small areas directly adjacent to the road. Not enough detail to conclude H4030.	No evidence suggesting that the feature is present.	South Pennine Moors SSSI underpinning the SAC includes, within the main habitat type or comments, 'dry heath' or ' heath' within unit 145. This unit is present within the mapped areas of exceedances.

The evidence in **Table 26** suggests that the following sensitive features associated with the SAC are not present within the identified areas of exceedance, or are only likely to be present in small amounts directly adjacent to the road:

- Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles
- Northern Atlantic wet heaths with *Erica tetralix*
- European dry heaths

Therefore, we conclude that LSE arising from NH_3 concentrations in this area of the SAC can be discounted for these sensitive features.

However, adverse effects resulting from airborne NH_3 along the A672 (M62/A672) cannot be ruled out for Blanket bogs and Transition mires and quaking bogs, as there are indicators from the desk-based assessment that suggest these habitats may be present in the areas of exceedance identified (up to approximately 20m, 23m and 29m from the edge of the road for the 2025 contribution from allocations, 2040 contribution from allocations, and 2040 contribution from allocations with link road cases, respectively).

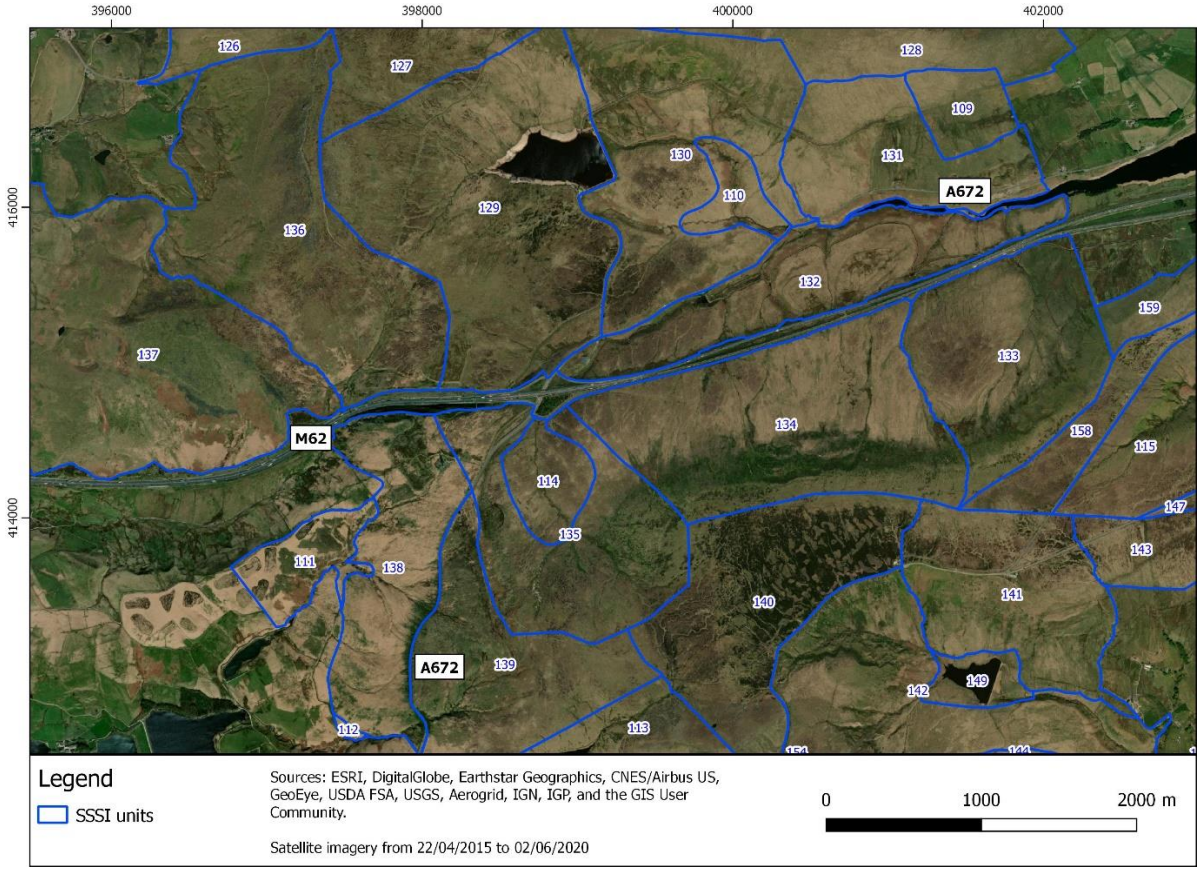
[77] Ecologist note: This doesn't correspond directly to one PHI type, so using the Habitat-correspondence-2008 spreadsheet, this habitat could refer to priority habitat types "upland heathland" and "lowland heathland".

Regarding Transition mires and quaking bogs, the JNCC description of the habitat[78] includes the National Vegetation Classification communities M4, M5, M8, M9, and S27. These communities are not present on any of the SSSI unit habitat maps provided by Natural England[79] along the M62/A672, so it is assumed that this habitat is not present in those areas, and therefore we conclude that LSE arising from NH_3 concentrations in this area of the SAC can be discounted for Transition mires and quaking bogs.

Consultation with Natural England and habitat mapping has confirmed that Blanket bogs are likely to be present within the exceedance areas in SSSI units 114, 129, 135, 138, and 139.[80] However, the SSSI unit mapping[79] indicates that Blanket bog is not likely to be present in SSSI units 110, 131, and 132; when cross-referenced with JNCC habitat descriptions[81] and Priority Habitat Inventory habitat descriptions,[82] no habitats synonymous with Blanket bog are present in the maps for these units. Therefore, LSE arising from NH_3 concentrations in SSSI units 110, 131, and 132 can be discounted for Blanket bogs, but there could potentially be adverse effects on Blanket bogs within small areas of SSSI units 114, 129, 135, 138, and 139.

The SSSI units in the vicinity of the M62/A672 exceedance areas are shown in **Figure 3-46**.

Figure 3-46 SSSI units in the vicinity of the exceedance areas adjacent to the M62/A672



[78] 7140 Transition mires and quaking bogs, Joint Nature Conservation Committee, https://sac.jncc.gov.uk/habitat/H7140/

[79] SSSI unit mapping was provided by Natural England for units 109, 110, 111, 112, 114, 128, 129, 130, 131, 135, 138, and 139, via email, on 13/01/2022.

[80] Email received from Natural England on 13/01/2022.

[81] 7130 Blanket bogs, Joint Nature Conservation Committee, https://sac.jncc.gov.uk/habitat/H7130/

[82] UK Biodiversity Action Plan Priority Habitat Descriptions, Blanket Bog, from UK Biodiversity Action Plan; Priority Habitat Descriptions. BRIG (ed. Ant Maddock) 2008, https://data.jncc.gov.uk/data/aadfff3d-9a67-467a-ac65-45285e123607/UKBAP-BAPHabitats-03-BlanketBog.pdf

3.7.3.3 Nitrogen deposition

Figure 3-47 illustrates the areas where the nitrogen deposition contribution from the GM “With Plan” scenarios are predicted to exceed 1% of the CL, when grassland deposition rates are considered. Most of the areas predicted to exceed 1% of the CL are characterised by short vegetation, and grassland deposition rates are applicable in these areas. There is also a small area of the site where trees are present near the A6024 and where forest deposition rates are applicable; this area is predicted to exceed 1% of the CL in the two 2040 cases, and is presented in Figure 3-51.

Figure 3-48, Figure 3-49 and Figure 3-50 present the total predicted nitrogen deposition rates for the three GM “With Plan” scenarios, using grassland deposition rates. Figure 3-52 and Figure 3-53 present the total predicted nitrogen deposition rates for the two 2040 “With Plan” scenarios, using forest deposition rates. These deposition rates were calculated by adding the GM contribution results to the 2017-2019 background deposition rates from APIS. The background nitrogen deposition rates from APIS are on a 5km x 5km grid, hence the total deposition rates appear to have large pixels where the background deposition changes based on the boundaries of the 5km grid.

Figure 3-47 Overview of screening results for nitrogen deposition at South Pennine Moors SAC, based on grassland deposition rates

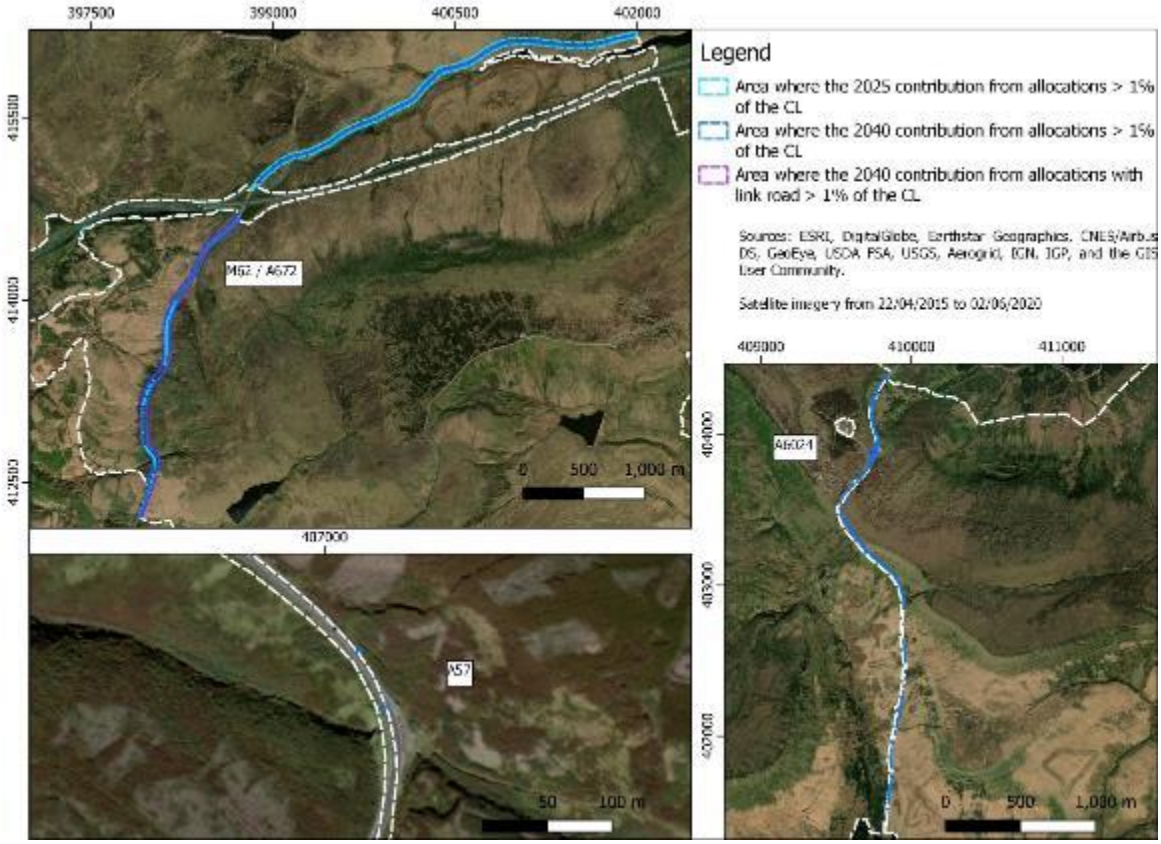


Figure 3-48 Total predicted nitrogen deposition at South Pennine Moors SAC, based on grassland deposition rates, using background deposition rates for 2017-2019; for 2025 contributions from allocations

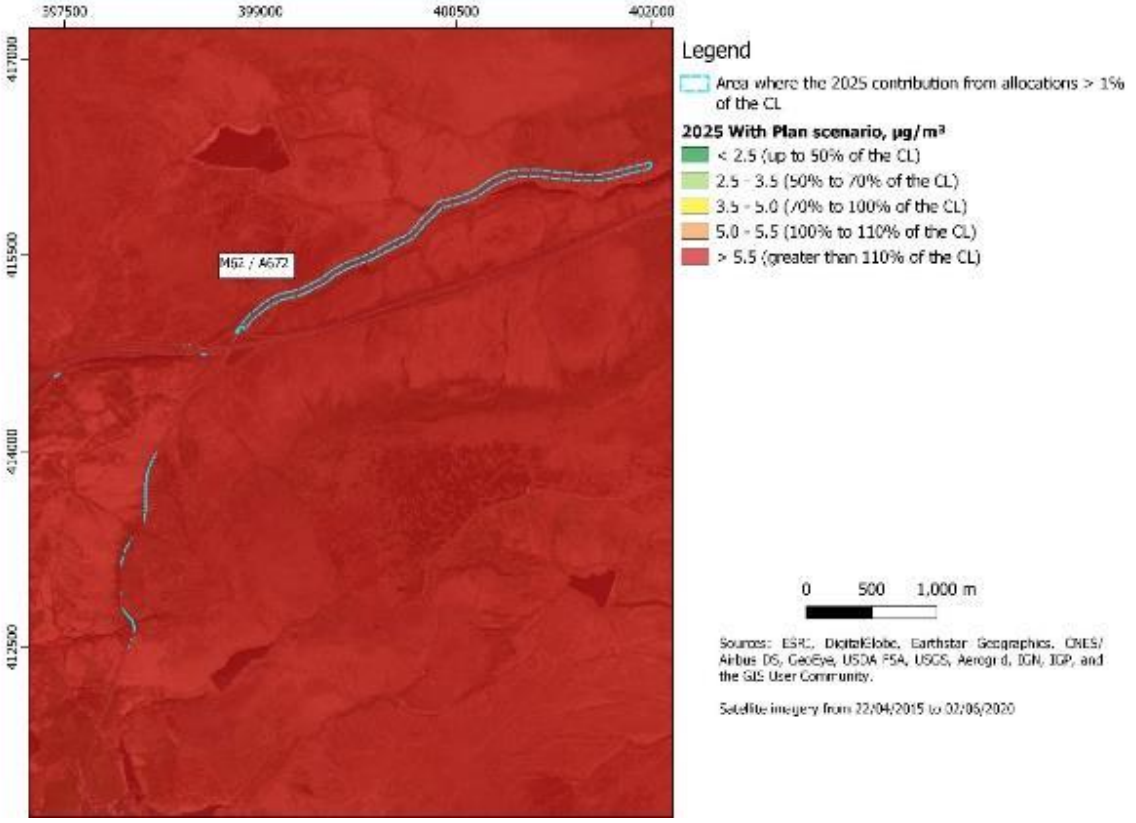


Figure 3-49 Total predicted nitrogen deposition at South Pennine Moors SAC, based on grassland deposition rates, using background deposition rates for 2017-2019; for 2040 contributions from allocations

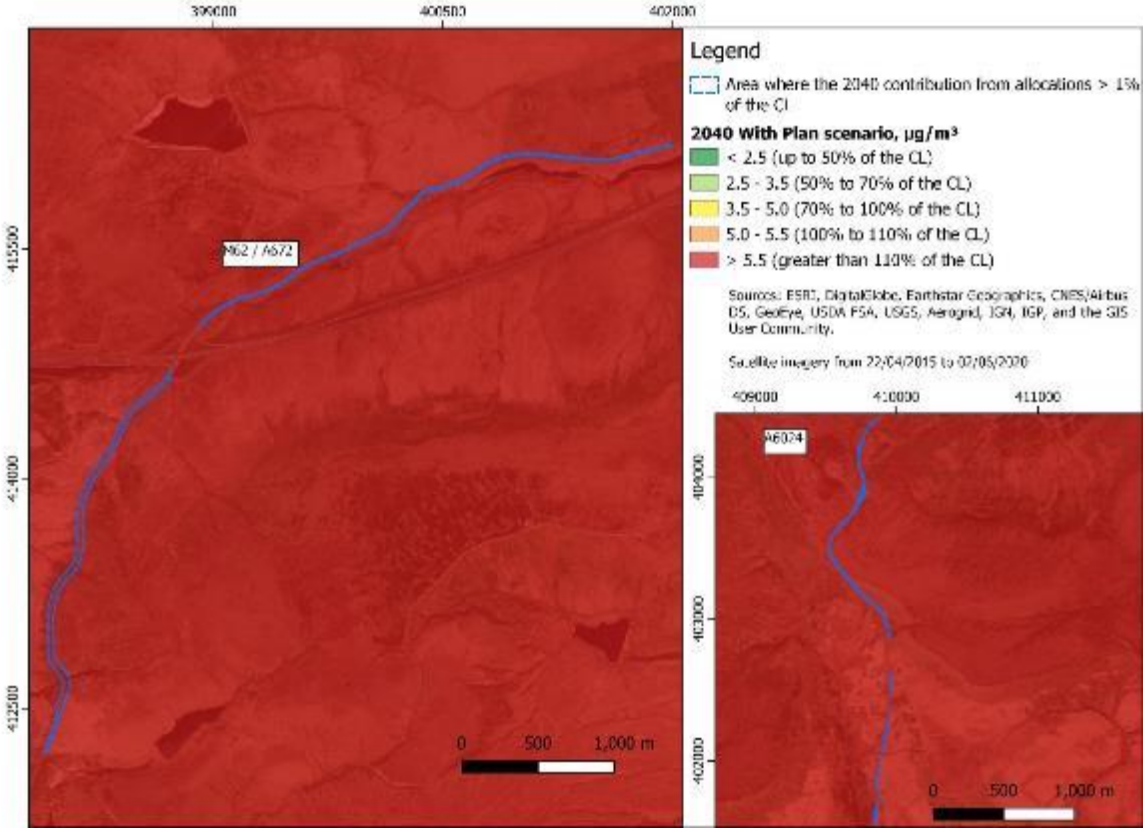


Figure 3-50 Total predicted nitrogen deposition at South Pennine Moors SAC, based on grassland deposition rates, using background deposition rates for 2017-2019; for 2040 contributions from allocations with link road

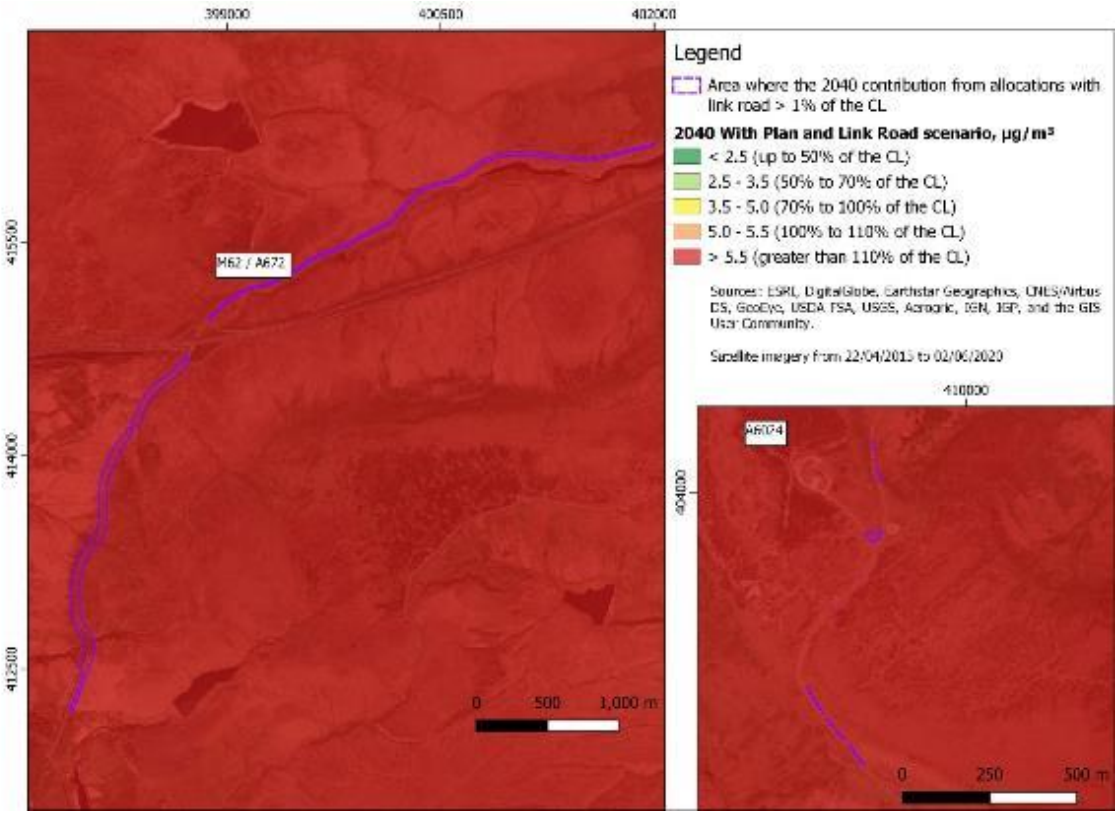


Figure 3-51 Overview of screening results for nitrogen deposition at South Pennine Moors SAC, based on forest deposition rates

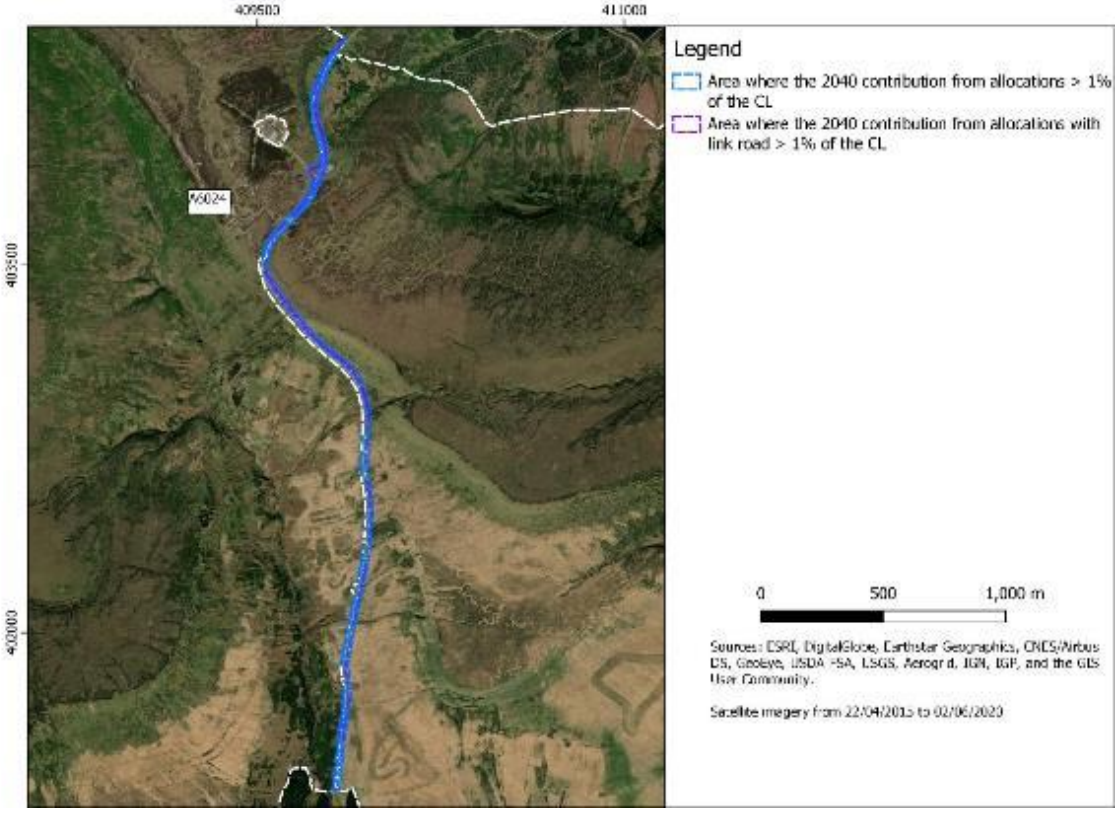


Figure 3-52 Total predicted nitrogen deposition at South Pennine Moors SAC, based on forest deposition rates, using background deposition rates for 2017-2019; for 2040 contributions from allocations

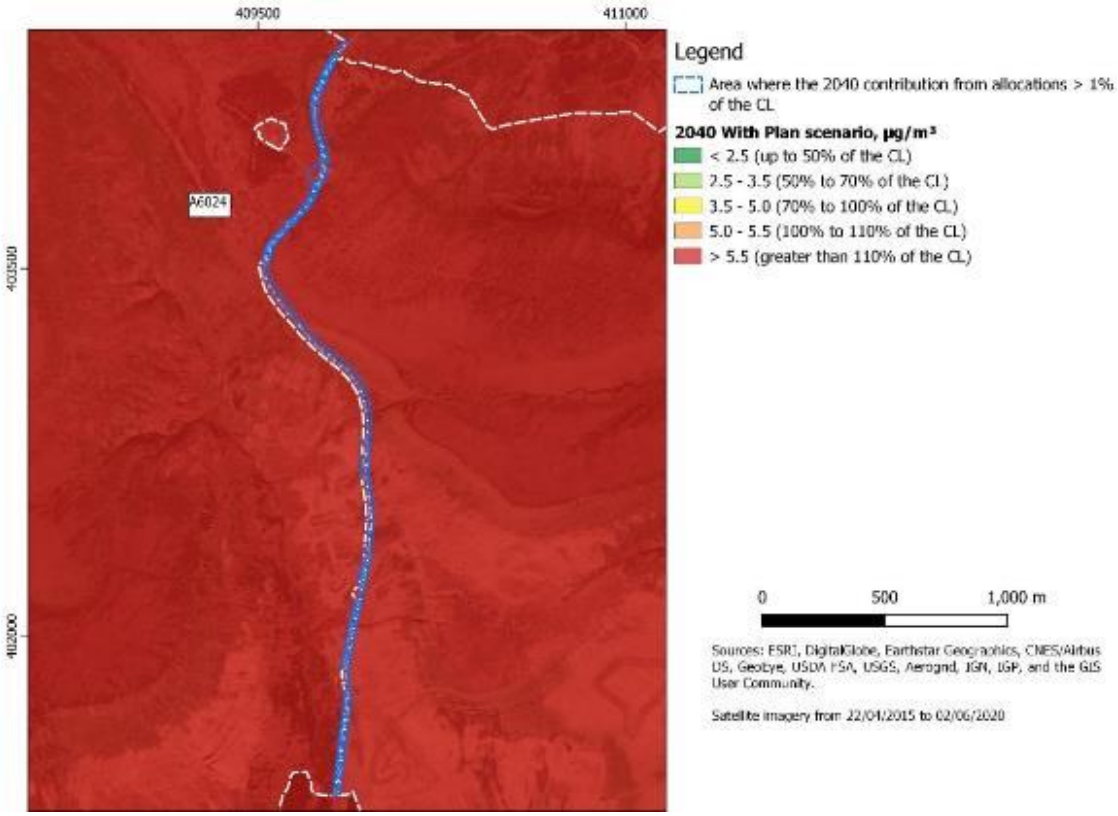
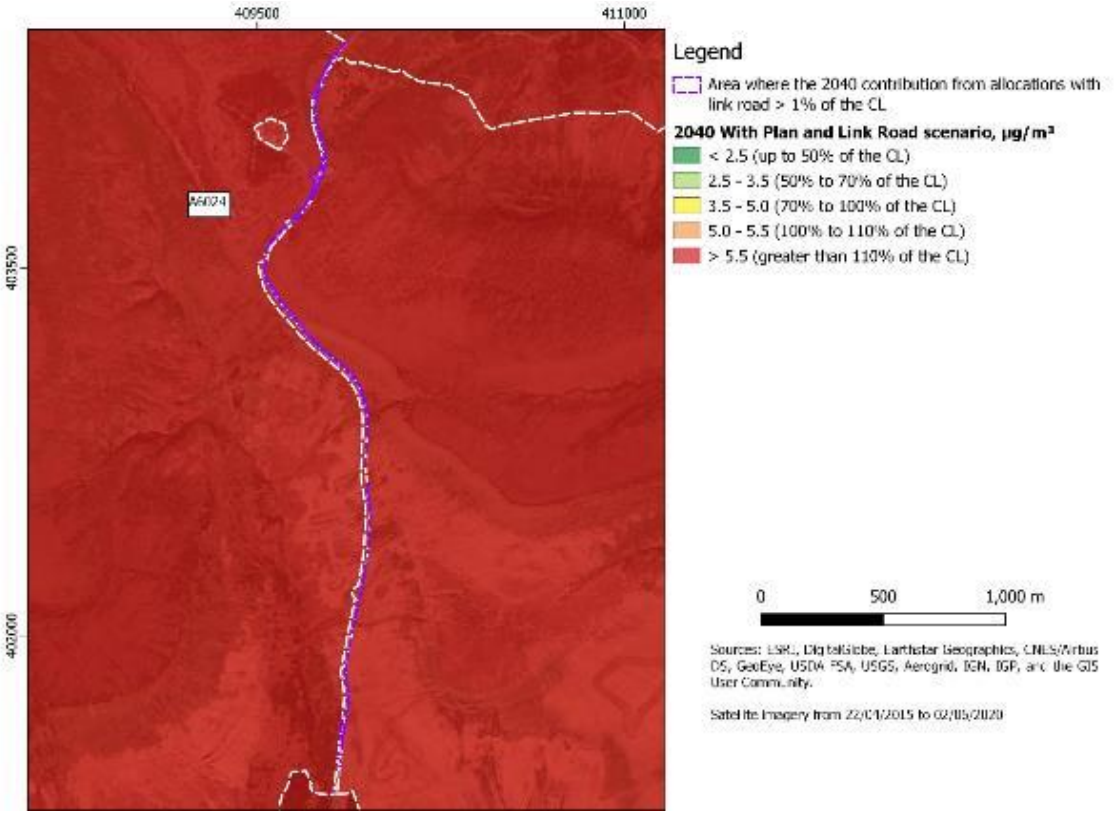


Figure 3-53 Total predicted nitrogen deposition at South Pennine Moors SAC, based on forest deposition rates, using background deposition rates for 2017-2019; for 2040 contributions from allocations with link road



For all three scenarios, there is an area in the vicinity of the M62/A672 that is predicted to exceed the screening threshold, and where the total nitrogen deposition is predicted to be greater than 100% of the CL, due to background deposition rates that currently exceed the CL. The area along the M62/A672 predicted to exceed the screening threshold for nitrogen deposition extends up to approximately 30m, 34m and 40m from the edge of the road for the 2025 contribution from allocations, 2040 contribution from allocations, and 2040 contribution from allocations with link road cases, respectively. These distances are the result of using the grassland deposition rates. For the two 2040 scenarios, there are similar areas in the vicinity of the A57 and the A6024. These areas extend up to 3m from the A57 using the grassland deposition rate for the 2040 contribution from allocations case, and up to 48m from the A6024 for 2040 contribution from the allocations case using forest deposition rates. Adverse effects from nitrogen deposition on this SAC cannot be ruled out in these areas on the basis of a comparison of the total predicted nitrogen deposition rates with the critical load.

An Appropriate Assessment for nitrogen deposition impacts on this site has been undertaken for the areas adjacent to the M62/A672, the A57 and the A6024, in consultation with Natural England.

A57

In the "2040 with allocations" scenario, two small areas, each measuring 3m x 3m, are predicted to exceed the screening threshold along the A57. One of the areas corresponds to a section of the road surface. The other area is along the road edge and extends less than 2m from the edge of the road. Guidance from the Institute of Air Quality Management advises that predicted concentrations within 2m of the edge of a road are not considered reliable and may not represent areas relevant to the assessment.[83] We therefore conclude that there are no LSE from nitrogen deposition impacts along the A57, as the areas that are predicted to exceed the screening threshold are very small and correspond to areas that are unlikely to be relevant for the assessment, i.e. on and within 2m of the road surface.

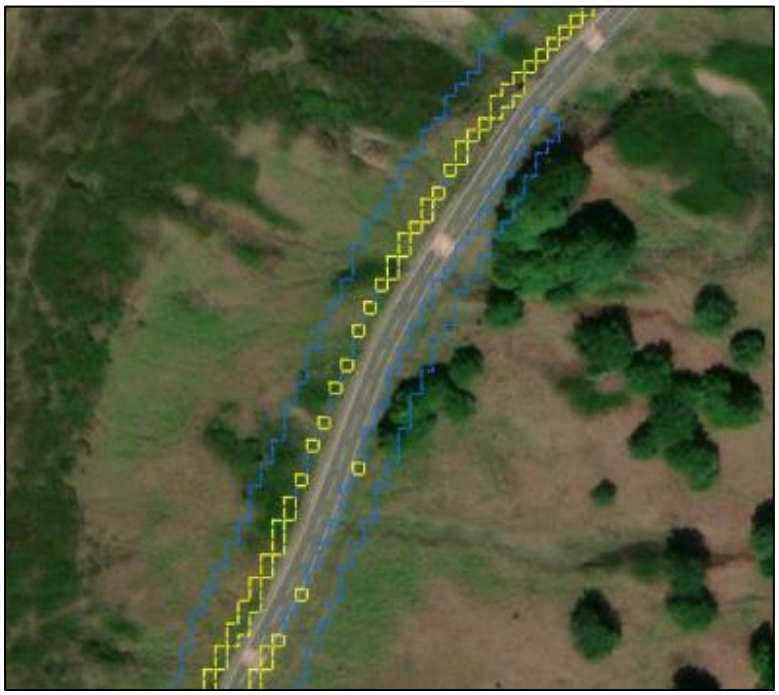
A6024

There are some areas along the A6024 predicted to exceed the screening threshold under the two 2040 scenarios; of these, the impact from the "2040 with allocations" scenario is predicted to be greater.

There are some trees towards the north end of this section of the A6024. If forest deposition rates are used (see blue outlines in Figure 3-54), the area predicted to exceed the screening threshold extends approximately 6-7m from the edge of the road and includes the edges of some of the trees. If grassland deposition rates are used (see yellow outlines in Figure 3-54), the area predicted to exceed the screening threshold extends approximately 3m from the edge of the road. Note that these distances are the areas predicted to exceed the screening threshold using the lowest critical load for nitrogen deposition (5 kgN/ha-year).

[83] Institute of Air Quality Management, "A guide to the assessment of air quality impacts on designated nature conservation sites", May 2020.

Figure 3-54 Screening results for nitrogen deposition at South Pennine Moors SAC (along A6024), based on forest deposition rates (blue) and grassland deposition rates (yellow) for the “2040 with allocations” scenario



Apart from Blanket bogs, the other habitat features associated with this SAC have a higher critical load of 10 kgN/ha-year. If grassland deposition rates are used and a critical load of 10 kgN/ha-year is used, the area predicted to exceed the screening thresholds along the A6024 is a small triangular area (see **Figure 3-55**) for the “2040 with allocations” scenario. The triangular area measures approximately 37m x 21m and is located near Holme Moss Car Park.

Figure 3-55 Area predicted to exceed the screening threshold for nitrogen deposition at South Pennine Moors SAC (along A6024), based on grassland deposition rates (yellow) for the “2040 with allocations” scenario and assuming a critical load of 10 kgN/ha-year

As part of the appropriate assessment, a desk-based assessment of the distribution of sensitive features and supporting habitats along the A6024 was carried out by ecologists at Ricardo Energy and Environment. The methodology and information sources used were the same as those described in Section 3.3.3. **Table 27** provides a summary of the evidence available to determine the likelihood of each feature being present.

Table 27 Likelihood of the presence of sensitive features of the South Pennine Moors SAC, within areas where 1% of the minimum critical load for nitrogen deposition (5 kgN/ha-year) is exceeded (A6024)

Sensitive feature	Geographical area	Feature likely to be present?	Evidence from priority habitat inventory	Evidence from SSSI unit(s) underpinning the SPA
Blanket bogs	Extending either side of the A6024 (Woodhead Rd) and by Holme Moss Car Park	Yes	Large sections along the western and eastern A6024 and the area extending opposite Holme Moss Car Park.	Dark Peak SSSI underpinning the SAC includes, within the main habitat type or comments, bog or blanket bog within units 5, 61, 58, 239 and 6. These units are present within the mapped areas of exceedances.
Transition mires and quaking bogs[84]	Extending either side of the A6024 (Woodhead Rd) and by Holme Moss Car Park	Inconclusive – bogs are present within priority habitat mapping and also mentioned within the underpinning SSSI units but there isn't enough detail to conclude H7140.	Large sections along the western and eastern A6024 and the area extending opposite Holme Moss Car Park (blanket bog).	Dark Peak SSSI underpinning the SAC includes, within the main habitat type or comments, bog within units 5, 58, 239 and 6. These units are present within the mapped areas of exceedances.
Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles[85]	Extending either side of the A6024 (Woodhead Rd) and by Holme Moss Car Park	No.	No evidence suggesting that the feature is present.	No evidence suggesting that the feature is present.
Northern Atlantic wet heaths with *Erica tetralix*[86]	Extending either side of the A6024 (Woodhead Rd) and by Holme Moss Car Park	Inconclusive – heath habitats present but not enough detail to conclude H4010.	Large section along the eastern A6024 from the Holme Moss Car Park and to the north of the section (upland heathland).	Dark Peak SSSI underpinning the SAC includes, within the main habitat type or comments, 'wet heath' or 'heath' within units 61 and 8. These units are present within the mapped areas of exceedances.

[84] Ecologist note: This doesn't correspond directly to one PHI type, so using the Habitat-correspondence-2008 spreadsheet, this habitat could refer to priority habitat types "blanket bog", "fens", and "fens, marsh and swamp" which translates to "lowland raised bog", "blanket bog", "upland flushes fens and swamp", "purple moor grass and rush pastures", "lowland fens" and "reedbeds" in the PHI layer.

[85] Ecologist note: Examined for any area in the PHI layer that corresponded to "deciduous woodland".

[86] Ecologist note: This doesn't correspond directly to one PHI type, so using the Habitat-correspondence-2008 spreadsheet, this habitat could refer to priority habitat types "upland heathland" and "lowland heathland".

Sensitive feature	Geographical area	Feature likely to be present?	Evidence from priority habitat inventory	Evidence from SSSI unit(s) underpinning the SPA
European dry heaths[87]	Extending either side of the A6024 (Woodhead Rd) and by Holme Moss Car Park	Inconclusive – heath habitats present but not enough detail to conclude H4030.	Large section along the eastern A6024 from the Holme Moss Car Park and to the north of the section (upland heathland).	Dark Peak SSSI underpinning the SAC includes, within the main habitat type or comments, 'dry heath' or 'heath' within units 61 and 8. These units are present within the mapped areas of exceedances.

The evidence in **Table 27** suggests that the following sensitive features associated with the SAC are not present within the identified areas of exceedance, or are only likely to be present in small amounts directly adjacent to the road:

- Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles

Therefore, we conclude that LSE arising from nitrogen deposition in this area of the SAC can be discounted for this sensitive feature.

Considering the higher critical load of 10 kgN/ha-year, which is set for all the sensitive features except for Blanket bogs, the only area predicted to exceed the screening thresholds along the A6024 is a small triangular area (see **Figure 3-55**) measuring approximately 37m x 21m, located near Holme Moss Car Park. Supplementary advice for the South Pennine Moors SAC states "*Transition mires and quaking bogs has only been recorded within a small section of Leek Moors SSSI and these bogs are estimated to cover an extent of <0.5% of the entire South Pennine Moors SAC area. There is limited data to provide a measure of extent for this feature.*"[88] The Leek Moors SSSI is located far from this part of the site. Considering the supplementary information, and the lack of evidence that heath habitats are present within the small triangular exceedance area near Holme Moss Car Park, we conclude that LSE arising from nitrogen deposition in this area of the SAC can be discounted for Transition mires and quaking bogs, Northern Atlantic wet heaths with *Erica tetralix*, and European dry heaths.

However, adverse effects resulting from nitrogen deposition along the A6024 cannot be ruled out for Blanket bogs, as there are indicators from the desk-based assessment that suggest these habitats may be present in the areas of exceedance identified (up to approximately 3m from the edge of the A6024, and a triangular area measuring approximately 37m x 21m located near Holme Moss Car Park).

M62/A672

For all three scenarios, there is an area in the vicinity of the M62/A672 that is predicted to exceed the screening threshold, and where the total nitrogen deposition is predicted to be greater than 100% of the CL, due to background deposition rates that currently exceed the CL. The area along the M62/A672 predicted to exceed the screening threshold for nitrogen deposition extends up to approximately 30m, 34m and 40m from the edge of the road for the 2025 contribution from allocations, 2040 contribution from allocations, and 2040 contribution from allocations with link road cases, respectively (similar, but larger, to the exceedance areas for airborne NH_3, which were 20m, 23m and 29m, respectively). These distances are the result of using the grassland deposition rates and a critical load of 5 kgN/ha-year.

If a critical load of 10 kgN/ha-year is used instead, the areas predicted to exceed the screening threshold extend up to approximately 9m, 10m and 14m from the edge of the road for the 2025 contribution from allocations, 2040 contribution from allocations, and 2040 contribution from allocations with link road cases, respectively.

[87] Ecologist note: This doesn't correspond directly to one PHI type, so using the Habitat-correspondence-2008 spreadsheet, this habitat could refer to priority habitat types "upland heathland" and "lowland heathland".

[88] Table 4, row 1, South Pennine Moors SAC Conservation Objectives Supplementary Advice, Natural England, 2019, http://publications.naturalengland.org.uk/file/5560704069533696

The evidence in **Table 26** (for airborne NH_3) also applies to the exceedance areas identified for nitrogen deposition, and suggests that the following sensitive features associated with the SAC are not present within the identified areas of exceedance, or are only likely to be present in small amounts directly adjacent to the road:

- Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles
- Northern Atlantic wet heaths with *Erica tetralix*
- European dry heaths

Therefore, we conclude that LSE arising from nitrogen deposition in this area of the SAC can be discounted for these sensitive features.

However, adverse effects resulting from nitrogen deposition along the A672 (M62/A672) cannot be ruled out for Blanket bogs and Transition mires and quaking bogs, as there are indicators from the desk-based assessment that suggest these habitats may be present in the areas of exceedance identified (for the critical load of 5 kgN/ha-year: up to approximately 30m, 34m and 40m from the edge of the road for the 2025 contribution from allocations, 2040 contribution from allocations, and 2040 contribution from allocations with link road cases, respectively, and for the critical load of 10 kgN/ha-year: up to approximately 9m, 10m and 14m from the edge of the road for the 2025 contribution from allocations, 2040 contribution from allocations, and 2040 contribution from allocations with link road cases, respectively).

Regarding Transition mires and quaking bogs, the JNCC description of the habitat[78] includes the National Vegetation Classification communities M4, M5, M8, M9, and S27. These communities are not present on any of the SSSI unit habitat maps provided by Natural England[79] along the M62/A672, so it is assumed that this habitat is not present in those areas, and therefore we conclude that LSE arising from nitrogen deposition in this area of the SAC can be discounted for Transition mires and quaking bogs.

Consultation with Natural England and habitat mapping has confirmed that Blanket bogs are likely to be present within the exceedance areas in SSSI units 114, 129, 135, 138, and 139.[80] However, the SSSI unit mapping[79] indicates that Blanket bog is not likely to be present in SSSI units 110, 131, and 132 (see Section 3.3.3.3). Therefore, LSE arising from nitrogen deposition in SSSI units 110, 131, and 132 can be discounted for Blanket bogs, but there could potentially be adverse effects on Blanket bogs within small areas of SSSI units 114, 129, 135, 138, and 139.

The SSSI units in the vicinity of the M62/A672 exceedance areas are shown in **Figure 3-46** for reference.

3.7.3.4 Acid deposition

Figure 3-56 illustrates the areas where the acid deposition contribution from the GM "With Plan" scenarios are predicted to exceed 1% of the CL, when grassland deposition rates are considered. All of the areas predicted to exceed 1% of the CL are characterised by short vegetation, and grassland deposition rates are applicable in these areas.

Figure 3-57, Figure 3-58 and Figure 3-59 present the total predicted acid deposition rates for the three GM "With Plan" scenarios, using grassland deposition rates. These deposition rates were calculated by adding the GM contribution results to the 2017-2019 background deposition rates from APIS. The background acid deposition rates from APIS are on a 5km x 5km grid.

For all three scenarios, there is an area in the vicinity of the M62 / A276 that is predicted to exceed the screening threshold, and where the total acid deposition is predicted to be greater than 100% of the CL, due to background deposition rates that currently exceed the CL. For the two 2040 scenarios, there are similar areas in the vicinity of the A6024. Adverse effects from acid deposition on this SAC cannot be ruled out in these areas on the basis of a comparison of the total predicted acid deposition rates with the critical load. An Appropriate Assessment for acid deposition impacts on this site has been undertaken for the areas adjacent to the M62/A672, and the A6024, in consultation with Natural England.

The areas along the M62/A276 and A6024 that are predicted to exceed the screening threshold for acid deposition do not extend as far into the site as the areas predicted to exceed the screening threshold for nitrogen deposition. As such, the Appropriate Assessment for nitrogen deposition also addresses the areas that need an Appropriate Assessment for acid deposition, and the conclusions are the same.

Figure 3-56 Overview of screening results for acid deposition at South Pennine Moors SAC, based on grassland deposition rates

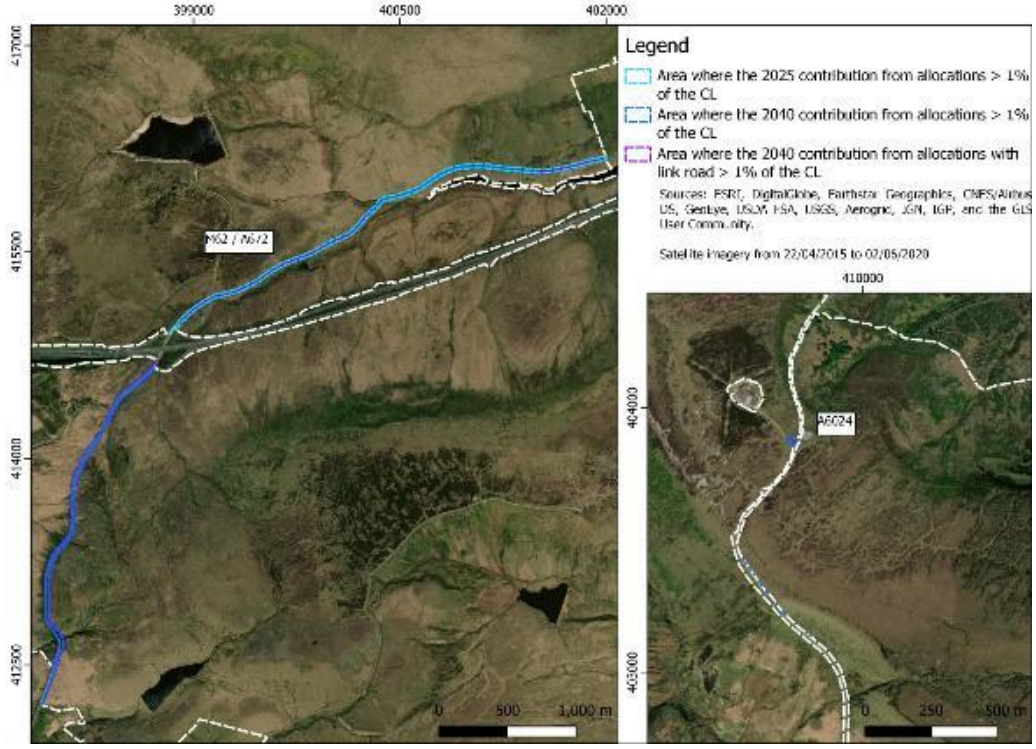


Figure 3-57 Total predicted acid deposition at South Pennine Moors SAC, based on grassland deposition rates, using background deposition rates for 2017-2019; for 2025 contributions from allocations

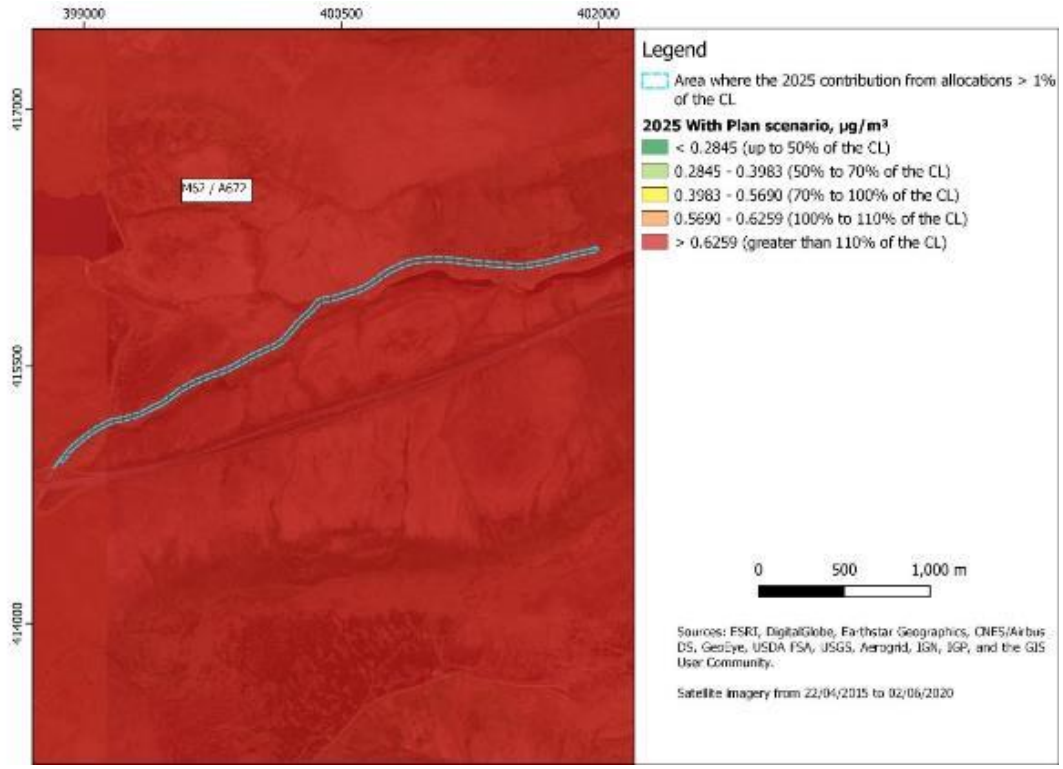


Figure 3-58 Total predicted acid deposition at South Pennine Moors SAC, based on grassland deposition rates, using background deposition rates for 2017-2019; for 2040 contributions from allocations

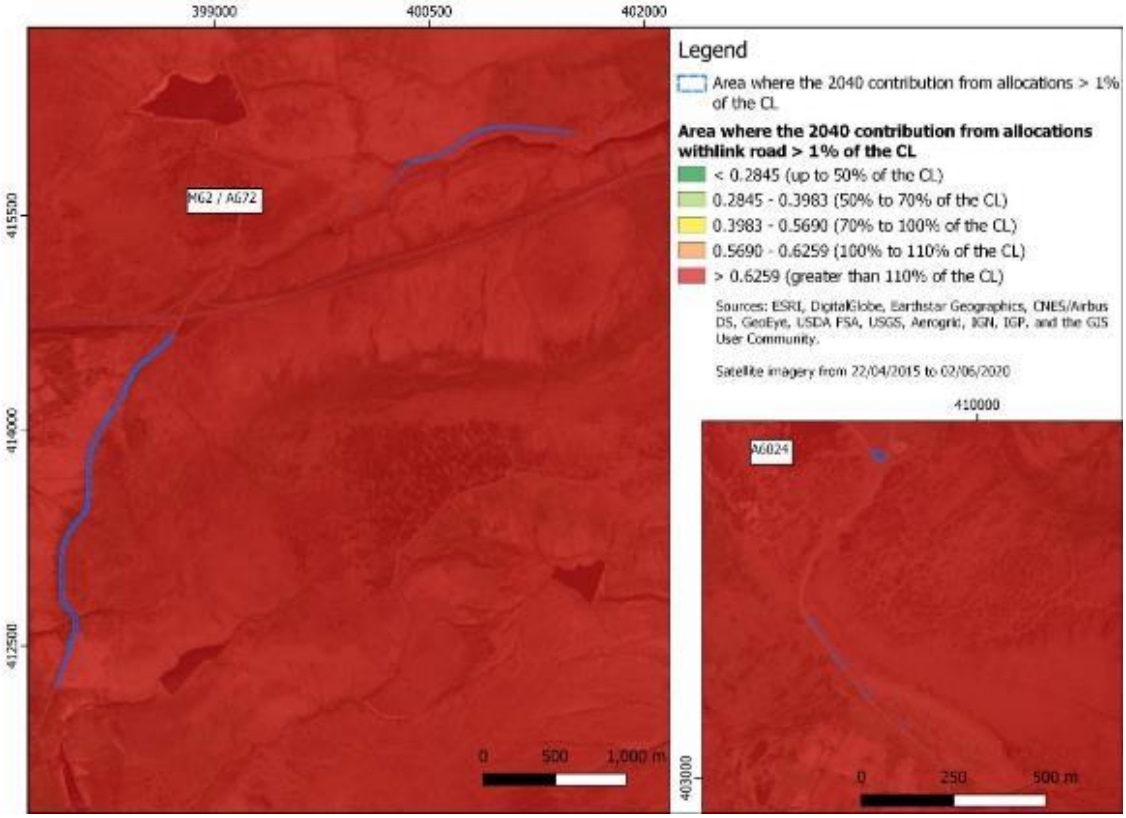
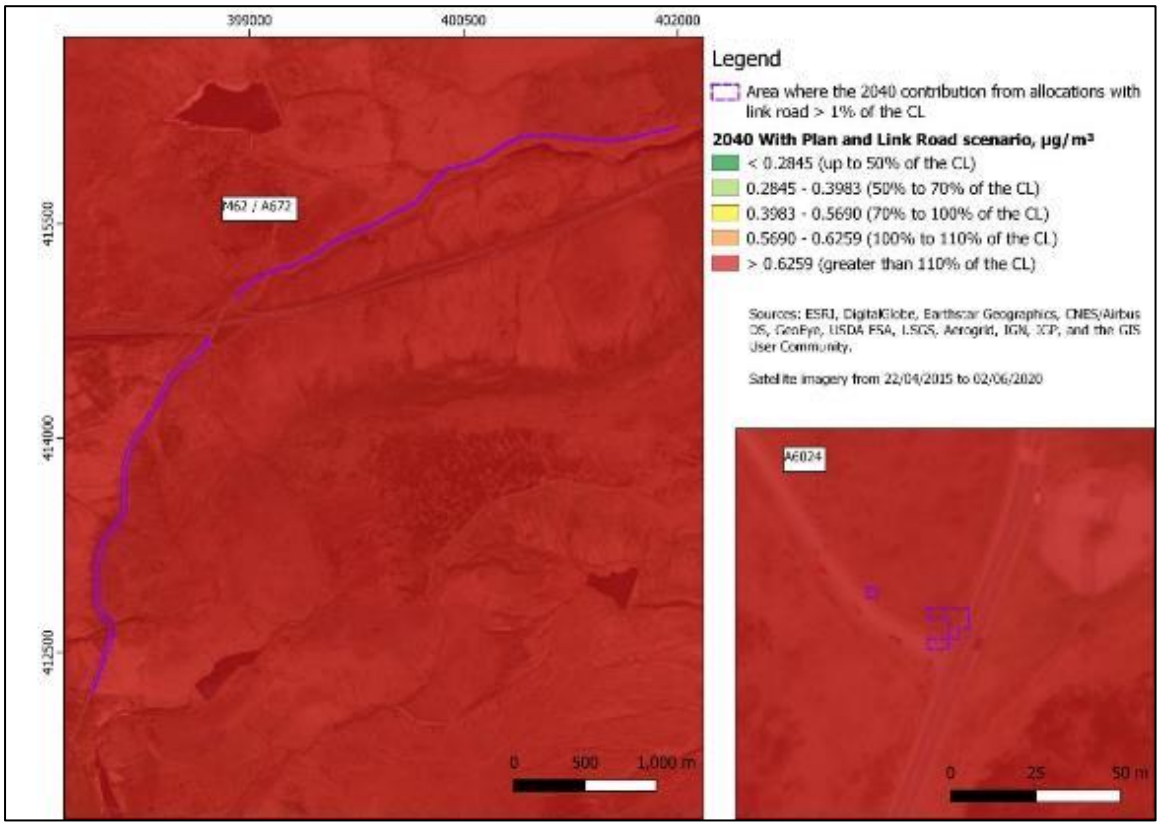


Figure 3-59 Total predicted acid deposition at South Pennine Moors SAC, based on grassland deposition rates, using background deposition rates for 2017-2019; 2040 contributions from allocations with link road



3.7.3.5 Assessment summary and next steps

Following HRA Stage 1 screening, Likely Significant Effects (LSE) at South Pennine Moors SAC have been identified for airborne NOx, airborne NH_3, nitrogen deposition and acid deposition (pre-mitigation).

During Stage 2 Appropriate Assessment, it was determined that no adverse effects are anticipated for this SAC site arising from increased airborne NOx concentrations associated with any of the GM “With Plan” development scenarios, alone or in combination with other plans and projects.

Further analysis was undertaken to determine whether the air quality impacts from the allocations, alone or in combination with other plans and projects, will have an adverse effect on the designated site. The focus of the assessment was on airborne NH_3, nitrogen and acid deposition, having rules out LSEs from airborne NOx earlier in Stage 2. The results of the Appropriate Assessment determined that LSEs arising from airborne NH_3, nitrogen and acid deposition could be ruled out for all locations and habitat types, with the exception of blanket bog habitat at limited areas along the A6024 and A672 / M62.

The next steps for the Appropriate Assessment for this site may include further examination of the likely locations of Blanket bogs, and Transition mires and quaking bogs, in the areas of exceedance identified. This could include site surveys.

On the basis that there could potentially be adverse effects related to air pollution in limited areas close to the A6024 and the M62/A672, mitigation measures have been investigated (see Chapter 5). Potential mitigation measures can be further discussed with Natural England, and measures which meet the appropriate regulatory requirements will be implemented as required to offset any potentially significant adverse impacts of the Places for Everyone plan.

3.8 South Pennine Moors Phase 2 SPA (UK9007022)

3.8.1 Background information and qualifying features

Underlying Sites of Special Scientific Interest (SSSI): South Pennine Moors SSSI.

The site qualifies under **Article 4.1** of the Directive (79/409/EEC) by supporting nationally important breeding populations of two species listed in Annex I.

Annex I species	**Estimated population & season**	**% GB pop.**
Merlin *Falco columbarius*	28 pairs - breeding	4.3%
Golden Plover *Pluvialis apricaria*	292 pairs - breeding	1.2%

The site qualifies under Article 4.2 of the Directive by supporting, in summer, a diverse assemblage of breeding migratory birds of moorland and moorland fringe habitats including: golden plover, lapwing *Vanellus vanellus*, dunlin *Calidris alpine*, snipe *Gallinago gallinago*, curlew, redshank *Tringa tetanus*, common sandpiper *Actitis hypoleucos*, short-eared owl *Asio flammeus*, whinchat *Saxicola rubetra*, wheatear *Oenanthe Oenanthe*, ring ouzel *Turdus toruatus* and twite *Carduelis flavirostris*. The population of twite in the South Pennines is geographically distinct and isolated from others in northern Britain, Ireland and Europe.

The Site Improvement Plan (SIP225) states that nitrogen deposition has been identified as a threat to this European site.

The conservation objectives for this site are to ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring;

- The extent and distribution of the habitats of the qualifying features,
- The structure and function of the habitats of the qualifying features,
- The supporting processes on which the habitats of the qualifying features rely,
- The population of each of the qualifying features, and,
- The distribution of the qualifying features within the site.

3.8.2 HRA Stage 1: Assessment of air quality impacts against screening thresholds

This section comprises the outcome of the assessment described in Section 2.4.

Table 28 summarizes all of the critical loads for nutrient nitrogen deposition (kgN/ha-year) and acid deposition (kEq/ha-year), as well as the critical levels for airborne ammonia (µg/m^3), applicable to this designated site. In this table, the most stringent critical load or critical level (CL) for each pollutant is indicated in bold. The critical level for airborne NOx is set at 30 µg/m^3 across all designated sites.

Table 28 Minimum Critical Load and Critical Level (CL) values and associated sensitive features for South Pennine Moors Phase 2

Sensitive feature	**Minimum nutrient nitrogen deposition CLs (kgN/ha-year)**	**Minimum acid deposition CLs (MinCLMaxN, kEq/ha-year)**	**Minimum airborne NH_3 CLs (µg/m^3)**
*Pluvialis apricaria (*North-western Europe) - European golden plover	**5**	**0.511**	**3**
Falco columbarius - Merlin	10	0.832	**3**

Sensitive feature	Minimum nutrient nitrogen deposition CLs (kgN/ha-year)	Minimum acid deposition CLs (MinCLMaxN, kEq/ha-year)	Minimum airborne NH_3 CLs ($\mu g/m^3$)
Asio flammeus - Short-eared owl	10	0.832	**3**

Consideration of in-combination effects

The Places for Everyone Plan could have a potentially significant impact in this area in isolation. In this case, there would be no requirement for further consideration of in-combination impacts in this area.

The South Pennine Moors Phase 2 SPA is within the GM study area, although mainly outside the authority boundaries. The dispersion modelling results for the GM study area account for air quality impacts associated with road traffic emissions from the allocations in Bolton, Bury, Manchester, Oldham, Rochdale, Salford, Tameside, Trafford, and Wigan.

The potential for impacts to arise at this site due to emissions of air pollutants was screened out for the following authorities and major projects:

- Stockport Metropolitan Borough Council
- Cheshire East Council
- West Lancashire Borough Council
- St Helens Council
- Warrington Borough Council
- Trafford Council
- High Peak Borough Council
- Highways England A57 Link Roads scheme

The HRA for Kirklees Metropolitan Borough Council Local Plan[52] highlighted potential increases in road traffic flows on the M62 and A635 resulting from the Kirklees Local Plan. These could result in an increase of more than 1% of the Critical Level for airborne NOx at a distance of up to 20m from the M62. Impacts due to nitrogen deposition, and impacts in the vicinity of the A635 would be lower still. Being in the vicinity of main roads, the areas affected would be "*unlikely to significantly alter or reduce the overall extent of the habitats supporting the SPA qualifying bird species.*" It was also concluded that "*the Publication Draft Local Plan alone will not result in adverse effects on the integrity of the South Pennine Moors SAC as a result of increased air pollution.*" However, in the light of the findings of increased air pollution levels, it is recommended that further assessment and mitigation of impacts due to the "Places for Everyone" plan should take account of potential in-combination effects with the Kirklees Local Plan.

The HRA for Calderdale Metropolitan Borough Council Local Plan[60] concluded as follows: "*adverse effects on the integrity to the South Pennine Moors (phase 2) SPA and SAC as a result of air pollution arising from the allocation and policies screened in from the Calderdale Local Plan and in combination with other plans can be ruled out.*" No further evaluation is needed in relation to potential in-combination impacts with Calderdale Local Plan.

The HRA for Rossendale Borough Council Local Plan[61] concluded as follows: "*since the main arterial road routes lie beyond the 200m zone from the European sites, no adverse effects arising from air pollution from vehicles are likely to occur.*" This conclusion is not reflected in the location of the M62 and A650 in relation to the South Pennine Moors Phase 2 SPA. As a result, it is recommended that

further assessment and mitigation of impacts due to the "Places for Everyone" plan should take account of potential in-combination effects with the Rossendale Local Plan.

The HRA for Blackburn with Darwen Borough Council Local Plan[53] concluded as follows: "*it is considered unlikely that this or any other site will be impacted upon in regard to air quality.*" No further evaluation is needed in relation to potential in-combination impacts with the Blackburn with Darwen Local Plan.

The M62 Motorway passes through the South Pennine Moors between Junctions 21 to 23. The Environmental Assessment of the Proposed M62 Smart Motorway Scheme (Junctions 20 to 25) includes modelling of NOx concentration and nitrogen deposition for a projected year of 2024. However, it was announced in January 2022 that smart motorway schemes would not be progressed for five years, due to road safety concerns.

With the Proposed M62 Smart Motorway Scheme, the area of the site which both exceeds the critical level, and where the impact with the Proposed Scheme is greater than 1% of the critical level, is approximately 1.2ha (~0.002% of the area of the site). This area lies primarily along the A672 carriageway to the north of Junction 22, with small areas to the southwest of Junction 22 and at the SAC boundary adjacent to the M62. The impacts of the Proposed Scheme on nitrogen deposition fall below 1% of the lower critical load within the first 10m from the SAC boundary alongside the M62. These impacts occur in an area of the SAC amounting to around 4ha or 0.006% of the area of the site. No significant air quality effects are identified in the Environmental Assessment of the M62 Smart Motorway Scheme between Junctions 20 to 25 for the South Pennine Moors Phase 2 SAC. [89]

The potential for in-combination impacts arising from the construction and operation of High Speed 2 (HS2) was also considered. No information was provided within HS2 Phase 2b Environmental Statement documentation regarding South Pennine Moors Phase 2 (SPA). In view of the absence of potential significant effects due to HS2 Phase 2b, there is no need to further consider the potential for in-combination impacts of HS2 with the Places for Everyone plan in relation to South Pennine Moors Phase 2 (SPA).

Screening results

Table 29 compares the maximum modelled contribution of each of the three GM "With Plan" scenarios to the lowest applicable CL. Values highlighted in yellow exceed the 1% screening threshold. This screening exercise represents a precautionary approach, as it assumes that the most sensitive qualifying features (with the lowest CLs) are present in the areas with the highest modelled contribution (typically adjacent to the busiest road).

All four pollutants exceeded the 1% screening threshold for all three GM "With Plan" scenarios. On the basis of available evidence and agreed thresholds, Likely Significant Effects from air quality impacts cannot be ruled-out, either for the GM "With Plan" scenarios in isolation or in-combination with anticipated development from neighbouring local authorities. Therefore, a Stage 2 Appropriate Assessment will be required, with some preliminary considerations provided in the next subsection of this report.

Table 29 Screening results based on dispersion modelling of Greater Manchester Scenarios:

	Airborne NH_3	Airborne NOx	Nutrient nitrogen deposition* Grassland	Acid deposition* Grassland
CL	3	30	5	0.511
Units	µg/m^3	µg/m^3	kgN/ha-year	kEq/ha-year

[89] Highways England, "Smart Motorways Programme Environmental Assessment Report M62 Junctions 20 to 25 (Preliminary Design – PCF Stage 3)", July 2020

	Airborne NH_3	Airborne NOx	Nutrient nitrogen deposition* Grassland	Acid deposition* Grassland
2025 contribution from allocations				
Maximum modelled contribution	0.032	0.85	0.23	0.016
% of CL	1.1	2.8	4.6	3.2
2040 contribution from allocations				
Maximum modelled contribution	0.034	0.58	0.22	0.016
% of CL	1.1	1.9	4.4	3.1
2040 contribution from allocations with link road				
Maximum modelled contribution	0.042	0.72	0.27	0.019
% of CL	1.4	2.4	5.5	3.8

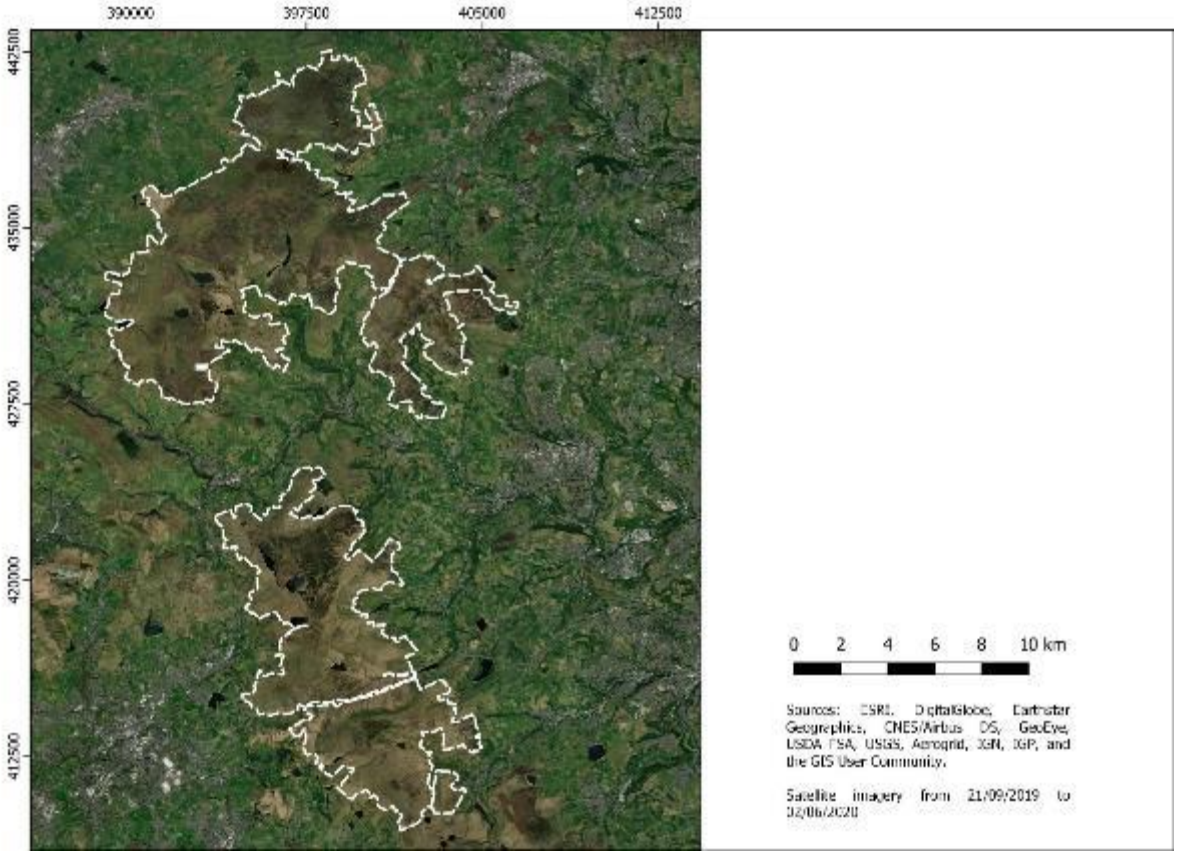
*The areas predicted to exceed the screening thresholds within this SPA are characterised by short vegetation, and therefore grassland deposition rates are applicable.

3.8.3 HRA Stage 2: Appropriate Assessment

As an initial consideration for Stage 2 Appropriate Assessment, this section considers the modelled contributions within the context of existing and forecast background pollution levels for the SPA.

Figure 3-60 provides an overview of the South Pennine Moors Phase 2 SPA.

Figure 3-60 South Pennine Moors Phase 2 SPA



3.8.3.1 Airborne NOx

The South Pennine Moors Phase 2 SPA is contained within the larger boundary of the South Pennine Moors SAC. The SPA and SAC share the same critical level (30 µg/m^3) for NOx. A detailed analysis of the total predicted NOx concentrations within the SAC can be found in Section 3.7.3.1.

On the basis of available evidence and agreed thresholds, there are no adverse effects on this SPA site arising from increased airborne NOx concentrations associated with any of the GM "With Plan" development scenarios, in isolation or in combination with anticipated development from neighbouring local authorities. No further assessment is required for NOx.

3.8.3.2 Airborne NH_3

Figure 3-61 illustrates the areas where the modelled contribution from the GM "With Plan" scenarios are predicted to exceed 1% of the CL.

Figure 3-62, Figure 3-63 and Figure 3-64 present the total modelled NH_3 concentration for the three GM "With Plan" scenarios. These concentrations were calculated by adding the GM contribution results to the 2017-2019 NH_3 background concentrations from APIS. The NH_3 concentrations from APIS are on a 5 km x 5 km grid, hence the total NH_3 concentrations appear to have large pixels where the background concentrations change based on the boundaries of the 5 km grid.

The model results for the 2025 contribution from allocations predict that a small area of the SPA exceeds the 1% screening threshold (light blue outlines in **Figure 3-61** and Figure 3-62). The area predicted to exceed the screening threshold is a very small section of the road surface of the A672. No sensitive features would be expected to be present in this area, and therefore adverse effects from NH_3 on this SPA in 2025 can be discounted. For the two 2040 scenarios, the total NH_3 concentration is predicted to be less than 1.5 µg/m^3 (50% of the CL) throughout in the vicinity of the M62/A672.

Figure 3-61 Overview of screening results for ammonia (NH_3) at South Pennine Moors Phase 2 SPA

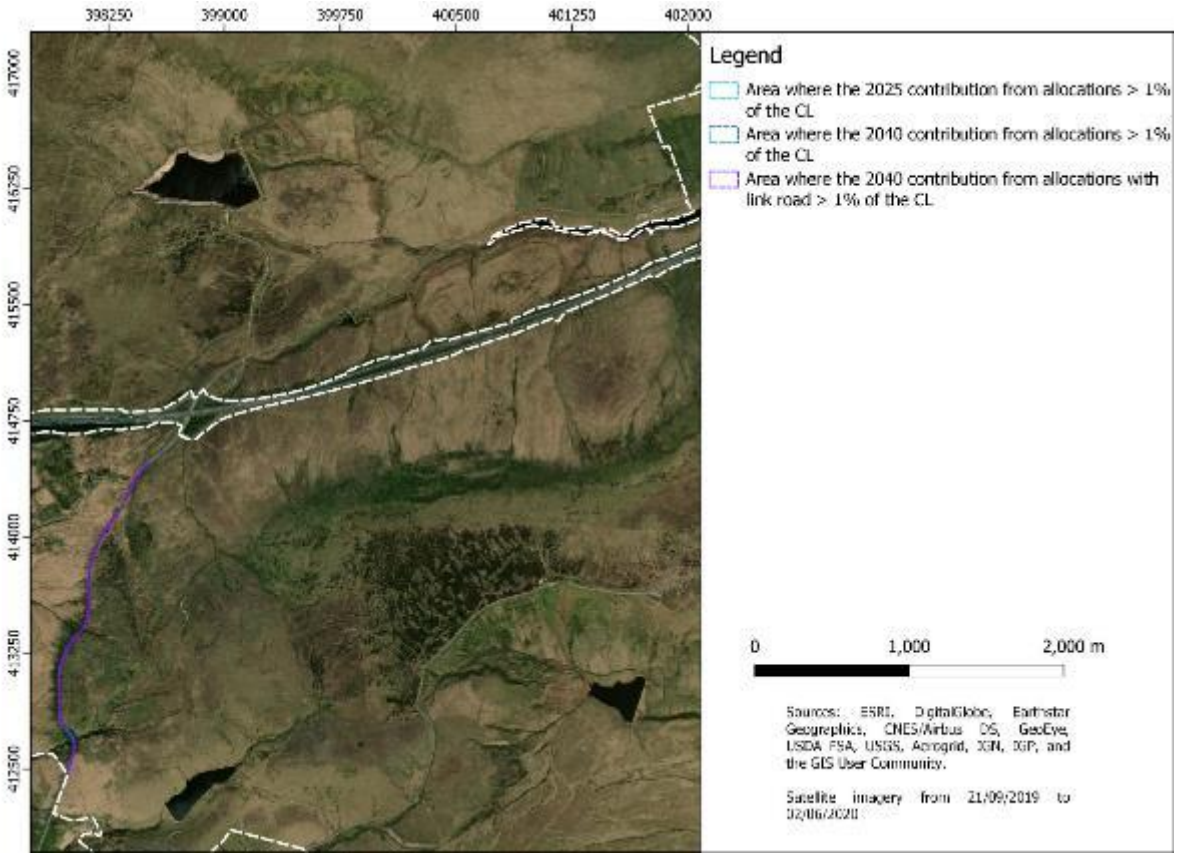


Figure 3-62 Total modelled concentration for NH_3 at South Pennine Moors Phase 2 SPA, using background NH_3 concentrations for 2017-2019; for 2025 contributions from allocations

Figure 3-63 Total modelled concentration for NH_3 at South Pennine Moors Phase 2 SPA, using background NH_3 concentrations for 2017-2019; for 2040 contributions from allocations

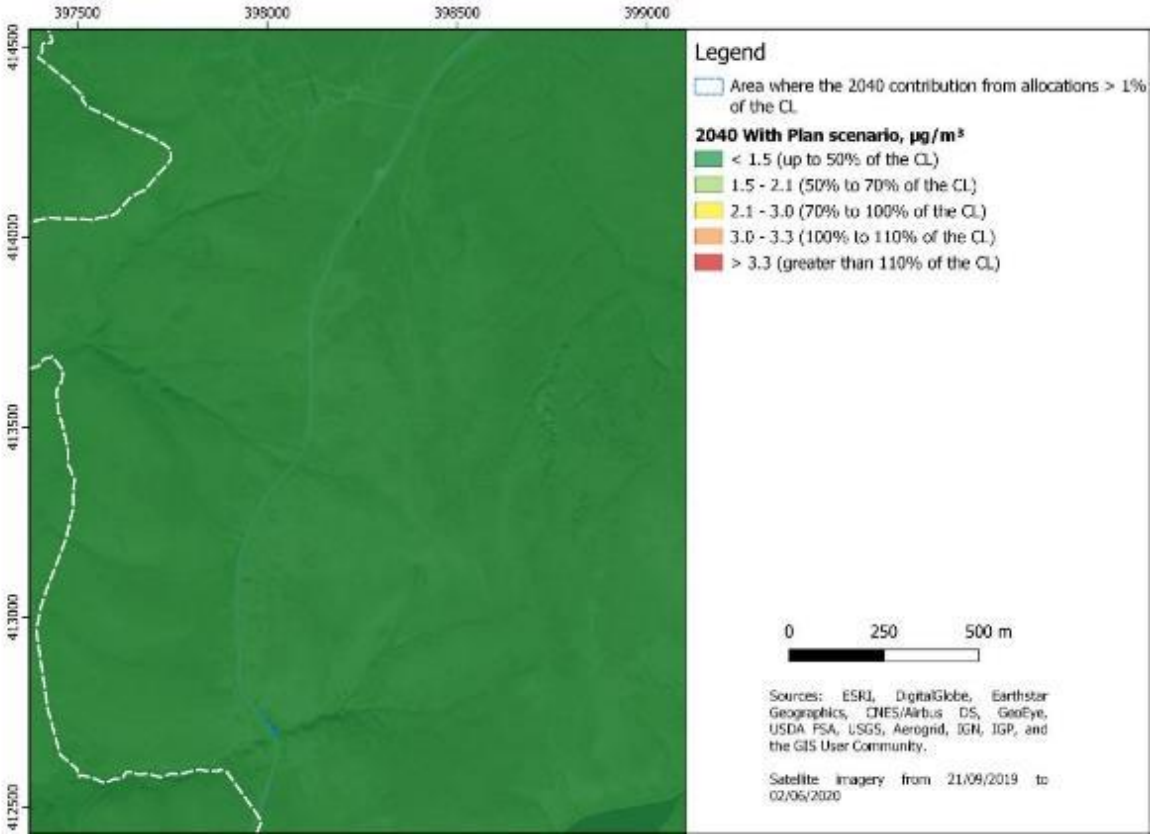
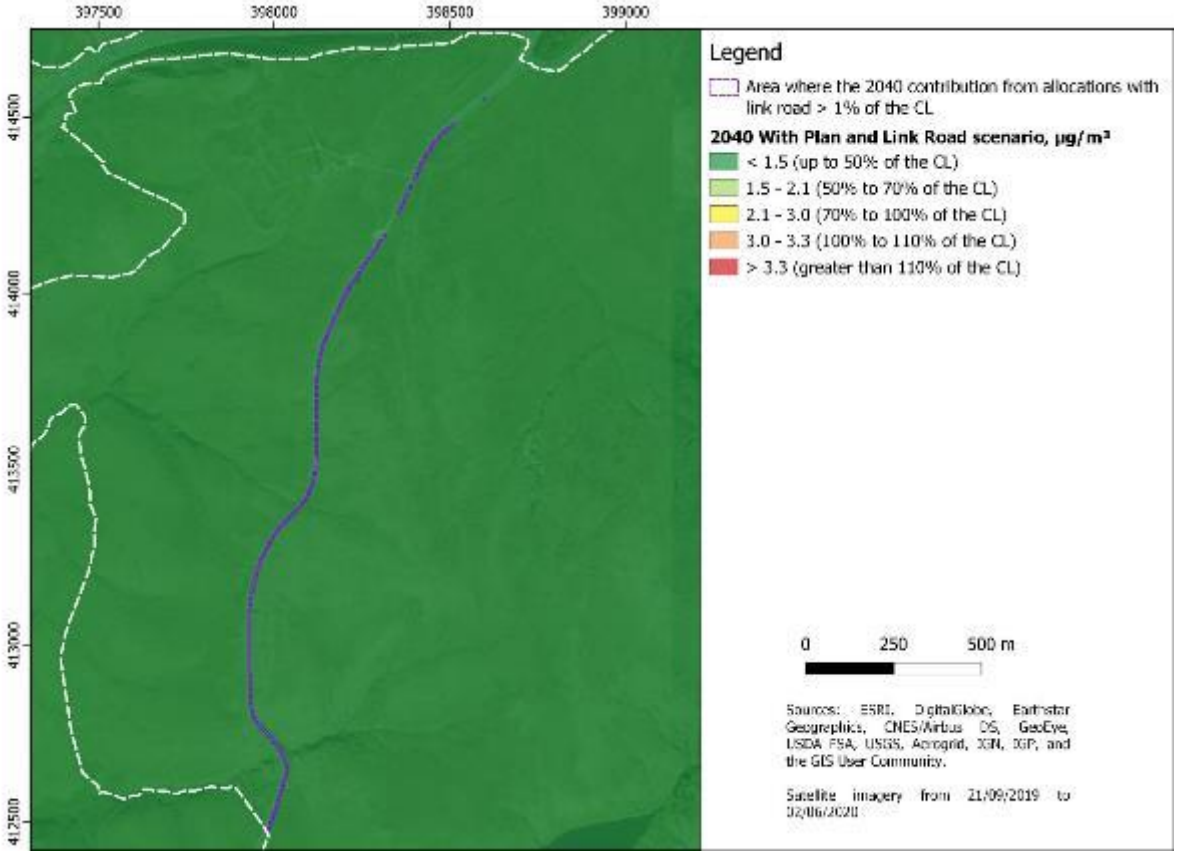


Figure 3-64 Total modelled concentration for NH_3 at South Pennine Moors Phase 2 SPA, using background NH_3 concentrations for 2017-2019; for 2040 contributions from allocations



On the basis of available evidence and agreed thresholds, there are no adverse effects on this SPA site arising from increased airborne NH_3 concentrations associated with any of the GM "With Plan" development scenarios, in isolation or in combination with anticipated development from neighbouring local authorities. No further assessment is required for NH_3.

3.8.3.3 Nitrogen deposition

The South Pennine Moors Phase 2 SPA is contained within the larger boundary of the South Pennine Moors SAC. The SPA and SAC share the same minimum critical load (5 kgN/ha-year) for nitrogen deposition. A detailed analysis of the total predicted nitrogen deposition concentrations within the SAC can be found in Section 3.7.3.3.

An Appropriate Assessment for nitrogen deposition impacts on this site has been undertaken for the areas adjacent to the M62/A672, in consultation with Natural England.

A672 (M62/A672)

A desk-based assessment of the distribution of sensitive features and supporting habitats along the A672 (M62/A672) was carried out by ecologists at Ricardo Energy and Environment. The following information has been used to determine the likelihood of each of the sensitive features being present in the areas of exceedance identified for nitrogen deposition:

- The underpinning SSSI unit mapping (using a shapefile in GIS) – the SSSI units within the areas of interest were looked up to determine the main habitats and/or species listed
- Priority habitat inventory (PHI) mapping (using a shapefile in GIS) – the priority habitats present in the PHI shapefile (classified as Biodiversity Action Plan Priority Habitats) were compared to the habitats given in the corresponding SSSI unit information (classified as a combination of

Phase 1 Habitat Classification, National Vegetation Classification, and best judgement based on the species listed) using JNCC's "Spreadsheet of Habitat Correspondences"[90] that shows how the main UK Habitat Classifications relate to / correspond with each other

- Satellite imagery was examined to consider the colours / textures / densities of known areas of the habitats
- SPA supplementary advice for lists of bird species and their habitat preferences were considered (see **Table 30**); information was taken from the supplementary advice document for the South Pennine Moors Phase 2 SPA[91]

Table 30: Inferred breeding habitats for sensitive features of the South Pennine Moors Phase 2 SPA

Sensitive feature	Breeding habitat mentioned specifically in Phase 1 SPA
Pluvialis apricaria (North-western Europe) - European golden plover	Principal habitats are blanket bogs, dry heaths, wet heaths and acid grassland. **Inferred suitable priority habitats for breeding = blanket bog, dry heath, wet heath and acid grassland**
Falco columbarius - Merlin	Heather moorland. Nest in shallow scrapes on the ground. **Inferred suitable priority habitats for breeding = heathland**
Asio flammeus - Short-eared owl	*Does not specifically mention short eared owl as one of the qualifying SPA features.*

Table 31 provides a summary of the evidence available to determine the likelihood of each feature being present.

Table 31 Likelihood of the presence of sensitive features of the South Pennine Moors Phase 2 SPA, within areas where 1% of the minimum critical load for nitrogen deposition (5 kgN/ha-year) is exceeded

Sensitive feature	Geographical area	Feature likely to be present?	Evidence from priority habitat inventory	Evidence from SSSI unit(s) underpinning the SPA
Pluvialis apricaria (North-western Europe) - European golden plover	Extending either side of the A672 & M62 (where they intersect)	Yes - species mentioned in the SSSI units and suitable supporting habitats for the species are present.	Blanket bog is present along the western A672 south of the M62 and north of the car park and along the eastern A672 roughly from the M62 junction to the end of the polygon. No evidence of wet heath or dry heath. Acid grassland (grass moorland) is present along the northern A672 north of the M62 junction on both sides of the road.	Golden plover are mentioned as present within South Pennine Moors SSSI comments on unit 135. This unit is present within the mapped area of exceedance. South Pennine Moors SSSI underpinning the SAC includes, within the main habitat type or comments, 'bog', 'blanket bog', 'heath' or 'acid grassland' within units 137, 136, 129, 130, 132, 131, 110, 135, 138 and 139. These units are present within the mapped areas of exceedances.

[90] Spreadsheet of Habitat Correspondences, JNCC, 2008, https://hub.jncc.gov.uk/assets/9e70531b-5467-4136-88f6-3b3dd905b56d

[91] European Site Conservation Objectives: Supplementary advice on conserving and restoring site features South Pennine Moors Phase2 Special Protection Area (SPA), Natural England, 2018.

Sensitive feature	Geographical area	Feature likely to be present?	Evidence from priority habitat inventory	Evidence from SSSI unit(s) underpinning the SPA
	Along the A672 (Manchester Rd)	Inconclusive - suitable supporting habitats potentially present.	Small sections of blanket bog overlapping along the northern A672. No evidence of wet heath or dry heath. Acid grassland (grass moorland) is present along the north of A672.	South Pennine Moors SSSI underpinning the SAC includes, within the main habitat type or comments, 'bog', 'blanket bog', 'heath' or 'acid grassland' within units 117 and 145. These units are present within the mapped areas of exceedances.
Falco columbarius - Merlin	Extending either side of the A672 & M62 (where they intersect)	Inconclusive - suitable supporting habitats potentially present.	No evidence of wet or dry heath.	South Pennine Moors SSSI underpinning the SAC includes, within the main habitat type or comments, 'wet heath', 'dry heath' or ' heath' within units 137 and 129. These units are present within the mapped areas of exceedances.
	Along the A672 (Manchester Rd)	Inconclusive - suitable supporting habitats potentially present.	No evidence of wet or dry heath.	South Pennine Moors SSSI underpinning the SAC includes, within the main habitat type or comments, 'wet heath' or ' heath' within units 117 and 145. These units are present within the mapped areas of exceedances.
Asio flammeus - Short-eared owl	Extending either side of the A672 & M62 (where they intersect)	Inconclusive - suitable supporting habitats potentially present.	No evidence of wet or dry heath.	South Pennine Moors SSSI underpinning the SAC includes, within the main habitat type or comments, 'wet heath', 'dry heath' or ' heath' within units 137 and 129. These units are present within the mapped areas of exceedances
	Along the A672 (Manchester Rd)	Inconclusive - suitable supporting habitats potentially present.	No evidence of wet or dry heath.	South Pennine Moors SSSI underpinning the SAC includes, within the main habitat type or comments, 'wet heath' or ' heath' within units 117 and 145. These units are present within the mapped areas of exceedances.

The desk-based assessment of the distribution of sensitive features and supporting habitats along the A672 (M62/A672) suggests that all three of the sensitive features are likely to be present in the areas of exceedance identified (for the critical load of 5 kgN/ha-year: up to approximately 30m, 34m and 40m from the edge of the road for the 2025 contribution from allocations, 2040 contribution from allocations, and 2040 contribution from allocations with link road cases, respectively, and for the critical load of 10

kgN/ha-year: up to approximately 9m, 10m and 14m from the edge of the road for the 2025 contribution from allocations, 2040 contribution from allocations, and 2040 contribution from allocations with link road cases, respectively).

Breeding bird survey data for the South Pennine Moors Phase 2 SPA[92] were examined, to establish if the areas of exceedance identified for nitrogen deposition include areas used for the Golden plover, for breeding. The survey data for 2014 demonstrated that the Golden plover favoured the Dark Peak, which includes the areas of exceedance adjacent to the M62/A672. No data for the Merlin, or Short-eared owl were available.

SSSI unit habitat maps provided by Natural England,[79] for SSSIs adjacent to the M62/A672, were also examined to check for breeding habitats suitable for the Merlin and Short-eared owl. For SSSI units 110, 129, 130, 131, and 132 (adjacent to the portion of the A672 that lies north of the M62), bracken is present within the exceedance areas; bracken is a suitable breeding habitat for the Short-eared owl and therefore its presence within these areas cannot be ruled out. However, heathland (suitable for the Merlin) is not present, and so it is unlikely that Merlin use the land within the exceedance areas for breeding.

For SSSI units 135, 138, and 139 (adjacent to the portion of the A672 that lies south of the M62), unit 135 contains rush pasture and unit 138 contains bracken; both are breeding habitats for the Short-eared owl and so their presence within these areas cannot be ruled out. It is unlikely that Short-eared owl are present within unit 139 as no suitable breeding habitats are mapped. Again, heathland (suitable for the Merlin) is not present in any of the SSSI units, and so it is unlikely that Merlin use the land within the exceedance areas for breeding.

The SSSI units in the vicinity of the M62/A672 exceedance areas are shown in **Figure 3-46** for reference.

In summary, SSSI unit mapping for units adjacent to the M62/A672 suggests that there is not supporting habitat for the Merlin present, and so LSE arising from nitrogen deposition in this part of the SPA can be ruled out for the Merlin. However, SSSI mapping showed that suitable breeding habitats for the Short-eared owl are present in every SSSI unit except for unit 139, so LSE arising from nitrogen deposition cannot be ruled out for the Short-eared owl. Breeding bird survey data for the Golden plover demonstrated the species favours the Dark Peak, which covers the exceedance areas in question; therefore, LSE arising from nitrogen deposition in this part of the SPA cannot be ruled out for the Golden plover.

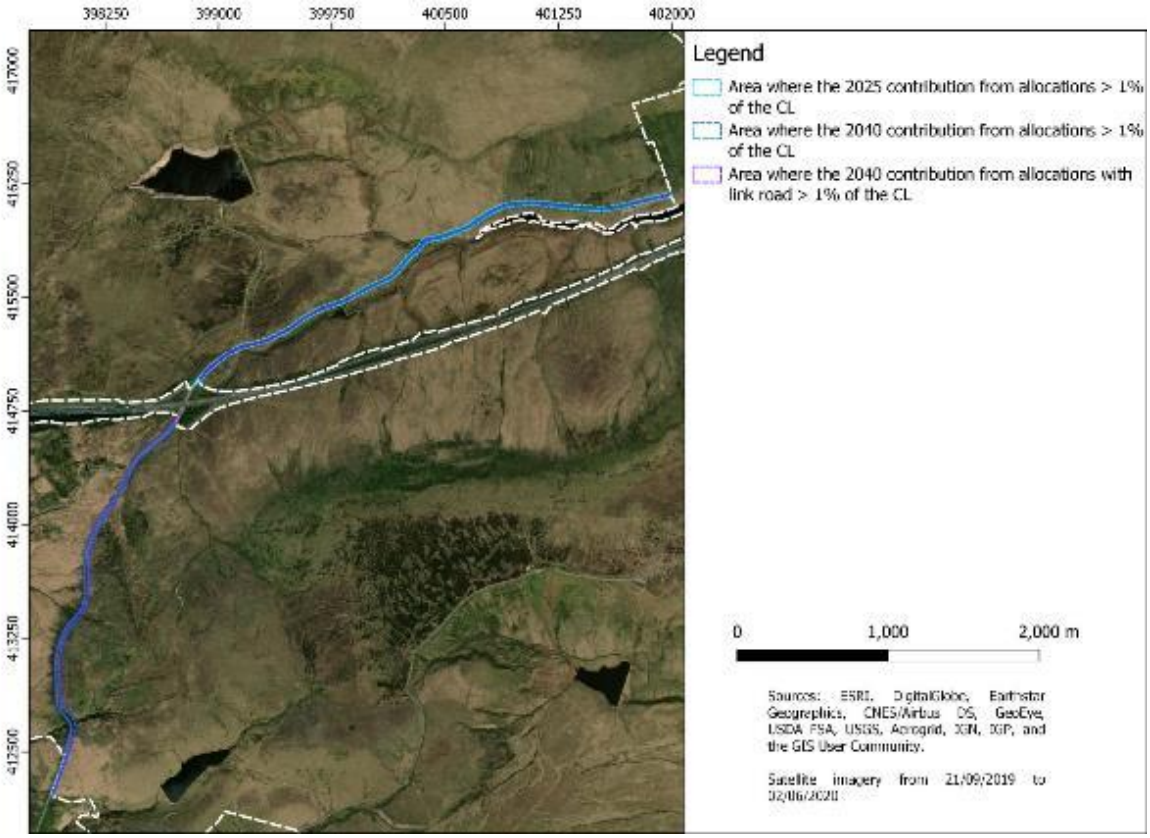
3.8.3.4 Acid deposition

The South Pennine Moors Phase 2 SPA is contained within the larger boundary of the South Pennine Moors SAC. A detailed analysis of the total predicted acid deposition concentrations within the SAC can be found in Section 3.7.3.4.

Figure 3-65 illustrates the areas where the acid deposition contribution from the GM "With Plan" scenarios are predicted to exceed 1% of the CL, when grassland deposition rates are considered. As the SPA has a slightly lower critical load for acid deposition (0.511 kEq/ha-year) than the SAC (0.569 kEq/ha-year), the areas within the SPA predicted to exceed the screening thresholds for acid deposition are similar but slightly larger than those areas predicted to exceed the screening thresholds within the SAC.

[92] South Pennine Moors Phase 2 SPA survey data sheet, 2014, provided by Natural England via email on 13/01/2022.

Figure 3-65 Overview of screening results for acid deposition at South Pennine Moors Phase 2 SPA, based on grassland deposition rates



An Appropriate Assessment for acid deposition impacts on this site has been undertaken for the areas adjacent to the M62/A672, in consultation with Natural England. For this SPA, the critical loads related to acid deposition are based on the same bird species and supporting habitats as the critical loads related to nitrogen deposition. The areas predicted to exceed the screening thresholds for acid deposition are slightly smaller than the areas predicted to exceed the screening thresholds for nitrogen deposition. Therefore, the same conclusions apply.

3.8.3.5 Assessment summary and conclusions

Following HRA Stage 1 screening, Likely Significant Effects (LSE) at South Pennine Moors Phase 2 SPA have been identified for nitrogen deposition and acid deposition (pre-mitigation). LSE can be discounted for airborne NOx and airborne NH_3.

An Appropriate Assessment has been undertaken to determine whether the air quality impacts from the allocations, alone or in combination with other plans and projects, will have an adverse effect on the designated site. The focus of the assessment was on nitrogen and acid deposition, having rules out LSEs from airborne NOx and airborne NH_3 at Stage 1. The Appropriate Assessment considered the likelihood of the presence of Golden plover, Merlin, and Short-eared owl within the exceedance areas identified, and determined that LSEs arising from nitrogen and acid deposition in limited areas along the M62/A672 could be ruled out for Merlin, but could not be ruled out for Golden plover or Short-eared owl.

On the basis that there could potentially be adverse effects related to air pollution in limited areas close to the A672, mitigation measures have been investigated (see Chapter 5). Potential mitigation measures can be further discussed with Natural England, and measures which meet the appropriate regulatory requirements will be implemented as required to offset any potentially significant adverse impacts of the Places for Everyone plan.

4. Summary of HRA results

This study has evaluated the potential effects of changes in air quality for three cases:

- **2025 contribution from allocations**: the air quality impacts associated with the PfE Plan allocations in 2025.
- **2040 contribution from allocations**: the air quality impacts associated with the PfE Plan allocations in 2040.
- **2040 contribution from allocations with link road**: the air quality impacts associated with the PfE Plan allocations in 2040 combined with the air quality impacts associated with a new link road between the A57 and M62.

This study has evaluated the following potential impacts at internationally designated habitat sites within 10 km of the PfE plan boundary:

- Increases in airborne concentrations of oxides of nitrogen;
- Increases in airborne concentrations of ammonia;
- Increases in deposition of nitrogen from the atmosphere to the designated sites; and
- Increases in deposition of acid from the atmosphere to the designated sites.

4.1 HRA Screening

The HRA Stage 1 Screening results indicate that there are no Likely Significant Effects related to air quality for the following European sites, for all three of the cases considered in this assessment. These sites have been screened out of requiring further analysis:

- Midland Meres & Mosses – Phase 1 (Ramsar site)
- Rostherne Mere (Ramsar Site)
- Rixton Clay Pits (SAC)

The HRA Stage 1 Screening results indicate that further analysis, in the form of an HRA Stage 2 Appropriate Assessment, is required for each of the following European sites for at least one of the three cases described above, and at least one of the four potential impacts:

- Manchester Mosses (SAC)
- Rochdale Canal (SAC)
- South Pennine Moors (SAC) and the overlapping sites Peak District Moors (South Pennine Moors Phase 1 (SPA) and South Pennine Moors Phase 2 (SPA)

4.2 Further analysis

For the designated sites requiring further analysis and Appropriate Assessment, this process includes the following steps:

1. Calculation of the total predicted pollution levels (baseline pollution levels + contribution from allocations) and comparison with the applicable Critical Loads and Critical Levels. This step also considers in-combination effects associated with other plans and projects. Where the total predicted pollution levels are predicted to be below the applicable Critical Loads and Critical Levels, adverse effects on the designated site can be ruled out and no further analysis is

necessary. These results are included in this report, whereas the rest of the steps described below will be undertaken during the consultation phase for the PfE Plan.

2. For designated sites where the total pollution levels are predicted to exceed the applicable Critical Loads and/or Critical Levels, further Appropriate Assessment has been undertaken. The aim of the Appropriate Assessment was to determine whether the air quality impacts from the allocations, alone or in combination with other plans and projects, could have an adverse effect on the designated site. The approach included considerations such as: the distribution of sensitive qualifying features within the designated site and their predicted exposure to air pollution; the current status of the site (favourable or unfavourable); the conservation objectives for the site; and whether there are plans to increase or restore the distribution of sensitive qualifying features within the site.
3. For designated sites where the Appropriate Assessment indicated that there are adverse effects related to air pollution, mitigation measures were investigated and recommended, as set out in Chapter 5. These will be discussed further with Natural England, and measures which meet the appropriate regulatory requirements for classification as mitigation measures will be recommended.

The overall results of the HRA are summarised in **Table 32**.

Table 32 Summary of HRA results

Designated Site	Airborne NOx	Airborne NH_3	Nitrogen deposition	Acid deposition
Manchester Mosses (SAC)	HRA Stage 2 indicates no adverse effects (total predicted concentration does not exceed the CL).	HRA Stage 2 indicates no adverse effects in isolation (when detailed modelling of the tree belt within the Holcroft Moss portion of the SAC is included, the model results do not predict an exceedance of the screening thresholds, where the qualifying features are present, or could be present).	HRA Stage 2 indicates no adverse effects in isolation (when detailed modelling of the tree belt within the Holcroft Moss portion of the SAC is included, the model results do not predict an exceedance of the screening thresholds, where the qualifying features are present, or could be present).	HRA Stage 2 indicates no adverse effects in isolation (when detailed modelling of the tree belt within the Holcroft Moss portion of the SAC is included, the model results do not predict an exceedance of the screening thresholds, where the qualifying features are present, or could be present).
Midland Meres & Mosses - Phase 1 (Ramsar)	Screened out at HRA Stage 1. The model results do not predict an exceedance of the screening thresholds for any of the modelled scenarios.	Screened out at HRA Stage 1. The model results do not predict an exceedance of the screening thresholds for any of the modelled scenarios.	Screened out at HRA Stage 1. The model results do not predict an exceedance of the screening thresholds for any of the modelled scenarios.	Screened out at HRA Stage 1. The model results do not predict an exceedance of the screening thresholds for any of the modelled scenarios.
Peak District Moors (South Pennine Moors Phase 1) (SPA)	HRA Stage 2 indicates no adverse effects (total predicted concentration does not exceed the CL).	HRA Stage 2 indicates no adverse effects (total predicted concentration does not exceed the CL).	HRA Stage 2 indicates potential for Golden plover, Merlin, and Short-eared owl to be present in limited areas along the A6024 where screening thresholds are exceeded. Mitigation measures investigated.	HRA Stage 2 indicates potential for Golden plover, Merlin, and Short-eared owl to be present in limited areas along the A6024 where screening thresholds are exceeded. Mitigation measures investigated.
Rixton Clay Pits (SAC)	Screened out at HRA Stage 1. The model results do not predict an exceedance of the screening thresholds for any of the modelled scenarios.	Screened out at HRA Stage 1. The model results do not predict an exceedance of the screening thresholds for any of the modelled scenarios.	Screened out at HRA Stage 1. The model results do not predict an exceedance of the screening thresholds for any of the modelled scenarios.	Screened out at HRA Stage 1. The model results do not predict an exceedance of the screening thresholds for any of the modelled scenarios.

Designated Site	Airborne NOx	Airborne NH_3	Nitrogen deposition	Acid deposition
Rochdale Canal (SAC)	HRA Stage 2 indicates no adverse effects (total predicted concentration does not exceed the CL).	HRA Stage 2 indicates no adverse effects (total predicted concentration does not exceed the CL).	HRA Stage 2 indicates no clear body of evidence to confirm that elevated nutrient nitrogen deposition directly affects the conservation of *L. natans.* However, indirect impacts may occur. Mitigation measures investigated.	HRA Stage 2 indicates no clear body of evidence to confirm that elevated nutrient nitrogen deposition directly affects the conservation of *L. natans.* However, indirect impacts may occur. Mitigation measures investigated.
Rostherne Mere (Ramsar)	Screened out at HRA Stage 1. The model results do not predict an exceedance of the screening thresholds for any of the modelled scenarios.	Screened out at HRA Stage 1. The model results do not predict an exceedance of the screening thresholds for any of the modelled scenarios.	Screened out at HRA Stage 1. The model results do not predict an exceedance of the screening thresholds for any of the modelled scenarios.	Screened out at HRA Stage 1. The model results do not predict an exceedance of the screening thresholds for any of the modelled scenarios.
South Pennine Moors (SAC)	HRA Stage 2 indicates no adverse effects (total predicted concentration does not exceed the CL).	HRA Stage 2 indicates no adverse effects along the A6024 (total predicted concentration does not exceed the CL). HRA Stage 2 indicates no adverse effects along the M62/A672 for all sensitive features except Blanket bogs (features are not likely to be present within areas of exceedance). HRA Stage 2 indicates potential for adverse effects for Blanket bogs in limited areas along the M62/A672. Mitigation measures investigated.	HRA Stage 2 indicates no adverse effects along the A57 (areas of exceedance are only on or within 2m of the road surface). HRA Stage 2 indicates no adverse effects along the A6024 for all sensitive features except Blanket bogs (features are not likely to be present within areas of exceedance). HRA Stage 2 indicates no adverse effects along the M62/A672 for all sensitive features except Blanket bogs (features are not likely to be present within areas of exceedance). HRA Stage 2 indicates potential for adverse effects for Blanket bogs in	HRA Stage 2 indicates no adverse effects along the A57 (areas of exceedance are only on or within 2m of the road surface). HRA Stage 2 indicates no adverse effects along the A6024 for all sensitive features except Blanket bogs (features are not likely to be present within areas of exceedance). HRA Stage 2 indicates no adverse effects along the M62/A672 for all sensitive features except Blanket bogs (features are not likely to be present within areas of exceedance). HRA Stage 2 indicates potential for adverse effects for Blanket bogs in

Designated Site	Airborne NOx	Airborne NH_3	Nitrogen deposition	Acid deposition
			limited areas along the M62/A672. Mitigation measures investigated.	limited areas along the M62/A672. Mitigation measures investigated.
South Pennine Moors Phase 2 (SPA)	HRA Stage 2 indicates no adverse effects (total predicted concentration does not exceed the CL).	HRA Stage 2 indicates no adverse effects (total predicted concentration does not exceed the CL).	HRA Stage 2 indicates no adverse effects along the M62/A672 for Merlin (suitable breeding habitats are not present within areas of exceedance). HRA Stage 2 indicates potential for adverse effects for Golden plover and Short-eared owl in limited areas along the M62/A672. Mitigation measures investigated.	HRA Stage 2 indicates no adverse effects along the M62/A672 for Merlin (suitable breeding habitats are not present within areas of exceedance). HRA Stage 2 indicates potential for adverse effects for Golden plover and Short-eared owl in limited areas along the M62/A672. Mitigation measures investigated.

4.3 Recommendations

This report has provided a detailed and robust assessment of the potential impacts of the proposed PfE plan allocations on internationally designated sites within 10 km of the Greater Manchester Combined Authority area due to emissions of air pollutants. This report provides a Stage 1 assessment for the purposes of the Habitats Regulations, and includes several of the steps needed for a complete Stage 2 assessment.

Based on the results of this study, it is recommended that no further assessment is required in relation to potential impacts on the following sites:

- Midland Meres & Mosses - Phase 1 (Ramsar)
- Rixton Clay Pits (SAC)
- Rostherne Mere (Ramsar)

In respect of other sites, some relatively small areas require further consideration, as it has not been possible to rule out the risk of a Likely Significant Effect due to the PfE plan.

- Manchester Mosses (SAC): Following more detailed assessment, it was found that the Places for Everyone plan would not have a significant effect at this site due to increases in air pollution. The proposed A57-M62 link road would result in larger areas of the Manchester Mosses SAC requiring consideration for further assessment and potentially mitigation. It is recommended that this should be viewed as a disadvantage of the proposed link road, and careful consideration should be given to the potential impacts at the Manchester Mosses SAC before proceeding with this option. The potential for in-combination effects with the Warrington Borough Local Plan was identified.
- Peak District Moors (South Pennine Moors Phase 1) (SPA): Small parts of this site could experience an increase in nitrogen and acid deposition due to the proposed plan. Further assessment and mitigation should be implemented, as set out in Chapter 5.
- Rochdale Canal (SAC): Further evaluation indicated that nitrogen deposition could potentially have a limited effect at this site. Further assessment and mitigation should be implemented, as set out in Chapter 5.
- South Pennine Moors (SAC): Small parts of this site could experience an increase in airborne ammonia, nitrogen deposition and acid deposition due to the proposed plan. Further assessment and mitigation should be implemented, as set out in Chapter 5.
- South Pennine Moors Phase 2 (SPA): Small parts of this site could experience an increase in nitrogen and acid deposition due to the proposed plan. Further assessment and mitigation should be implemented, as set out in Chapter 5.

Discussions between representatives of Greater Manchester Combined Authority and Natural England[47] have demonstrated that an effective partnership can be developed in order to identify any potentially significant impacts, and to put appropriate mitigation in place, if this should be needed.

Limited potential for in-combination impacts has been identified in relation to proposed development plans being brought forward or implemented by neighbouring authorities. There is also potential for in-combination impacts with the Highways England A57 link roads scheme in relation to the South Pennines SAC and SPAs. Where appropriate, the Greater Manchester Combined Authority should work collaboratively with other local authorities and Highways England under the Duty to Cooperate to address such impacts.

5. Conclusions and mitigation

5.1 Overall conclusions

This HRA demonstrates that increased emissions to air due to the "Places for Everyone" plan will have no adverse effect on the integrity of any European Sites, either alone or in combination with any other plan, with the following extremely limited exceptions:

1. The Places for Everyone plan could potentially act in combination with the Warrington Council Plan to have an adverse effect over a small part of the Holcroft Moss SSSI, part of the Manchester Mosses SAC.
2. The Places for Everyone plan could potentially result in a slight worsening in the condition of the Rochdale Canal SAC due to increase in nitrogen deposition.
3. The Places for Everyone plan could potentially result in an adverse effect over small parts of the South Pennine Moors SAC and South Pennine Moors Phase 1 and Phase 2 SPAs adjacent to limited sections of the A6024, A672 and A57.

At all other locations within European sites located within 10 km of the plan boundary, the plan is forecast to have no adverse effect on the integrity of the European sites.

GMCA proposes further assessment and mitigation measures set out in the following sections, to address these limited potential effects.

5.2 Mitigation of air pollution impacts

The Chartered Institute of Ecology and Environmental Management (CIEEM) has produced an Advisory Note on Ecological Assessment of Air Quality Impacts.[93] This includes guidance on avoidance and mitigation of impacts. Extracts from this guidance are provided in Appendix 3.

The following points are relevant in the context of the mitigation of the small-scale impacts of the Places for Everyone plan due to increases in air pollution.

- Further emission reduction measures linked to the plan could be considered, and would in principle be effective in mitigating impacts. This could entail placing additional requirements on development which would add to traffic flows in the key areas. Such development could be required to limit car parking to a lower level than would normally be required, or could be required to deliver an increased proportion of access by low-emitting or zero emitting (e.g. electric) vehicles
- Pollutant interception is already taking place at the Holcroft Moss SSSI via the tree belt located between the M62 motorway and the habitat area. The deployment of a further tree belt to protect this site is suggested in Section 5.3.2 below as a possible further measure for consideration by Warrington Borough Council. At other sites, the proximity of the site to the source of pollution means that interception would not be likely to be effective.
- Habitat management would potentially be effective in mitigating impacts. Additional management measures over and above existing management measures are proposed in Sections 5.3.2, 5.4.2 and 5.5.2 below.
- While compensation could potentially be appropriate, it has not been proposed for the nature conservation sites potentially affected by the Places for Everyone plan.

[93] Chartered Institute of Ecology and Environmental Management, "Advisory Note: Ecological Assessment of Air Quality Impacts", 2021

- As indicated in the CIEEM guidance, it would not be possible to detect any impact of the Places for Everyone plan by monitoring either chemical parameters (including airborne pollutants) or biological parameters. However, enhancements to existing biological monitoring arrangements could potentially be effective in identifying the need for specific site management measures, enabling mitigation of impacts due to air pollution in general. Additional monitoring measures over and above existing measures are proposed in Sections 5.3.2, 5.4.2 and 5.5.2 below.
- The CIEEM guidance notes that it may be difficult to provide certainty of mitigation for a strategy based on adaptive monitoring. In the case of the potential impacts of the Places for Everyone plan; the potential impacts are marginal in the context of the impacts due to air pollution from wider sources. In this context, an adaptive monitoring strategy, in which mitigation actions are taken in response to monitoring, can deliver certainty of mitigation of the marginal impacts. For example, enhanced monitoring enables earlier action to be taken to mitigate air pollution impacts, for example, by removal of unwanted invasive species. While this would not mitigate all air pollution impacts, this approach can certainly mitigate the marginal potential additional impacts of the Places for Everyone plan.
- Management plans are in place for all the European sites under consideration. In accordance with the CIEEM guidance, GMCA proposes to deliver any mitigation measures as part of these management plans, working with appropriate partners to do so.

A range of potential mitigation measures for SAC peatland habitat are set out by Grzybowski and Glińska-Lewczukb (2020).[94] These are reproduced in Appendix 4.

5.3 Manchester Mosses SAC (Holcroft Moss SSSI)

5.3.1 Further assessment

More detailed assessment has already been carried out to establish the potential effect of the Places for Everyone plan at this site. The Places for Everyone plan is forecast to result in a slight increase in traffic-related pollution across the site, with the effect reducing with distance away from the M62. The detailed assessment demonstrated that the Places for Everyone plan itself would not have an adverse effect on the integrity of the SAC.

The Warrington Borough Council local plan would have a similar effect, although the Warrington plan is forecast to result in a greater increase in pollutant levels at the SAC than the Places for Everyone plan. The Warrington Borough Council local plan and the Places for Everyone plan in combination could potentially have an adverse effect on the integrity of the SAC. Most of this effect would result from the Warrington plan, with a smaller contribution from the Places for Everyone plan.

5.3.2 Mitigation

The relevant area of Holcroft Moss SSSI is located in the borough of Warrington. The Warrington Borough local plan would also be responsible for most of any in-combination impacts.

As Holcroft Moss in located in the borough of Warrington, it is appropriate for Warrington Borough Council to take the lead on developing and implementing mitigation measures. GMCA will work with Warrington Borough Council in this process, and will make a proportionate contribution to the cost and resource requirements of any identified mitigation.

[94]m Grzybowski and K Glińska-Lewczukb, "*The principal threats to the peatlands habitats, in the continental bioregion of Central Europe – A case study of peatland conservation in Poland,*" Journal for Nature Conservation Volume 53, February 2020

Natural England has advised that measures to improve the status of Holcroft Moss SSSI are under way. This is confirmed in Natural England's Supplementary Advice document,[95] which highlights that bog habitat is being restored through re-wetting of the site with the aim of returning it to "Active Raised Bog" status by 2035.

Although restoration work is ongoing at the site, effective mitigation measures over and above the management-focused measures currently being implemented are available. These could include:

(a) The impacts of air pollution at the site due to baseline and new traffic could be reduced by developing a tree belt along the eastern edge of the site. Assessment of the tree belt between the northern edge of the bog habitat and the M62 shows that this could be effective in reducing nitrogen, acid and ammonia inputs to the site, offsetting the relatively small increases in air pollution resulting from the proposed development plans.

(b) Increased nitrogen input to the site could potentially result in an increase in invasive non-native species (or a slower decline in such species than would otherwise occur). The Supplementary Advice document notes that action in relation to this will comprise "periodic monitoring." If needed to offset the in-combination impact of the Warrington plan and Places for Everyone plan, this protective action could be enhanced to provide for more frequent monitoring, and (if required) manual management of the site to remove invasive species.

(c) Further measures can be developed from the list provided in Appendix 5.

GMCA will work with Warrington Borough Council in accordance with the authorities' Duty to Co-operate, to ensure that GMCA makes a proportionate contribution to mitigation of any in-combination impacts.

5.4 Rochdale Canal SAC

5.4.1 Further assessment

The relevant feature for this site is Luronium natans, known as floating water plantain.

More detailed assessment has already been carried out to establish the potential effect of the Places for Everyone plan at this site. The Places for Everyone plan is forecast to result in a slight increase in nitrogen deposition at the site. While evidence is unclear, elevated nutrients might increase the spread of competitors of L. natans, both native and non-native, thus having an indirect impact on its abundance and distribution and therefore site integrity.

5.4.2 Mitigation

Natural England has advised that measures to maintain the status of Rochdale Canal SAC are being carried out. This is confirmed in Natural England's Supplementary Advice document,[96] which notes that the target for this site is to "*maintain the distribution and continuity of the feature and its supporting habitat.*" Measures to achieve this include "*ensure the supporting water bodies are sufficiently free of other competing vegetation to allow space for this early successional species to thrive.*"

Effective mitigation measures over and above those already being carried out are available. As set out in Section 3.5.4, a strategic, long-term programme of invasive species control within the canal would constitute an appropriate response in the absence of feasible avoidance and reduction measures.

[95] Natural England, "European Site Conservation Objectives: Supplementary Advice on Conserving and Restoring Site Features: Manchester Mosses Special Area of Conservation (SAC)," (2016) Site code: UK0030200

[96] Natural England, "European Site Conservation Objectives: Supplementary advice on conserving and restoring site features: Rochdale Canal Special Area of Conservation (SAC)," (2019) UK0030266

This would entail the physical removal of invasive species, at appropriate times of year, for safe disposal away from the SAC; but only where such plants would not have other negative impacts on the natural environment. Physical removal is important because it would not only remove the invasive competitive species, but it would also gradually reduce some nitrogen from the canal in the form of invasive plant tissue which would otherwise be re-released into the water during decomposition. It is partly for this reason that herbicide treatment is not recommended (as well as the herbicide's potential toxic effects on *L. natans*).

It will be equally important to undertake an effective monitoring (regular survey) programme to ensure adequate implementation each year and to assess the effects on *L. natans*. This monitoring would allow for the control programme to be adapted in response to the information gained to improve and maintain its effectiveness.

GMCA will work with an existing nature conservation body, or if necessary set up a new conservation body, to identify a programme of work to be supported by GMCA which is considered to be sufficient to mitigate the relatively small increases in nitrogen deposition forecast to result from the Places for Everyone plan.

5.5 South Pennine Moors SAC and South Pennine Moors Phase 1 and Phase 2 SPAs

5.5.1 Further assessment

More detailed assessment has already been carried out to establish the potential effect of the Places for Everyone plan at these sites. The Places for Everyone plan is forecast to result in a slight increase in airborne ammonia, nitrogen deposition and acid deposition in small parts of these extensive sites lying close to the A6024, the A627 and the A57. A marginal increase in nitrogen deposition with potential to slightly hinder recovery of bog habitat in these small areas is likely to be the most significant potential impact of the plan.

5.5.2 Mitigation

Natural England advised at a meeting held in January 2022 that the blanket bog habitats of the South Pennine Moors are all degraded, but are also all capable of restoration, with restoration programmes under way.

Natural England's Supplementary Advice document for the SAC[97] confirms that an overarching objective is to maintain the existing site area, stating: "*There should be no measurable reduction (excluding any trivial loss) in the extent and area of this feature.*" The Places for Everyone plan would have a marginal effect only on nitrogen deposition, and would not result in any measurable reduction in the extent of blanket bog or other specified habitats. Nevertheless, GMCA will implement measures to offset the marginal effects of the proposed Places for Everyone plan at the South Pennine Moors SAC/SPAs.

Effective mitigation measures over and above those already being carried out are available. These could include:

(a) Support could be provided to enable the scheduled periodic monitoring activities identified in the Supplementary Advice document to be carried out more frequently, enabling any problems to be identified and addressed more quickly.

[97] Natural England, "European Site Conservation Objectives: Supplementary advice on conserving and restoring site features: South Pennine Moors (Phase 2) Special Protection Area (SPA)," (2018) Site Code: UK9007022
Natural England, "European Site Conservation Objectives: Supplementary advice on conserving and restoring site features: South Pennine Moors Special Area of Conservation (SAC)," (2019) Site Code: UK0030280

(b) Support could be provided to enhance the active management of undesirable species in the zones closest to the A6024, A627 and A57 through frequent surveying and removal of invasive species.

(c) Support could be provided for maintaining and upgrading the existing footpath network to a higher standard than would otherwise be possible, encouraging walkers to remain on footpaths and reduce/avoid encroachment on areas of protected habitat.

(d) Further measures can be developed from the list provided in Appendix 4.

GMCA will work with an existing partnership body such as Pennine Prospects, or if necessary set up a new conservation body, to identify a programme of work to be supported by GMCA which is considered to be sufficient to mitigate the relatively small increases in nitrogen deposition forecast to result from the Places for Everyone plan.

Appendices

Appendix 1: Air dispersion model verification and adjustment

Appendix 2: Detailed assessment of Manchester Mosses SAC

Appendix 3: Extract from CIEEM Guidance

Appendix 4: Extract from Grzybowski and Glińska-Lewczukb (2020)

Appendix 1: Air dispersion model verification and adjustment

As discussed in Section 2.3.6 this study uses the validated model and hence model adjustment factors calculated during this project. This Appendix outlines the methodology used.

Verification of the model involves comparison of the modelled results with any local monitoring data at relevant locations; this helps to identify how the model is performing and if any adjustments should be applied. The verification process involves checking and refining the model input data to try and reduce uncertainties and produce model outputs that are in better agreement with the monitoring results. This can be followed by adjustment of the modelled results if required. The LAQM.TG(16) guidance recommends making the adjustment to the road contribution of the pollutant only and not the background concentration these are combined with.

The approach outlined in LAQM.TG(16) section 7.508 – 7.534 (also in Box 7.14 and 7.15) has been used in this case. To verify the model, the predicted annual mean Road NOx concentrations were compared with concentrations measured at the various monitoring sites during 2017.

Total measured NOx for each monitoring site was calculated from the measured NO_2 concentration using Version 7.1 of the Defra NOx/NO_2 calculator available from the LAQM website[98], as this is the version of the calculator recommended for the year 2017. The calculator was used for NO_2 measurements from each local authority separately, as it was determined that the air dispersion model provided a better fit for the measured NO_2 data if the general calculator inputs (regional concentrations of ozone, oxides of nitrogen and nitrogen dioxide) were tailored to each local authority individually. Background NOx values for 2017 were obtained from the 2017 reference year background maps available on the LAQM website.

The initial comparison of the modelled vs measured Road NOx identified that the model was under-predicting the Road NOx contribution at most locations. Refinements were subsequently made to the model inputs to improve model performance where possible.

The gradient of the best fit line for the modelled Road NOx contribution vs. measured Road NOx contribution was then determined using linear regression and used as a domain wide Road NOx adjustment factor. This factor was then applied to the modelled Road NOx concentration at each discretely modelled receptor point to provide adjusted modelled Road NOx concentrations. A linear regression plot comparing modelled and monitored Road NOx concentrations after adjustment is presented in Figure A1-1. A primary NOx adjustment factor (PAdj) of **2.8457** based on model verification using all of the included 2017 NO_2 measurements was applied to all modelled Road NOx data prior to calculating an NO_2 annual mean.

The total annual mean NO_2 concentrations were then determined at points within the model domain using the NOx/NO_2 calculator to combine background and adjusted road contribution concentrations. For this step of the process, regional concentrations of ozone, oxides of nitrogen and nitrogen dioxide were set to those of the local authority where the calibration point was located. The following relationship was determined for conversion of total NOx concentrations to total NO_2 concentrations:

$$(NO_2 \text{ in } \mu g/m^3) = -0.0007(NOx \text{ in } \mu g/m^3)^2 + 0.5465(NOx \text{ in } \mu g/m^3) + 4.5019$$

To evaluate model performance and uncertainty, the Root Mean Square Error (RMSE) for the observed vs predicted NO_2 annual mean concentrations was calculated, as detailed in Technical Guidance LAQM.TG(16). This guidance indicates that an RMSE of up to 4 $\mu g/m^3$ is ideal, and an RMSE of up to

[98] https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html

10 µg/m^3 is acceptable. In this case the RMSE was calculated at 9.9 µg/m^3, which is acceptable, and reasonable for a modelling study over this large a geographical region.

Figure A1-1: Predicted annual average NO_2 concentrations against measured concentrations at monitoring locations. The 30% confidence intervals are also plotted.

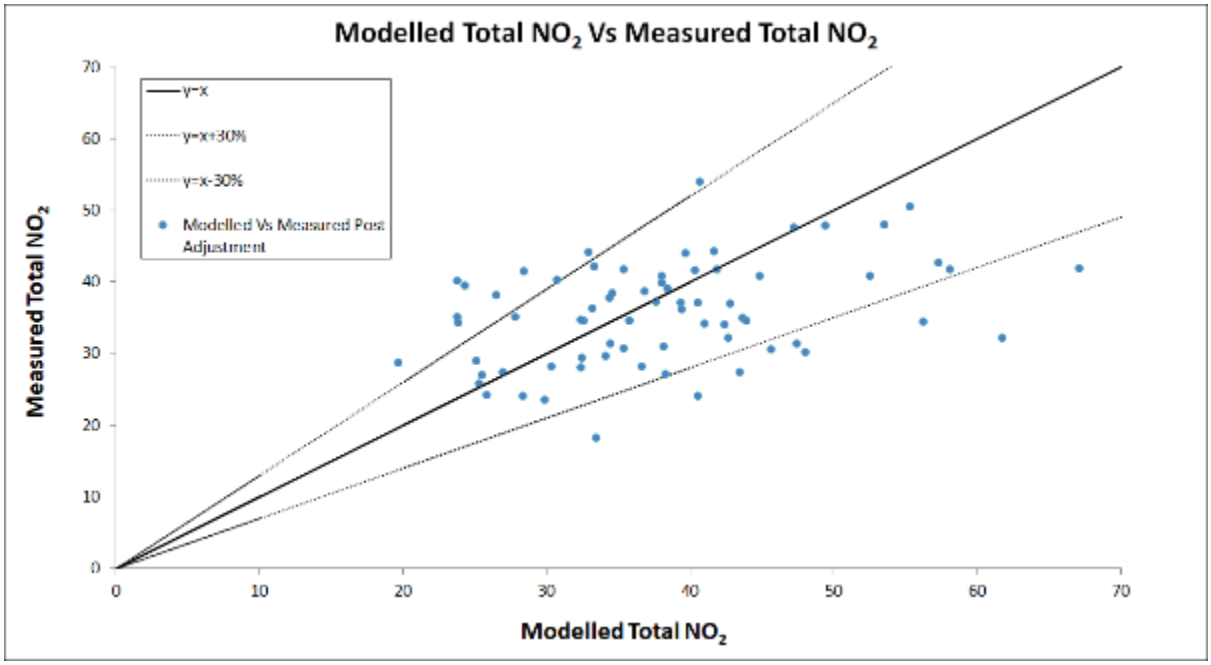


Table A1-1: Modelled and measured NO_2 concentrations for the 2014 reference year and calculated RMSE value

Council	Site ID	Easting	Northing	Measured NO_2 annual mean concentration 2017 (µg/m3)	Modelled NO_2 annual mean concentration 2017 (µg/m^3)
Bolton	Bolton14	373839	406130	23.4	29.9
Bolton	Bolton41	366286	406561	35.0	27.9
Bolton	Bolton60	373287	405061	30.8	38.2
Bolton	Bolton64	371965	409907	31.2	34.5
Bolton	Bolton66	371442	411599	37.0	39.4
Bolton	Bolton3	370763	407929	41.3	28.5
Bury	BURY	380637	406974	28.0	30.4
Bury	BUR2	381650	403222	42.0	33.4
Bury	BUR1	378190	407480	27.0	38.3
Bury	BuryBU7	381887	411223	24.0	28.4
Bury	BuryBU6	379659	410881	36.1	33.2
Manchester	MAHG	384179	386086	24.0	40.6
Manchester	MAN71	385161	398290	50.4	55.4
Manchester	MAN88A	386536	396699	47.5	47.3
Manchester	MAN89A	386681	396806	34.4	32.6
Manchester	MAN28	387951	397430	38.5	36.9
Manchester	MAN36	385205	399750	34.0	41.1
Manchester	MAN73	388601	396048	39.0	38.5

Council	Site ID	Easting	Northing	Measured NO_2 annual mean concentration 2017 (µg/m3)	Modelled NO_2 annual mean concentration 2017 (µg/m^3)
Manchester	MAN74	385399	390093	37.1	37.6
Manchester	MAN75	387363	394617	47.7	49.5
Manchester	MAN8A	381384	387484	29.2	32.5
Manchester	MAN86A	387150	396808	36.9	40.6
Oldham	OLRDNO	392111	406432	39.8	38.0
Rochdale	Rochdale4A	387083	406258	29.5	34.2
Rochdale	Rochdale8A	388914	412083	41.5	40.4
Rochdale	Rochdale11A	389954	413797	43.9	39.7
Rochdale	Rochdale12A	392061	415678	40.1	30.8
Rochdale	Rochdale9A	389055	412217	41.6	41.9
Rochdale	Rochdale17A	391106	412288	25.7	25.3
Salford	SalfordSA26	380718	399597	34.6	32.4
Salford	SalfordSA27	383078	398741	36.8	42.8
Salford	SalfordSA28	377289	401010	32.1	42.7
Salford	SalfordSA51	375213	397661	34.3	56.3
Salford	SalfordSA52	375149	397587	31.2	47.5
Salford	SalfordSA55	372850	400733	34.8	43.7
Salford	SalfordSA60	382445	397724	40.7	44.9
Salford	SalfordSA22	374807	400858	41.8	67.1
Salford	SalfordSA31	374025	401905	30.4	45.7
Salford	SalfordSA39	383040	398563	41.6	58.1
Salford	SalfordSA14	382833	401035	36.0	39.5
Tameside	TAM1	399719	395804	44.0	33.0
Tameside	TamesideT 1	394050	397190	28.1	36.7
Tameside	TamesideT 13	392590	398430	42.5	57.4
Tameside	TamesideT 14	393710	398790	40.7	52.6
Tameside	TamesideT 18	392120	395510	47.8	53.6
Tameside	TamesideT 24	390490	395630	34.4	35.8
Tameside	TamesideT 27	396520	398310	28.8	25.1
Tameside	TamesideT 43	394209	398930	44.1	41.7
Tameside	TamesideT 21	400400	395980	53.8	40.7
Tameside	TamesideT 25	393060	401060	27.9	32.5
Tameside	TamesideT 28	397040	402440	39.3	24.4
Tameside	TamesideT 30	393380	399810	38.3	34.6
Tameside	TamesideT 32	396982	402437	26.8	25.5
Tameside	TamesideT 35	397080	402540	40.0	23.9
Tameside	TamesideT 24	390490	395630	34.4	35.8
Trafford	TRF2	379413	394014	30.0	48.1
Trafford	Trafford5	379119	392033	24.1	25.9
Trafford	Trafford18	378004	391466	18.1	33.5
Trafford	Trafford22	377061	390086	32.1	61.8
Trafford	Trafford24	379263	385806	27.2	27.0

Council	Site ID	Easting	Northing	Measured NO_2 annual mean concentration 2017 (µg/m3)	Modelled NO_2 annual mean concentration 2017 (µg/m^3)
Trafford	Trafford 15	379089	393283	30.6	35.4
Wigan	Wigan 14	366880	403254	34.2	23.9
Wigan	Wigan 33	359726	405534	37.6	34.4
Wigan	Wigan 52	362137	396947	41.6	35.4
Wigan	Wigan 53	353896	408519	27.2	43.5
Wigan	Wigan 114	365116	400260	40.7	38.0
Wigan	Wigan 117	357048	405200	34.5	44.0
Wigan	Wigan 28	366423	399893	38.0	26.5
Wigan	Wigan 61	364025	403079	33.9	42.5
Wigan	Wigan 71	368244	402562	35.0	23.8
Wigan	Wigan 81	355978	410362	28.6	19.7
RMSE (all sites in this table)					**9.89**

PM_{10} model verification

The model output of Road PM_{10} (the total PM_{10} originating from road traffic) was compared with measured Road PM_{10}, where the measured Road PM_{10} contribution is calculated as the difference between the total measured PM_{10} and the background PM_{10} value.

The initial comparison of the modelled vs measured Road PM_{10} identified that the model was under-predicting the Road PM_{10} contribution at most locations. Refinements were subsequently made to the model inputs to improve model performance where possible.

The gradient of the best fit line for the modelled Road PM_{10} contribution vs. measured Road PM_{10} contribution was then determined using linear regression and used as a domain wide Road PM_{10} adjustment factor. This factor was then applied to the modelled Road PM_{10} concentration at each discretely modelled receptor point to provide adjusted modelled Road PM_{10} concentrations. A plot comparing modelled and monitored total PM_{10} concentrations during 2017 is presented in Figure A1-2. A primary PM_{10} adjustment factor (PAdj) of **3.7894** based on model verification using all of the included 2017 PM_{10} measurements was applied to all modelled Road PM_{10} data prior to calculating an PM_{10} annual mean.

To evaluate the model performance and uncertainty, the Root Mean Square Error (RMSE) for the observed vs predicted PM_{10} annual mean concentrations was calculated, as detailed in Technical Guidance LAQM.TG(16). The calculated RMSE is presented in Table A1-2. In this case the RMSE was calculated at **3.7 µg/m^3**.

Limited measurement data was available for the verification of the modelled Road NH_3 data. Using PM_{10} and NOx as an example, the TG16 guidance states that 'in the absence of any PM_{10} data for verification, it may be appropriate to apply the road NOx adjustment to the modelled road-PM_{10}'. In this case, the primary PM_{10} adjustment factor (PAdj) of **3.7894** was applied to all modelled Road NH_3 data prior to calculating the annual mean. The PM_{10} adjustment factor (**3.7894**) was used in preference of that calculated for NOx (**2.8457**) as this represented the worst-case scenario and a more cautious approach when determining the effects of future modelled scenarios.

Figure A1-2: Predicted annual average PM_{10} concentrations against measured concentrations at monitoring locations. The 30% confidence intervals are also plotted.

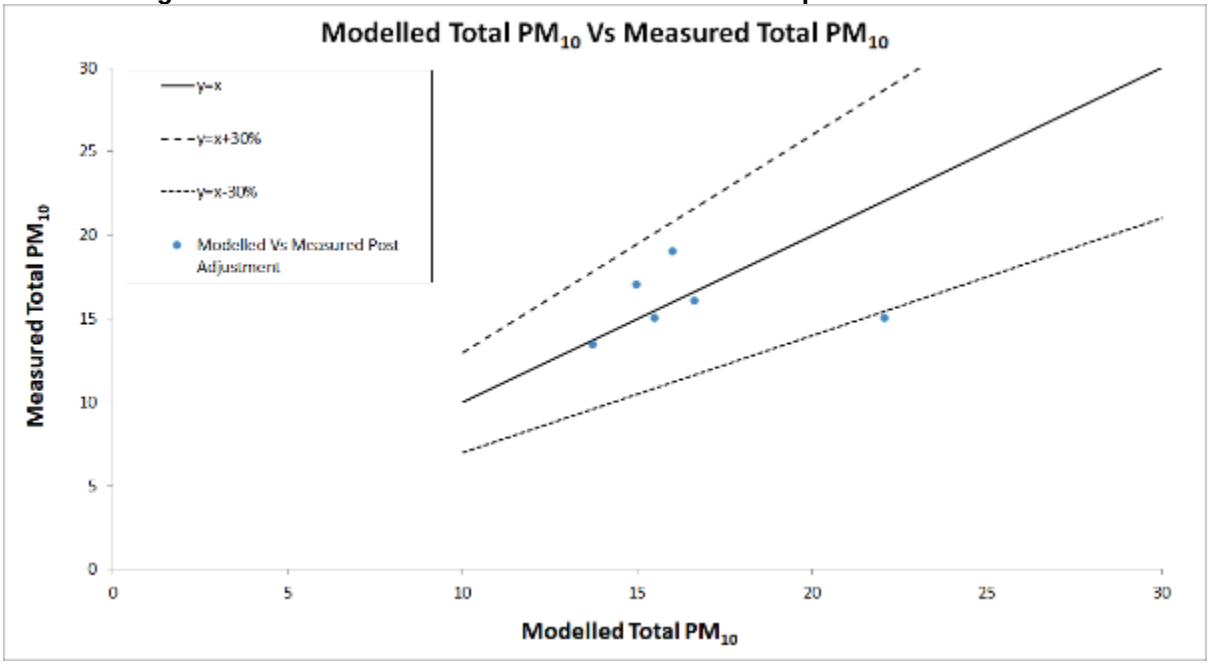


Table A1-2 Modelled and measured PM_{10} concentrations for the 2017 reference year and calculated RMSE value

Council	Site ID	Easting	Northing	Measured PM_{10} annual mean concentration 2014 (µg/m³)	Modelled PM_{10} annual mean concentration 2014 (µg/m³)
Bury	BURY	380637	406974	15.0	15.5
Bury	BUR2	381650	403222	19.0	16.0
Bury	BUR1	378190	407480	16.0	16.6
Manchester	MAHG	384179	386086	13.4	13.8
Tameside	TAM1	399719	395804	17.0	15.0
Trafford	TRF2	379413	394014	15.0	22.1
RMSE (all included sites)					**3.3 µg/m³**

Appendix 2: Detailed assessment of Manchester Mosses SAC

A2.1 Scope of this study

The screening assessment found a potential risk of impacts due to airborne ammonia, nitrogen deposition and acid deposition across part of the Holcroft Moss SSSI component of the Manchester Mosses SAC. The 2040 with-plan scenario resulted in an increase in these impacts above the screening threshold of 1% of the applicable Critical Loads/Critical Levels over part of the Holcroft Moss SSSI, compared with the 2040 do-minimum scenario.

The scope of this study is to provide more detailed air quality modelling around the Holcroft Moss component of the Manchester Mosses SAC. The reason for this additional modelling is that the original modelling did not account for the dense number of trees that form a barrier between the Manchester Mosses site and the M62 motorway, which is the primary cause of road traffic contributions at this site. As well as presenting a physical barrier to dispersion, the trees also absorb a proportion of ammonia and NOx emitted from traffic on the M62. This document sets out the modelling methods and results of the detailed tree barrier modelling which was carried out to enable these effects to be taken into account in the assessment of potential impacts of the Places for Everyone plan.

A2.2 Modelling approach

The modelling for this aspect has been undertaken using ADMS-Roads dispersion model. The reason this model has been chosen is because of its ability to provide detailed treatment of single-sided, partially-porous street canyons, and thereby account for the effects the tree belt has on the flow fields and concentrations. A further interaction that can be modelled within ADMS-Roads is plume depletion as a result of dry deposition within the tree barrier. This has the overall effect of reducing concentrations and deposition rates within the parts of Holcroft Moss SSSI lying to the south of the tree barrier.

The modelling study used a subset of roads from the overall air quality modelling study which could affect this area of Manchester Mosses SAC. Section A2.4 provides details of the study area.

This study used the reference year (2040 without plan) to derive the proportion of modelled concentrations when street canyon effects and plume depletion are accounted for compared to the modelled concentrations when these effects are not included, as in the main air quality modelling study. This proportion was then applied to the results of the main modelling study to provide updated concentrations across Holcroft Moss SSSI. Details of the RapidAIR model are included in the main report and the ADMS-Roads model description is provided in Section 2.5.

We have focused on deriving proportional changes for the "without development" scenario, as the proportional changes are linear at all locations, and the same pattern would be forecast for the 2040 with-plan and 2040 without-plan scenarios.

The contributions resulting from the Places for Everyone plan in 2040 were updated to account for the effect of the tree barrier for each of the currently exceeding airborne pollutant concentrations and deposition rates – that is, airborne ammonia, nitrogen deposition and acid deposition.

A2.3 Evidence for including tree barrier

The presence of buildings on either side of a road can introduce 'street canyon' effects which result in pollutants becoming trapped, leading to increased pollutant concentrations. A report[99] published by the Air Quality Expert Group (AQEG), an expert committee to Defra, summarises existing literature

[99] Air Quality Expert Group (AQEG) (2017). Impacts of Vegetation on Urban Air Pollution.

pertaining to the impacts of vegetation of urban air pollution, including the effects of dense barriers of trees, concluding that dense trees such as those between the M62 and Holcroft Moss can produce effects analogous to those that would occur in the presence of a building or single-sided street canyon, including a recirculating region and turbulent wake effects.

Wind tunnel and CFD model studies have shown that when the wind blows from the road to the tree barrier there are reductions in concentrations on the downwind side of the barrier. These reductions decrease with distance away from the barrier and depend on the height and density of the barrier as well as other factors such as atmospheric stability and building morphology in the neighbourhood of the barrier. AQEG highlighted that for the studies conducted in the field, the concentration reduction is attributable to a combination of deposition/depletion and dispersion effects.

A2.4 Description of the study area

Study domain

The study domain in the original modelling is presented in the main report and covers the entirety of Greater Manchester. As this study is only interested in a small subset of this area around the Manchester Mosses area, a reduced model domain has been used. This has the benefit of including all sources likely to have an impact on the designated site while enabling reasonable model run times using the ADMS model. Figure A2- **1** presents the ADMS-Roads modelling domain along with the roads modelled in this subset.

Figure A2- 1: Air quality study domain extent

This study is focused on the concentrations at Holcroft Moss which forms one of the three areas under the designated site Manchester Mosses. The Holcroft Moss boundary runs parallel to the M62, at a distance of approximately 25m from the M62 road carriageway. The M62 is the principal road of interest in this study, as the road traffic associated with this road is the main cause of modelled impacts above

1% of Critical Loads/Critical Levels within Holcroft Moss presented in the main report. Holcroft Lane, B5212 towards the east of the designated site is less likely to have an impact due to the emissions being considerably less than the M62 as a result of lower traffic flows. However, it has been included due to its proximity to the site.

The tree barrier spans approximately 150m at its maximum width, 135m of this falls within the designated site. At its minimum width it covers approximately 115m with 95m falling within the designated site.

A2.5 ADMS-Roads modelling system

The ADMS-Roads dispersion model was used to derive proportions as a result of the inclusion of deposition and a street canyon caused by the tree belt to the north of Holcroft Moss in the immediate vicinity. These proportions have been applied to the original RapidAIR modelling to calculate an adjusted NO_2 and NH_3 road contribution. Finally, these pollutants were used to derive nitrogen and acid deposition.

A2.5.1 Model description

ADMS-Roads models dispersion within the atmosphere of pollutants released from road traffic, which is modelled using line source models. It is designed to allow consideration of dispersion ranging from the simplest scenarios such as a single road to more complex scenarios such as multiple road traffic emission sources over large areas. In the modelling of dispersion of road traffic emissions allowance is made for initial dispersion in the vehicle wake, traffic induced turbulence and the effects of street canyons. A significant feature of the model is the ability is that modelling near roads ADMS-Roads applies up-to-date parameterisations of the boundary layer structure based on the Monin-Obukhov length, and the boundary layer height. This allows for a realistic representation of the changing characteristics of dispersion with height.

The model has been extensively validated against field data sets. Since 1992 CERC have been key participants in the series of “Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes” workshops, hosting the 11th Conference in the UK in 2007. The workshops have included validation of models against field data sets, analysis of the validation results and discussion of validation techniques. Documents describing the latest model validation are available on the CERC website.

A2.5.2 Model selection

Dispersion modelling in complex topography is challenging and is especially so when low wind speeds arising from flows around obstacles influence ambient air quality. The primary reason for utilising ADMS-Roads is the model’s ability to alter the flow fields as a result of obstacles such as tree barriers. It can also account for plume depletion as a result of deposition within the tree canopy. This was not able to be captured in the original modelling due to the large nature of the original modelling domain. Including these physical effects which are relevant to the Holcroft Moss SSSI ensures that concentrations and deposition rates are more accurately represented at the designated site.

A2.6 Representing the tree belt in ADMS-Roads

The modelling assessment included simulating the effect of changes to vegetation/trees within the study area, which is represented through a one-sided porous street canyon and including plume depletion as a result of deposition of pollutants. There is one section of trees as mentioned in Section A2.1 which was included within the model. This comprises a dense belt of trees to the south of the M62. The majority of these trees fall within the Holcroft Moss boundary, whilst a few are on the roadside of the boundary. **Figure A2- 2** presents aerial satellite imagery of the tree barrier as well as showing how the tree barrier is represented within ADMS-Roads. **Figure A2- 3** presents roadside photography taken from the M62.

Figure A2- 2: Aerial satellite image of tree barrier and representation in ADMS-Roads

Figure A2- 3: Roadside photography taken from the M62 of the tree barrier

A2.7 Advanced street canyon model description

The dispersion of pollutants from a road source within a street canyon may be altered by channelling of the flow caused by the canyon walls and a recirculating flow region driven by the component of the above-canopy flow perpendicular to the road. When street canyons have a high aspect ratio, flow velocities can also reduce significantly near the ground. The advanced street canyon module within ADMS-Roads incorporates the following effects of a street canyon:

(a) pollutants are channelled along the canyon;

(b) pollutants are dispersed across the canyon by circulating flow at road height;

(c) pollutants become trapped within the recirculation regions;

(d) pollutants leave through gaps between buildings;

(e) pollutants leave from the canyon top; and

(f) pollutants leave the canyon from the downstream end of the canyon.

A street canyon is characterised by the following parameters when using the advanced street canyon model option within ADMS-Roads:

- Width: distance from the road centreline to the canyon wall;
- Average height: the average height of buildings/trees within the canyon wall;
- Minimum height: the minimum height of buildings/trees within the canyon wall;
- Maximum height: the maximum height of buildings/trees within the canyon wall; and
- Building length: the total length of road with adjacent building/trees

These values are processed to obtain average canyon height H, total canyon width g and porosity α. Porosity is defined below, where L_B is the length of road with adjacent buildings and L_R is the total length of road which the street canyon is attached to. A porosity value of 1.0 represents no barrier present, whereas a value of 0.0 signifies a full barrier.

$$\alpha = 1 - \frac{L_B}{L_R}$$

A2.8 Dry deposition model description

Dry deposition occurs when material is lost from the plume at the surface of the ground with a certain deposition velocity. This results in a change to the airborne concentration of a pollutant compared to when there is no deposition. Including the dry deposition model option has two consequences: a reduction in plume strength with distance as material is removed from the plume at the surface, and an adjustment of the vertical profile due to removal of material at the surface.

Roadside and aerial photography were used to estimate the input parameters required by ADMS-Roads advanced street canyon module; width, average height, minimum height, max height and building length. **Table A2- 1** presents the values used within the model setup. Similarly, the relevant deposition velocities used for NH_3 and NO_2 are presented in **Table A2- 2**. The forest habitat deposition was chosen to be used for the entire model domain due to this modelling exercise being interested in the effects the forested habitat is having on plume depletion.

As the tree barrier is deciduous, the barrier will be more solid in summer than in winter. As such, in order to provide a conservative estimate of the potential air quality improvements from removing the barrier, no street canyon effects were assumed to arise from the barrier during winter months (defined

as November to March inclusive for the purposes of this study). A barrier with a porosity of 40%[100] was assumed to be present from April to October, representing the non-solid nature of the barrier even outside the dormant season.

Deposition velocities were representative of a woodland area, in accordance with published guidance, as used in the main modelling study.

Table A2- 1: Tree barrier parameters needed for input into ADMS-Roads advanced street canyon model option

Parameter	Value
Width (m)	13.5
Average height (m)	12
Minimum height (m)	9
Maximum height (m)	16
Building length (m)	287
Length of road (m)	479
Porosity (%)	40

Table A2- 2: Deposition velocities used for ADMS-Roads modelling

Pollutant	Habitat	Deposition velocity (m/s)
NO_2	Forest	0.003
NH_3	Forest	0.03

A2.9 Air quality modelling

The model setup for the ADMS-Roads model is described in this section. Section A2.6 provides details of the model inputs.

A2.9.1 Summary of model steps

The steps taken regarding updating the model results to include the effects of the tree barrier to the north of the site are highlighted in the workflow in **Figure A2- 4**.

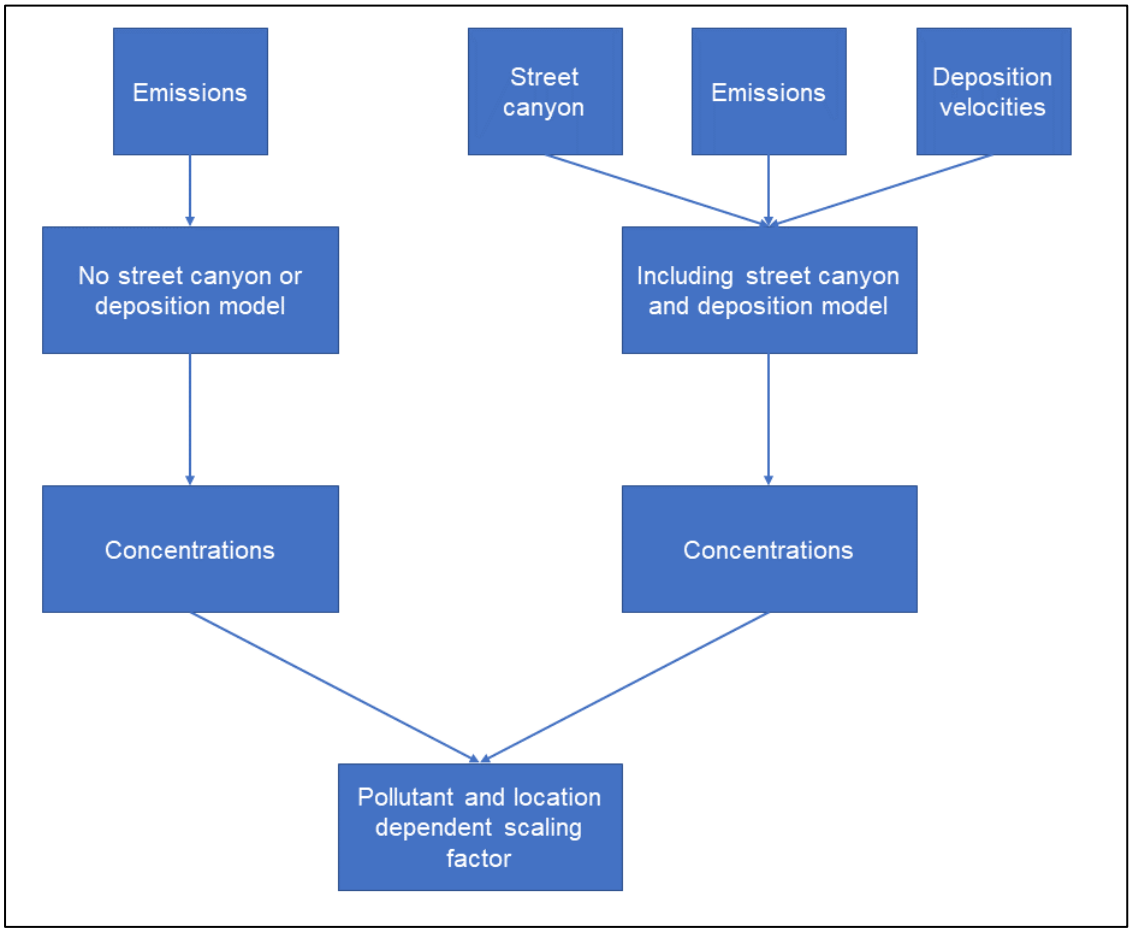
The initial stage of modelling was to create a scaling factor for each pollutant which accounts for the impacts associated with a porous one-sided street canyon and plume depletion as a result of deposition. This was conducted in ADMS-Roads. This was carried out by creating a baseline model which replicated the processes modelled in the original RapidAIR modelling process. The second model setup included the tree barrier and the physical processes associated with it – barrier effect on dispersion, and depletion of nitrogen dioxide and ammonia while passing through the barrier. To ensure a conservative approach was taken, it was assumed that the street canyon was only present during summer months, whilst during winter months no canyon was modelled at all. With regards to plume depletion, the deposition velocity applied is not seasonal dependent so has been accounted for throughout the year. The finalised scaling factors showing the proportionate change when street canyons and plume depletion for NO_2 and NH_3 are included is presented in Section A2.10.

The final step was to apply the scaling factors to the relevant original modelling conducted in RapidAIR. This includes applying the NO_2 deposition and street canyon scaling factor to the NO_2 2040 Plan A road contribution. Similarly, the NH_3 deposition and street canyon scaling factor was applied to the NH_3 2040

[100] Thomson et al. (2021), Green infrastructure for air quality improvement in street canyons.

Plan A road contribution. Once these had been calculated the adjusted contributions for NO_2 and NH_3 were used to calculate airborne NH_3, nitrogen deposition and acid deposition.

Figure A2- 4: Workflow to calculate barrier and depletion effect of including a tree barrier



A2.10 Scaling factors

This section provides the spatially varying scaling factors for NO_2 and NH_3 which have been derived from the differences which arise due to the inclusion of plume depletion and a street canyon to the north of Holcroft Moss.

The general variation in calculated scaling factors across the model domain is illustrated in **Figure A2- 5** and **Figure A2- 6** for the NO_2 and NH_3 scaling factors respectively. As expected, concentrations within the street canyon are higher than without the street canyon, due to the trapping of pollution within the canyon area around the M62 road carriageway. This reduces dispersion further south into Holcroft Moss SSSI. The same effect is observed for both NO_2 and NH_3.

The large differences between the two substances arise due the effects of plume depletion. NH_3 is removed to a greater extent than NO_2 due to its higher deposition velocity (see **Table A2- 2**). As a result, the scaling factor for NH_3 is generally lower than that of NO_2.

Figure A2- 5: Scaling factor accounting for differences due to the inclusion of plume depletion and a street canyon for NO_2

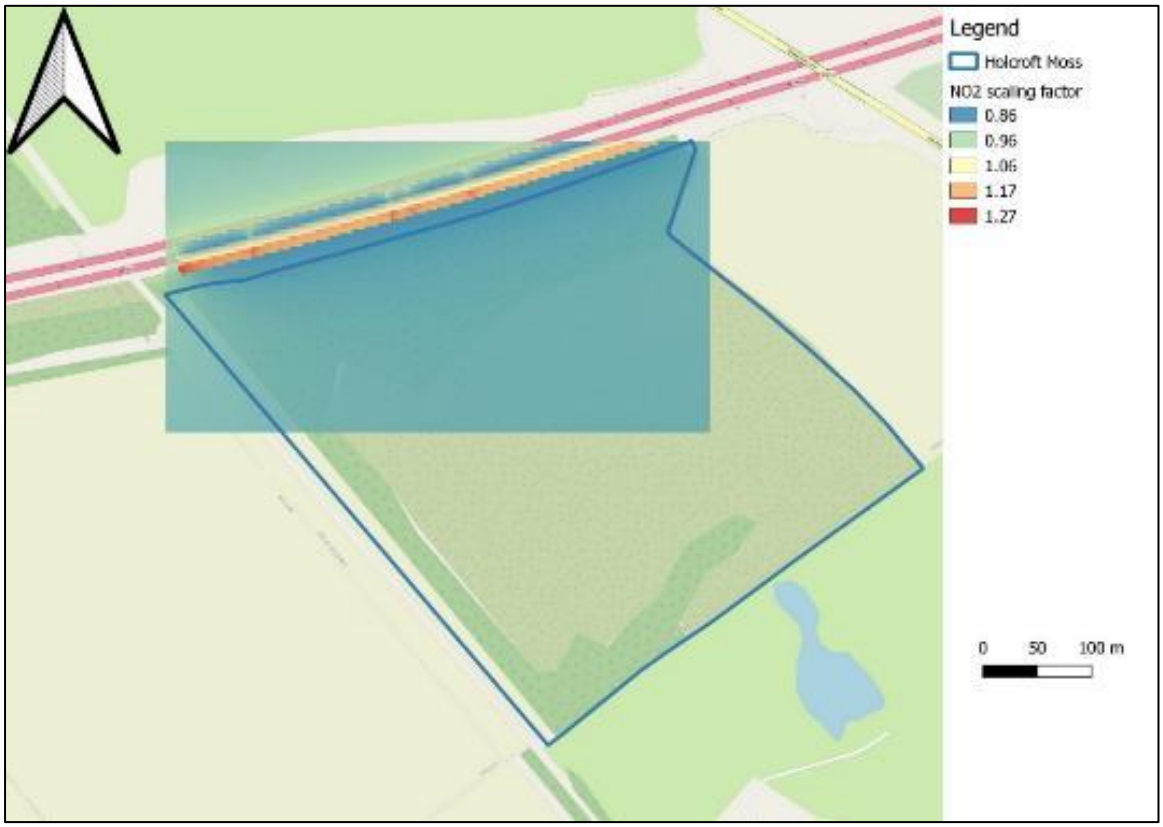
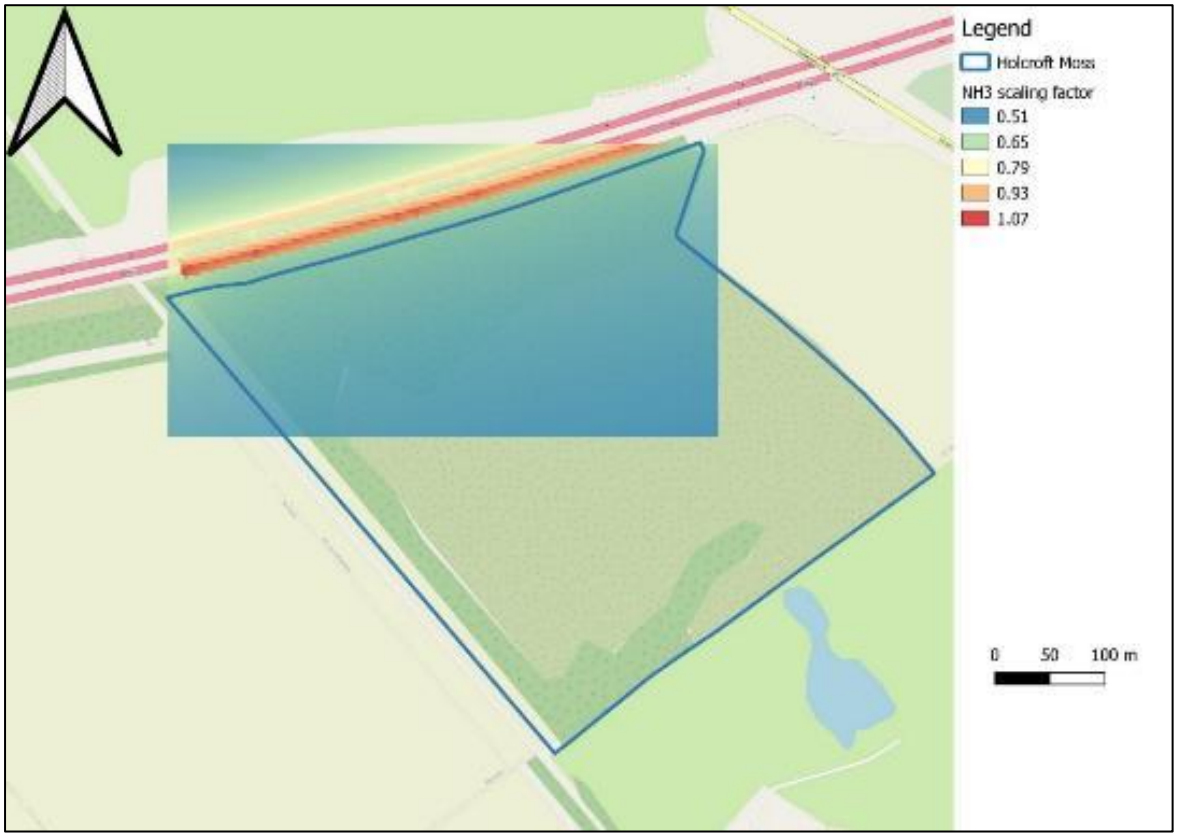


Figure A2- 6: Scaling factor accounting for differences due to the inclusion of plume depletion and a street canyon for NH_3



A2.11 Results

X compares the maximum modelled contribution of the Greater Manchester 2040 contributions from allocations scenario to the lowest applicable CL. Values highlighted in yellow exceed the 1% screening threshold.

The screening results indicate that the maximum contribution from the Places for Everyone plan – tree barrier scenario results in three pollutants (NH_3, nitrogen and acid deposition) exceeding the 1% threshold. However, the magnitude of these exceedances are lower than the model results for the plan-wide modelling study. Unlike the main modelling study, the exceedances do not penetrate past the tree line and into the area where relevant habitats are present to the south of the tree line. **Figure A2- 7**, **Figure A2- 8** and **Figure A2- 9** present each of the three pollutants of interest illustrating where the exceedances of the 1% threshold occur.

Table A2- 3: Screening results based on dispersion modelling of Greater Manchester 2040 contribution from allocations – tree barrier scenario

	Airborne NH_3	Nutrient nitrogen deposition	Acid deposition
CL	1	5	0.564
Units	µg/m^3	kgN/ha-year	kEq/ha-year
2040 contribution from allocations – tree barrier			
Maximum modelled contribution	0.021	0.13	0.0092
% of CL	2.13	2.59	1.62

Figure A2- 7: Model results for ammonia (NH_3) at Manchester Mosses SAC

Figure A2- 8: Model results for nitrogen deposition at Manchester Mosses SAC

Figure A2- 9: Overview of screening results for acid deposition at Manchester Mosses SAC, based on grassland deposition rates

A2.12 Conclusions

The increases in modelled concentrations and deposition rates are forecast to be below 1% of the relevant Critical Loads and Critical Levels across the parts of Holcroft Moss SSSI (a component of Manchester Mosses SAC) where the qualifying features are present, or could be present.

From the updated modelling study, it is concluded that the Greater Manchester Combined Authorities “Places for Everyone” plan would not have a likely significant adverse effect on the Holcroft Moss component of the Manchester Mosses SAC due to emissions to air from road traffic associated with the plan.

Appendix 3: Extract from CIEEM Guidance

Source Management

For some projects … it is possible to avoid or reduce negative effects by changing the location and/or design of a project. Where projects cannot completely avoid an impact, the effects may still be minimised in order to increase the acceptability of the project. … Potential measures that an ecologist could consider include: …

- *For strategic land use plans, identifying emission reduction measures to maintain or reduce overall emissions levels at designated sites and other ecological receptors*
- *Traffic management measures to limit the effects of vehicle emissions on ecological receptors. For example, it may be possible to include measures to discourage the use of roads near designated sites by targeting improvements elsewhere or even closing certain routes to motorised vehicles*
- *Measures to promote the use of more sustainable transport options to reduce vehicle emissions through 'modal shift'*

Mitigation – Pollutant Interception

It may be possible to intercept a proportion of pollutants from an emission source before they reach a designated site. Measures range from the use of strategically located barriers and vegetation (tree shelterbelts, green walls) through to technological solutions. …

Habitat Management

Habitat management may either maintain the target habitats in a favourable condition, despite additional nitrogen inputs, or mitigate the effects of air pollution through measures that maintain the favourable conservation status of target species or ecological communities. It can therefore offer opportunities to address negative effects on ecological receptors. Caution is advised regarding the use of habitat management in the context of Appropriate Assessment under the Habitats Regulations. Habitat management applied to address the effects of air pollution on European Sites may not pass the relevant legal tests to be deemed 'mitigation'. Habitat management in this context may need to be considered 'compensation', which cannot be used in HRA until after the Appropriate Assessment stage …

It is important to consider other sources of pollution on a designated site if introduction or alteration of habitat management to address air quality effects is being considered. Designated sites may already be subject to management agreements between landowners and the SNCB(s) and/or a more strategic Site Nitrogen Action Plan (SNAP) may be in place or under development. Where such agreements/plans are in place, early consultation with the relevant SNCB is advised. …

Compensation Measures

Where it is not thought possible to avoid or mitigate negative effects arising from air pollution, compensation may be considered as a last resort. Some of the techniques that can be considered are similar to those identified in the mitigation section above. It is important to be clear on whether measures being proposed are considered mitigation or compensation. In accordance with CIEEM guidance70, mitigation normally involves measures that reduce the effects arising from an impact. Compensation, on the other hand, involves measures that make up for the loss of, or permanent damage to, ecological features despite mitigation.

Compensation for air quality effects could therefore include one or more of the following:

- *Providing new areas of habitat that support the qualifying interests of a designated site, either at or near to the designated site*

- *Enhancing management of existing habitats that support the qualifying interests of a designated site, either at or away from the designated site*
- *Where a qualifying interest is a species rather than a habitat, carrying out targeted interventions to improve the conservation status of the species.*

Monitoring

Where negative effects are predicted or where there is uncertainty over predicted effects, monitoring may be appropriate. Monitoring may (and in many cases should) be linked to measures that would be taken if the monitoring revealed negative effects were occurring. Chemical or biological monitoring could be considered, or a combination of both. …

It should be noted that monitoring is not easy, not least because air quality fluctuates according to changes in meteorological conditions, emissions from a range of sources, and/or emissions from the specific plan or project under consideration. The effects of other environmental variables may mask the effects of air quality, negating the value of any monitoring proposed. The purpose, and the viability of any proposed monitoring measures to achieve that purpose, should always be carefully considered. …

Adaptive Management and Other Measures in Response to Monitoring

Under certain circumstances, it may be appropriate to consider the use of adaptive management strategies to tailor responses to the results of monitoring. Adaptive management is a decision process that promotes flexible decision-making in response to increasing knowledge of how habitats (or other ecological receptors) are responding to management actions and other events.

It will be most appropriate to consider adaptive management for air quality effects in a plan/project context when it can be integrated into existing management for a designated site. Many designated sites are already under management plans, either managed by the relevant SNCB; by landowners (sometimes through agreements such as Environmental Stewardship); or by other parties such as conservation charities. In some cases, strategic SNAPs might be in place or under development. Where existing measures are in place, a plan or project could provide additional support to sustain or modify these to respond to potential effects from air quality impacts.

Integrating into existing measures rather than trying to deliver adaptive management at the plan or project level has a number of advantages, and:

- *Avoids conflicts with existing site management practices;*
- *Supports holistic management of the designated site(s) for nature conservation objectives;*
- *Streamlines the delivery of the adaptive management measures;*
- *It is easier to demonstrate delivery and enable compliance checks through the planning process, for example through the use of S106 agreements.*

For statutory designated sites, the relevant SNCB will usually be able to provide advice on any existing agreements/plans, and should be consulted along with landowners/managers where adaptive management measures are being considered. For non-statutory designated sites, management may be administered through local authorities, nature conservation charities, or the landowner. Land managers should be engaged as early as possible in the project- or plan-making process, once the need for adaptive management measures in relation to air quality has been identified.

Adaptive management is typically carried out where there is uncertainty about the ecological effects arising from a planned activity. Given the high legal bar of certainty for Habitats Regulations Assessment (the removal of reasonable scientific doubt over potential for adverse effects before authorising a plan or project; see Box 1), careful consideration will be needed when proposing this during HRA of European Sites.

This is because by the time vegetation/habitats have changed enough for effects to be linked to a new air quality impact, this would usually indicate that an adverse effect on site integrity has occurred. A Competent Authority may only grant permission for a plan or project where there is no likelihood (i.e. without reasonable scientific doubt) that an adverse effect on integrity would occur. Under an adaptive management scenario, absence of reasonable scientific doubt would be difficult to demonstrate.

Appendix 4: Extract from Grzybowski and Glińska-Lewczukb (2020)

Habitat type	Mitigation measures
Degraded raised bogs 7120	Prohibition of peat extraction/ designing protection activities / maintaining proper water and sewage management (e.g., block ditches to raise water table; create terraces by building bunds to retain water and distribute it more evenly; provide open-water reservoirs to increase lateral seepage; alter microtopography; provide variety of habitats for species colonization; establish buffer zones between arable lands or urban areas and peatland habitats)/re-vegetating, diversification of sward using plug plants; seed application/plug planting/Sphagnum propagation/coniferous forest in immediate surroundings are recommended since they may be responsible for lowering pH of water
Active raised bogs, fens, bog woodland 7110; 7140; 7210; 91D0	Forestry management (e.g., prohibition of afforestation of the habitat area; establish forest buffer zones around the habitat; leaving of dead and dying trees – 91D0 elimination of broadleaved forest stands (birch), coniferous forest in immediate surroundings are recommended since they may be responsible for lowering pH of water)/ management and dispersal of accessibility paths, tracks, cycling etc. in the vicinity of the habitat/managing heavy visitor use (human intrusions and disturbances; leisure fishing, hunting, collection (fungi, lichen, berries etc.), outdoor sports and leisure activities, recreational activities etc.)/ water management (e.g., rewetting-increase in water retention; block ditches to raise water table; create terraces by building bunds to retain water and distribute it more evenly; stabilising bare peat (heather brash/geo-textiles); alter microtopography; provide variety of habitats for colonization/re-vegetating, diversification of sward using plug plants; seed application/plug planting/ Sphagnum propagation
Peat 7150	Forestry management (e.g., prohibition of afforestation of the habitat area; establish forest buffer zones around the habitat)/establish buffer zones between arable lands or urban areas and peatland habitats by creation of grass/bush/trees strips to prevent adjacent land use from affecting restored hydrology and the flow of pollution (fertilisation, biocides, hormones and chemicals) from the catchment area/management and dispersal of accessibility paths, tracks, cycling etc. in the vicinity of the habitat/managing heavy visitor use (human intrusions and disturbances; leisure fishing, hunting, collection (fungi, lichen, berries etc.), outdoor sports and leisure activities, recreational activities etc.)/removal of invasive species/re-vegetating, diversification of sward using plug plants; seed application/plug planting/provide variety of habitats for colonization/ water management (e.g. block ditches to raise water table; create terraces by building bunds to retain water and distribute it more evenly; provide open-water reservoirs to Increase lateral seepage; alter microtopography; provide variety of habitats for colonization/ managing grazing (overgrazing); mowing/cutting of grassland (e.g., Phragmites sp., etc.) and removal of biomass in the winter period

The Gemini Building
Fermi Avenue
Harwell
Didcot
Oxfordshire
OX11 0QR
United Kingdom

t: +44 (0)1235 753000
e: enquiry@ricardo.com

ee.ricardo.com

APPENDIX 3

Recreation study

Ricardo Energy & Environment

Recreation study for the Greater Manchester "Places for Everyone" Plan

Report for Greater Manchester Combined Authority

ED 14503111 | Issue Number 3 | Date 10/02/2022

Customer:

Greater Manchester Combined Authority

Customer reference:

N/A

Contact:

Claire Pitcher
Ricardo Energy & Environment
30 Eastbourne Terrace, Paddington, London,
W2 6LA, United Kingdom

t: +44 (0) 1235 75 3458
e: claire.pitcher@ricardo.com

Ricardo is certificated to ISO9001, ISO14001 and OHSAS18001

Authors:

Eve Loxham, Mark Spence, Claire Pitcher and Richard Andrews

Approved By:

Martin Ferreira

Date:

10 February 2022

Ricardo Energy & Environment reference:

Ref: ED14503111- Issue Number 3

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1 Introduction

1.1 Background and Purpose of the Report

Places for Everyone (PfE) Joint Development Plan (hereafter referred to as the "PfE plan") is a plan of nine district Councils of Greater Manchester; Bolton, Bury, Manchester, Trafford, Tameside, Salford, Wigan, Rochdale and Oldham. The PfE plan is aimed at ensuring that Greater Manchester has the right land in the right places to deliver housing and employment land up to 2037, along with identifying the new infrastructure required to achieve the aspirations of the plan and describing the required measures and mechanisms to achieve sustainable growth.

A draft Habitats Regulations Assessment (HRA) was produced by The Greater Manchester Ecology Unit to support the Plan. This was completed in June 2021 and issued to Natural England for consultation in August 2021.

Natural England's consultation response (1 October 2021) raised a number of concerns regarding the assessment of recreational pressures on the South Pennine Moors Special Area of Conservation (SAC) and Peak District Moors (South Pennine Moors Phase 1) Special Protection Area (SPA)/South Pennine Moors Phase 2 SPA:

"The HRA has identified potential effects in relation to in-combination recreational impacts on the Peak District Moors (South Pennine Moors Phase 1) Special Protection Area (SPA)/South Pennine Moors Phase 2 SPA/ South Pennine Moors Special Area of Conservation (SAC). Natural England's view is that the recommended mitigation measures require strengthening and the site allocation policies in the Plan need to reflect the measures proposed in the HRA. To address these issues, Natural England advise:

- *Justification is needed for the 50-house threshold for green infrastructure and designated site information pack requirements. Natural England's Impact Risk Zones use a threshold of 50 houses for individual applications, but the PfE HRA should consider in-combination impacts so the threshold should not necessarily be the same.*
- *Natural England support the commitment to develop a Visitor Management Strategy for the South Pennines but advise there is a need for more detail to have sufficient certainty that the mitigation is secure and deliverable. For example, we would expect to see details on the proposed delivery mechanisms, timelines, aims and objectives, partners, and progress to date. The City of Bradford Metropolitan Borough Council has started work on a draft South Pennine Moors SPA/SAC Planning Framework Supplementary Planning Document. The SPD introduces measures to avoid and mitigate potential recreational disturbance on the South Pennine Moors. This draft can be found here: https://bradford.oc2.uk/document/9/1389#d1389 You may wish to consider a similar approach in order to address recreational disturbance impacts on the South Pennine Moors SPA & SAC.*
- *Mitigation measures relating to green infrastructure and designated site information pack requirements should be added to the relevant site allocation policy wording in the Plan.*

Without this detail we consider the plan currently unsound with regard to the 'effective' test and we also raise legal compliance issues with regard to the Habitats Regulations."

The purpose of this study is to assess the recreational pressures arising from the PfE plan alone and/or in-combination with neighbouring Local Planning Authority (LPA) Local Plans, and determine whether there would be an Adverse Effect on Integrity (AEoI). If an AEoI is identified, the scope of the mitigation strategy will be documented. This study forms an appendix to the overarching updated HRA.

1.2 Report Structure

This report is divided into the following sections:

- Section 1: Background and purpose of the report
- Section 2: Assessment approach
- Section 3: Assessment
- Section 4: Mitigation
- Section 5: Conclusions

2 Assessment Approach

2.1 Background

The responses of neighbouring Local Planning Authorities (LPAs) to the same issue of increased recreational pressure from housing growth have been reviewed, namely Bradford District Council (South Pennine Moors SPA/SAC Planning Framework Supplementary Planning Document, January 2021) and Calderdale Council (HRA Addendum, June 2019).

The following principles have been established from these assessments that will be used:

- Exclusion zone: determine a 400m exclusion zone from the boundary of the SAC/SPA where development is only required if a sequential approach is followed.
- Functionally linked habitat zone: determine the availability of functionally linked habitat within 0.4-2.5km of the SAC/SPCA boundary and proximity to housing allocations.
- Recreational pressures zone: determine a 7km zone from the SAC/SPA boundary within which housing allocations will be quantified.

On the basis of the number of houses being allocated within each zone, Bradford District Council concluded an adverse effect on integrity (AEoI), and therefore developed a costed mitigation plan akin to a Strategic Access Management and Monitoring Strategy (SAMMS). Calderdale, with a lower number of houses being proposed within 7km, concluded no AEoI alone or in-combination, however strengthened policy wording.

2.2 Approach

The recreation study has followed best practice guidance, namely the HRA Handbook available online from DTA Ecology[101].

The following activities have been undertaken to determine whether the PfE Joint Development Plan would have an adverse effect in integrity (AEoI) alone and/or in-combination with other plans and projects:

2.2.1 Determining AEoI alone:

1. Evaluate number of new properties within 7km of European sites using GIS data layers provided by GMCA, assuming within the Rochdale, Tameside and Oldham districts.
2. Establish if any development is required in the 0.4-2.5km zone which could be considered as functionally linked habitat for the SPA qualifying features.
3. Provide a summary of the visitor data within the NECR 150 Report *Monitor of Engagement with the Natural Environment survey (2009-2012): Visit taking in the South Pennines* (freely accessible online[102]).
4. Determine the main visitor attractions of the South Pennine Moors within the Rochdale, Tameside and Oldham authority boundaries and therefore likely 'hot-spots'.
5. Determine extent or distribution of qualifying features in proximity to hot spots if data publicly available (e.g. priority habitat mapping for the SAC, breeding bird reports).

[101] Tyldesley, D. & Chapman, C. (2021). *The Habitats Regulations Assessment Handbook* [online]. DTA Publications Limited. Available at: https://www.dtapublications.co.uk/handbook/.

[102] Burt, J., Stewart, D. and Turner, M. (2014) *Monitor of Engagement with the Natural Environment survey (2009 - 2012): Visit taking in the South Pennines.* Natural England Commissioned Reports, Number 150.

6. Quantify the number of additional visits that could be made to the South Pennine Moors as a result of new properties.

2.2.2 Determining AEoI in-combination:

1. Determine the potential in-combination developments that will need to be considered i.e. those developments planned or approved, including those in neighbouring LPAs, and Local Plan allocations with neighbouring LPAs, and quantify amount of housing.
2. Quantify the combined number of additional visits that could be made to the South Pennine Moors.

2.2.3 Mitigation requirements:

The level of mitigation required will be dependent on the outcomes of the preceding stages. To fulfil the requirements of the Habitats Regulations, the mitigation must be effective, timely, reliable, guaranteed to be delivered and as long-term as necessary (in perpetuity).

The PfE Joint Development Plan is to be submitted to the Planning Inspectorate in mid -February 2022. As such, there is limited time to produce a fully costed Strategic Access Monitoring and Management Strategy (SAMMS), if required. It is therefore proposed that an outline strategy be produced, with key commitments, a timetable for refinement and sufficient caveats to be included within refined policy wording, to ensure development could not be occupied[103] until the mitigation is in place and operational.

2.3 Sources of Information

Data on the European sites and their interest features has been collected from the Joint Nature Conservation Committee (JNCC) and Natural England (NE) websites. These data include information on the attributes of the European sites that contribute to and define their integrity, current conservation status and the specific sensitivities of the site, notably the site boundaries and the boundaries of the component SSSIs; the conservation objectives; the condition , vulnerabilities and sensitivities of the sites and their interest features; the current pressures and threats for the sites; and the approximate locations of the interest features within each site (if reported); and designated or non-designated 'functional habitats' (if identified).

The following sources of published information were used:

- Site citations.
- Site Register Entries.
- Standard Data Form (SPA/SAC) or Information Sheet (Ramsar site).
- Conservation Objectives and Supplementary Advice on Conservation Objectives (for SPAs/SACs).
- Site Improvement Plans (SIPs).
- SSSI Impact Risk Zones (in England), which apply equally to European sites.
- Site condition assessment has been integrated with SSSI assessments through Common Standards Monitoring (CSM).
- Definitions of Favourable Conservation Status (where available for species/habitat).
- Article 12 (SPA) and Article 17 (SAC) status reports.

[103] The adverse effect would occur once the houses are occupied with new residents who can therefore travel to the European site. However, whether this is sufficiently precautionary may need to be considered when developing the mitigation strategy and policy wording. For example, it may be that to allow sufficient time, the mitigation is needed prior to commencement of the development build or needs to be phased (as per Bradford City Council).

3 Assessment

3.1 Identification of relevant European sites

With regards to recreational pressures from increased housing growth outlined in the PfE plan, three European sites have been identified which could potentially be impacted:

- South Pennine Moors SAC
- Peak District Moors (South Pennine Moors Phase 1) SPA
- South Pennine Moors Phase 2 SPA

The qualifying features for each site are provided in Table 1. Within the South Pennine Moors Site Improvement Plan[104], those qualifying features identified as being sensitive to pressures arising from recreational activities have been identified, with the relevant action(s) detailed.

3.1.1 Conservation Objectives

The conservation objectives for the South Pennine Moors SAC are:

"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 the qualifying natural habitats*
- *The structure and function (including typical species) of the qualifying natural habitats, and,*
- *The supporting processes on which the qualifying natural habitats rely"*

The conservation objectives for the Peak District Moors (South Pennine Moors Phase 1) SPA and South Pennine Moors Phase 2 SPA are:

"Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring;

- *The extent and distribution of the habitats of the qualifying features*
- *The structure and function of the habitats of the qualifying features*
- *The supporting processes on which the habitats of the qualifying features rely*
- *The population of each of the qualifying features, and,*
- *The distribution of the qualifying features within the site."*

3.1.2 Condition and Favourable Conservation Status

'Favourable Conservation Status' (FCS), as defined by Natural England, describes the situation in which a habitat or species is thriving throughout its natural range and is expected to continue to thrive in the future[105]. This concept is embedded within the HRA process through the Conservation Objectives and Supplementary Advice on Conservation Objectives (SACO). The latter provides attributes and targets to achieve the conservation objectives. If a plan/project has the potential to prevent a qualifying feature from attaining the specific targets within the SACO, it is likely that the

[104] Natural England (2014) Improvement Programme for England's Natura 2000 Sites (IPENS) Planning for the Future South Pennine Moors Site Improvement Plan (v1.0)

[105] Hanna, J. 2021. Favourable Conservation Status Definitions. Natural England Technical Information Note, TIN180. Natural England, York.

plan/project will undermine the Conservation Objectives. It is, therefore, also likely that the plan/project will result in the site not achieving FCS for its qualifying features[106].

Natural England have been undertaking a project, whereby the contribution England needs to make to achieve FCS for a species or habitat is defined within a specific document. To date, the qualifying species and habitats of the South Pennine Moors SAC, Peak District Moors (South Pennine Moors Phase 1) SPA and South Pennine Moors Phase 2 SPA have not been covered. However, JNCC's Article 12 and 17 reporting has been reviewed to provide an indication of status across the site network within the UK.

A separate periodic review is undertaken to determine the condition of the underlying Sites of Special Scientific Interest (SSSI), which provides a good indication of local issues which may be causing the site to be in unfavourable condition, although the designated features of the SSSI do not always correspond with the European site qualifying features.

Two SSSIs are in proximity to the district boundaries of Rochdale, Oldham and Tameside; South Pennine Moors SSSI and Dark Peak SSSI. These underly the South Pennine Moors SAC and Peak District Moors (South Pennine Moors Phase 1) SPA. The South Pennine Moors Phase 2 SPA is located to the north of Rochdale (c.6.6km), however the underlying SSSI is still South Pennine Moors SSSI:

- There are 164 live units for the South Pennine Moors SSSI, with only 0.64% of the SSSI being in favourable condition, 91.74% in unfavourable-recovering, 7.43 unfavourable – no change, and 0.19% unfavourable – declining.
- There are 246 live units for Dark Peak SSSI, with 4.33% favourable, 90.91% unfavourable – recovering, 4.67% unfavourable – no change, 0.10% unfavourable – declining.

3.2 Impact Pathways

The South Pennine Moors SAC, Peak District Moors (South Pennine Moors Phase 1 SPA) and South Pennine Moors Phase 2 SPA are vulnerable to a range of impact pathways, noting that not all impact pathways are associated with recreational pressures. Those pathways associated with recreational pressures include, for example, erosion and trampling of habitats, and disturbance of birds. The relevant impact pathways from increased recreational pressure from housing growth are identified in Table 1.

[106] DTA Publications (December 2020) The Habitats Regulations Assessment Journal: Issue 15, pgs 18-21 *"Defining and applying Favourable Conservation Status in England: Natural England's Defining Favourable Conservation Status project."*

Table 1 European site, sensitivity to recreational pressures, impact pathways from PfE and existing actions within the Site Improvement Plan[107]

European site	Qualifying features	Sensitive to recreational pressures?	Impact pathways from recreational pressure	SIP actions
South Pennine Moors SAC	H4010 Northern Atlantic wet heaths with *Erica tetralix* H4030 European dry heaths H7130 Blanket bog H7140 Transition mires and quaking bogs H91A0 Old sessile oak woods with Ilex and Blechnum in the UK	✓ ✓ ✓ ✓ X	Trampling, bicycles, motor vehicles/illegal off-roading leading to de-vegetation, soil compaction and erosion. Increased risk of fire and burn damage through BBQs, campfires. Dog fouling leading to nutrient enrichment	Monitor sensitive Natura features where disturbance is a factor (or a potential factor) to discern trends and refine advice on recreational activities. Develop and implement habitat and species management plans in relation to specific disturbance issues, potentially as part of a public access management plan. Manage erosion issues away from Public Rights of Way Act (PROW), caused by public access (open access desire lines and informal paths), by installing flagstone paths and stabilising and restoring adjoining bare peat on SAC blanket bog sites. Increase awareness of the importance of the sites in terms of SAC/SPA designation (including Habitats Regulations) and the impact of potentially disturbing activities (including open access) on them, through access and community projects. Develop and implement a Peak Park events web-based application system. Increase pressure on highways authorities and owners to manage PROWs, to avoid ongoing damage to features.
Peak District Moors (South Pennine Moors Phase 1) SPA	A140 Golden plover, *Pluvialis apricaria* (breeding) A098 Merlin, *Falco columbarius* (breeding) A222 Short-eared owl, *Asio flammeus* (breeding)	✓	Deterioration of supporting habitats (blanket bogs, European dry heaths, Northern Atlantic wet heaths).	As above for supporting habitats. Implement a co-ordinated approach across Local Authorities, covering the South Pennine Moors SPA Phase 2, to evaluate the 'in combination effects at a site level' when considering/developing local Development frameworks, infrastructure programmes and evaluating planning permissions. This needs to consider both land which is covered by the SPA and land which is functionally linked (e.g. adjacent feeding habitats for SPA birds). Establish and monitor cumulative impacts of development on South Pennine Moors SPA Phase 2 bird populations.
South Pennine Moors Phase 2 SPA	A140 Golden plover, Pluvialis apricaria (breeding) A098 Merlin, *Falco columbarius* (breeding) Breeding bird assemblage: A142 Northern lapwing, *Vanellus vanellus* A222 Short-eared owl, *Asio flammeus* A160 Eurasian curlew, *Numenius arquata* A162 Common redshank, *Tringa totanus* A275 Whinchat, *Saxicola rubetra* A277 Northern wheatear, *Oenanthe oenanthe* A282 Ring ouzel, *Turdus torquatus* A367 Twite, *Carduelis flavirostris* A466 Dunlin, *Calidris alpina schinzii* A168 Common sandpiper, *Actitis hypoleucos* A153 Common snipe, *Gallinago gallinago*	✓		

[107] Natural England (2014) Improvement Programme for England's Natura 2000 Sites (IPENS) Planning for the Future South Pennine Moors Site Improvement Plan (v1.0)

3.3 Consideration of AEoI Alone

3.3.1 Existing housing land supply

Three of the PfE plan districts directly border the South Pennine Moors SAC and Peak District Dales Peak District Moors (South Pennine Moors Phase 1) Special Protection Area (SPA): Oldham, Rochdale and Tameside. The South Pennine Moors Phase 2 SPA is within 6.6km of the northern boundary of the Rochdale district.

Within these three districts, there is an existing housing supply (based on previous plan allocations and small site allowances) which can accommodate a proportion of the predicted housing supply needed. Table 2 provides a summary of the existing housing supply sites for Oldham, Rochdale and Tameside, and Figure 1 shows the land supply locations relative to the 2.5km and 7km buffer zones. A small number of areas are identified within 400m in Oldham and Rochdale districts (e.g. The Rams Head Inn area on the A672 (Oldham) and Calderbrook (Rochdale)).

Table 2 Oldham, Rochdale and Tameside existing housing supply within zones (2.5km and 7km)

District	Existing supply (2020-2037)	Small site allowances (2020-2037)	Demolitions	Total[108]	Total within 2.5km zone	Total within 7km zone
Oldham	10,398	780	223	10,955	396	3,112
Rochdale	8,780	207	990	7,997	626	4,168
Tameside	6,347	576	-	6,923	57	3,484

3.3.2 PfE housing allocations

To meet the housing supply demand for the predicted growth with the PfE plan, a number of additional sites are required. Using the housing allocation data made available, a total of 8,161 houses are required within these districts between 2020 and 2037 (the lifetime of the plan). Table 3 provides a summary of the allocations per site, and the allocations within the different zones.

There are no allocations within 400m of the European site boundary, however c.471 houses are required within 2.5km and an additional c.4,065 within 7km.

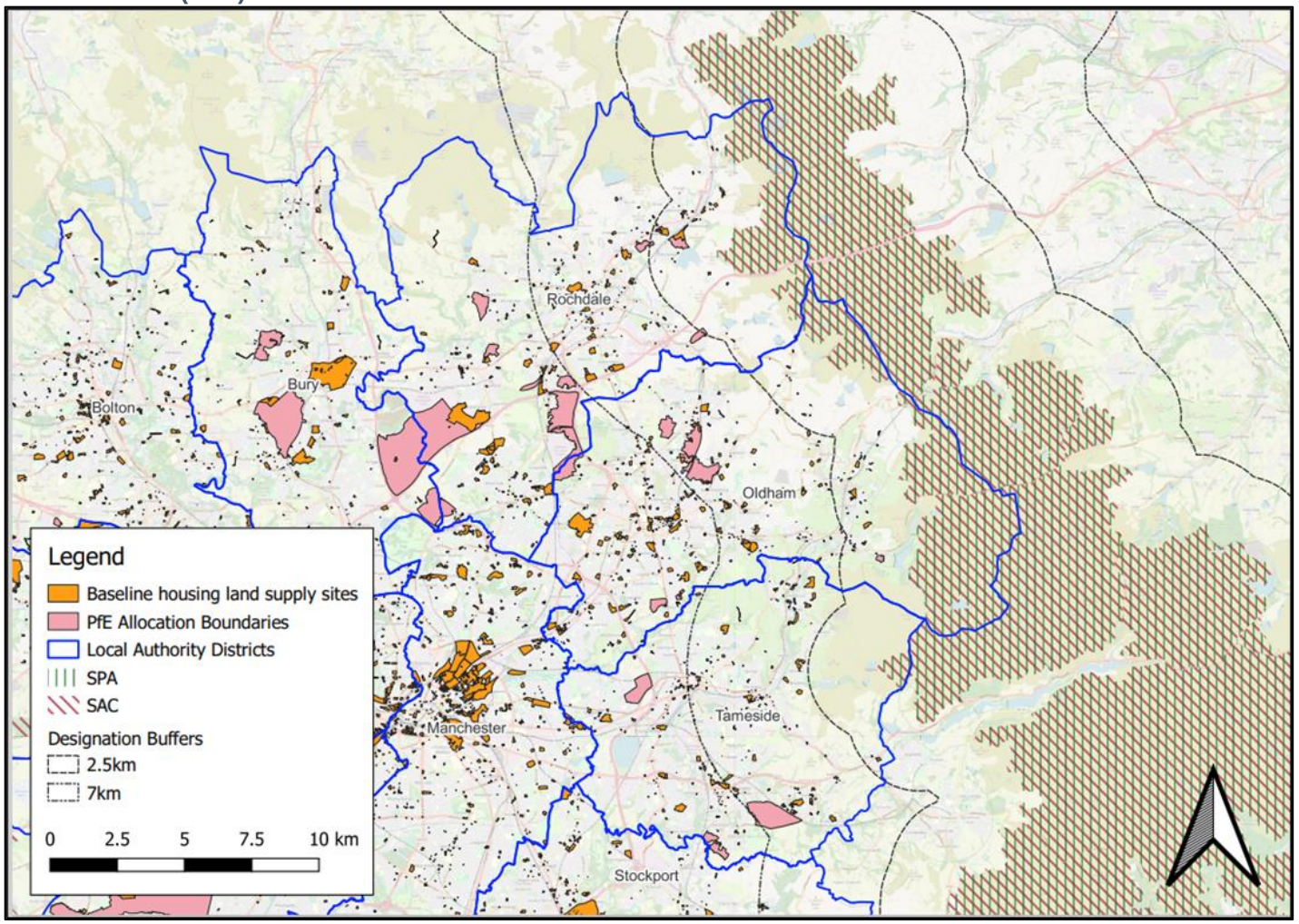
Table 3 Oldham, Rochdale and Tameside housing allocations within zones (2.5km and 7km)

Allocation name	District	Total no. within Plan (to 2037)	Future Need (to 2050)	Within 2.5km zone?	Within 7km zone?
Land south of Coal Pit Lane (Ashton Road)	Oldham	255	0	x	x
Beal Valley	Oldham	482	0	x	✓
Broadbent Moss	Oldham	874	500	x	✓
Cowlishaw	Oldham	465	0	x	✓
Hanging Chadder	Oldham	260	0	x	✓
Chew Brook Vale (Robert Fletchers)	Oldham	171	0	✓	✓

[108] The total is calculated from the existing supply plus small site allowances, minus demolition.

Allocation name	District	Total no. within Plan (to 2037)	Future Need (to 2050)	Within 2.5km zone?	Within 7km zone?
South of Rosary Road	Oldham	60	0	x	x
Bottom Field Farm (Woodhouses)	Oldham	30	0	x	x
Northern Gateway Heywood / Pilsworth	Rochdale	0	0	N/A	N/A
Northern Gateway Simister and Bowlee	Rochdale	200	0	x	x
Stakehill	Rochdale	1,681	0	x	x
Bamford and Norden	Rochdale	450	0	x	x
Castleton Sidings	Rochdale	100	0	x	x
Crimble Mill	Rochdale	250	0	x	x
Land North of Smithy Bridge	Rochdale	300	0	✓	✓
Newhey Quarry	Rochdale	225	0	x	✓
Roch Valley	Rochdale	200	0	x	✓
Trows Farm	Rochdale	550	0	x	x
Godley Green Garden Village	Tameside	1,116	1,234	x	✓
South of Hyde	Tameside	442	0	x	✓

Figure 1 Existing housing supply and allocations within 2.5km and 7km of the South Pennine Moors SAC/Peak District Moors (South Pennine Moors Phase 1) Special Protected Area (SPA)/South Pennine Moors Phase 2 SPA[109]



[109] Only the South Pennine Moors SAC/Peak District Moors (South Pennine Moors Phase 1) Special Protected Area (SPA)/South Pennine Moors Phase 2 SPA is shown. There are other European sites relevant to the Plan, considered in the main HRA.

3.3.3 Functionally linked habitat zone: within 2.5km

There are two designations within 2.5km of the boundaries of the PfE plan districts; South Pennine Moors SAC and the Peak District Moors (South Pennine Moors Phase 1) SPA.

Consideration of off-site functional habitat is listed within the SACO for one of the qualifying features of the South Pennine Moors SAC; H7140. Transition mires and quaking bogs; Very wet mires often identified by an unstable 'quaking' surface. The attribute and target explanation states *"…This supporting habitat may be critical to the typical species of the feature to support their feeding, breeding, roosting, population dynamics ('metapopulations'), pollination or to prevent/reduce/absorb damaging impacts from adjacent land uses e.g. pesticide drift, nutrient enrichment*." Current evidence presented within the SACO states that the extent of this qualifying feature is limited to Leek Moor SSSI, although acknowledging a lack of data and mapping for the site as a whole. On the basis that Leek Moor SSSI is located south of Macclesfield, and c. 17km to the closest housing allocation within the PfE plan, no impacts to this qualifying feature are anticipated. As none of the other South Pennine Moors SAC features have an attribute relating to offsite habitats, AEoI from development within 2.5km are not anticipated.

The Peak District Moors (South Pennine Moors Phase 1) SPA is designated for the following qualifying features:

- A140 Golden plover, *Pluvialis apricaria* (breeding)
- A098 Merlin, *Falco columbarius* (breeding)
- A222 Short-eared owl, *Asio flammeus* (breeding)

Golden plover in particular, is considered to be a mobile species which could forage on habitats outside the boundaries of the SPA. The SACO includes the following attributes and targets for this species:

- Supporting habitat (both within and outside the SPA): function/supporting process - Food availability within supporting habitat:
    - Maintain the availability of key prey items (e.g. earthworm, leatherjackets, beetles, spiders) at prey sizes preferred by Golden Plover.
    - Maintain existing, and elsewhere restore the amount of prey-rich grassland feeding habitat within 4km of moorland nesting areas.

Merlin also has an attribute relating to food availability within offsite supporting habitat, with the following areas specifically cited; Stalybridge Moor, Thurlstone Moor and Canyards Hills. Stalybridge Moor is in proximity to the Tameside district. The closest allocation in Tameside is Godley Green Garden Village, c.3.7km to the south west, and is separated from the moors by urban development at Godley and Hattersley. Thurlstone Moor is close to Barnley and Canyards Hill is close to Stocksbridge, both are on the eastern side of the moors.

Short-eared owl is considered unlikely to frequently forage outside the SPA, with the following habitat requirements; "*Extensive, low nutrient and naturally vegetated open ground supporting abundant vole populations will provide prey source for breeding short-eared owl*", and no specific areas or distances identified in the SACO for offsite habitat.

As previously discussed, the Bradford City Supplementary Development Plan included the proposed zoning strategy for the South Pennine Moors, and therefore the justification for considering functionally linked habitats within 0.4-2.5km is contained within that document (Appendix 2).

There are a number of existing housing supply areas within the 2.5km zone. There are two allocations wholly within the 2.5km boundary; Land north of Smithy Bridge (Rochdale) and Chew Brook Vale (Robert Fletchers) (Oldham), and two which are just outside; Roch Valley and Newhey Quarry (both Rochdale). The site allocations were subject to Preliminary Ecological Appraisals between 2019 and 2020 (desk based only, but considering priority habitats)[110,111]. None of the sites have been identified as supporting habitats that could support the qualifying features, or the qualifying features themselves, based on review of the priority habitat inventory, Greater Manchester Bird Atlas 2007-2011 - Bird records, abundance and distribution data for Greater Manchester, and Greater Manchester Local Record Centre (GMLRC). Phase 1 Habitat surveys have not been carried out on all the sites to verify these results. Roch Valley and Newhey Quarry were subject to more detailed surveys in 2019[112] and 2020[113] respectively, which concluded that the sites do not provide suitable habitat, and are therefore not functionally linked.

As such, where initial habitat surveys of the sites have identified the potential for supporting habitat then bird surveys will be necessary at the project stage. Habitat checks by a suitably qualified ecologist with experience of the relevant bird species will be necessary to identify whether a site is likely to provide suitable habitat. Project level Stage 2 Appropriate Assessments will be required, and the developer will need to submit the necessary information to the LPA to allow an assessment to be carried out. This will need to cover the potential scale of any loss and/or deterioration of the supporting habitat in light of the conservation objectives for the SPA. This subsequent survey and assessment work may identify the requirement for mitigation measures to avoid AEoI. Mitigation measures may include:

- Avoidance of areas used by significant numbers of SPA birds (to be determined by a project level Habitats Regulations Assessment);
- Provision of equivalent or greater quantity and quality of replacement habitat on-site (or as a last resort off site within 2.5km) with improved management to ensure use by SPA birds;
- Timing of works (construction, operation and decommissioning) outside the period most frequently used by SPA birds;
- Monitoring of impacts to assess bird use over time.

3.3.4 Recreational pressure zone: within 7km

South Pennine Moors are currently thought to be receiving 20 million annual visits (average between 2009 and 2012). To understand how the housing growth within Rochdale, Oldham and Tameside might affect the South Pennine Moors, data collected by Natural England in the Natural England Report

[110] The Greater Manchester Ecology Unit (June 2020 (amended April 2021)) Preliminary Ecological Appraisals Areas being considered for allocation for future development within the Greater Manchester Spatial Framework in Oldham.

[111] The Greater Manchester Ecology Unit (September 2020) Preliminary Ecological Appraisals / Screening Strategic Areas being considered for allocation for future development within Places for Everyone in Rochdale

[112] TEP surveys 2019, Rochdale planning application reference 19/00881/FUL

[113] Middlewood Ecology March 2020)

NECR150 "*Monitor of engagement with the Natural environment survey (2009-2012): Visit taking in the South Pennines*"[114] has been used to determine likely growth in visitor numbers from each district.

3.3.4.1 Existing visitor numbers and recreational preferences

Table 4 provides the data from the NECR150 report with existing levels of visits from the PfE plan districts. Only local authorities with a percentage of visits greater than 0.5% were included in the original monitoring report, and therefore the other PfE district (e.g. Tameside) are not included.

Table 4 Visitor numbers to South Pennine Moors from PfE Districts[115]

	Annual volume of visits taken to South Pennines (m)	% of visits taken to South Pennines (from NECR total)	Per capita annual visits taken to South Pennines
Bolton	4.3	20.7	19
Bury	1.3	6.4	9
Manchester	0.4	1.8	1
Rochdale	0.3	1.7	2
Oldham	0.2	0.8	1

A greater number of visits are made to the South Pennine Moors from Bolton, Bury and Manchester than the districts within 7km. The NECR150 report highlighted that of the 9 million visits taken to the South Pennine Moors which were not classified as being within the catchment area, large proportions of visits came from Leeds and Manchester. The allocations within the PfE plan for both Bolton and Manchester are employment only, and therefore are unlikely to give rise to significant additional visits. Within Bury, there are four housing allocation areas; Walshaw, Elton Reservoir, Northern Gateway Heywood / Pilsworth and Northern Gateway Simister and Bowlee. As such, the Bury allocations have been considered further to determine likely increases in visitor numbers in Section 3.3.4.3, with proposed housing numbers provided in Table 5.

Table 5 Bury district housing allocations

Allocation name	District	Total no. within Plan (to 2037)	Future Need (to 2050)
Northern Gateway Heywood / Pilsworth	Bury	190	0
Northern Gateway Simister and Bowlee	Bury	1,282	0
Walshaw	Bury	1,187	0
Elton Reservoir	Bury	1,655	1,445

The NECR150 report also identified the activities listed in Table 6 as being popular on the South Pennines for visitors who live within proximity to the moors.

Table 6 Activities undertaken on visits to the South Pennine Moors

Activities undertaken	Visits to the South Pennines (%)
Walking with a dog	50
Walking without a dog	32
Eating or drinking out	6
Playing with children	6

[114] Burt, J., Stewart, D. and Turner, M. (2014). *Monitor of Engagement with the Natural Environment survey (2009 - 2012): Visit taking in the South Pennines*. Natural England Commissioned Reports, Number 150.

115 Only local authorities' areas representing 0.5% of visits or more are shown.

Activities undertaken	Visits to the South Pennines (%)
Wildlife watching	3
Appreciating scenery from a car	3
Road cycling	3
Informal games and sport (e.g. frisbee)	3
Visiting an attraction	3
Running	2
Picnicking	2
Off road cycling or mountain biking	1
Fishing	1

3.3.4.2 Recreational 'hot-spots' in proximity to PfE plan

The main visitor attractions in proximity to Rochdale, Oldham and Tameside are as follows:

- **Pennine Way:** This is a national trail which lies in a roughly north-south orientation within the SAC/SPA, mainly within the western edge. The full trail is 435 km long, and the trail within the SAC/SPA is approximately 36.3km. The trail passes through two of the PfE districts; Rochdale and Oldham. The trail length within Rochdale is approximately 7.5km, and the trail within Oldham is approximately 6.7km.
- **Pennine Bridleway:** This is a national trail which runs within the SAC/SPA, the Pennine Bridleway is specifically designed to be used by equestrians, and is also popular with mountain biking. The full trail is 330km long, and it splits in two east of Burnley town centre and re-joins as one trail again to the east of Rochdale town centre. The trail within the SAC/SPA is approximately 12.1km long. The trail passes through three PfE districts; Rochdale, Oldham and Tameside. The respective lengths within each of these are Rochdale 21.7km, Oldham 16.8km and Tameside 8.0km.
- **Hollingworth Lake:** This attraction is outside the SAC/SPA and lies along the edge of a section of the Pennine Bridleway trail. It includes a visitor centre, toilets, café, and a nature reserve. Activities on the lake include watersports and a walking trail.
- **Blackstone Edge:** This is a summit on the Pennine Way which has views from the top of Greater Manchester and Yorkshire.
- **Rochdale Canal:** This canal runs through Rochdale town centre and passes close to the edge of the SAC/SPA near Timbercliffe (approximately 0.21 km to the west of the SAC/SPA). The towpath along the canal is a walking route and cycle path, with many easy access points leading to the SAC/SPA along the route.
- **Marsden Moor Estate:** This is a 5000 acre moorland estate run by the National Trust which offers walking routes along the footpaths. There are several car parks associated and mentioned on the National Trust website, along with an ice cream vendor. The estate head office is close to Marsden train station and there are walking trails which start from here.
- **Transpennine trail (National Cycle Network):** This cycle network runs through the centre of the SAC/SPA and crosses from Hadfield to Penistone, along the A628.
- **West Yorkshire Cycle Route (National Cycle Network):** This cycle network runs to the east of the SAC/SPA from Halifax to join with the Transpennine Trail near Thurlstone. This trail is not within the SAC/SPA but runs adjacent to it at the very southern section, however there is easy access to other trails and footpaths which enter the SAC/SPA.

- **Route 66 (National Cycle Network):** This cycle network runs along Rochdale Canal which is to the west of the SAC/SPA. The network does not enter the SAC/SPA, however there is easy access to other trails and footpaths which enter the SAC/SPA.
- **Gadding's Dam:** This reservoir is within the SAC/SPA and is a popular place for wild swimming, and day trippers using the beach and reservoir. Access is along footpaths from the nearest car park along the road, and this area is prone to congestion.
- **Dovestone Reservoir and Chew Reservoir:** This reservoir is not located within the SAC/SPA and is on the western edge. It is a popular place with visitors and has extensive footpaths, a sailing club, orienteering courses, access to Pennine bridleway for horses, and access to the wider moorland footpaths. The area is also advertised for nearby rock climbing. A RSPB reserve (Dove Stone) is located at this site also. Chew Reservoir itself is not classified as being within the SAC/SPA, although the habitats surrounding are. There is easy access from Dovestone Reservoir to Chew Reservoir via footpaths.
- **Green Withens Reservoir:** This reservoir is located within the SAC/SPA and includes a watersports centre. There is also easy access to footpaths and trails which further extend into the SAC/SPA.
- **Standedge Tunnel and visitor centre:** The tunnel is Britain's longest, deepest, and highest canal tunnel. The visitor centre is not located within the SAC/SPA, however there is easy access to footpaths and trails within the SAC/SPA. The area provides a visitor centre, café, and boat trips.
- **Walkerwood Reservoir:** This reservoir is outside the SAC/SPA and is adjacent to Stalybridge Country Park. There is a car park and access along footpaths to a series of other reservoirs to the east including Brushes reservoir, Lower Swineshaw Reservoir and Higher Swineshaw Reservoir (this one being adjacent to the SAC/SPA boundary).

3.3.4.3 Estimated increase in visitor numbers from the PfE plan

With reference to the NECR150 report on visitor numbers to the South Pennine Moors, Tameside recorded <0.5% of the annual volume of visits to the site. Oldham and Rochdale recorded 0.8% and 1.7% respectively (see Section 3.3.4.1 for a summary of the NECR150 relevant to the PfE plan). This is equivalent to a per capita annual visit to the South Pennines, of 1 for Oldham and 2 for Rochdale. As the visitor numbers from Tameside were small, a per capita annual visit equivalent was not included in the study. On a precautionary basis, the estimated visitor numbers calculated below are based on an assumed 0.5 per capita annual visit.

In addition, housing allocations are proposed within Bury which had 6.4% of the annual volume of visits to the sites, and a per capital annual visit equivalent of 9.

The average household size is 2.4 (ONS,2020) and therefore the calculations presented in Table 7 can be made for the increase in visitor numbers from housing growth within 7km of the South Pennine Moors, and Bury, predicted within the lifetime of the plan (to 2037).

Table 7 Estimated increase in visits from existing housing supply and proposed allocations within 7km of the South Pennine Moors SAC/Peak District Moors (South Pennine Moors Phase 1) SPA

District	Existing Housing Supply Contribution			Housing Allocation Contribution		
	No. of new homes	No. of people	No. of visits[116]	No. of new homes	No. of people	No. of visits[116]
Oldham	3,112	7,469	7,469	2,597	6,233	6,233
Rochdale	4,168	10,003	20,006	3,956	9,195	18,990
Tameside	3,484	8,362	4,181	1,558	3,740	1,870
TOTAL APPROX. INCREASE IN VISITS:			**31,656**			**27,093**

Taking the housing allocations in Bury, the following calculation can be made:

- 4,314 new homes x 2.4 average occupancy = 10,354 new people.
- 9 visits per capita per year = 93,186 visits.

This gives an approximate total of 31,656 additional visits for the existing housing supply within Oldham, Rochdale and Tameside, equating to an increase of 0.16% on visitor numbers above the 20,000,000 estimated in the NECR150 report. Approximately 120,279 additional visits will arise from the proposed housing allocations within Oldham, Rochdale, Tameside and Bury, equating to an increase of 0.60% on visitor numbers above the 20,000,000 estimated in the NECR150 report.

The above calculations on the likely increase in visitors to the South Pennine Moors as a result of housing allocations proposed in the PfE plan are estimates based on the best available data. There is a degree of uncertainty, given the age of the visitor survey data. The use of a 2.4 occupancy rate is also considered to be worst case with the potential for lower occupancy rates as housing is brought forward for development. However, the information is considered suitably precautionary to determine AEoI.

The Bradford District Council South Pennine Moors SPA/SAC Planning Framework Supplementary Planning Document (SPD) is the most recent HRA completed assessing recreational pressures on the South Pennine Moors. This HRA adopted a 'zone of influence' approach (400m, 2.5km and 7.5km) based on other strategic approaches to recreational pressure (e.g. Thames Basin heaths). Although increases in recreational visits have been quantified using a similar approach to other neighbouring Local Plans completed before 2021, a threshold approach to determine AEoI has not been adopted within this assessment. There is not sufficient evidence on visitor numbers and the resulting impacts to determine with any certainty, a threshold under which visitor number increases over the baseline would not give rise to AEoI. Therefore, all housing development within the 7km, regardless of how small is considered as having an AEoI.

[116] Assuming 1 visit per person for Oldham, 2 visits per person for Rochdale and 0.5 visits per person for Tameside.

3.4 Consideration of AEoI In-combination

The LPAs that are within 7km of the same areas of the South Pennine Moors SAC and Peak District Moors (South Pennine Moors Phase 1) SPA are listed in Table 8 and have been considered within the in-combination assessment.

However, the majority of the HRA work undertaken to support the in-combination assessment by other LPAs is several years old, and does not reflect latest case law or best practice guidance in the relation to in-combination assessments, and the use of thresholds when determining an AEoI. The SACO for the majority of the qualifying features identify that "*Active and ongoing conservation management is needed to protect, maintain or restore this feature at this site*" and identifies public access and recreational pressures as issues, which is reflected in the Site Improvement Plan to address this.

Table 8 Plans with which the PfE could potentially have an in-combination effect alongside HRA conclusions

Local Planning Authority	Predicted level of growth	HRA conclusions
Rossendale[117]	It is expected that the Plan will deliver approximately 3,180 homes over the Plan period,	The Rossendale Local Plan allocates 941 new dwellings within 7km of the SAC/SPA boundary. At 11.75 annual visits per person per year, this would increase the number of annual visits to the Moors by approximately 25,430 which, as a proportion of existing levels, would constitute a 0.13% increase.
Calderdale[118]	For Calderdale's Local Plan as a whole there is a requirement to deliver 12,600 new dwellings over the Plan Period to 2032/33.	The Calderdale Local Plan allocates 4,126 new dwellings within 7 km of the SPA/SAC, approximating to 28,060 new visits per year. Using the NERC150 data and calculations, the allocated sites within 7km will be about 0.14% of the total annual trips to the South Pennines. A LSE alone was ruled out, as was an in-combination effect.
Kirklees[119]	The Plan seeks to deliver 27,300 new homes by 2031	The Plan allocates 4,579 new homes within 7km which was calculated to increase the number of annual visitors at the SPA by 136,900 – 142,900. As this constitutes a 0.3% increase, an LSE alone was ruled out. In-combination effects were also ruled out.
High Peak[120]	The plan seeks to deliver 7,280 houses over the Plan	Concluded no adverse effects on the Peak District Moors (South Pennine Moors Phase 1) SPA and SAC in terms of recreational disturbance.
Stockport[121]	The plan is still being developed, however there is an indication of the need for c.3,500 houses.	An HRA has not been completed for the updated plan at this stage. Based on information from the existing house supply, the majority of development is concentrated to the west, outside the 7km buffer zone.

[117] Lepus Consulting (July 2018) Habitat Regulations Assessment of the Rossendale Borough Council Local Plan Appropriate Assessment.

[118] Calderdale LPA (June 2019) Addendum to Calderdale Local Plan Habitats Regulations Assessment:

[119] Land Use Consultants (2016) Publication Draft Kirklees Local Plan Habitats Regulations Assessment Report.

[120] Environ (August 2014) High Peak Local Plan Habitats Regulations Assessment Addendum to the Submission Version.

[121] https://www.stockport.gov.uk/about-the-stockport-local-plan

As set out in Section 3.3, the use of a zoned approach has been adopted within this assessment, given the uncertainty over assigning thresholds for visitor numbers. On the basis that each neighbouring LPA have incremental increases in housing development within 7km of the South Pennines European sites, giving rise to additional recreational visits, an AEoI to the South Pennine Moors SAC and Peak District Moors (South Pennine Moors Phase 1) SPA cannot be ruled out. Using the data available, assuming an increase in visits from the PfE plan of approximately 31,656 from the existing housing supply, 120,279 from the proposal allocations (including Bury), and the neighbouring LPA visits approximates to 196,390 (excluding High Peak and Stockport, and using the highest number of annual visits for Kirklees), this would be an increase of 1.58% for the proposed allocations, and 1.74% when including the existing housing supply, over the existing average of 20 million visits per year to the South Pennine Moors. Therefore, it is considered that mitigation measures will be required to avoid an AEoI.

4 Mitigation

Mitigation measures are required for the recreational pressure arising from housing development within 7km of the South Pennine Moors SAC, Peak District Moors (South Pennine Moors Phase 1) SPA and South Pennine Moors SPA, both from the PfE plan alone and in-combination with neighbouring plans.

As such, a strategic and consistent approach across relevant LPAs should be adopted. A policy approach to the wording of the PfE or district Local Plans could be utilised which sets out a mechanism by which significant effects on the SAC and SPAs can be avoided or mitigated. Using other HRAs as examples, this could take the form of three zones of influence around the SAC/SPA boundary where appropriate measures can be specified to ensure the integrity of the SAC and SPA is protected:

- Within 400m of the SAC/SPA boundary, an exclusion zone would apply, where no net increase in the number of houses is permitted unless a sequential approach is followed, for example development on previously developed land and conversation of existing properties buildings. This ensures that development within this zone avoids significant effects. This would be applicable to the small number of developments in the existing housing supply within 400m in the Oldham district.
- Within 2.5km of the SAC/SPA boundary, an assessment of the potential for the site to provide functionally linked habitat would need to be undertaken through a project level HRA (supported by detailed surveys and habitat assessments if required), and mitigation identified if required.
- Where housing development is proposed outside the exclusion zone but within the 2.5km and 7km zone of influence of the SAC/SPA, mitigation measures would need to avoid and/or reduce the impacts from increased recreational pressure, and would need to be delivered prior to occupation and secured in perpetuity, for example through developer contributions to recreation provision.

Mitigation measures could be based on a combination of a Strategic Access Management and Monitoring Strategy (SAMMS) and the provision of Suitable Alternative Natural Greenspace (SANG). The SAMM project would monitor access to the SAC/SPA through updated surveys and other means and deliver management on a strategic basis to ensure that access issues are addressed in a comprehensive way. SANG would provide an alternative recreation destination to attract people to visit rather than visiting the South Pennine moors itself.

A fully developed and costed SAMMS and SANG have not been completed, however GMCA is committed to progressing appropriate options to ensure that the recreation impacts are fully mitigated. As such, the following possibilities will be explored as a starting point:

- Combined approach with Bradford District Council who already have a visitor strategy which is managed through their Countryside Service (although likely to be focused on different areas of the SAC/SPA given the differing localities of the LPAs).
- Establish whether there is an alternative mechanism for management with the Moorland Partnership and explore funding and initiatives such as:
    - Dog walking project – educating dog walkers about sensitivity of habitats to trampling and dog fouling, and disturbance issues particularly in the breeding bird season. A

similar project was undertaken as part of the SAMMS for The Swale SPA and Ramsar in the Thames Estuary.

- Develop and fund appropriate habitat management and restoration, targeting the key recreational hot-spots used by visitors from the PfE districts.
- Develop on-site visitor education to encourage sensitive recreational use of the site, again potentially targeting key recreational hot-spots.
- Use of habitat banking through the biodiversity net gain process

- Actively promote the use of existing recreational facilities and proposed SANG within the district boundaries.

Once further work has been undertaken on the scoping of the SAMMS and SANG, a workshop will be held with Natural England and the relevant delivery partners to agree the range of mitigation measures that could be implemented, and ensure these are sufficiently ‘additional’ to those already committed to in the Site Improvement Plan, and will therefore adequately address impacts from the proposed housing growth and increase in visitor numbers.

In parallel to developing the range of mitigation measures, the process by which developers can utilise and contribute to the SAMMS will need to be established. Developer contributions to a strategic mitigation scheme are commonly applied, as outlined in the Bradford District Council South Pennine Moors SAC/SPA SPD, and used in other areas such as the Solent Bird Aware project in the south east.

The cost of the mitigation strategy and cost per dwelling tariff would need to be established. The tariff is normally based on the number of bedrooms per individual dwelling, and should not only include an amount to support the mitigation but also an allowance to establish a monitoring programme.

LPAs with similar strategic mitigation schemes also facilitate the project-level HRA process by requesting developers to complete a checklist whereby the option to adopt the strategic scheme, and therefore developer contribution is confirmed, or the applicant can set out an alternative approach to avoiding and mitigating the recreational impact arising out of the development for consideration by the LPA.

5 Conclusions

Three zones have been applied to the housing allocations within the PfE plan to determine the potential for AEoI on the South Pennine Moors SAC, Peak District Moors (South Pennine Moors Phase 1) SPA and South Pennine Moors Phase 2 SPA; an exclusion zone with exceptions (within 400m), consideration of functionally linked habitat (within 2.5km) and recreational pressure from increases in visitor numbers (within 7km).

A small number of existing housing supply areas were identified within the 400m zone in the districts of Oldham and Rochdale. Within the 2.5km zone, four housing allocations were identified which based on desk based and ecological survey work completed to date are not considered to support functionally linked offsite habitat. Within 7km of the SAC/SPA boundary there are a total of 10,764 houses identified in the existing housing supply (Oldham, Rochdale and Tameside) and 12,425 houses identified in the proposed allocations. The latter has also included further consideration of Bury given the high number of visits to the South Pennine Moors identified from this location in the Natural England visitor survey work. Assuming a 2.4 occupancy rate, this would result in an increase in approximately 151,935 visits per annum, an increase of 0.76% over the existing 20,000,000 baseline. When considering allocations within the neighbouring LPA plans, this increases to 1.74% over the baseline. As such, an AEoI is considered likely without mitigation.

Mitigation options include a policy approach within the PfE or district Local Plans so that developments within 400m should be avoided, unless a sequential approach is met e.g. previously developed sites or replacement buildings. This approach will need to be adopted for those existing housing supply areas in Oldham and Rochdale. Housing allocations within 2.5km of the European site boundary could cause the loss of offsite habitats that have a functional or structural role in maintaining the populations of the SPA qualifying features. As such, survey work and project-level HRAs (if necessary) should be undertaken as developments come forward within this zone to determine use of the site and requirements for mitigation. Developments within the 7km zone could give rise to increased recreational pressure on the European site, through increases in visitor numbers, both from the PfE plan alone and in-combination with other LPA plans. Mitigation, in the form of a SAMMS and SANG, is therefore required to ensure development can proceed without an AEoI.

The SAMMS and SANG will require coordination with other statutory and non-statutory bodies already involved in the management of the South Pennine Moors. Further work should be undertaken to develop the mitigation options in the SAMMS and SANG and the proposed delivery mechanism.

The Gemini Building
Fermi Avenue
Harwell
Didcot
Oxfordshire
OX11 0QR
United Kingdom

t: +44 (0)1235 753000
e: enquiry@ricardo.com

ee.ricardo.com

APPENDIX 4

Statement on behalf of United Utilities Water Limited in response to infrastructure capacity query

Places for Everyone (August 2021)

Statement on behalf of United Utilities Water Limited in response to infrastructure capacity query for Habitat Regulation Assessment

Thank you for your consultation seeking the views of United Utilities as part of the preparation of Places for Everyone (PfE). United Utilities have been informed by the Greater Manchester Combined Authority (GMCA) of Natural England's response to the latest PfE consultation in August 2021, which makes reference to the preparation of the Habitat Regulation Assessment (HRA). This states:

"*Natural England advise that it would be preferable to confirm capacity as part of the PfE HRA to ensure that the proposed site allocations are deliverable. Additional mitigation is proposed stating that large-scale site allocation policies in the Plan should include* ***a requirement that developments will not be permitted if they would have an unacceptable effect on water quality****. However, not all the large-scale site allocation policies include wording to this effect. Natural England advise that the HRA should identify the relevant policies requiring mitigation for clarity and ensure the policy is updated to reflect this*."

For ease of reference, the relevant part to which we respond to below has been highlighted in bold and underlined.

United Utilities are committed to collaborating with all stakeholders to drive water quality improvements across Greater Manchester. In our response to the latest PfE consultation, we highlighted how new development should manage foul and surface water in a sustainable way in accordance with national planning policy, setting out the need to follow the hierarchy of drainage options for surface water in National Planning Practice Guidance which clearly identifies the public combined sewer as the least preferable option for the discharge of surface water. A policy was recommended outlining the need for future applicants to fully investigate the hierarchy of drainage options to discharge surface water. It is our view that a separate planning policy for surface water management sets a clear process in relation to sustainable drainage for all new development.

We have acknowledged that a number of PfE allocations have more sustainable options for the disposal of surface water than the public sewer, so there will be an expectation as development comes forward for applicants to demonstrate alternatives for discharging surface water than to our combined sewer network (this combines foul and surface water flows). This should be supported by planning policy, including the necessary linkages to related policies like green infrastructure that help to slow the flow of surface water on site before it eventually discharges.

If there is a consistent approach to sustainable drainage as part of all new development as it comes forward, this increases the opportunity to reduce the volume of surface water flowing into our wastewater network. This matters because, during periods of very heavy rainfall, the extra volume of water entering a combined sewer system (one that contains foul and surface water flows) can discharge into a water course through a sewer overflow.

Our existing drainage network in Greater Manchester is largely dominated by combined sewers. The design of the combined sewer network include sewer overflows that are designed to prevent network

flooding to streets, homes and businesses by discharging into a nearby watercourse at times of high flow. Such discharges are permitted by the Environment Agency and are subject to regular review.

Met Office data shows that average annual water run-off in the North West is 28% higher than the average for England and Wales. This underscores the challenge that United Utilities and other bodies face in managing the flow of surface water. We are committed to minimising surface water flow to the combined sewer network as this will reduce the number of times a sewer overflow is used, thereby helping improve water quality. We see opportunities to combine our own plans to manage surface water sustainably with the plans being developed by others, such as PfE, to drive environmental benefits for the water environment in Greater Manchester.

We are working on schemes to respond to the growth proposed in Greater Manchester to meet the needs of our customers. It is important to note that the growth proposed in PfE is proposed over a number of our five year AMP investment periods, (currently AMP7, 2020-25), so there will be opportunity to review and respond to specific infrastructure issues over a number of investment periods. The full detail of drainage requirements for new Consultation Response on behalf of United Utilities Water Limited Copyright © United Utilities Water Limited 2020 2 development proposals will not be known yet at this stage, and we will seek to inform and update our own investment decisions when the relevant information is received.

Moving forward, we respectfully request that the GMCA continues to consult and liaise with United Utilities for all future planning documents. We are keen to continue working in partnership with the GMCA and other relevant stakeholders to ensure that all new growth can be delivered sustainably and to drive improvements to the water environment. It should be mentioned that this can only be achieved if there is a consistent approach for all development across the region, and is addressed consistently in collaboration with United Utilities and other relevant stakeholders.