Smart Motorways Programme

Statement to Inform the Appropriate Assessment

Tranche 5 – M62 Junctions 20-25 (Preliminary Design – PCF Stage 3)

HE551534-WSP-EGN-SG-RP-LE-00033

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Notice

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Executive summary

WSP was commissioned by Highways England to design and assess a proposed Smart Motorway - All Lane Running (SM-ALR) scheme on the M62 between junction 20 - which is the interchange with the A627(M), south of Rochdale and junction 25 east of Brighouse, just north of the river Calder crossing, hereafter referred to in this report as the 'Proposed Scheme'.

This Statement to Inform the Appropriate Assessment (SIAA) presents the second of four stages in Habitats Regulations Assessment (HRA) under the Conservation of Habitats and Species Regulations 2017 (as amended). The SIAA has been produced to advise the Competent Authority on whether any of the likely significant effects (LSEs) on European sites (comprising Special Areas of Conservation (SACs), Candidate SACs (cSACs), Special Protection Areas (SPAs), Proposed SPAs (pSPA), and Ramsar sites) identified during HRA Stage 1: screening of the Proposed Scheme, will result in Adverse Effects on Site Integrity (AESIs) following the application of mitigation measures. The screening is reported in the screening matrices in Appendix A.

The M62 junctions 20 to 25 runs for approximately 34.8 km between Rochdale and north sides of Huddersfield, from the A627(M) at junction 20 to the A644 at junction 25. The existing layout of M62 junction 20 to 25 is predominately dual 3 lane motorway with hard shoulder (D3M), with the exception of the eastbound carriageway between junctions 21 (chainage 16+400) to 22 (chainage 21+925) and the westbound carriageway between junctions 24 (chainage 36+400) to 25 (chainage 41+750) where these sections are already dual 4 lane motorway (D4M) due to the existing provision of a climbing lane.

As part of the Proposed Scheme, and to maintain continuity of 4 lanes along the route, these existing climbing lane/ D4M sections, will retain the existing highway cross section, retaining the 4 running lanes and the hard shoulder and the operating regime converted to Controlled Motorway by introduction of civil and technology infrastructure such as gantries, signs and signals e.g. Motorway Signal Mark 4 (MS4) and Advance Motorway Indicators (AMIs). Therefore, the Proposed Scheme will provide four permanent running lanes, by converting the hard shoulder into a running lane in combination with continued four-lane running where this already takes place, between junction 20 and junction 25. Through junction running (TJR) will be provided at all junctions except for junction 25 on the eastbound carriageway; and junction 20 and 24 on the westbound carriageway. Smart motorway will be supported by technology to monitor conditions and inform drivers.

A summary description of the Proposed Scheme is provided below:

- Installation of 90 overhead gantries, in addition to 7 existing gantries retained, fitted with signs and signals, which will display suitable variable mandatory speed limits based on traffic conditions.
- Construction of 35 emergency areas, in addition to retaining 8 existing short sections of hard shoulder to provide a safe area for vehicles to stop in an emergency.
- Closed Circuit Television cameras, Motorway Incident Detection and Automatic Signalling (MIDAS) side fire radar and loop detectors and Stopped Vehicle Detection provided to support the installed signals.
- Installation of a reinforced concrete barrier (RCB) to replace existing steel barrier in the central reserve to improve safety for users and maintainers of the Proposed Scheme; between junction 22 and junction 23, sections of existing wire rope barrier will be retained/or renewed to minimise any operational impacts from drifting snow on this elevated and exposed section.

It should be noted that, whilst the Proposed Scheme will generally constitute an upgrade to ALR, two links (junction 21 to junction 22 eastbound and junction 25 to junction 24 westbound) will be upgraded to Controlled Motorway[1] (CM) operation. These sections currently include four lanes with a hard-shoulder and the Proposed Scheme will retain this layout with the introduction of gantries, signs and signalling to support the introduction of Variable Mandatory Speed Limits.

[1] These existing climbing lane/ D4M sections, will retain the existing highway cross section, retaining the 4 running lanes and the hard shoulder and also include active traffic management technology and infrastructure to manage congestion, when the operating regime converted to Controlled Motorway.

The Proposed Scheme and construction activities will be located within the current Highways England boundary including existing hard standing and soft estate.

The HRA screening assessment as reported in the screening matrices in Appendix A (and detailed in Table 1-1 of this SIAA), concluded that the Proposed Scheme would result in LSEs on South Pennine Moors Phase 2 SPA and South Pennine Moors SAC. Following assessment, likely significant effects were not ruled out for the following impacts during construction only:

- South Pennine Moors SAC/South Pennine Moors Phase 2 SPA - habitat loss; and
- South Pennine Moors Phase 2 SPA - disturbance to Annex I and assemblage bird species.

Impacts with respect to South Pennine Moors Phase 2 SPA were screened in for all qualifying features[2] with respect to both habitat loss and disturbance. Impacts with respect to South Pennine Moors SAC were screened in for the qualifying Annex I habitat features: blanket bog; and transition mires and quaking bogs.

Habitat loss due to land take would occur within the SAC/SPA boundary, where it overlaps with the Highways England operational land boundary, up to a maximum of approximately 0.20 ha of semi-improved neutral grassland and approximately 0.03 ha of modified dry bog. (Note this is based on standardised worst-case footprint assumptions for construction and are anticipated to reduce during the detailed design process). While these habitats are not Annex 1 habitat features for which the SAC is designated, a precautionary stance is taken in that there is potential for qualifying features of the South Pennine Moors SAC (blanket bog and transition mires and quaking bogs) to be present.

A proportion of the habitat loss will be temporary in nature (land required to facilitate construction of the Proposed Scheme). Mitigation will avoid any SAC qualifying habitats present in the vicinity of Proposed Scheme infrastructure through micro-siting[3], notably near Junction 22, where works although within the highways operational boundary are also within the SAC/SPA boundary.

Reinstatement of semi-improved grassland (which is considered to be 'site fabric'[4]) will also take place in line with the requirements of Outline Environmental Management Plan clauses Nat021 (preparation and implementation of a Vegetation Management Plan) and Nat055 (requirement to reinstate habitat subject to temporary habitat loss) but this will not constitute mitigation in the context of the SAC/SPA. Such habitat replacement is considered enhancement given that it will include planting seed mixes of species used as food sources by qualifying species of the SPA. Given avoidance of habitat that may comprise a qualifying interest feature, this impact will have no AESI on habitats in the South Pennine Moors SAC/South Pennine Moors Phase 2 SPA. With regards to the SPA, it is established that few qualifying features have the potential to be present within or adjacent to any areas of habitat loss. This is limited to whinchat, wheatear and twite. These species range widely in the SPA and will not be impacted by the temporary impact of habitat loss.

Disturbance to birds that are qualifying or assemblage features of the South Pennine Moors Phase 2 SPA will be restricted, at a worst-case, to disturbance tolerant passerine species whinchat, wheatear and twite. Twite is known to forage (although not nest) close to the M62 while whinchat and wheatear while not recorded in survey work carried out for Natural England in 2014 have the potential to be present based on habitat preferences. The two qualifying features of the SPA, merlin and golden plover (in addition to the remaining assemblage features) are not considered to be present based on known habitat preferences within the SPA, their sensitivity to disturbance and lack of positive records from 2014 surveys of the SPA. Consultation with Natural England and RSPB concurred with this assessment in that most species will breed and forage further from the existing M62, but species such as twite can forage around road verges. Twite are not known to be sensitive to either visual or noise disturbance when foraging.

Compound construction will occur prior to the start of main works. Disturbance from the construction and use of the candidate construction compounds has been avoided through locating them in areas in

[2] Merlin and golden plover are qualifying interests in their own right under Article 4.1, with a breeding bird assemblage designated under Article 4.2 (lapwing, dunlin, snipe, curlew, redshank, common sandpiper, short-eared owl, whinchat, wheatear, ring ouzel, and twite).
[3] Specifying the precise location of construction activities and Proposed Scheme infrastructure.
[4] 'Site-fabric' is a general term used by Natural England (2018) *'Natural England's approach to advising competent authorities on the assessment of road traffic emissions under the Habitats Regulations'* to describe land and/or permanent structures present within a designated site boundary which are not, and never have been, part of the special interest of a site, nor do they contribute towards supporting a special interest feature of a site in any way, but which have been unavoidably included within a boundary for convenience or practical reasons. Areas of site-fabric will be deliberately excluded from condition assessment and will not be expected to make a contribution to the achievement of conservation objectives.

excess of 400m from the SPA. Disturbance during main construction works will be mitigated through management of site lighting, soft start techniques, and measures such as switching off vehicles when not in use. The Delivery Partner will not be permitted to select any construction compound locations within 400m of the South Pennine Moors SAC and Phase 2 SPA, or within 50m of the Rochdale Canal SAC. In addition, they will not be permitted to select any construction compound locations that have drainage links that feed directly into or through any European Site.

With regards to the potential use of diversion routes for overnight closures, the nature of SMP construction is such that these are predicted to be used on a maximum of 86 nights on the M62 Junction 20-25 SMP Scheme[5]. Use during the bird breeding season of the signed/unsigned diversion routes that traverse the SPA would have the potential to disturb SPA qualifying interest species. As such, Highways England will not permit any use of the diversion routes between March to August inclusive as part of the Proposed Scheme. The mitigation measures applied above are predicted to result in no AESI for any of the European sites potentially affected by the Proposed Scheme. The HRA can therefore be concluded at Stage 2: Appropriate Assessment. There is no requirement to move to HRA Stage 3 and beyond for the purposes of compliance with the Conservation of Habitats and Species Regulations 2017 (as amended).

[5] The actual number of vehicles that will be diverted cannot be accurately predicted. However, based on a review of traffic data from Webtris observed data for 2018 (supplied by Atkins and reviewed by Arup, the traffic modelling suppliers for the project), total flows (combined light and heavy loads) for the period 2300-0500 to represent a full overnight closure to allow the installation and/or removal of portal gantry superstructure are estimated at 5,195 for J21 – 22, 5,344 for J22 – J23 and 5,171 at J23 – J24 respectively.

1. Introduction

1.1.1. This Statement to Inform the Appropriate Assessment (SIAA) has been prepared by WSP on behalf of Highways England. It has been produced with regard to Regulations 27 to 30 and 32 to 37 of the Conservation of Habitats and Species Regulations 2017 (as amended) in implementing Article 6(3) of the European Community Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (the Habitats Directive), in relation to the protection of European Sites during the delivery of plans and projects.

1.1.2. In England, the requirements of the Habitats Directive are transposed into national law through the Conservation of Habitats and Species Regulations 2017 (as amended). This SIAA provides information to support Highways England's completion of an Appropriate Assessment under Regulation 63 of the Habitats Regulations. Under Regulation 63, a 'Competent Authority' (in this case Highways England) must complete an Appropriate Assessment before deciding to undertake any plan or project which is likely to have a significant effect on a European Site.

1.1.3. This SIAA has also been produced to provide information to support consultation with the Local Planning Authority under Regulation 77 of the Habitats Regulations.

1.1.4. The definition of 'European Site' comprises sites designated as any of the following:

- Special Area of Conservation (SAC) or candidate SAC (cSAC);
- Special Protection Area (SPA) or potential SPA (pSPA); or
- Wetlands of International Importance (Ramsar sites) – as a matter of UK government policy.

1.1.5. The 'Proposed Scheme' is a proposed Smart Motorway - All Lane Running (SM-ALR) scheme on the M62 between junction 20 - which is the interchange with the A627(M), south of Rochdale and junction 25 east of Brighouse, just north of the river Calder crossing. The Proposed Scheme is located within 2km of three European Sites: the South Pennine Moors Phase 2 SPA; the South Pennine Moors SAC; and the Rochdale Canal SAC. The South Pennine Moors Phase 2 SPA is designated due to the presence of populations of breeding birds included in Article 4.1 or Article 4.2 of the EC Birds Directive 2009/147/EC. The South Pennine Moors SAC is designated due to the presence of several upland habitats listed on Annex I of the Habitats Directive. Each of the three European Sites is crossed by or adjacent to the Proposed Scheme. The Rochdale Canal SAC is designated due to the presence of floating water-plantain *Luronium natans,* an aquatic plant species listed on Annex II of the Habitats Directive.

1.1.6. An additional European Site (the Denby Grange Colliery Ponds SAC), located approximately 13km from the Proposed Scheme, was screened out during an initial high level search for European Sites. This was because no conceivable impact pathways that could affect the sole qualifying feature (great crested newt, *Triturus cristatus*) were identified. No other European Sites were identified within 15km of the Proposed Scheme and no European Sites designated for bat populations were identified within 30km.

1.1.7. Development of the Proposed Scheme will require physical modifications to the existing M62 corridor between Junction 20 – 25 to facilitate all-lane running. Physical modifications include reconstruction of existing surfacing, construction of Emergency Areas and the removal and installation of gantries and signage to provide information to road users. Physical modifications will be delivered by a programme of construction works. Associated with this would be increased levels of human activity including the use of machinery, which would lead to increased levels of noise and visual/lighting impacts. Construction activities would also require temporary and permanent land take although no permanent land take will take place outside of the existing highway boundary. Construction activities could lead to changes in water quality due to incidental run-off from construction activities and changes in air quality due to generation of construction dust.

1.1.8. There would also be changes during operation, as a result of implementation of the Proposed Scheme. This included predicted changes in air quality as a result of increased volumes of traffic and hence increased vehicle emissions. The potential for changes to hydrological conditions was also identified, as a result of an increased paved area and modifications to M62 drainage required for the Proposed Scheme. The shift to four-lane running would also result in localised and limited widening at junction locations (between approximately 3.2m – 3.7m) of the width of the M62 over which traffic runs, in those locations where four lane running is not already in place. This would

extend any visual and noise effects from traffic, although such effects are predicted to be minimal given the minor width increase that would occur as the majority will involve conversion of existing hard shoulder.

1.1.9. The potential for the Proposed Scheme to lead to Likely Significant Effects (LSE) on the identified European Sites was assessed with the results reported in the screening matrices in Appendix A. On review of the Proposed Scheme's zone of influence, the European site's qualifying interest features, conservation objectives and potential threats to site integrity, the following impact pathways were identified;

- Land take (permanent and temporary - but constrained within the existing highways operational boundary) from within the South Pennine Moors SAC/South Pennine Moors Phase 2 SPA;
- Emissions during construction and operation (e.g. generation of dust; increase in nitrous oxides (NOx) levels and the rate of nitrogen deposition) at South Pennine Moors SAC/South Pennine Moors Phase 2 SPA;
- Emissions during operation (e.g. increase in nitrous oxides (NOx) levels and the rate of nitrogen deposition) at Rochdale Canal SAC;
- Disturbance of SPA qualifying features during construction and operation where located within the South Pennine Moors Phase 2 SPA or surrounding habitats outside of the South Pennine Moors Phase 2 SPA; and
- Hydrological connectivity to the South Pennine Moors SAC, South Pennine Moors Phase 2 SPA and Rochdale Canal SAC, introducing risk of changes in quality and quantity of aquatic habitats associated with European sites during construction and operation.

1.1.10. These impacts were identified through consideration of the potential impact pathways of the Proposed Scheme and the conservation objectives and vulnerabilities of the sites identified, using the professional judgment of experienced and qualified ecologists and in consultation with Natural England (see Section 7 for a summary of consultation undertaken).

1.1.11. Table 1-1 provides a summary of the conclusions of Stage 1: Screening Assessment (as reported in Section 4 of this SIAA and the screening matrices in Appendix A). Table 1-1 indicates where LSEs have been identified and taken forward to Stage 2: Appropriate Assessment.

Table 1-1: Outcomes of Stage 1: Screening Assessment

x = no LSE; ✓ = LSE cannot be ruled out; N/A = no pathway

European Site	Construction				Operation		
	Changes in air quality	**Changes in water quality**	**Disturbance to bird features**	**Habitat loss**	**Changes in air quality**	**Changes in hydrological conditions**	**Disturbance to bird features**
Rochdale Canal SAC	×	×	N/A	N/A	×	N/A	N/A
South Pennine Moors SAC	×	×	N/A	✓	×	×	N/A
South Pennine Moors Phase 2 SPA	×	×	✓	✓	×	×	×

1.1.12. The following sources of guidance and standards have been referred to during production of this SIAA:

- Highways England. (2015). Smart Motorways: Interim Advice Note (IAN) 161/15;
- Highways England. DMRB LA 115 – Habitats Regulations Assessment. Revision 0; and
- Highways England. DMRB HD 44/09 – Assessment of Implications (of Highways and or Roads Projects) on European Sites (including Appropriate Assessment[6]).

[6] This Statement to Inform the Appropriate Assessment had been largely completed prior to the publication of DMRB LA 115; as such both DMRB HD 44/09 and DMRB LA 115 were referred to.

1.1.13. The professional competency of the authors of this SIAA are detailed in Table 1-2.

Table 1-2: Professional Competency

Name	**Grade and Company**
Ian Ellis	Associate Director (WSP)
Expertise and Professional Qualification	
Extensive experience focussed on the strategic planning and delivery of large infrastructure projects including gaining Development Consent Orders (DCO) in both marine and onshore sectors. He has acted as expert witness for Public Inquiries and Development Consent Order Hearings with the Planning Inspectorate covering both specific ornithological and wider ecological issues. Frequently manages Environmental Statements and EIAs produced for planning applications in addition to Habitats Regulations Assessments. Commonly involved in leading stakeholder consultation and negotiation with both statutory conservation bodies and NGOs. AQUIND Interconnector (AQUIND Limited) 2018 – 2020 (Ecology Lead) Project management of all onshore ecological aspects of the DCO application for this Scheme. Responsibilities include direction of the survey programme, preparation of both ES chapters and HRA Report. Great Yarmouth Third River Crossing (Norfolk County Council) 2018 – 2020 (Ecology Lead) Project management of all ecological aspects of the DCO application for this Scheme. Responsibilities include preparation of both ES chapters and HRA Report. Smålandsfarvandet and Sejerø Bugt Wind Farms, Denmark (Energinet) 2015 – 2016 (Ornithology Project Director). Expert due diligence of existing ornithological assessment documents. Lead author of re-assessment of Report to Inform Appropriate Assessment for the two wind farms. BSc (Hons) Zoology MRes Ecology and Environmental Management	
Name	**Grade and Company**
Philip Davidson	Associate Director (WSP)
Expertise and Professional Qualification	
Over 15 years' experience in ecological survey, impact assessment, mitigation design and implementation. Extensive HRA project experience in last ten years. Specialises in air quality impacts on ecological sites, EcIA and HRA. Presented at joint Institute of Air Quality and Chartered Institute of Ecology and Environmental Management events in 2019 and 2017. Drax Repower North Yorkshire 2017 - 2019: Project Ecologist. Responsible for leading all ecological assessment work on the project. Authored the project Habitats Regulations Assessment work – including screening for Likely Significant Effects and Report to Inform Appropriate Assessment. Close liaison with Air Quality lead during assessment of operational air quality impacts on European Sites. A1 in Northumberland M2F, 2018 – date: HRA approval. Authoriser and approver of HRA screening report for this Scheme to upgrade the A1 via a Development Consent Order (DCO). Provided technical advice to the author and reviewer and to the Project Ecologist. Advised air quality and ecology teams on approach to assessing air quality impacts on designated sites. Redcar and Cleveland Draft Local Plan, 2016 – 2017: HRA lead. Authored the first two drafts of the HRA of the Redcar and Cleveland Local Plan. Included assessment of potential Likely Significant Effects (LSE) that could arise from policies and allocations included within the Local Plan, including impacts from industry, recreational disturbance through tourism policies and policies that could increase traffic-related impacts on European Sites. Provided advice to Redcar and Cleveland Borough Council on approaches to mitigating effects on European Sites. BSc (Hons) Ecology	

2. The Proposed Scheme

2.1. Overview of the Proposed Scheme

2.1.2. Highways England is proposing to upgrade the M62 between junction 20 and junction 25 to a Smart Motorway All Lane Running (SM-ALR) scheme. The single defined option for the Proposed Scheme will permanently convert the existing hard shoulder into an extra running lane (lane 1) to provide additional capacity with the exception of the eastbound carriageway between Junction 21 and 22 and junction 24 to 25 on the westbound carriageway, where these are currently 4 lanes with hard shoulder and this cross section will be retained. The objectives of SM-ALR schemes are to:

- Relieve congestion and smooth traffic flow;
- Improve journey times and journey time reliability;
- Maintain safety levels for all road users; and
- Support the economic development of the nation.

2.1.3. The Proposed Scheme would provide four permanent running lanes between junction 20 and 25. The SM-ALR will be supported through the installation of technology to monitor conditions and inform drivers, including overhead gantries and enhanced message signs.

2.1.4. The Proposed Scheme runs for approximately 34.8 km and extends east of junction 20, the interchange with the A627(M) (Ordnance Survey (OS) grid reference SD 88300 09800), south of Rochdale to junction 25 east of Brighouse, just north of the river Calder crossing (OS grid reference SE 17025 22900). The Proposed Scheme includes directional signs on existing gantries 1.3 km beyond the east and west extents of the core scheme. Pavement resurfacing and realignment works starts at junction 20 (chainage 10+750) and ends east of junction 25 (chainage 43+225). Figure 2-1 in Appendix B shows the location of the Proposed Scheme.

2.1.5. The Proposed Scheme is considered an 'improvement scheme' under the Highways Act 1980. As an improvement scheme with no permanent works beyond the existing highway boundary, the Proposed Scheme falls under Highways England's permitted development rights.

2.2. Scheme description

2.2.2. This section covers the Proposed Scheme in its entirety and subsequent sections present details in the context of European sites.

All lane running

2.2.3. Where the existing three-lane carriageway with hard shoulder is to be upgraded to four-lane ALR, the proposed layout will be accommodated within the existing carriageway and hard shoulder.

2.2.4. The existing layout of M62 junction 20 to 25 is predominately dual 3 lane motorway with hard shoulder (D3M), with the exception of the eastbound carriageway between junctions 21 (chainage 16+400) to 22 (Chainage 21+925) and the westbound carriageway between junctions 24 (chainage 36+400) to 25 (chainage 41+750) where these sections are dual 4 lane motorway (D4M) due to the existing provision of a climbing lane. As part of the Proposed Scheme, and to maintain continuity of 4 lanes along the route, these existing climbing lane/ D4M sections, will retain the existing highway cross section, retaining the 4 running lanes and the hard shoulder and the operating regime converted to Controlled Motorway by introduction of civil and technology infrastructure such as gantries, signs and signals e.g. Motorway Signal Mark 4 (MS4) and (Advance Motorway Indicators (AMIs)

2.2.5. Junction layouts will be reconfigured to accommodate the fourth running lane. Lanes 1 (former hard shoulder which now becomes a running lane) where through junction running is implemented and lane 4 adjacent to sections of Reinforced Concrete Barrier (RCB) installation, will be resurfaced

with low noise surfacing (thin wearing course). The overall minimum carriageway width for all four running lanes would be 13.75m, although in some locations it would be wider. In general, no widening within the soft estate will be required with the exception being occasional locations near junctions for location specific modifications at diverge and merge points. All works would be within Highways England boundary. The junctions where localised widening will occur (Figure 2-1, Appendix B) are:

- Junction 20 Eastbound (EB) diverge;
- Junction 20 EB merge;
- Junction 21 EB diverge;
- Junction 21 Westbound (WB) merge;
- Junction 21 WB diverge;
- Junction 22 WB diverge;
- Junction 25 WB merge; and
- Junction 25 WB diverge.

2.2.6. Variable Mandatory Speed Limits (VMSL) will be enabled using a combination of portal and cantilever/super cantilever gantry mounted Variable Message Signs (VMS) and lane specific signalling using Advanced Motorway Indicators (AMIs) mounted above each lane.

Emergency areas

2.2.7. Where hard shoulders have been converted into a running lane, dedicated Emergency Areas (providing 'areas of relative safety') will be constructed at specific locations to provide a safe area for vehicles to stop in an emergency without interrupting the flow of traffic. Ten of the proposed Emergency Areas will be constructed within 100m of a European Site, as set out in paragraph 2.2.28.

2.2.8. The positioning of Emergency Areas has been designed in accordance with Interim Advice Note (IAN) 161/15[7] and guidance from the Overseeing Organisation.

Central reserve works

2.2.9. The M62 between junction 20 to 25 central reserve currently comprises sections of RCB and steel barrier Vehicle Restraint System (VRS), also with some extensive areas of soft verge and tree planting to separate the northbound and southbound carriageways. Existing steel barriers will be replaced with RCB along the majority of the Proposed Scheme length. This provides safety benefits for road users and workers and will allow the central reserve to be narrowed to accommodate the ALR in certain areas, with sections also hardened where narrow verge areas are located. Existing sections of RCB will not be replaced. Where new RCB is being provided, it is also proposed that, where this coincides with existing soft-estate in the central reserve, the central reserve will be hardened/paved.

Gantries, signs and signals and roadside devices

2.2.10. The Proposed Scheme will include the removal of 19 superspan, one super cantilever, 15 portal and 25 MS3 gantries. 97 new overhead, predominantly cantilever, gantries are proposed fitted with AMIs, VMS and Advanced Directional Signs (ADS). These will display variable speed limits based on traffic conditions.

2.2.11. The location of proposed gantries is presented in Figure 2-2, Appendix B, along with the location of other SM-ALR supporting infrastructure such as Closed-Circuit Television (CCTV) cameras and Motorway Incident Detection and Automatic Signalling (MIDAS) radar positions. Details of works within 100m of European Sites are provided in paragraph 2.2.28.

Lighting

2.2.12. The motorway is currently lit throughout between Junctions 20 to 25 and current proposals are for it to remain lit.

[7] Highways England. (2015). Smart Motorways: Interim Advice Note (IAN) 161/15.

2.2.13. The following lighting proposals are to be implemented to minimise the effects of lighting along the Proposed Scheme which will be an improvement on the current lighting status:

- Luminaires shall have the capacity to dim in hours of low operation i.e. outside of peak traffic; and
- Full-cut off lanterns complete with Light Emitting Diodes 'LEDs' which do not emit any ultra violet output, hence having a reduced impact on residential receptors and flora and fauna.

Drainage strategy

2.2.14. Finalised requirements for drainage will be determined during the detailed design stage. Where the carriageway is balanced (i.e. where the road surface is close to level across the width of the Proposed Scheme), there will be no requirement for any drainage within the central reserve if it is hardened; any existing drainage within the hardened central reserve will therefore be abandoned or removed.

2.2.15. Where the carriageway is super elevated between junction 20 and junction 25, a surface water collection system will be required within the central reserve; this is likely to be a 1.2 m wide surface water channel in accordance with the SMP design guide drainage hierarchy. Where a concrete barrier already exists the existing surface drainage will be retained, subject to condition.

2.2.16. The drainage system associated with new areas of hardstanding will be designed to accommodate a 1-year design storm without surcharge and a 5-year storm with no surface flooding (20-year storm critical loads). This includes a 20% allowance for climate change, as per IAN 161/15 for new impermeable areas e.g. for Emergency Areas.

2.2.17. Requirements for attenuation to maintain IAN 161/15 design requirements (no change to outfall discharge rates) will be accommodated within the existing highway boundary. As a minimum, the run-off from Emergency Areas will be attenuated. Where Emergency Areas are created, the Proposed Scheme will also include pollution control devices in the drainage for the new Emergency Areas. This is a standard design measure, that would be employed across the entire Proposed Scheme where Emergency Areas are proposed.

2.2.18. Existing chambers within the hard shoulder or any new running lanes will be relocated or covered over and connected to adjacent verge side chambers with larger chambers, to allow for maintenance, flow control and attenuation requirements in accordance with IAN 196/17.

Land take and temporary construction areas

2.2.19. Apart from the Delivery Partner's construction compounds, for which locations are yet to be agreed (candidate locations are shown on Figure 2-1 in Appendix B and described below), all proposed temporary and permanent works lie within the existing highway boundary. Thus, there is no requirement for permanent additional land take from outside the Highways England estate.

2.2.20. Main construction compounds have been assessed as located in areas where LSE will not arise (refer to Figure 2-1 in Appendix B and the screening matrices in Appendix A).

2.2.21. In addition to the main construction compounds, the Delivery Partner is also likely to need to identify other compound/work areas locations to support implementation of the Proposed Scheme. Provisional locations have been identified by Highways England, as set out in Figure 2-1 in Appendix B. It should be noted that no detail is available as to whether or not any of these locations would be used by the Delivery Partner and in what manner. A preliminary appraisal of the potential for Impact Pathways to European sites concluded that there would be LSEs from potential disturbance to the qualifying interest features of the South Pennine Moors Phase 2 SPA for construction compound locations within 400m of the SPA.

2.2.22. To avoid LSE in the absence of confirmed locations for construction compounds, restrictions on where these can be located are included in the Outline Environmental Management Plan. These measures are set out in Section 6 (Mitigation) of this SIAA.

Temporary works

2.2.23. The Proposed Scheme will involve the following general work and sequencing:

- Site mobilisation and site clearance: establishment of temporary fencing, utility relocations (none within any European Site) and establishment of construction compound site and

access, and vegetation clearing and stripping, stockpiling and management of topsoil and unsuitable material;

- There will be activities operating in a temporary fashion associated with the Main works: establishing the ground levels, undertaking ground works including drainage systems, installing the gantries and associated infrastructure and construction of the RCB and Vehicle Restraint System (VRS). Resurfacing of the existing surface and other pavement works (including carriageway markings); and
- Landscaping and decommissioning: vegetation planting, removal of construction compound and site tidy up.

2.2.24. Construction of the Proposed Scheme will require some limited motorway closures at the weekend or at night, requiring the diversion of motorway traffic onto local roads. A number of potential signed diversion routes have been identified (refer to Figure 2-3, Appendix B), which are currently used as Emergency Diversion Routes for the existing motorway. The following existing Emergency Diversion Route traverse the South Pennine Moors SAC/South Pennine Moors Phase 2 SPA:

- Area 10 - Routecard F1 - non-HGV (A6193; A664; A58; B6138);
- Area 10 - Routecard F4 - non-HGV (A6193; A664; A58; A646; A629); and
- Area 10 - Routecard F4 - HGV (A6193; A664; A58).

2.2.25. It should be noted that other local roads traverse the South Pennine Moors SAC/South Pennine Moors Phase 2 SPA that are not designated Emergency Diversion Routes. These include the A672, A62 and A640, and provide potential east-west routes across the South Pennine Moors SAC/South Pennine Moors Phase 2 SPA (refer to Figure 2-3, Appendix B). Therefore, it is possible that road users will use these other local roads in the event of a diversion. Use of these would be at the discretion of the road user.

2.2.26. These roads provide potential routes between Junctions 21 to 22, 23 and 24. It is likely that discretionary use of these routes by diverted road users would be relatively low, given the advanced notification of closures and promotion of official diversions that would be completed by Highways England. It is not possible to provide quantitative estimates for any use of unsigned diversion routes. Investigations are underway by Highways England to determine whether quantitative estimates can be made based on the findings of previous SMP schemes.

Works in proximity to designated sites

2.2.27. The Proposed Scheme bisects and is adjacent to the South Pennine Moors SAC/South Pennine Moors Phase 2 SPA between junction 21 and junction 23 from SD946138 (MP71/9) to SE034162 (MP79/1). Works situated within 400m[8] of the SAC/SPA boundary include:

- Uptake of the hard shoulder to create 4-lane ALR Smart Motorway;
- Creation of 10 Emergency Areas to include: eastbound EA-EB-05, EA-EB-06, EA-EB-07, EA-EB-08 and westbound EA-WB-07, EA-WB-08, EA-WB-09, EA-WB-10, EA-WB-11 and EA-WB-12;
- Creation of 24 Single Span gantries including: eastbound G2-11, G2-13, G2-14, G2-16, G2-17, G2-19, G2-20, G3-04, G3-07, G3-10 and westbound G2-04, G2-05, G2-07, G2-08, G2-10, G2-12, G2-15, G3-01, G3-02, G3-03, G3-05, G3-06, G3-08, G3-09;
- Creation of 1 Double Span gantry: G2-18;
- Potential removal of 8 single span gantries and 4 double span gantries; and
- Installation of 2x emergency telephones.

2.2.28. The construction works within 400m[9] of the South Pennine Moors SAC/South Pennine Moors Phase 2 SPA (as described above) are anticipated to take approximately 12 to 15 months during the total 3 to 4-year construction programme to deliver, where these areas are constructed in sequence.

[8] 400 m is considered the maximum zone of influence for disturbance in accordance with M. Ruddock & D.P. Whitfield (2007). A Review of Disturbance Distances in Selected Bird Species.
[9] 400 m is considered the maximum zone of influence for disturbance in accordance with M. Ruddock & D.P. Whitfield (2007). A Review of Disturbance Distances in Selected Bird Species.

2.2.29. In relation to Electrical Infrastructure (EI) and supplies, five new Distribution Network Operator (DNO) supplies had been identified within the South Pennine Moors SAC/Phase 2 SPA. When choosing sites for new electrical supply locations, these considered the surrounding area from an engineering and environmental aspect, stakeholder impact and other factors such as access requirements and general constructability/maintenance requirements.

2.2.30. The DNO was consulted to gain input into where they believed they could feasibly provide new connections to help feed into the design as early as possible. Due to the cost, site constraints, engineering/buildability and maintenance factors, the five potential EI sites within the SAC/SPA will not be taken forward into detailed design. The proposed DF3 design has therefore omitted these sites and identified alternate power supplies outside European sites. Subject to detailed design outcomes, requirements for larger power cables and increase in ducting at some locations adjacent to the SAC may be identified, although this increase in infrastructure would be relatively minor, located entirely within the existing highway boundary and outwith European Sites (as such without impact pathways).

Land take within and adjacent to European Sites

2.2.31. The Proposed Scheme and construction activities will be located within the current Highways England boundary, comprising existing hard standing and soft estate. From GIS mapping it appears small sections of the South Pennine Moors SAC/South Pennine Moors Phase 2 SPA designated sites fall within the highways land ownership boundary (operational land north of junction 22)[10]; however, this does not necessarily mean that the highways land, and its associated verges, will be of nature conservation interest and form part of a qualifying feature. The majority of verge habitats are semi-improved neutral grassland and are considered to be 'site fabric'.

2.2.32. The Proposed Scheme would result in land take from within the SAC up to a maximum of approximately 0.23 ha (Note this is based on standardised worst-case footprint assumptions for construction and are anticipated to reduce during the detailed design process). Based on phase 1 habitat mapping across the Proposed Scheme, which includes the use of remote sensing data where there were health and safety restrictions over surveys, this would comprise approximately 0.2 ha of semi-improved neutral grassland (site fabric) and 0.03 ha of modified dry bog habitats (estimates based on Phase 1 habitat mapping (see Figure 6-1, Appendix B)).

2.2.33. On a precautionary basis, it is assumed that the modified dry bog habitat could equate to the qualifying interest features blanket bogs or transition mires and quaking bogs. This habitat loss, if realised, would take place within the existing highway boundary, with a proportion of the habitat loss being temporary in nature (land required to facilitate construction of the Proposed Scheme).

2.2.34. Long-term habitat loss will therefore be less than the total assumed for this assessment, but this cannot be determined precisely until detailed design has been undertaken and the delivery partner appointed. Locations for reinstatement would be identified by the Delivery Partner during the detailed design stage and agreed with Natural England and the Highways England Project Manager, in accordance with Outline Environmental Management Plan clauses Nat055, Nat026, Land005 and Land011.

[10] It should be noted that SAC/SPA mapping will have been completed at a relatively coarse resolution in comparison to the delineation of the M62 boundary. This may have contributed to overlaps with the soft estate of the M62.

3. Methodologies

3.1. Legislative Requirements and Guidance

3.1.2. This section sets out the applicable methodologies and assumptions for the assessment of the Proposed Scheme with regard to the requirements of the Conservation of Habitats and Species Regulations 2017 (as amended) (hereafter referred to as 'the Habitats Regulations') and the HRA process as set out in DMRB (HD 44/09)[11] (Highways Agency, 2009) and IAN 141/11[12].

3.1.3. This document takes account of recent judgements made with respect to HRA by the Court of Justice of the European Union (CJEU) and the national courts in the UK.

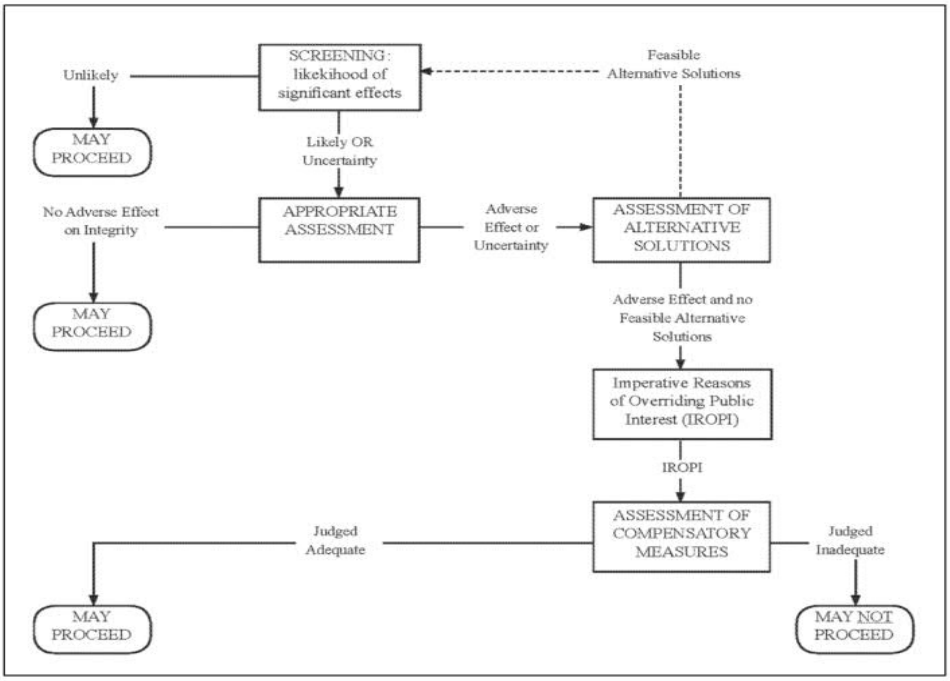
3.2. Stages of HRA

3.2.2. There are five stages which can constitute a HRA:

- Stage 1: Screening;
- Stage 2: Appropriate Assessment;
- Stage 3: Alternative Solutions;
- Stage 4: Imperative Reasons of Overriding Public Interest (IROPI); and
- Stage 5: Assessment of compensatory measures

3.2.3. The relationship between the five stages is shown in Plate 3-1 below.

Plate 3-1: Habitats Regulations Assessment Process



Source: DMRB Volume 11 Section 4 Part 1 Environmental Assessment, HD 44/09 Assessment of Implications (of highways and/or road projects) on European Sites (including Appropriate Assessment)

3.2.4. All stages of the process are referred to as the Habitats Regulations Assessment (HRA) process to clearly distinguish the whole process from the one step within it referred to as the "Appropriate

[11] Design Manual for Roads and Bridges: Volume 11 Environmental Assessment Section 4 Assessment of Implications on European Sites.
[12] Interim Advice Note 141/11 Assessment of Implications (of Highways and/or Roads Projects) on European Sites (Including Appropriate Assessment) and the Planning Act 2008

Assessment".

3.2.5. The methodology for Stage 1 of the HRA process is summarised in Section 3.3, while the Stage 2 methodology is detailed in Section 3.4.

3.2.6. For this SIAA, only the summary of Stage 1 and the results of Stage 2 are presented.

3.3. Stage 1: Screening Methodology

3.3.2. The screening methodology uses pathways to link development impacts and effects on European sites that have potential to be vulnerable to those impacts. Each development impact is considered, and its pathway assessed to understand the likelihood of an impact resulting in a likely significant effect on a European Site.

3.3.3. When screening in/out European sites and their features of interest, it needs to be established whether there is a pathway between the likely development impacts (causes) and the possible effect they have on qualifying interest features of European sites. Where there are no pathways to affect a European site from the Proposed Scheme, they are not considered further. Where a pathway is identified, consideration is then given to whether there is a mechanism for LSEs to occur. A copy of the screening matrices setting out the findings of the screening exercise is provided in Appendix A.

3.3.4. Where the HRA screening identified the potential for LSE, these were taken forwards for assessment in the SIAA.

3.4. Stage 2: Appropriate Assessment

3.4.2. In accordance with the Habitats Regulations, Appropriate Assessment is required when, in view of a European site's objectives, a project:

- is likely to have a significant effect on a European site in Great Britain (either alone or in combination with other projects and/or plans); and/or
- is not directly connected with or necessary to the management of the site.

3.4.3. Stage 2 considers likely significant effects in greater detail. This includes consideration of mitigation measures where these will be applied to avert an adverse effect on the integrity of the European sites concerned. If information is not sufficient to confirm that an adverse effect upon the site's integrity cannot be ruled out, then Stage 3 is undertaken to investigate alternative solutions.

3.4.4. The methods used to make such an assessment in Stage 2 depend on the nature of the likely effects, and the interest features, conservation objectives and conservation status of the site potentially affected. Section 4 below sets out European sites and qualifying features that have been screened out of further assessment in Stage 1.

Assessment of land take on interest features

3.4.5. Land take from within the boundary of a European site (either temporary or permanent) could remove a proportion of the habitats which form (or support) the qualifying interests for which the European Site is designated. Land take from adjacent habitats that are functionally linked (for example clearance of areas of heathland habitat from an area adjacent to a SAC designated for heathland habitats) may also be relevant, if these support the overall status of habitats within the designated site.

3.4.6. Land take could lead to the following impacts on European Site qualifying interests:

- Permanent habitat removal (South Pennine Moors SAC habitats);
- Temporary removal/disturbance of habitats (South Pennine Moors SAC habitats); and
- Reduction in foraging opportunities (removal/disturbance of habitats used by South Pennine Moors Phase 2 SPA qualifying features).

3.4.7. A consultation response received from Natural England on the 29th May 2019 identified that Natural England considered any habitat loss from within a European site, regardless of scale, should be considered to lead to LSE. Their advice was therefore that any habitat loss resulting from the Proposed Scheme should be considered at Stage 2 (Appropriate Assessment) of the HRA process.

3.4.8. The assessment of land take impacts has considered the following when assessing the potential for adverse effects on integrity:

- Extent of habitat loss/disturbance within European site boundaries;
- Type of habitat(s) affected including assessment of whether they could support SAC habitats/SPA qualifying features;
- Functional linkages between habitat lost within the Proposed Scheme boundary and adjacent European sites (the South Pennine Moors SAC/South Pennine Moors Phase 2 SPA being the only relevant site)
- Avoidance and mitigation measures to be employed during implementation of the Proposed Scheme; and
- Whether the predicted extent of habitat loss after mitigation could alter the ecological structure or functioning of European Site qualifying interests or their ability to meet their Conservation Objectives

Assessment of disturbance effects on bird features during construction

3.4.9. Disturbance can be defined as a discrete effect in time that disrupts an ecosystem or population structure[13]. Potential ecological consequences on breeding birds in response to high levels or prolonged exposure to disturbance effects include:

- Reduction in breeding success;
- Displacement of breeding birds from affected area; and
- Reduction in foraging opportunities.

3.4.10. Disturbance can originate from a variety of sources and with respect to birds, it is expected that the Proposed Scheme has potential to introduce disturbance through both noise and visual effects during construction[14].

3.4.11. Disturbance may be a response to the physical (including visual) presence of construction equipment, or a response to the associated construction noise. A disturbance event may cause birds to take flight (either returning to the same area or departing entirely), or to cease feeding or roosting. A single instance of taking flight or ceasing to feed does not have an immediate effect on the survival or productivity of an individual bird. However, repeated disturbance, or disturbance over an extended period, can affect the survival and productivity of a bird.

3.4.12. Different species of bird have different tolerance thresholds to noise disturbance (and visual disturbance) and therefore construction works and other operations impact upon different species in differing ways. Furthermore, birds are liable to habituation (e.g. they usually become more tolerant with increased exposure time to regular activities) to both aural and visual disturbance stimuli.

3.4.13. Sound created by the operation of machines and vehicles has the potential to cause birds to cease feeding, or to fly away from the area of influence. Disturbance will depend on the nature or type of sound and the strength of the sound reaching birds using habitat adjacent to the Proposed Scheme. It is recognised that very loud and short, sharp 'percussive' sounds, most familiar as gunshot but also produced during construction activity, for example the hammering in of metal piles, have the greatest potential to cause disturbance to birds[15].

3.4.14. Loud but discontinuous sounds, such as those produced by machinery during construction processes, have been shown to cause disturbance when that sound is above certain recorded

[13] White P.S. and Pickett, S.T.A. (1985). The Ecology of Natural Disturbance and Patch Dynamics.

[14] Hockin, D, Ounsted, M., Gorman, M., Hill., D., Keller, V. and Barker, M.A. (1992). Examination of the Effects of Disturbance on Birds with reference to its Importance in Ecological Assessments. Journal of Environmental Management (1992) 36, 253-286

[15] Madsen, J. and Fox, A.D. (1995). Impacts of hunting disturbance on waterbirds – a review. Wildlife Biology 1, 193-207

levels[16]. While most noise studies on birds have focussed on wintering water bird species[17], certain studies have investigated the effect on breeding passerine species with respect to road traffic noise[18].

3.4.15. Upland breeding species, as relevant to the Proposed Scheme, are comparatively less studied. However, a suite of information on species specific responses to disturbance from renewable energy developments in such environments is available[19]. This relates to disturbance through visual cues. While birds typically react to visual and noise disturbance in different ways, importantly, noise stimuli rarely cause disturbance before associated visual stimuli have an effect[20]. Therefore, information on species sensitivity to human disturbance through visual means[21] typically suggests an upper limit to where disturbance effects from the Proposed Scheme can be expected.

3.4.16. The assessment of disturbance effects on SPA bird features is focused on a stepwise process of evidence gathering:

1. Determine sensitivity of SPA species to noise and visual disturbance through review of available literature. This step will identify either through species specific evidence or through evidence from 'proxy' species[22] the distance at which SPA features are sensitive to disturbance. This will allow the identification of the suite of SPA features that have the potential to be impacted by the Proposed Scheme.
2. Establish known habitat preferences of all qualifying interest species sensitive to disturbance. Review existing data on locations within the SPA where qualifying interest bird species breed. A search of literature (e.g. Birds of the Western Palearctic[23] and BTO Bird Facts[24]) will, establish core nesting habitat in which the species occur.
3. In the absence of site-specific breeding bird data, habitat information (as detailed in the PCF Stage 3 Environmental Assessment Report) can be cross-referenced with the outcomes of Step 2 to determine an assessment of likely presence of species sensitive to disturbance. The outcome of this step will determine a list of SPA features that require further consideration on whether the construction of the Proposed Scheme could have an adverse effect on any SPA feature.
4. From Step 3, further consideration of species ecology including known population size[25] and density will be made against worst-case assumptions of the construction activities and period for the Proposed Scheme. This process allows full and robust consideration of available evidence in order to determine whether the conservation objectives of the SPA are affected and ultimately concluding whether there are any AESIs in the absence of mitigation.
5. Finally, where potential AESI is concluded with respect to any SPA feature, avoidance and mitigation measures to be employed during implementation of the Proposed Scheme are considered in order to make a final determination of AESI.

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3.4.17. The process outlined in Steps 1-5 will make a series of assumptions in order to lead to the final determination. Critically, as no baseline data is available regarding locations of breeding birds

[16] West, E.W., Dooling, R.J., Popper, A.N., Buehler, D.M. (2007). Noise impacts on birds: Assessing take of endangered species. The Journal of the Acoustical Society of America 122, 3082

[17] Cutts, N., Phelps, A. and Burdon, D. (1999). Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Institute of Estuarine and Coastal Studies, University of Hull.

[18] Halfwerk, W., Holleman, C., Lessells, C. & Slabbekoorn, H. (2011). Negative impact of traffic noise on avian reproductive success. Journal of Applied Ecology 48, 210-219.

[19] Pearce-Higgins, J. W., Stephen, L., Langston, R. H., Bainbridge, I. P. and Bullman, R. (2009), The distribution of breeding birds around upland wind farms. Journal of Applied Ecology, 46: 1323-1331.

[20] Cutts, N., Hemingway, K. and Spencer, J. (2013). Waterbird disturbance mitigation toolkit: Informing estuarine planning and construction Projects. Version 3.2, March 2013. Available at: http://www.tide-toolbox.eu/tidetools/waterbird_disturbance_mitigation_toolkit/ [accessed April 2014]

[21] Ruddock, M. and Whitfield, D.P. (2007). A Review of Disturbance Distances in Selected Bird Species. A report from Natural Research (Projects) Ltd to Scottish Natural Heritage.

[22] Proxy species refer to related species that have similar ecological niche and therefore considered to react to disturbance in a similar fashion.

[23] Snow, D. W. & Perrins, C. M. (1998). The Birds of the Western Palearctic Concise Edition. ISBN 0-19-854099-X.

[24] Robinson, R.A. (2005) BirdFacts: profiles of birds occurring in Britain & Ireland (BTO Research Report 407). BTO, Thetford (http://www.bto.org/birdfacts, accessed on 18/05/2020)

[25] Keystone Ecology. (2014). South Pennine Moors SSSI/SPA Phase 2. Breeding Bird Surveys 2014. Unpublished report to Natural England.

within the vicinity of the Proposed Scheme, Steps 1-2 in particular will utilise literature on species ecology combined with known habitat information to inform the assessment.

Embedded measures

3.4.18. Good practice environmental measures designed to minimise the environmental effects of the Proposed Scheme would be delivered scheme-wide and are considered generic (i.e. their use is not triggered by any specific receptor). Such measures will be incorporated into the Construction Environmental Management Plan for the Proposed Scheme. The Construction Environmental Management Plan will be produced by the Delivery Partner prior to the start of works. The contents of the Construction Environmental Management Plan would be required to follow the requirements of the Outline Environmental Management Plan (submitted at SGAR3), which specifies measures to avoid/control impacts on the human and natural environment.

3.4.19. All measures included in this SIAA that are deemed to be required in order to avoid effects on site integrity are included in and secured by the Outline Environmental Management Plan. The Construction Environmental Management Plan will subsequently include and secure these measures with the Highways England Project Director committed to their delivery.

3.4.20. The screening matrices presented in Appendix A refer to embedded mitigation measures clauses as outlined in the Outline Environmental Management Plan. Key clauses made in the Outline Environmental Management Plan, which are considered to be embedded measures, include the following relevant to this SIAA:

- Habitat creation: Where habitat loss is required, suitable habitat will be reinstated post construction in accordance with the Environmental Masterplan. Where replacement habitat is provided, it shall be integrated with landscape planting using native species of local provenance to establish/enhance wildlife corridors;
- Works affecting priority habitat: Where Section 41 priority habitats are located adjacent to working zones, temporary exclusion fencing (Heras or similar) shall be installed prior to construction and maintained throughout to prevent encroachment of machinery or personnel. Materials and spoil shall be stored away from priority habitat areas;
- Works <8m of watercourses: Best practice techniques shall be used for works close to ditches, watercourses and culverts to avoid / minimise risk of contamination or damage to sensitive ecological receptors (habitats and species);
- Construction compounds: Compounds, vehicles, storage of materials and haul routes (where on unpaved surfaces) are to be located to avoid an adverse impact upon sensitive habitats and species;
- Night working: Working during dark conditions where a potential impact upon sensitive habitats and species exists will be avoided (except in emergency situations);
- Night working: Where lighting, generators (and other noisy equipment) are required these shall be located to avoid impacts to sensitive habitats and species. Lighting is to be directional and shielded to illuminate the works area only;
- Vegetation clearance: Construction works and vegetation clearance shall be confined to the minimum areas required as defined on the schedule of work areas during detailed design. Those areas to be worked under the Ecological Clerk of Works (ECoW) or Environmental Manager's supervision, shall be clearly defined and fenced off prior to works starting nearby;
- Works near European Designated Site: Works with the potential to cause a change to any impact pathways of a European Designated Site shall be located and specified in a manner so as to ensure no change to the HRA Screening Report or Appropriate Assessment findings; and
- Works affecting SAC/SPA: Where works are likely to damage the condition or special features of a SAC/SPA, then advice is to be sought from Natural England before carrying out those works.

4. Protected sites potentially affected by the proposals

4.1.2. This section summarises the designated sites subject to Likely Significant Effects as reported in the screening matrices in Appendix A.

4.2. Identification of European sites

4.2.2. Four European Sites were identified within the area of influence (up to 15 km) of the Proposed Scheme. These were:

- South Pennine Moors SAC;
- South Pennine Moors Phase 2 SPA;
- Rochdale Canal SAC; and
- Denby Grange Colliery Ponds SAC.

4.2.3. Denby Grange Colliery Ponds SAC (approximately 13km from the Proposed Scheme) was screened out of the assessment during the initial high-level search. This was because no conceivable impact pathways that could affect the sole qualifying feature (great crested newt, *Triturus cristatus*) were identified.

4.2.4. Table 4-1 below provides an overview of the European Sites and reasons for their inclusion or exclusion from this assessment. Conservation Objectives and associated Supplementary Advice on Conservation Objectives for each feature of the European Sites are detailed in Appendix D. A summary of the outcomes of the HRA screening is presented in Table 4-2, with the screening matrices included in Appendix A.

4.2.5. The location of the identified European Sites and search areas are shown on Figure 2-1 in Appendix B.

Table 4-1: European Sites identified for HRA Screening (Stage 1)

Site Name	Distance from the Proposed Scheme	Qualifying Interests	Interaction with Proposed Scheme
Denby Grange Colliery Ponds SAC	13km	Great Crested Newt, Annex II species	None – no impact pathways have been identified that could affect the sole qualifying interest (Great Crested Newt). This is due to: • the limited mobility of this species (which can move up to 1 km from breeding ponds, but typically less); • the presence of major barriers to movement of this species between the SAC and the Proposed Scheme (A-roads and motorways); and • the lack of conceivable hydrological links between the SAC and the Proposed Scheme.
South Pennine Moors SAC	Abuts Highways England land boundary* 0m	Qualifying interests include the Annex I habitats European dry heaths, blanket bogs, old sessile oak woods with *Ilex* and *Blechnum* in the British Isles, northern Atlantic wet heaths with *Erica tetralix* and transition mires and quaking bogs.	Small sections of the South Pennine Moors SAC fall within the highways land ownership boundary (north of junction 22)[26]. The Proposed Scheme would result in land take from within the SAC/SPA of up to a maximum of 0.23 ha. This habitat loss would take place within the existing highway boundary, with a proportion of the habitat loss being temporary in nature (land required to facilitate construction of the Proposed Scheme).
South Pennine Moors Phase 2 SPA	Abuts Highways England land boundary* 0m	Qualifying Interests include bird species merlin *Falco columbarius* and golden plover *Pluvialis apricaria* listed on Annex 1 and an assemblage of Annex 4.2 breeding bird species.	Small sections of the South Pennine Moors Phase 2 SPA fall within the highways land ownership boundary (north of junction 22)[27]. Presence of qualifying interests within or adjacent to the Proposed Scheme has not been confirmed in regard to either breeding or foraging. However, species such as twite *Linaria flavirostris* (Annex 4.2 assemblage species) are known to forage close to the M62. The Proposed Scheme is considered to have potential to impact certain Supplementary Advice on Conservation Objectives such as the ability to restore the extent, distribution and availability of suitable breeding habitat, and restrict and reduce the frequency, duration and/or intensity of disturbance to nesting and feeding qualifying interests. Further information and assessment on SPA qualifying features is provided in Sections 5 and 6, with reference to individual species accounts in Tables 5-1, 5-2 and 5-3.
Rochdale Canal SAC	The Proposed Scheme boundary crosses the Rochdale Canal SAC. However, the nearest location where works are proposed (minor changes to signage on an existing gantry) is located approximately 370 m east of the SAC.	This SAC contains important habitats for submerged aquatic plants and emergent vegetation. It is designated as a SAC due to the presence of the nationally scarce floating water-plantain *Luronium natans*, which is the sole qualifying interest.	The Proposed Scheme boundary crosses the Rochdale Canal SAC; however, the closest physical works will be limited to replacement of existing advance directional signage on an existing double span gantry situated 370 m east. The potential for operational air quality impacts and hydrological impacts (construction and operation) were considered during the HRA screening exercise; the potential for LSE was ruled out following assessment. No impact pathways have been identified that would lead to likely significant effects, either alone or in-combination with other plans or projects with respect to the qualifying interests of Rochdale Canal SAC.

[26] It should be noted that SAC/SPA mapping (designated in 1997/2004 respectively) will have been completed at a relatively coarse mapping resolution. It is considered a likely scenario that GIS inaccuracy may have contributed to overlaps between the SAC/SPA and the soft estate of the M62.
[27] It should be noted that SAC/SPA mapping (designated in 1997/2004 respectively) will have been completed at a relatively coarse mapping resolution. It is considered a likely scenario that GIS inaccuracy may have contributed to overlaps between the SAC/SPA and the soft estate of the M62.

4.3. Conclusions of the screening assessment

4.3.2. The following impacts were screened for the potential to lead to significant effects:

- Changes in air quality from atmospheric pollution associated with construction activities (South Pennine Moors SAC/South Pennine Moors Phase 2 SPA);
- Changes in air quality from atmospheric pollution associated with increased traffic (all three sites for which impact pathways were identified)
- Changes in water quality (all three sites for which impact pathways were identified);
- Changes in hydrological conditions (South Pennine Moors SAC/South Pennine Moors Phase 2 SPA);
- Increase in disturbance levels associated with construction activities, and the use of potential signed/unsigned diversion routes that traverse the SAC/SPA (South Pennine Moors Phase 2 SPA);
- Increase in disturbance levels associated with operation (South Pennine Moors Phase 2 SPA); and
- Habitat loss/land take during construction (South Pennine Moors SAC/South Pennine Moors Phase 2 SPA).

4.3.3. These were identified through consideration of the potential impact pathways of the Proposed Scheme and the conservation objectives and vulnerabilities of the sites identified, using the professional judgment of experienced and qualified ecologists and in consultation with Natural England (see Section 7 for a summary of consultation undertaken).

4.3.4. A summary of the conclusions of Stage 1: Screening Assessment (as fully detailed in the HRA Screening Report for the Proposed Scheme) is given in Table 4-2 which indicates where LSEs have been identified and taken forward to Stage 2: Appropriate Assessment. Rochdale Canal SAC was screened out of the assessment with respect to all impacts and features.

4.3.5. With respect to South Pennine Moors SAC, LSE have been identified in relation to habitat loss of Annex I qualifying interest habitats (blanket bogs and transition mires and quaking bogs).

4.3.6. With respect to South Pennine Moors (Phase 2) SPA, LSEs have been identified with regards to habitat loss and disturbance during construction to both the qualifying features (merlin and golden plover) that are listed on Annex I qualify under Article 4.1 of the EC Directive by supporting nationally important populations and assemblage species that qualify under Article 4.2 (migratory birds of moorland and moorland fringe habitats).

Table 4-2: Outcomes of Stage 1: Screening Assessment

European Site	Qualifying Feature[28]	Construction				Operation		
		Changes in air quality	Changes in water quality	Disturbance to bird features	Habitat loss	Changes in air quality	Changes in hydrological conditions	Disturbance to bird features
Rochdale Canal SAC	Annex II species: Floating water-plantain *Luronium natans*	×	×	N/A	N/A	×	N/A	N/A
South Pennine Moors SAC	Annex I habitat: European dry heaths	×	×	N/A	×	×	×	N/A
	Annex I habitat: Blanket bogs	×	×	N/A	✓	×	×	N/A
	Annex I habitat: Old sessile oak woods with Ilex and *Blechnum* in the British Isles	×	×	N/A	×	×	×	N/A
	Annex I habitat present as a qualifying feature, but not a primary reason for site selection: Northern Atlantic wet heaths with *Erica tetralix*	×	×	N/A	×	×	×	N/A
	Annex I habitat present as a qualifying feature, but not a primary reason for site selection: *Transition mires and quaking bogs*	×	×	N/A	✓	×	×	N/A
South Pennine Moors Phase 2 SPA	Article 4.1 qualifying feature: merlin *Falco columbarius*	×	×	✓	✓	×	×	×
	Article 4.1 qualifying feature: golden plover *Pluvialis apricaria*	×	×	✓	✓	×	×	×
	Article 4.2 assemblage: lapwing *Vanellus vanellus*	×	×	✓	✓	×	×	×
	Article 4.2 assemblage: lapwing *Vanellus vanellus*	×	×	✓	✓	×	×	×
	Article 4.2 assemblage: dunlin *Calidris alpima*	×	×	✓	✓	×	×	×
	Article 4.2 assemblage: snipe *Gallinago gallinago*	×	×	✓	✓	×	×	×
	Article 4.2 assemblage: curlew *Numenius arquata*	×	×	✓	✓	×	×	×
	Article 4.2 assemblage: redshank *Tringa totanus*	×	×	✓	✓	×	×	×
	Article 4.2 assemblage: common sandpiper *Actitis hypoleucos*	×	×	✓	✓	×	×	×
	Article 4.2 assemblage: short-eared owl *Asio flammeus*	×	×	✓	✓	×	×	×
	Article 4.2 assemblage: whinchat *Saxicola rubetra*	×	×	✓	✓	×	×	×
	Article 4.2 assemblage: wheatear *Oenanthe oenanthe*	×	×	✓	✓	×	×	×
	Article 4.2 assemblage: ring ouzel *Turdus torquatus*	×	×	✓	✓	×	×	×
	Article 4.2 assemblage: twite *Carduelis flavirostris*	×	×	✓	✓	×	×	×

x = no LSE; ✓ = LSE cannot be ruled out; N/A = no pathway

[28] Peregrine receives an entry in the 2016 SPA review (Stroud et al., 2016) – it is detailed as 'not yet classified' with no population given. This species is therefore not detailed further in this SIAA.

5. Potential Impacts

5.1. Introduction

5.1.2. This section describes the impacts on site integrity for the South Pennine Moors SAC and South Pennine Moors Phase 2 SPA, following consideration of embedded measures as described in Section 3. This refers to the blanket bog, and transition mires and quaking bogs qualifying interests of South Pennine Moors. Other qualifying interests of the SAC are not present within 200m of the Proposed Scheme. All qualifying interest and assemblage features of the South Pennine Moors Phase 2 SPA are considered. The section describes whether the European sites are considered to be subject to AESI following application of embedded measures but excluding additional mitigation measures.

5.2. South Pennine Moors SAC

Habitat loss

5.2.2. The Proposed Scheme will require minor land-take from within the boundary of the South Pennine Moors SAC where the boundary overlaps with the Highways England operational land boundary. The maximum potential land-take predicted is 0.23 ha (Note this is based on standardised worst-case footprint assumptions for construction and are anticipated to reduce during the detailed design process). In the absence of detailed design/ additional mitigation measures, this would comprise up to 0.2 ha of semi-improved neutral grassland (considered to constitute Site Fabric) and 0.03 ha of modified dry bog. Whilst these habitats are not confirmed as qualifying interests of the SAC, there is considered to be potential for them to occur (the modified dry bog could be considered to represent the Annex I blanket bog habitat).

5.2.3. This 0.23ha includes both temporary land-take during construction and permanent land-take associated with installation of infrastructure for the Proposed Scheme. Permanent land-take would be less than the total land-take required during construction. In the absence of detailed design proposals, which would be generated by the Delivery Partner once commissioned, it is not possible at this time/stage of design to provide accurate figures for permanent land-take relative to temporary land-take. As such, the precautionary principle has been followed and all land take is assumed to lead to permanent habitat loss.

5.2.4. Taking a highly precautionary approach and assuming that all identified land-take would be permanent, habitat loss would equate to approximately 0.0003% by area of the SAC. The Natura 2000 datasheet for the SAC identifies that the SAC includes approximately 27,440 ha of blanket bog habitat. The small extent of bog habitats identified within the Proposed Scheme footprint (up to 0.03 ha) would represent approximately 0.0001% of this habitat type within the SAC.

5.2.5. It is considered, that the scale of potential habitat loss from the SAC is highly unlikely to affect the integrity of the European site. Mitigation measures are presented in Section 6, notwithstanding that the impacts are considered to be of a de minimis nature.

5.3. South Pennine Moors Phase 2 SPA

Increase in disturbance levels associated with construction activities

Overview

5.3.2. The M62 sits within/immediately adjacent to the SPA for approximately 9.4 km between most of junctions 21 and 23. Within this section of road there are embankments and/or the Proposed Scheme is in cuttings adjacent to both the eastbound and westbound carriageways that will largely eradicate visual disturbance and significantly reduce noise disturbance impacts in these areas. From junction 21 to 22, the eastbound carriageway is flanked by a cutting for its entire length. The westbound carriageway is flanked by an embankment from approximately chainage 20+550 to junction 22; the remaining extent of westbound carriageway does not sit immediately adjacent to

the European site (the SPA south of the M62 extends to approximately chainage 20+900; see Figure 2-2 in Appendix B).

5.3.3. When considering the above vertical alignment features of the M62 between junctions 21 and 23, the total length of the M62 within/immediately adjacent to the SPA that would be subject to the greatest overall disturbance (including maximum visual disturbance, due to the topography described above) will be c.3.75 km (Figure 2-1, Appendix B).

Birds response to disturbance

5.3.4. A disturbance event can be considered likely to lead to birds taking flight (either returning to the same area or departing entirely), or to cease feeding or roosting. A single instance of taking flight or ceasing to feed does not have an immediate effect on the survival or productivity of an individual bird. Repeated disturbance, or disturbance over an extended period, can affect the survival and productivity of a bird. There is therefore considered the potential for disturbance in the South Pennine Moors to result in nest abandonment and ultimately displacement of SPA features within a defined source of disturbance.

5.3.5. Response to sound can be affected by many factors, both acoustic and non-acoustic. The significance of its impact, for example, can depend on such factors as the margin by which a sound exceeds the background sound level, its absolute level, time of day and change in the acoustic environment. Various research articles and theses have been published regarding the effects of noise (and other sources of disturbance) on birds, as referred to within this SIAA.

5.3.6. Visual or human disturbance is caused by the mere presence of humans (or associated activity) in the environment. Therefore, visual disturbance can also redirect time and energy from reproduction and foraging. One or two metrics are recorded: alert distance (AD), the distance between the disturbance source and the animal at the point where the animal changes its behaviour in response to the approaching disturbance source (specifically, in birds, when the head is raised in an alert posture and/or flight initiation distance (FID), the point at which the bird flushes or otherwise moves away from the approaching disturbance source. Key factors that have the potential to affect the scale of visual disturbance in an open landscape such as the where the Proposed Scheme is situated includes:

- The scale of the visual disturbance - birds may react to a greater extent to a grouped source such as multiple construction workers;
- Reaction distances may be less in birds which are less capable of withstanding the effects of disturbance (e.g. those more stressed by low food availability or poor body condition. Birds on their breeding grounds are less likely to be subject to low food availability than on migration / when over wintering;
- The availability of alternative habitat may affect tolerance of disturbance and hence both AD and FID. With respect to the Proposed Scheme, nesting birds are considerably more constrained than foraging birds. Foraging birds therefore are considerably less sensitive to both visual and noise disturbance.
- Direct approaches are considered to have a greater impact on bird behaviour. Such direct approaches to a nesting bird species are considered unlikely to occur as a result of the Proposed Scheme.

5.3.7. The following sections follow the step-wise process outlined in Section 2 to determine the potential for adverse effects from noise or visual disturbance from the Proposed Scheme.

Step 1 - Sensitivity of SPA features to noise and visual disturbance

5.3.8. Table 5-1 presents a summary of evidence available for all qualifying and assemblage features of South Pennine Moors (Phase 2) SPA.

5.3.9. A single species, merlin, is considered to be highly sensitive to both visual and noise disturbance. A suite of species, including all breeding waders (golden plover, lapwing, common sandpiper, redshank, dunlin and curlew) and short-eared owl, are considered moderately sensitive. The four breeding passerine species that are included on the SPA assemblage criterion (whinchat, wheatear, ring ouzel and twite) are considered to have low sensitivity to both visual and noise disturbance.

Table 5-1: Sensitivity of SPA bird features

SPA Qualifying feature	Sensitivity to Visual Disturbance	Sensitivity to Noise Disturbance	Summary of Sensitivity
Merlin	Empirical records of disturbance distances few and most observations refer to non-breeding birds which flushed at up to 125 m distance from an approaching human. However, studies of breeding merlin have recommended an upper limit of 300 - 500 m corresponded to the 200 - 400 m proposed by Currie & Elliott (1997) and the few recommended protective buffers (c. 400 m) in the USA. An upper limit (AD) distance of 400 m for breeding merlin is therefore considered appropriately conservative for the purposes of this SIAA with respect to visual disturbance.	Few species-specific information available although approaches applied to prevent any effects on breeding merlin include a standoff distance of 350m from construction activities[29]. While noise disturbance is expected to be reduced from visual disturbance distances on a precautionary basis for noise disturbance it is assumed to be similar.	Highly sensitive to both visual and noise disturbance with visual disturbance up to 400m. Particularly prone to nest desertion.
Golden plover	Considered to be reasonably tolerant of moderate level visual disturbance in the non-breeding season, birds that are closer than 200m to potential activities should be considered when commencing works, especially if it includes workers. Breeding period evidence: during the pre-incubation period, the birds were sensitive to the presence of people within about 200 m and flew more often. During incubation, golden plovers incubated for 96% of the time, but would have incubated for 98% of the time if they had not been disturbed[30]. Detailed work indicated that golden Plovers guarding chicks utilize heavily disturbed habitat at a lower rate than surrounding areas, but that such rates of avoidance are reduced when the movement of people is restricted to a surfaced footpath[31].	Golden Plover are moderately sensitive to noise stimuli but with little direct evidence, a precautionary approach assumes tolerance of noise up to 72dB being acceptable at the bird but with caution at levels above 55 dB (60dB in a highly disturbed area). A standoff distance of 150m recommended for construction activities[34]	Moderately sensitive to both noise and visual disturbance

[29] https://www.vikingenergy.co.uk/assets/files/sandwater-road/vol4/appendix-8.4-draft-bird-protection-plan.pdf

[30] P. E. Yalden, D.W. Yalden (1990). Recreational disturbances of breeding golden plovers *Pluvialis apricarius*, Biological Conservation, Volume 51, Issue 4, 1990, Pages 243-262.

[31] Pearce-Higgins, J.W. & Yalden, D.W. 1997. The effect of resurfacing the Pennine Way on recreational use of blanket bog in the Peak District National Park, England. Biol. Conserv. 82: 337–343

SPA Qualifying feature	Sensitivity to Visual Disturbance	Sensitivity to Noise Disturbance	Summary of Sensitivity
Lapwing	Non-breeding evidence: Lapwing are reasonably tolerant of moderate level visual disturbance stimuli. However, birds that are closer than 300m to planned activities should be considered when commencing works and efforts should be made to avoid high level disturbance at such time if possible, especially if it includes workers.	Non-breeding evidence: Lapwings are thought to be only moderately sensitive to noise stimuli but there is little evidence to support this, and so a standard 'precautionary' approach should be applied, with noise of up to 72dB acceptable at the bird but with caution given for noise levels in excess of 55dB (60dB in a highly disturbed area). Breeding lapwing know to decrease in density within 100m of roads as a response to traffic noise32 which concurs with recommended standoff distance from construction[33].	Moderately sensitive to both noise and visual disturbance
Dunlin	In the non-breeding season, dunlin is considered very tolerant of moderate and high level visual disturbance. Impacts of up to 75 m only are considered to lead to disturbance events. Breeding season evidence: Dunlin habitat utilization in disturbed areas showed a non-significant increase of approximately 50% following the provision of a surfaced footpath, in a manner similar to that observed for Golden Plover34.	Nonbreeding evidence: Dunlin are not particularly sensitive to noise stimuli and as such a noise level of 72dB measured at the bird is acceptable but with caution above 60dB. Dunlin will forage extremely closely to plant (75m from worker). Recommended standoff distance of 100m from construction[35].	Low-moderate sensitivity to both visual and noise disturbance
Snipe	No evidence in breeding season. Considered to be confiding in non-breeding season with flushing distance of less than 74 m[36]	No species-specific evidence available. Sensitivity likely to be similar to that of other small wader species such as dunlin.	Considered to be of low-moderate sensitivity to both visual and noise disturbance.
Curlew	Non-breeding evidence: Curlew are considered to be wary of moderate and high-level visual disturbance. Birds that are closer than 300m should be considered when commencing works and efforts should be	Non-breeding evidence: Curlew are moderately sensitive to noise stimuli but due to their wary nature the minimum approach distance can be expected to be no less than 100m. A standoff distance of 150m	Moderately sensitive to both noise and visual disturbance

[32] Reijnen, R, Foppen, R., and Meeuwsen, H. (1996). The Effects of traffic on the density of breeding birds in Dutch agricultural grasslands. Biological Conservation: 75: 255-260.
[33] https://www.vikingenergy.co.uk/assets/files/sandwater-road/vol4/appendix-8.4-draft-bird-protection-plan.pdf
[34] Pearce-Higgins, J.W, Finney, S.K., Yalden, D.W. and Langston, R.H.W. (2007). Testing the effects of recreational disturbance on two upland breeding waders. Ibis 149: 45-55
[35] https://www.vikingenergy.co.uk/assets/files/sandwater-road/vol4/appendix-8.4-draft-bird-protection-plan.pdf
[36] Scaton, F, (2018) Disturbance of non-breeding waders by pedestrians and boats in a Mediterranean lagoon. International Journal of Ornithology 65(2): 209-220.

SPA Qualifying feature	Sensitivity to Visual Disturbance	Sensitivity to Noise Disturbance	Summary of Sensitivity
	made to avoid high level disturbance at such a time if possible, especially if it includes workers. Breeding areas in the South Pennines associated with low potential disturbance37.	recommended for construction activities.	
Redshank	Non-breeding evidence: Redshank are very tolerant of moderate and even high-level visual disturbance stimuli. However, birds that are closer than 100m of works should be considered when commencing works.	Redshank are conversely particularly sensitive to noise stimuli, especially in conjunction with visual stimuli. standoff distance of 100m recommended for construction activities	Moderately sensitive to noise disturbance
Common sandpiper	Considered sensitive to disturbance during the breeding season with human presence considered to impact reproductive success[38]	No species-specific evidence available. Although ecological niche different, response to noise disturbance is likely to be similar to other small waders such as dunlin.	Considered to be of moderate sensitivity to both visual and noise disturbance.
Short-eared owl	Relatively few sources of information on the species sensitivity to disturbance. It was considered from expert opinion that there were a wide range of typical distances at which short-eared owls were disturbed by an approaching observer, from < 10 m to 300 – 500 m.	More recent information on this species is available in Senzkai et al (2016) who also suggest that traffic noise reduces foraging efficiency in wild owls[39]. The researchers estimated that effects of traffic noise on owls' ability to detect prey reach >120 m from a road. The article reported that owls localize and attack prey using prey-generated rustling sounds at frequencies spanning 6–8.5 kHz. The authors suggested, based on observations of 45 short-eared owls, that their ability to detect prey was negatively associated with sound pressure level of traffic noise. The owls' ability to detect prey was affected at 40 dBA and was approximately 17% lower than detections in ambient sound conditions at distances of up to 120 m. This research did not consider disturbance effects on short-eared owls engaging in breeding behaviours.	Moderately sensitive to noise disturbance

[37] Haworth, P.F., and Thompson, D.B.A. (1990) Factors associated with the breeding distribution of upland birds in the South Pennines, England. Journal of Applied Ecology 27: 52-577.

[38] Yalden, D.W. (1992). The influence of recreational disturbance on Common Sandpipers *Actitis hypoleucos* breeding by an upland reservoir. Biol. Conserv. 61: 41–50.

[39] Senzaki, M., et al, 2016, Traffic noise reduces foraging efficiency in wild owls, Scientific Reports, 6, 20602

SPA Qualifying feature	Sensitivity to Visual Disturbance	Sensitivity to Noise Disturbance	Summary of Sensitivity
Whinchat	No species-specific information available. However, reviews of other passerines species detail low sensitivity to visual disturbance with Alert Distance of less than 50m. Long distance migrant passerines, like Whinchat have been found to be the least affected to recreational disturbance[40] and the related wheatear has not been found to be sensitive to disturbance[41].	No species-specific information available. Most direct anthropogenic noise studies on birds have addressed the impact of road traffic noise, with song frequency shifts under noisy conditions a common finding[42]. However, reviews of other passerine species detail lower sensitivity to noise disturbance compared to other species.	Low sensitivity to visual and noise disturbance
Wheatear	No species-specific information available. However, reviews of other passerines species detail low sensitivity to visual disturbance with Alert Distance of less than 50m. Long distance migrant passerines, like Wheatear have been found to be the least affected to recreational disturbance which concurs with research on effects of disturbance on wheatear in the West Midlands[43],[44].	Most direct anthropogenic noise studies on birds have addressed the impact of road traffic noise, with song frequency shifts under noisy conditions a common finding[42]. However, reviews of other passerines species detail lower sensitivity to noise disturbance compared to other species. Standoff distance recommended of 20m during construction[45] which concurs with research on effects of disturbance on wheatear in the West Midlands[46].	Low sensitivity to visual and noise disturbance
Ring ouzel	No species-specific information available. However, reviews of other passerines species detail low sensitivity to visual disturbance with Alert Distance of less than 50m. Long distance migrant passerines, like Wheatear have been found to be the least affected to recreational disturbance	No species-specific information available. Most direct anthropogenic noise studies on birds have addressed the impact of road traffic noise, with song frequency shifts under noisy conditions a common finding[42]. However, reviews of other passerines species detail lower sensitivity to noise disturbance compared to other species.	Low sensitivity to visual and noise disturbance
Twite	No species-specific information available although current use of foraging habitat	No species-specific information available, although current use of foraging habitat	Low sensitivity to visual and noise disturbance

[40] Botsch, Y., Tablado, Z. and Jenni, L., (2017). Experimental evidence of human recreational disturbance effects on bird-territory establishment. Proc. R. Soc B 284.
[41] International Orienteering Federation. (2005). The effect of an orienteering event on breeding wheatear Oenanthe Oenanthe at Titterstone Clee, Shropshire, UK.
[42] Patricelli, J. & Blickley, G. (2006). Avian communication in urban noise: causes and consequences of vocal adjustment. The Auk 123, 639-649.
[43] International Orienteering Federation. (2005). The effect of an orienteering event on breeding wheatear Oenanthe Oenanthe at Titterstone Clee, Shropshire, UK.
[44] Botsch, Y., Tablado, Z. and Jenni, L., (2017). Experimental evidence of human recreational disturbance effects on bird-territory establishment. Proc. R. Soc B 284.
[45] https://www.vikingenergy.co.uk/assets/files/sandwater-road/vol4/appendix-8.4-draft-bird-protection-plan.pdf
[46] International Orienteering Federation. (2005). The effect of an orienteering event on breeding wheatear Oenanthe Oenanthe at Titterstone Clee, Shropshire, UK.

SPA Qualifying feature	Sensitivity to Visual Disturbance	Sensitivity to Noise Disturbance	Summary of Sensitivity
	adjacent to the M62 strongly suggests tolerance to disturbance. However, reviews of other passerines species detail low sensitivity to visual disturbance with Alert Distance of less than 50m.	adjacent to the M62 strongly suggests tolerance to disturbance. Most direct anthropogenic noise studies on birds have addressed the impact of road traffic noise, with song frequency shifts under noisy conditions a common finding[42]. However, reviews of other passerines species detail lower sensitivity to noise disturbance compared to other species.	

Step 2 - Habitat preferences of SPA bird features

5.3.10. Table 5-2 presents the preferred nesting habitat and the known distribution of South Pennine Moors (Phase 2) SPA features. These habitat preferences are applied in Step 3 in a comparison with habitat data collected for the Proposed Scheme.

5.3.11. Several species, namely golden plover, curlew, dunlin and redshank strongly favour the higher plateau areas of the SPA of over 430m elevation. Common sandpiper has a discrete habitat specialism in that it is restricted to large reservoir complexes within the SPA. Merlin, the SPA feature identified as being highly sensitive to disturbance in Step 1, favours steep areas of moor and heath associated with heather.

5.3.12. There is relatively limited information on the distribution of the four assemblage passerine species with whinchat and ring ouzel in particular being scarce across the SPA. Twite is however comparatively well studied through a Recovery Project undertaken by a partnership between the RSPB and Natural England. Twite are known to nest within c300m of the M62 in moorland vegetation (especially bracken litter and heather) but do almost all of their feeding in grassland off the moor, usually within 2.5km of the nest. These grasslands are usually hay meadows on the nearby farmland, but they also feed on road verges. As part of the Recovery Project there are three twite feeding stations, which are very small areas where Niger seed is put out by volunteers in order to catch and ring Twite. Only one is in the vicinity of the M62, in Derby Delph Quarry.

Table 5-2: Preferred nesting habitat and known distribution of South Pennine Moors (Phase 2) SPA features

Species	Preferred nesting habitat	Distribution with South Pennines Moors (Phase 2) SPA
Merlin	Moor and heath	Prefers steep areas with *Calluna vulgaris* and *Pteridium*
Golden plover	Open ground among heather and grass	Associated with the high plateau (>430m). Golden plover use the blanket bog habitat within the SPA and are more common on the higher, flatter and more remote bogs with a mosaic of short and dense vegetation, with the area around Oxenhope Moor maintaining high breeding densities.
Lapwing	Short grassland	Lapwing predominantly use the moorland fringe with shorter vegetation.
Dunlin	Moor	Associated with the high plateau (>430m). The central block of the SPA meanwhile supports the core breeding area for Dunlin.
Snipe	Wet areas with tussocky vegetation	Snipe use the eastern side of the central block, predominantly Pickles rough and Warley Moor.
Curlew	Tussock on rough pasture or in tall vegetation of an unimproved hay crop.	Associated with the high plateau (>430m). Curlew are present throughout the SPA, with Oxenhope Moor and Heptonstall Moor supporting highest densities during the bird breeding season.
Redshank	Wet grassland with shallow surface water or damp soil	Associated with the high plateau (>430m). Redshank can be found in the damp moorland fringe habitat.
Common sandpiper	Along fast rivers and by lakes	Predominantly using dense vegetation in close proximity to the major reservoir complexes in the SPA.
Short-eared owl	Heather and tall rushes	Avoids blanket bog, prefers grass and sedge dominated margins of reservoirs, moorland with short vegetation. Short-eared owl use the long heather and tall rushes on open moorland to provide cover for their nests, predominantly in the central belt of the South Pennine Moors and regularly observed on Wadsworth Moor.
Ring ouzel	Open moorland	Strong affinity with *Calluna vulgaris* and *Pteridium aquilinum* dominated areas. Ring ouzel are scarce across the SPA and it is therefore difficult to determine local use across the site.
Wheatear	Open country	N/A
Whinchat	Open grassland, meadow	Whinchat are scarce across the SPA and it is therefore difficult to determine local use across the site.
Twite	Moorland edges, under bracken or tall heather	Strong affinity with *Calluna vulgaris* and *Pteridium aquilinum* dominated areas. Twite predominantly use the southern block of the SPA, with the core breeding area being north of the M62 on the edges of Soyland and Rishworth Moor.

Step 3 - Habitats present at the Proposed Scheme

5.3.13. The M62 sits within/immediately adjacent to the SPA for approximately 9.4 km between junctions 21 and 23. At this point, the Proposed Scheme lies at an elevation of 300 – 340m. As reported in Chapter 6 of the PCF Stage 3 Environmental Assessment Report, due to the localised and largely temporary nature of the construction disturbance associated with the Proposed Scheme, field surveys have focused upon those areas necessary to assess the impacts such as habitat fragmentation or to identify mitigation requirements. All habitat surveys were undertaken outside of the highway boundary. Access was the only limitation to the habitat survey with approximately 35% of the route not surveyed. This limitation has been reduced through the use of remote sensing survey techniques and so combining a range of datasets and specialist GIS tools to determine the habitats present.

5.3.14. Long sward semi-improved neutral grassland was the most common habitat type recorded within the highway boundary and wider study area and is abundant throughout. Lowland fen is located in a number of areas predominantly between Junction 21 and 22. Bog habitat occurs along the South Pennine Moors Phase 2 SPA/South Pennine Moors SAC at Junction 22. The habitat within proximity of the area of greatest overall disturbance (3.75 km) therefore comprises mainly a mosaic of bog/degraded bog, with tracts of semi-improved grassland flanking the M62.

5.3.15. Booth Wood Reservoir borders the eastern boundary of the SPA immediately north of the Proposed Scheme.

5.3.16. When cross-referencing with known nesting habitat preferences and distribution information within the SPA, it is considered that the following features will not be present adjacent to the Proposed Scheme:

- Merlin – favours steep areas on moorland that are not present. This species sensitivity to disturbance also means that it is unlikely to nest in close proximity to the M62 and not considered sensitive when foraging;
- Dunlin – restricted to nesting / foraging on high plateau areas in the central belt of the SPA on open moor; and
- Ring Ouzel – found in open moorland.

5.3.17. It is concluded that there is no adverse effect on Site Integrity in relation to these three species, due to the lack of potential for disturbance on these three SPA features. Furthermore, several other species are considered unlikely to be present due to them favouring higher areas of the SPA – golden plover, short-eared owl, curlew and redshank. These species are not restricted to open moor habitat however, so are considered further in Step 4 alongside lapwing, common sandpiper, whinchat, wheatear and twite.

Step 4 – Assessment of potential adverse effects

5.3.18. Nine SPA features are considered for further assessment: golden plover, lapwing, snipe, curlew, common sandpiper, short-eared owl, whinchat, wheatear and twite. Table 5-3 provides a summary of the cited populations of each feature of the SPA alongside the most recent population estimates made in 2014[47].

5.3.19. For completeness, Table 5-3 also includes information on the three species ruled out of further assessment in Step 3 (merlin, dunlin and ring ouzel).

5.3.20. All features of the SPA are present in low densities, with the most abundant being curlew at 456 pairs as recorded in the 2014 survey. The 2014 survey undertaken for Natural England also found no relevant breeding bird features in the area of Linsgreave Clough immediately south of Junction 22.

[47] Keystone Ecology. (2014) South Pennine Moors SSSI/SPA Phase 2. Breeding Bird Surveys 2014. Unpublished report to Natural England.

Table 5-3: Breeding populations for SPA qualifying features

Species	Status	Population at time of classification	2001 SPA Review[48]	2016 Review[49]	2014 survey[50]
Merlin	Article 4.1 Qualifier	28 pairs; 4.3% British breeding population	77 pairs; 5.9% of the British breeding population	45 pairs; 4.1% of the British breeding population	13
Golden plover	Article 4.1 Qualifier	292 pairs; 1.2% of the British breeding population	752 pairs; 3.3% of the British breeding population	1,289 pairs; 2.6% of the British breeding population	259
Lapwing	Article 4.2 Qualifier	N/A	N/A	N/A	133
Dunlin	Article 4.2 Qualifier	N/A	140 pairs; 1.3% of the breeding Baltic/UK/Ireland population	140 pairs; 1.6% of the British breeding population	46
Snipe	Article 4.2 Qualifier	N/A	N/A	N/A	106
Curlew	Article 4.2 Qualifier	N/A	N/A	N/A	456
Redshank	Article 4.2 Qualifier	N/A	N/A	N/A	12
Common sandpiper	Article 4.2 Qualifier	N/A	N/A	N/A	N/A
Short-eared owl	Article 4.2 Qualifier	N/A	25 pairs; 2.5% of the British breeding population	25 pairs; 4.1% of the British breeding population	10
Ring ouzel	Article 4.2 Qualifier	N/A	N/A	N/A	2
Wheatear	Article 4.2 Qualifier	N/A	N/A	N/A	20
Whinchat	Article 4.2 Qualifier	N/A	N/A	N/A	9
Twite	Article 4.2 Qualifier	N/A	N/A	N/A	34

5.3.21. Noise impacts from construction activities have been modelled and are illustrated within Figure 6-1 in Appendix B. Predicted maximum noise levels at 100m are 62 dB LAeq.8h. Beyond 100m, noise levels drop to at or below levels at which they are likely to lead to disturbance of any SPA qualifying features. This is further discussed in the sections below.

5.3.22. Visual disturbance during construction may derive from vegetation clearance activities and construction vehicles, plant, personnel and activities. Whilst these construction activities will all be apparent, visibility will be intermittent and limited through the long sections of deep cutting over open habitat east of Junction 22. In addition, whilst construction activity and plant will be more noticeable through the open habitat section (through the SPA between Rakewood viaduct and Junction 22), traffic and existing infrastructure is already highly visible on open sections of embankment. As a result, the proposed works, which will include temporary traffic management, heavy plant within the existing hard shoulder and localised vegetation clearance, will constitute

[48] Stroud, DA, Chambers, D, Cook, S, Buxton, N, Fraser, B, Clement, P, Lewis, P, McLean, I, Baker, H & Whitehead, S (eds). 2001. The UK SPA network: its scope and content. JNCC, Peterborough. Represents populations from South Pennine Moors (Phases 1 & 2) comprises the legal entity of Peak District Moors (South Pennine Moors Phase 1) and South Pennine Moors Phase 2.

[49] Stroud, D.A., Bainbridge, I.P., Maddock, A., Anthony, S., Baker, H., Buxton, N., Chambers, D., Enlander, I., Hearn, R.D., Jennings, K.R., Mavor, R., Whitehead, S. & Wilson, J.D., on behalf of the UK SPA & Ramsar Scientific Working Group. The status of UK SPAs in the 2000s: The Third Network Review. JNCC, Peterborough. Inc Represents populations from South Pennine Moors (Phases 1 & 2) comprises the legal entity of Peak District Moors (South Pennine Moors Phase 1) and South Pennine Moors Phase 2.

[50] Keystone Ecology. (2014) South Pennine Moors SSSI/SPA Phase 2. Breeding Bird Surveys 2014.

only a change to the perception of the motorway through the open moorland. The Proposed Scheme will be contained within the existing highway boundary with minimal vegetation loss.

Golden plover

5.3.23. Golden plover is considered to be moderately sensitive to both noise and visual disturbance. It occurs in relatively large numbers within the SPA, with 259 birds recorded in the 2014 survey. It is however associated with the high plateau of the SPA away from the Proposed Scheme. Indeed, the 2014 survey undertaken for Natural England found that golden plover were nesting away from the M62 on these higher areas.

5.3.24. Therefore, it is concluded that nesting golden plover will not be affected by the Proposed Scheme from either visual or noise disturbance due to their clear preferences for habitats that do not occur within 400m of the Proposed Scheme. In any case, their moderate sensitivity to disturbance would ordinarily preclude them from nesting close to the M62. Habitats adjacent to the Proposed Scheme do provide potential for foraging habitat for this species; however, the distance to their breeding areas and their reduced sensitivity compared to nesting individuals would preclude any impact on this species should they be present. No adverse effects on site integrity are predicted for golden plover.

Lapwing

5.3.25. Lapwing is considered to be moderately sensitive to both noise and visual disturbance. Lapwing utilise short grassland within which to nest so there is potential for the species to be present adjacent to the Proposed Scheme. Lapwing is however present in low densities with just 133 pairs present across the SPA in 2014 and no individuals of this species were recorded adjacent to Junction 22 in 2014.

5.3.26. Lapwings are known to reduce in density within 100m of existing roads. There is therefore little prospect of the species being present within any area of the SPA likely to be impacted by noise from the Proposed Scheme. Indeed, the 2014 survey of the SPA did not find this species adjacent to Junction 22. No adverse effects on site integrity are predicted for lapwing.

Snipe

5.3.27. Snipe is considered to be low-moderate sensitivity to both noise and visual disturbance. Snipe favours wet areas with tussocky vegetation within which to breed – such habitat has not been identified to be present within the vicinity of the Proposed Scheme. In 2014, snipe was found to occur in the eastern side of the central block of the SPA on Pickled Rough and Warley Moor. These areas are over 15km north of the M62. Snipe is present in low density in the SPA, with 106 pairs recorded.

5.3.28. Considering the lack of potential breeding habitat, the known distribution of the species a considerable distance from the Proposed Scheme and the lack of records adjacent to Junction 22 in 2014, it is considered that snipe is highly likely to be absent from the vicinity of the Proposed Scheme. Considering the species limited flushing distance of up to 7m, snipe is also very unlikely to be affected by either noise or visual disturbance from the Proposed Scheme even if present in adjacent habitats. No adverse effects on site integrity are predicted for snipe.

Curlew

5.3.29. Curlew is considered to be of moderate sensitivity to noise and visual disturbance. Whilst noted as being widespread in the SPA (and the most abundant in relevant terms with 456 pairs in 2014), they are concentrated on high plateau areas of over 430m away from the Proposed Scheme. Indeed, 2014 surveys carried out for Natural England noted that all curlew were found distant from the M62 within the SPA.

5.3.30. Curlew are considered to be absent as a breeding bird from any habitat that is subject to noise or visual disturbance from the Proposed Scheme. Whilst foraging curlew do have the potential to be present in this area due to suitability of grassland habitat, curlew is substantially less sensitive to disturbance compared to breeding birds and there is a vast extent of alternative foraging habitat present elsewhere in the SPA. It is again noted that the 2014 surveys carried out from Natural England did not record curlew adjacent to junction 22 either breeding or foraging. No adverse effects on site integrity are predicted for curlew.

Redshank

5.3.31. Redshank are considered to be moderately sensitive to noise disturbance while conversely tolerant of visual disturbance. Redshank are rare in the SPA, with only 12 pairs recorded in 2014. Redshank favour nesting habitat involving wet grassland generally on the high plateau above 430m.

5.3.32. Redshank are therefore considered to be absent as a breeding bird from any habitat potentially exposed to noise disturbance from the Proposed Scheme, as confirmed by the 2014 surveys at Junction 22 undertaken for Natural England. Redshank forage in wetland habitat away from breeding areas, which again is absent from the areas surrounding the Proposed Scheme. No adverse effects on site integrity are predicted for redshank.

Common sandpiper

5.3.33. Common sandpipers are considered to be moderately sensitive to noise and visual disturbance. Whilst no population information is available for this species in the SPA, they are known to be largely restricted to reservoir complexes. The only relevant habitat that occurs in the SPA that is in proximity to the Proposed Scheme is Booth Wood Reservoir. Only a portion of the reservoir lies within the SPA and is bordered on its entire length by the M62 to the south and the A672 to the north. The Proposed Scheme would not add to any baseline level of disturbance at the reservoir in any meaningful fashion. No adverse effects on site integrity are predicted for common sandpiper.

Short-eared owl

5.3.34. Short-eared owl is considered to be of moderate sensitivity to visual and noise disturbance and favours heather and tall rushes within moorland for which to nest. The semi-improved grassland that takes the form of the bulk of habitat adjacent to the Proposed Scheme is not considered suitable to support the species. Short-eared owls are sparsely distributed within the SPA, with just 10 pairs recorded in 2014. The species was not recorded in habitat adjacent to Junction 22.

5.3.35. Whilst foraging short-eared owl do have the potential to be present in this area due to suitability of grassland habitat and traffic noise is known to have the potential to impact foraging efficiency, the species is considered to be substantially less sensitive to disturbance compared to breeding birds and there is a vast extent of alternative foraging habitat present elsewhere in the SPA. No adverse effects on site integrity are predicted for short-eared owl.

Wheatear

5.3.36. As with all passerine species, wheatear is considered to be of low sensitivity to noise and visual disturbance. Although the species lack of sensitivity to disturbance, this does not necessarily preclude them being present adjacent to the M62 (during construction across an assumed two breeding seasons from 2020 to 2021). 20 pairs of this species were estimated to occur in 2014 in the SPA with none for example close to Junction 22. Whilst based on habitat preferences, there is some potential for wheatear to be present in habitat adjacent to the Proposed Scheme the species is tolerant to disturbance. Only 20 pairs of this species occurred in the SPA as a whole in 2014 and with the majority or all of these found in more optimal habitat away from the M62. Therefore, there is considered to be no adverse effects on site integrity for wheatear.

Whinchat

5.3.37. As with all passerine species, whinchat is considered to be of low sensitivity to noise and visual disturbance. Whilst the species lack of sensitivity to disturbance does not necessarily preclude them being present adjacent to the M62 (during construction across an assumed two breeding seasons from 2019 to 2021), 9 pairs of this species were estimated to occur in 2014 in the SPA, with none close to Junction 22. As with the related species wheatear, whinchat is tolerant to disturbance and with no individuals of this species found in habitat adjacent to Junction 22 in 2014 Only 9 pairs of this species occurred in the SPA as a whole in 2014 and with the majority or all of these found in more optimal habitat away from the M62. Therefore, there is considered to be no adverse effects on site integrity for wheatear.

Twite

5.3.38. As with all passerine species considered, twite is considered to be of low sensitivity to noise and visual disturbance. Whilst the species lack of sensitivity to disturbance does not necessarily preclude them being present adjacent to the M62 (during construction across an assumed two

breeding seasons from 2020 to 2021), Indeed, there is specific management of sections of the M62 soft estate for the benefit of foraging twite between approximately ch19+350 and ch20+950. These management sections are outside the boundary of the SPA.

5.3.39. Twite nest in moorland vegetation (especially bracken litter and heather), but do almost all of their feeding in grassland off the moor, usually within 2.5km of the nest[51]. These grasslands are usually hay meadows on the nearby farmland, but they also feed on road verges. As twite already nest within c300m of the M62, they are not considered to be affected if works are undertaken adjacent to nest sites. On this basis, there are no adverse effects on site integrity for twite.

Summary

5.3.40. Steps 1- 4 have concluded that there are no adverse effects on site integrity on any Article 4.1 qualifying or Article 4.2 assemblage features of South Pennine Moors (Phase 2) SPA from visual or noise disturbance from the Proposed Scheme.

5.3.41. Natural England and RSPB have been consulted on this assessment and both parties are in agreement with conclusions reached. Further details of consultation undertaken with respect to the Proposed Scheme are summarised in Section 7 and presented in Appendix C.

Use of diversion routes

5.3.42. Construction of the Proposed Scheme will require motorway closures at the weekend or at night for the removal of existing gantries and the erection of the new superspan or cantilever gantries, requiring the diversion of motorway traffic onto local roads. Total motorway closures (both carriageways) would however only be required for the removal and/or installation of the superstructure of superspan portal gantries. All other installation or demolition processes would be undertaken under local carriageway closures. In discussion with Operations Directorate and Core Responders during the preparation of the Traffic Management Plan, it was confirmed that no suitable new diversion routes could be identified given the constraints of:

- Putting in the order of 5,237 vehicles, of which over 50% are HGVs along these routes, an average of approximately 873 vehicles per hour (6 hour traffic management closure flow). See text and Table 5-4 below on the estimation of potential diverted traffic on link by link basis;
- Topography and local road geography;
- Road standard, safety and access constraints; and
- 'Political/operational concerns' in relation to local residents and authorities along the corridor.

5.3.43. It should be noted that the actual number of vehicles diverted cannot be accurately predicted. However, based on a review of traffic data from Webtris observed data for 2018 (supplied by Atkins and reviewed by Arup, the traffic modelling suppliers for the project), Table 5-4 presents a summary (on a link by link basis) of potential total flows for the period 2300-0500 to represent a full overnight closure to allow the installation and/or removal of portal gantry superstructure. These are in line with durations supported by WSP's deliverability advice from Costain. It should be acknowledged that with advance notification and other strategies to forewarn road users, lower night time flows are likely to be realised, albeit any reductions cannot be quantified.

Table 5-4: Potential Total Traffic Flows in a time period between 2300-0500 (Light – cars vans / Heavies – Heavy goods Vehicles

Link	Eastbound			Westbound			Total Flow		
	Light	Heavies	Total	Light	Heavies	Total	Light	Heavies	Total
J21 - J22	1753	1086	2839	1440	916	2356	3193	2002	5195
J22 - J23	1721	1102	2823	1468	1053	2521	3189	2155	5344
J23 - J24	1683	967	2650	1613	908	2521	3296	1875	5171

[51] RSPB. (2010). Breeding twite survey in the South Pennines - additional sites.

5.3.44. An estimate of the number of motorway closures for each Emergency Diversion Route that passes through the SPA is presented in Appendix E. In summary, this suggests that a total of 86 closures requiring diversion routes through the SPA could be required. It is considered that use of the signed/unsigned diversion routes that traverse the SPA (refer to Figure 2-3, Appendix B) during the bird breeding season would have the potential for disturbance of SPA qualifying interest species.

5.3.45. Whilst the location of the SPA is situated between Junction 21 and 22, due to the lack of suitable diversion route and the operational layout of Junction 23, which is a restricted movement junction, it is anticipated that any closure of the motorway will necessitate the need to utilise existing diversion which spans between Junction 21 and 24. This is to ensure the diverted traffic is moved to routes that are both suitable and safe.

5.3.46. The length of each relevant signed/unsigned diversion route that traverse the SPA (refer to Figure 2-3, Appendix B) and the area of potential disturbance is shown in Table 5-5.

Table 5-5: Signed/unsigned diversion route length and potential area of disturbance

Signed/Unsigned Diversion Route	Length within SPA (m)	Potential area of disturbance (400m beyond the diversion route within the SPA) (hectares)
Area 10 - Routecard F1 - non-HGV (A6193; A664; A58; B6138) (approved signed/emergency diversion route)	3,691	356
Area 10 - Routecard F4 - non-HGV (A6193; A664; A58; A646; A629) (approved signed/emergency diversion route)	2,788	258
Area 10 - Routecard F4 - HGV (A6193; A664; A58) (approved signed/emergency diversion routes)	2,788	258
Un-signed Route A672 - J21 to J24 (A640, A672, A58, A646, A629)	5,953	489
Un-signed Route A640 - J21 to J24 (A640, A643, Kew Hill Rd, Lindley Rd)	5,815	493
Un-signed Route A62 – J21 to J24 (A640, A6052, A62, A629)	930	227

5.3.47. Use of the signed/unsigned diversion routes during the bird breeding season has the potential to lead to disturbance of SPA qualifying features, given the substantive increase in nocturnal traffic volumes across the SPA that could occur relative to baseline conditions. While all features for which the SPA is designated are present in low numbers and sparsely distributed across the SPA, no information is available to quantify their density or occurrence with respect to the diversion routes. The diversion routes involve routes that have significantly reduced traffic when compared with the M62. Therefore, the potential for highly and moderately sensitive species nesting in close proximity to roadsides cannot be ruled out.

5.3.48. In the absence of certainty as to the precise distribution of qualifying and assemblage features, there is the objective possibility of harm on SPA qualifying and assemblage features. As such, AESI cannot be discounted with any use of signed/unsigned diversion routes during the bird breeding season which encompasses the period of March through to August.

Habitat loss

5.3.49. The Proposed Scheme will require minor land-take from within the boundary of the South Pennine Moors (Phase 2) SPA where the boundary overlaps with the Highways England operational land boundary. The maximum potential land-take predicted is 0.23 ha (note this is based on

standardised worst-case footprint assumptions for construction and are anticipated to reduce during the detailed design process). This is predicted to comprise up to 0.2 ha of semi-improved neutral grassland (considered to constitute 'Site Fabric') and 0.03 ha of modified dry bog.

5.3.50. This 0.23ha includes both temporary land-take during construction and permanent land-take associated with installation of infrastructure for the Proposed Scheme. Permanent land-take would be less than the total land-take required during construction. In the absence of detailed design proposals, which would be generated by the Delivery Partner once commissioned, it is not possible at this time/stage of design to provide accurate figures for permanent land-take relative to temporary land-take. As such, the precautionary principle has been followed and all land take is assumed to have potential to lead to permanent habitat loss.

5.3.51. In reality, any permanent habitat loss would likely be less than this (as described in paragraphs 5.2.2. and 5.2.3 above), and some habitat loss may be avoided altogether via the detailed design process. The level of loss is considered negligible in the context of the functioning of the qualifying interest features of the SPA and as such would be indistinguishable from baseline conditions.

5.3.52. As detailed in the assessment of disturbance effects above, there is considered be no potential for the majority of SPA qualifying or assemblage features to be present at or adjacent to the area of potential habitat loss. The only species that are considered to have some potential to be nesting adjacent to the Proposed Scheme (but not within it), despite 2014 survey data finding their absence, are wheatear, whinchat and twite. These species are all tolerant of disturbance and any loss of a foraging resource will be imperceptible considering the vast availability of more optimal habitat found elsewhere in the SPA.

5.3.53. It is concluded that there are no adverse effects on site integrity on any Article 4.1 qualifying or Article 4.2 assemblage features of South Pennine Moors (Phase 2) SPA from habitat loss from the Proposed Scheme. Notwithstanding this conclusion, mitigation measures are presented in Section 6.

In-combination effects

5.3.54. The assessment of in-combination effects was informed by the Combined and Cumulative Effects Chapter of the PCF Stage 3 Environmental Assessment Report.

5.3.55. No Nationally Significant Infrastructure Projects (NSIP) have been identified within 1 km of the Proposed Scheme. Following a review of the Planning Inspectorate (PINS) website[52], one project was identified that could conceivably have an in-combination effect with the Proposed Scheme. This is the Trans-Pennine Upgrade. A review of the Trans-Pennine Upgrade on the PINS website confirmed that this project was at a relatively early stage of the NSIP planning process.

5.3.56. Some environmental information was accessible via the Trans-Pennine Upgrade Environmental Scoping Report, which confirmed that the Trans-Pennine Upgrade is located approximately 2.5 km from the South Pennine Moors SAC/South Pennine Moors Phase 2 SPA[53]. The Trans-Pennine Upgrade is located in excess of 10 km from the Proposed Scheme, based on review of the Environmental Scoping Report. No other information on the potential effects (or lack thereof) on European Sites from the Trans-Pennine Upgrade was available on the PINS website. Given the distance between the Trans-Pennine Upgrade and European Sites/the Proposed Scheme, significant in-combination effects are not predicted to arise.

5.3.57. A number of smaller developments submitted through the Town and Country Planning route were identified in the cumulative assessment chapter of the EAR (see Table 10.3 of that document).[54] These developments comprise two business/industrial parks and four sites proposed for residential development/redevelopment. Given the location and nature of these other proposed projects, no appreciable in-combination effects with the Proposed Scheme are predicted to arise. The identified developments are summarised in Table 5-6 below, along with a summary of the assessment for in-combination effects.

[52] https://infrastructure.planninginspectorate.gov.uk/projects/north-west/ Accessed 28/05/2019.
[53] Trans-Pennine Upgrade Programme Environmental Impact Assessment Scoping Report. Highways England, November 2017. Accessed from https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/TR010034/TR010034-000008-TPUP%20-%20Scoping%20Report.pdf on 29/05/2019
[54] HE551534-WSP-EGN-SG-RP-LE-00030: Smart Motorways Programme Draft Environmental Assessment Report Chapter 10 – Assessment of Combined and Cumulative Effects

Table 5-6: In-combination Assessment

Development	Distance and Orientation from Proposed Scheme	Assessment of potential in-combination effects
Trans-Pennine Upgrade	Greater than 10km south of the Proposed Scheme	Located in excess of 10km from the Proposed Scheme and more than 2.5km from the South Pennine Moors SAC/Phase 2 SPA. Given the distances involved, no conceivable pathways for significant in-combination effects are predicted to arise.
Hill Top Primary School, Kirkholt, Rochdale	20m north of Proposed Scheme, east of Junction 20	Housing allocation for the development of 107 units. Rochdale Canal is located ~1.5km to the west, South Pennine Moors SAC and Phase 2 SPA is located approximately 6.3 km to the north-east. Given scale and nature of development and location in relation to European Sites, no impact pathways for significant in-combination effects are predicted to arise.
Land north and west of Gemhill Avenue, Fixby, Huddersfield	150m east of Proposed Scheme boundary, east of Junction 24	Erection of 252 dwellings and formation of vehicular access. Located approximately 10.6km north-east of the South Pennine Moors SAC and Phase 2 SPA. Given the distance to the SAC/SPA, no conceivable pathways for significant in-combination effects are predicted to arise.
Peat Pond Farm, Lindley Moor Road, Lindley Moor, Huddersfield, HD3 3TD	90m south of Proposed Scheme, south-west of Junction 24	Demolition of existing buildings, plus mixed use residential and industrial development (Class B1c/B2, or B8). Located approximately 7.3km east of South Pennine Moors SAC and Phase 2 SPA – therefore outside of any perceivable effects.
Land At Dean Farm Badger Lane Rochdale OL16 4RQ	50m north of Proposed Scheme, east of Junction 20	Erection of 50 residential dwellings. Located approximately 2km east of the Rochdale Canal SAC and 6.3km west of the South Pennine Moors SAC and Phase 2 SPA. Given scale and nature of development and location in relation to European Sites, no impact pathways for significant in-combination effects are predicted to arise.
Land South Of Fire Station Clough Lane Rastrick Brighouse Calderdale	20m north of Proposed Scheme, east of Junction 24	Residential Development of 113 dwellings with vehicular access from New Hey Road. Located approximately 10.7km north-east of South Pennine Moors SAC and Phase 2 SPA. Given scale and nature of development and location in relation to European Sites, no impact pathways for significant in-combination effects are predicted to arise.
Kingsway Business Park John Milne Avenue Rochdale	30m north of Proposed Scheme, north-west of Junction 21	Outline application, with all matters reserved, for a mixed-use business park. Approximately 4km east of Rochdale Canal SAC and 4km west of South Pennine Moors SAC and Phase 2 SPA. Given scale and nature of development and location in relation to European Sites, no impact pathways for significant in-combination effects are predicted to arise.

6. Mitigation

6.1.2. This section details proposed additional mitigation measures proposed in relation to:

- Habitat loss relating to both South Pennine Moors SAC and South Pennine Moors Phase 2 SPA);
- Disturbance of bird features of the South Pennine Moors Phase 2 SPA.

6.1.3. An Environmental Clerk of Works (ECoW), or equivalent functional party within the Delivery Partner organisation, will be employed for the duration of construction of the Proposed Scheme including enabling works. An Ecological Clerk of Works (EcCoW) will also be employed to advise on specific ecological matters. The EcCoW must be experienced in advising on construction activities where native UK upland bird species and South Pennine Moors SAC qualifying habitats are present. This will form part of the mechanisms to ensure that measures to address impacts on nature conservation receptors are implemented.

6.2. Habitat Loss

6.2.2. Habitat earmarked for development or temporary loss during construction will remain in situ for as long as practicably possible i.e. habitat will only be cleared immediately prior to works commencing in specific areas. A breeding bird nest check will be required, to be undertaken by the EcCoW, if habitat clearance is required during the bird breeding season. Habitat lost as a result of the Proposed Scheme is unlikely to provide nesting habitat for SPA qualifying species but could possibly be used by SPA assemblage passerine species (wheatear, whinchat, and twite). Twite nest on moorland fringe so will only potentially forage within the area.

6.2.3. Temporary habitat loss will be minimised with all access taken along the existing M62 carriageway. All temporary habitat lost within the existing highway boundary will comprise semi-improved grassland or other habitats that do not meet the criteria of the qualifying interest features (and are considered to be site fabric). All temporary habitat loss from within the South Pennine Moors SAC will be reinstated in a manner that will provide enhancements for the SAC/SPA (using a seed mix of value to the qualifying interest features, including plant species such as dandelion, sorrel and Autumn Hawkbit). The Delivery Partner will be required to deliver these measures, including specifying planting mixes via Outline Environmental Management Plan Clauses Nat055 (requirement to reinstate habitat in accordance with the Environmental Masterplan), Nat106 (requirement to develop proposals for species-rich grassland planting), Land009 (requirement to deliver landscaping of the Proposed Scheme in accordance with the approved planting strategy) and Land011 (requirement for the Delivery Partner to develop a detailed landscaping scheme).

6.2.4. Under the SGAR3 design, 0.03ha of dry modified bog near the cattle grid adjacent the A672/M22 (EB) junction could have been lost. This will be avoided through the Proposed Scheme committing to avoid any temporary or permanent disturbance/loss of habitat from areas that may support Annex 1 qualifying features of the South Pennine Moors SAC. The precise locations of any potential Annex 1 habitats will be marked out and securely fenced off prior to site investigations or construction works commencing. This will prevent any risk of accidental access by plant or machinery. This measure is set out in the Outline Environmental Management Plan and has been committed to by the Highways England Project Director.

6.2.5. In summary, there will be no land take from areas supporting South Pennine Moors SAC Annex 1 habitats following implementation of the proposed mitigation.

6.2.6. As set out in paragraph 2.2.21, the locations of all necessary construction compounds and other logistical support areas (welfare facilities; car parking; laydown sites etc) would be confirmed by the Delivery Partner once appointed. To provide certainty that no LSE can result from any subsequently chosen construction compound locations in terms of habitat loss, the Delivery Partner will be required to only consider additional construction compound locations that meet the following criteria:

- Located in excess of 400m from the South Pennine Moors SAC/Phase 2 SPA;
- Located in excess of 50m from the Rochdale Canal SAC; and
- Uses drainage pathways that do not enter European Sites.

6.2.7. The Highways England Project Director will not permit the use of any construction compounds that do not meet these criteria. This is also set out in the Outline Environmental Management Plan, which will be adopted into the Delivery Partners Construction Environmental Management Plan.

6.3. Disturbance

Construction Activities

6.3.2. Based on the typical production/construction rate on smart motorway schemes, works in the vicinity of the South Pennine Moors SAC/South Pennine Moors Phase 2 SPA will take approximately 12 to 15 months. This will vary from localised ducting and cabinet installation to major works that can be predicted to require the use of the diversion routes such as decommissioning and installation of gantries. With early planning, these major works can be programmed to take place to take into account the necessary seasonal restrictions applicable to the Proposed Scheme.

6.3.3. Whilst it has been determined that there are no AESI with respect to SPA features, it is determined that demolition/construction works in areas east of Junction 22 should be timed, as far as practicable, to avoid the bird breeding season, i.e., March to August inclusive; and that all works commence in late-summer/autumn. This is because the topography of land surrounding the Proposed Scheme east of Junction 22 is generally more open than to the west of Junction 22. There is therefore greater potential for disturbance impacts (noise and visual) to propagate further from the source of disturbance east of Junction 22. The boundary of the South Pennine Moors Phase 2 SPA is also generally closer to the Proposed Scheme east of Junction 22 compared to west of Junction 22.

6.3.4. If the Delivery Partner proposes different construction compound locations to those assessed in this SIAA, including satellite construction compounds, they will be required to be located outside of any area that would result in any effects on the SPA. This is considered to be any area within 400m of the SPA. This is dictated by evidence from the species, merlin, that is most sensitive to disturbance. This is mandated via Clause Nat115 and Nat108 of the Outline Environmental Management Plan[55]. Use of the existing Highways England depot located north of Junction 22 (Ch 22+750) for welfare facilities and parking vehicles between September and February inclusive (i.e. outside the bird breeding season) is not considered to lead to any significant disturbance effects on SPA qualifying features. This depot will not be used outside of this period i.e. during the bird breeding season between March and August, due to the potential for disturbance of SPA qualifying features.

6.3.5. Enabling works in the area of Junction 22 will have a duration of 4 to 6 months subject to phasing of the works and weather conditions; this would be in the form of plane and inlay in most instances and with limited full depth reconstruction in EB Lane 1 of up to 2,500m and 2,250m in WB Lane 1 in the vicinity of Junction 22. These enabling works commenced in November 2019 and are expected to be complete by June 2020. The Delivery Partner was notified in November 2019 that works that are not completed before the end of February will need to be omitted or delayed until after the bird breeding season (end of August).

6.3.6. Should construction activities be unavoidably scheduled for the bird breeding season (March – August), field checks for breeding birds will be undertaken prior to the commencement of works. Where works can be programmed to entirely avoid the bird breeding season, checks for breeding birds will not be required.

6.3.7. The area of search will be defined by the project ECoW in consultation with Highways England and the Delivery Partner, as it is recognised there are locations where topography or other factors mean that the ZoI of disturbing activities is reduced. Once detailed information regarding the approach to construction is available from the Delivery Partner this would also inform if and where checks are required. The nest checks will include the monitoring of active nests where appropriate, to be determined by the ECoW.

[55] HE551534-WSP-EGN-SG-RP-LE-00018

6.3.8. The EcCoW shall then determine if construction activities are likely to affect the viability of individual breeding pairs of SPA qualifying species or disturb breeding birds[56] to the extent that an offence under the Wildlife and Countryside Act 1981 (as amended) could occur. In this event, works in the vicinity of the nest site (distance to be determined by the EcCoW) shall cease until the chicks have fledged or the nest has otherwise failed. In the unlikely event areas of particularly high density and diversity of nesting SPA qualifying species are identified, the EcCoW shall advise on the need for limiting works adjacent to these areas to outwith the bird breeding season. This advice shall be provided within 2 hours of the necessity of stopping work being established to the Delivery Partner Environmental Manager, Delivery Partner Project Manager and Highways England Project Manager.

6.3.9. The results of the surveys to identify breeding territories and nest sites shall also inform whether to employ a 'soft-start' to any piling activities if these are undertaken during the bird breeding season. In most instances, regular pad foundations will be preferred. However, if required, it is expected that where piled foundations are used, these will be constructed using the bored pile system such as helical piles; these generate reduced noise and vibration relative to percussive piling and would therefore have a reduced potential to disturb SPA qualifying features. The EcCoW shall be responsible for advising the Delivery Partner on when soft-start piling should be used, based on the results. A 'soft start' shall require that each time an activity is started up after a period of inactivity, the acoustic levels shall be gradually increased over a period of 30 minutes to allow birds to habituate and minimise disturbance effects. No piling activities shall commence without prior approval of the EcCoW.

6.3.10. Plant and equipment will be maintained and not run unnecessarily to minimise noise. Plant and equipment will be located or orientated away from adjacent habitat whenever possible. Site lighting, where required, will be directed towards the work area to minimise light spill onto adjacent habitat.

6.3.11. With the application of targeted avoidance as described above combined with the evidence on species habitat preferences, know distribution in the SPA and tolerance to disturbance outlined in Section 5.3, it is considered that any effects associated with disturbance impacts will not compromise the conservation objectives of the South Pennine Moors Phase 2 SPA. There will therefore be no effect upon the integrity of the European Site.

Use of diversion routes

6.3.12. Mitigation measures for the potential use of the three signed diversion routes that traverse the SPA for overnight closures are to restrict the use of the three signed diversion routes that traverse the SPA to the period September to February inclusive[57], and/or mandate the use of those diversion routes that do not traverse the SPA (Area 10 – Routecard F1 – HGV and Area 12 Routecard; refer to Figure 2-3, Appendix B). Advance notification of closures and strategic re-routing would be provided by Highways England to minimise traffic required to use the diversion routes. Neither of these scenarios are predicted to lead to AESI, although it is recognised that a proportion of road users have the potential to use other routes away from the signed diversion routes.

6.3.13. While the SIAA has set out an appreciation of the potential effects that the use of diversion routes passing through the South Pennine Moors Phase 2 SPA, it is premature at this stage of scheme design, to define the actual way the scheme works are to be resourced, undertaken and scheduled. Nevertheless, it is recognised that constraints upon how the Proposed Scheme would be delivered are necessary to avoid any AESI upon the SPA. To this end, Highways England undertakes to establish the following delivery controls:

- The Works Information prepared for the Delivery Partner will provide explicit recognition of the environmental and construction constraints to be imposed upon scheme delivery and the control measures to be implemented during the construction phase.
- A Construction Environmental Management Plan and Traffic Management Plan is to be prepared by the Delivery Partner and shall provide a robust and complete response to

[56] Impacts on birds could include, but not limited to, reduction in breeding success due to disturbance either reducing the ability to find a mate or to flee/abandon their nests/clutch.

[57] Qualifying features of the South Pennine Moors Phase 2 SPA involve species for their breeding populations only. Certain species such as merlin do however have the potential to be present within the SPA outside of the bird breeding period. It is considered that the qualifying features are substantially less sensitive to disturbance in the non-breeding period with no mitigation being necessary.

demonstrate delivery of the Proposed Scheme within the constraints outlined below in a manner that will be acceptable to the Highways England Project Management Team.

- The Construction Environmental Management Plan shall be provided to the Competent Authority at least two months prior to the commencement of works as confirmation of the successful translation of the SIAA into the proposed method of construction.
- A system of reporting of the management of closures affecting the South Pennine Moors Phase 2 SPA shall be defined within the Works Information.

6.3.14. It is worth noting that each of the potential diversion routes gives rise to not only impacts to bird life, but also to the disturbance to human residents along the corridors. There are also safety implications associated with the use of such routes. While traffic management techniques are available to be deployed to enable removal/installation of gantries that reduces or removes the use of diversions, it is premature for such decisions to be made until a Delivery Partner has considered how it would construct the Proposed Scheme and also completed a safety assessment exploring the risks to works, road accidents on diversion routes as well as the impact on human and ecological receptors.

6.3.15. For this reason, Table 6-1 presents the control measures post SGAR3 Highways England is required to adhere to, to avoid AESI being experienced.

Table 6-1: Controls to Address Risk of Disturbance to SPA qualifying features post-SGAR3

Activity	Control Measures
Works Information	Details of the diversion routes traversing the South Pennine Moors Phase 2 SPA shall be included. Existing night-time hourly traffic data for the M62 and A58 shall be provided. Full motorway closures with diversions routed through the SPA during the period March to August shall be excluded. A construction method shall be specified that precludes the use of any diversion routes traversing the South Pennine Moors Phase 2 SPA during the bird breeding season (March to August inclusive).
Communications	The principal hauliers using the motorway between ports and other major destinations shall be identified and notified of carriageway or full closures at least two months in advance of closures to permit re-scheduling/re-routing. This will include identification of welfare facilities with HGV parks at Birch Services and Hartshead Services, that could be used by hauliers as an alternative to having to follow overnight diversion routes. The main delivery businesses using the motorway based on origin destination data derived from GPS digital shall be identified and notified of carriageway or full closures at least two weeks in advance of closures to permit re-scheduling/re-routing. Highways England National Traffic Operations Centre shall be notified at least six weeks in advance of closures to facilitate strategic re-routing informed by traffic information systems. A method statement shall be prepared for Highways England approval to establish how road users would be notified of closures such that there is clarity over the signage. The method statement shall be documented in the Stakeholder Management and Communication Plan. As part of the Temporary Traffic Regulation Order application process the Delivery Partner, in liaison with key stakeholders, will agree suitable diversion routes as well as any additional restrictions deemed fit such as speed reduction, etc to manage traffic along this route to facilitate safe delivery of the Proposed Scheme.
Monitoring	A report shall be provided to the Highways England Project Manager documenting an analysis of the traffic taking diversion routes to report the effectiveness of the notification process for each closure and to institute changes to traffic management practice where necessary to remain within the commitments set out in the Construction Environmental Management Plan and Traffic Management Plan.

7. Consultation

7.1.2. Consultation with Natural England and the RSPB has been undertaken. Key comments are summarised below and shown in full in Appendix C.

RSPB

7.1.3. The RSPB noted that the M62 was in place long before the South Pennine Moors SAC/South Pennine Moors Phase 2 SPA designation, and hence birds would be used to existing road noise with minimal impact expected. The RSPB also commented on twite, one of the rarer species in the qualifying assemblage of the SPA. These nest within 300m of the road and forage in areas off the moorland edge that include grass verges; however later in summer the species can use a range of thistle and composite species that would not be confined to moorland edges.

Natural England

7.1.4. A consultation response received from Natural England on 29 May 2019 identified that Natural England considered any habitat loss from within a European site, regardless of scale, should be considered to lead to LSE. Their advice was therefore that any habitat loss resulting from the Proposed Scheme should be considered at Stage 2 (Appropriate Assessment) of the HRA process.

7.1.5. Natural England noted that, with regards to effects of construction on air quality, mitigation should be considered in an appropriate assessment. This has been considered in the above assessment, but on review of the scale of impacts predicted and in accordance with the assessment in line with DMRB LA 105, LSE were discounted at the screening stage.

7.1.6. Natural England also advised that operational air quality impacts be considered in the Appropriate Assessment, as an exceedance of 1% of assessment criteria (1% of the critical load for nitrogen deposition) was predicted across 0.1ha of potential Annex 1 habitat. This equated to approximately 0.003% of the extent of this habitat within the South Pennine Moors SAC, based on the extents of habitats reported in the N2K data sheet. Following assessment of operational air quality impacts following the method in Table 2.98 of DMRB LA 105, air quality impacts continued to be screened out, as the predicted impacts were insufficient to lead to LSE.

7.1.7. Natural England also confirmed that the provision of noise impact locations with habitat suitability information for SPA birds, would be sufficient to inform the Appropriate Assessment. The habitat assessment and disturbance analysis detail, along with a highly precautionary approach to characterising the effects of disturbance, to include all SPA qualifying features, would also be required.

8. Conclusion

8.1.2. The Proposed Scheme is not connected with or necessary to the management of any European sites.

8.1.3. Applying the relevant thresholds from guidance set out in DMRB, the following European Sites were identified for consideration as part of the HRA screening process:

- South Pennine Moors SAC;
- South Pennine Moors Phase 2 SPA; and
- Rochdale Canal SAC.

8.1.4. Based on consideration of the nature of the works and the qualifying features of the European sites, consideration was given to the following impacts with the potential to lead to significant effects:

- Changes in air quality from atmospheric pollution (construction dust) associated with construction activities (all sites);
- Changes in air quality from atmospheric pollution (NOx concentrations and nitrogen deposition) associated with increased traffic (all sites)
- Changes in water quality (all sites);
- Changes in hydrological conditions (South Pennine Moors SAC/South Pennine Moors Phase 2 SPA);
- Increase in visual and acoustic disturbance levels up to 400m from construction activities, and the use of the potential signed/unsigned diversion routes that traverse the SAC/SPA (South Pennine Moors Phase 2 SPA);
- Increase in disturbance levels associated with operation (South Pennine Moors Phase 2 SPA); and
- Habitat loss/land take during construction (South Pennine Moors SAC/South Pennine Moors Phase 2 SPA).

8.1.5. Any Likely Significant Effect on the interest features of the sites, either alone or in-combination with other plans/projects, was excluded at Stage 1: Screening, for the following European Sites:

- Rochdale Canal SAC

8.1.6. Furthermore, the following impacts were also excluded at Stage 1: Screening:

- South Pennine Moors SAC
  - All changes in air quality (construction and operation)
  - Changes in water quality (construction and operation)
  - Changes in hydrological conditions (construction and operation)
- South Pennine Moors Phase 2 SPA
  - Changes in air quality (construction and operation)
  - Changes in water quality (construction and operation)
  - Changes in hydrological conditions (construction and operation)
  - Disturbance to bird features (operation)

8.1.7. Based on information considered at Stage 1: Screening, the following effects could not be excluded, and were taken forward to Stage 2: Appropriate Assessment:

- South Pennine Moors SAC
  - Temporary and permanent habitat loss
- South Pennine Moors Phase 2 SPA
  - Temporary and permanent habitat loss
  - Increase in disturbance levels associated with construction activities.

8.1.8. The Appropriate Assessment considers a series of measures, to be documented in, and implemented through delivery of the Construction Environmental Management Plan. Oversight of

the Construction Environmental Management Plan will be provided by a project Environmental Clerk of Works (ECoW) and Ecological Clerk of Works (EcCoW) who should have previous experience providing EcCoW services in relation to upland bird species. Specifically, the following measures will be implemented, as set out in detail in Section 6, with reporting of ecological mitigation measures by the Delivery Partner to Highways England under Outline Environmental Management Plan Clause Nat095:

- An ECoW and EcCoW will be employed;
- Managing the timing of site and vegetation clearance activities;
- No Proposed Scheme infrastructure will be sited in potential SAC qualifying interest habitats, to avoid any possible loss of these;
- Timing of road resurfacing works east of Junction 22 will be completed outside the bird breeding season (which runs from March to August inclusive) where practicable;
- Construction works within 400m of the South Pennine Moors Phase 2 SPA will be informed by findings of pre-construction nesting bird checks and oversight by the EcCoW, with soft-start to piling activities at the discretion of the EcCoW; Construction compounds, welfare facilities and other construction phase infrastructure will not be located within 400m of the South Pennine Moors SAC and Phase 2 SPA or in areas that drain through any European Site; and
- Diversion routes through the South Pennine Moors Phase 2 SPA will not be used during the bird breeding season (March to August inclusive.

8.1.9. Following a full and proportionate assessment at Stage 2: Appropriate Assessment, incorporating the mitigation measures summarised above, and in view of the relevant site conservation objectives, the potential for any adverse effect on the integrity of European Sites was excluded. A summary of the outcomes of the SIAA with respect to relevant Supplementary Advice Conservation Objectives are presented in Table 8-1 and 8-2 below.

8.1.10. Therefore, the HRA can be concluded at Stage 2: Appropriate Assessment, and there is no requirement to move to HRA Stages 3 and 4 for the purposes of HRA under the Habitats Regulations.

Table 8-1: Summary of SIAA Findings – South Pennine Moors SAC

Qualifying Interest	Attributes		Target	Interaction with Proposed Scheme	Mitigation (embedded/additional)	Compliance
H7130 Blanket bogs	Extent and distribution of the feature	Extent of the feature within the site	Restore the total extent of the habitat feature at or to feature extent baseline-value of just under 20,000ha	Proposed Scheme within 100m of South Pennine Moors SAC between~ Ch19+000 to 26+000. The boundary of the Proposed Scheme overlaps with 0.23ha of SAC, with potential for 0.03ha of bog habitats to be present.	Additional – mitigation measures in place to ensure any loss of Annex I habitat will be avoided. Additional – restrictions on any additional construction compound locations to be used by Delivery Partner.	No adverse effect on site integrity
	Extent and distribution of the feature	Spatial distribution of the feature within the site	Restore the distribution and configuration of the feature, including where applicable its component vegetation types, across the site	Proposed Scheme within 100m of South Pennine Moors SAC between~ Ch19+000 to 26+000. The boundary of the Proposed Scheme overlaps with 0.23ha of SAC, with potential for 0.03ha of bog habitat to be present within the Proposed Scheme boundary – remainder of habitat where Proposed Scheme and SAC boundary overlaps considered to be site fabric.	Additional – mitigation measures in place to ensure any loss of Annex I habitat will be avoided. Additional – restrictions on any additional construction compound locations to be used by Delivery Partner.	No adverse effect on site integrity
	Structure and function (including its typical species)	Vegetation community composition	Ensure the component vegetation communities of the feature are referable to and characterised by the following National Vegetation Classification types:	Proposed Scheme within 100m of South Pennine Moors SAC between~ Ch19+000 to 26+000. The boundary of the Proposed Scheme overlaps with 0.23ha of SAC, with potential	Additional – mitigation measures in place to ensure any loss of Annex I habitat will be avoided. Additional – restrictions on any additional construction compound	No adverse effect on site integrity

Qualifying Interest	Attributes		Target	Interaction with Proposed Scheme	Mitigation (embedded/additional)	Compliance
			M3 *Eriophorum angustifolium* bog pool community, M19 *Calluna vulgaris – Eriophorum vaginatum* blanket mire, M20 *Eriophorum vaginatum* blanket and raised mire; and M25 *Molinia caerulea – Potentilla erecta* mire	for 0.03ha of bog habitat to be present within the Proposed Scheme boundary – remainder of habitat where Proposed Scheme and SAC boundary overlaps site fabric, with non-SAC habitats.	locations to be used by Delivery Partner.	
H7140. Transition mires and quaking bogs	Extent and distribution of the feature	Extent of the feature within the site	Maintain the total extent of the Feature	Proposed Scheme within 100m of South Pennine Moors SAC between~ Ch19+000 to 26+000. The boundary of the Proposed Scheme overlaps with 0.23ha of SAC, with potential for 0.03ha of bog habitats to be present.	Additional – mitigation measures in place to ensure any loss of Annex I habitat will be avoided. Additional – restrictions on any additional construction compound locations to be used by Delivery Partner.	No adverse effect on site integrity
	Extent and distribution of the feature	Spatial distribution of the feature within the site	Maintain or restore as appropriate the distribution and configuration of the feature, including where applicable its component vegetation types, across the site	Proposed Scheme within 100m of South Pennine Moors SAC between~ Ch19+000 to 26+000. The boundary of the Proposed Scheme overlaps with 0.23ha of SAC, with potential for 0.03ha of bog habitat to be present within the Proposed Scheme boundary – remainder of habitat where Proposed Scheme and SAC	Additional – mitigation measures in place to ensure any loss of Annex I habitat will be avoided. Additional – restrictions on any additional construction compound locations to be used by Delivery Partner.	No adverse effect on site integrity

Qualifying Interest	Attributes		Target	Interaction with Proposed Scheme	Mitigation (embedded/additional)	Compliance
				boundary overlaps considered to be site fabric.		
	Structure and function (including its typical species)	Vegetation community composition	Ensure the component vegetation communities of the feature are referable to and characterised by the following National Vegetation Classification type: M4 *Carex rostrata – Sphagnum recurvum* mire M9 *Carex rostrata – Calliergon cuspidatum/ giganteum* mire	Proposed Scheme within 100m of South Pennine Moors SAC between~ Ch19+000 to 26+000. The boundary of the Proposed Scheme overlaps with 0.23ha of SAC, with potential for 0.03ha of bog habitat to be present within the Proposed Scheme boundary – remainder of habitat where Proposed Scheme and SAC boundary overlaps site fabric, with non-SAC habitats.	Additional – mitigation measures in place to ensure any loss of Annex I habitat will be avoided. Additional – restrictions on any additional construction compound locations to be used by Delivery Partner.	No adverse effect on site integrity

Table 8-2: Summary of SIAA Findings – South Pennine Moors Phase 2 SPA

Species	Attributes		Target	Interaction with Proposed Scheme	Mitigation (embedded/additional)	Compliance
Merlin	**Breeding Population**	Population abundance	Restore the size of the breeding Merlin population to a level which is consistently above 28 pairs, whilst avoiding deterioration from its current level as indicated by the latest mean peak count or equivalent.	Proposed Scheme - -No – species highly sensitive to disturbance so not considered to be present as a breeding bird adjacent to the M62. Preferred nesting habitat not present and the species not recorded in 2014 near Junction 22. Diversion Routes - Yes	Additional - Diversion routes through the SPA to be avoided during March – August inclusive. Whilst it has been determined that there are no AESI with respect to SPA features for the Proposed Scheme, it is determined that demolition/construction works in areas east of Junction 22 should be timed, as far as practicable, to avoid the bird breeding season, i.e., March to August inclusive.	No adverse effect on site integrity
	Supporting habitat (both within and outside the SPA): extent and distribution	Extent and distribution of supporting breeding habitat	Restore the extent, distribution and availability of suitable breeding habitat which supports breeding Merlin for all necessary stages of its breeding cycle (courtship, nesting, feeding)	Proposed Scheme - No – habitat loss of SPA trivial and suitable breeding habitat for merlin is a considerable distance from the Proposed Scheme. Diversion Routes – No. Use of diversion routes would not alter the extent and distribution of supporting habitat.	N/A	No adverse effect on site integrity
	Supporting habitat (both within and outside the SPA): disturbance	Minimising disturbance caused by human activity	Restrict and reduce the frequency, duration and/or intensity of disturbance to nesting, feeding and/or communal roosting birds so that the Merlin population is not significantly disturbed during the breeding period.	Proposed Scheme - No – species highly sensitive to disturbance so not considered to be present as a breeding bird adjacent to the M62. Preferred nesting habitat not present and the species not recorded in 2014 near Junction 22. Diversion Routes - Yes	Additional – Diversion routes through the SPA to be avoided during March – August inclusive. Whilst it has been determined that there are no AESI with respect to SPA features for the Proposed Scheme it is determined that demolition/construction works in areas east of Junction 22 should be timed, as far as practicable, to avoid the bird breeding season, i.e., March to August inclusive.	No adverse effect on site integrity
Golden Plover	**Breeding Population**	Population abundance	Maintain the size of the breeding Golden Plover population at a level which is consistently above 292 pairs, whilst	Proposed Scheme - No – species sensitive to disturbance so not considered to be present as a breeding bird adjacent to the M62. Preferred nesting habitat not present	Embedded – Construction compounds, vehicles, storage of materials and haul routes (where on unpaved surfaces) are to be located to avoid an adverse impact upon sensitive habitats and species.	No adverse effect on site integrity

Species	Attributes		Target	Interaction with Proposed Scheme	Mitigation (embedded/additional)	Compliance
			avoiding deterioration from its current level as indicated by the latest mean peak count or equivalent.	and the species not recorded in 2014 near Junction 22. Diversion Routes - Yes	Additional– Diversion routes through the SPA to be avoided during March – August inclusive. Whilst it has been determined that there are no AESI with respect to SPA features for the Proposed Scheme it is determined that demolition/construction works in areas east of Junction 22 should be timed, as far as practicable, to avoid the bird breeding season, i.e., March to August inclusive.	
	Supporting habitat (both within and outside the SPA): extent and distribution	Extent and distribution of supporting breeding habitat	Restore the extent, distribution and availability of suitable breeding habitat which supports breeding Golden Plover for all necessary stages of its breeding cycle (courtship, nesting, feeding)	No – habitat loss of SPA trivial and area affected considerable distance from golden plover breeding and foraging habitat. Diversion Routes – No. Use of diversion routes would not alter the extent and distribution of supporting habitat	N/A	No adverse effect on site integrity
	Supporting habitat (both within and outside the SPA): disturbance	Minimising disturbance caused by human activity	Restrict and reduce the frequency, duration and/or intensity of disturbance affecting nesting, roosting, and/or foraging birds so that the Golden Plover population is not significantly disturbed during the breeding period.	No – species moderately sensitive to disturbance so not considered to be present as a breeding bird adjacent to the M62. Preferred nesting habitat not present and the species not recorded in 2014 near Junction 22.	Additional– – Diversion routes through the SPA to be avoided during March – August inclusive. Whilst it has been determined that there are no AESI with respect to SPA features for the Proposed Scheme it is determined that demolition/construction works in areas east of Junction 22 should be timed, as far as practicable, to avoid the bird breeding season, i.e., March to August inclusive.	No adverse effect on site integrity
	Supporting habitat (both within and outside the SPA): function/	Connectivity with supporting habitats	Maintain the safe passage of birds moving between nesting and feeding areas used by breeding Golden Plover.	Proposed Scheme - No – works will not provide any additional barrier to movement of golden plover to that already present. Diversion Routes – No. An increase in traffic would not provide a barrier to foraging golden plover.	Additional – Although there is considered to be no interaction, diversion routes through the SPA to be avoided during March - August inclusive.	No adverse effect on site integrity

Species	Attributes		Target	Interaction with Proposed Scheme	Mitigation (embedded/additional)	Compliance
	supporting process					
Assemblage	**Assemblage of species**	Assemblage abundance	Maintain the presence of the breeding bird assemblage associated with upland moorland and its fringes and the abundance of each of its component populations, whilst avoiding deterioration from current levels of abundance as indicated by the latest mean peak counts or equivalent.	Proposed Scheme - Yes – although only limited assemblage species (common sandpiper wheatear, whinchat, twite) have potential to interact with the Proposed Scheme. These are all either not sensitive to disturbance or with common sandpiper restricted to reservoir complexes not influenced by the Proposed Scheme. 2014 survey data found none of these species to be present adjacent to Junction 22. Diversion Routes - Yes	Embedded – Construction compounds, vehicles, storage of materials and haul routes (where on unpaved surfaces) are to be located to avoid an adverse impact upon sensitive habitats and species. Additional – Whilst it has been determined that there are no AESI with respect to SPA features, it is determined that demolition/construction works in areas east of Junction 22 should be timed, as far as practicable, to avoid the bird breeding season, i.e., March to August inclusive. Diversion routes through the SPA to be avoided during March – August inclusive.	No adverse effect on site integrity
	Assemblage of species	Diversity of species	Maintain the overall species diversity of the SPA assemblage.	Proposed Scheme - No – The Proposed Scheme will no effect the diversity of assemblage species within the SPA. Only limited assemblage species (Common sandpiper, wheatear, whinchat, twite) have the potential to interact with the Proposed Scheme. These are all either not sensitive to disturbance or with common sandpiper restricted to reservoir complexes not influenced by the Proposed Scheme. 2014 survey data found none of these species to be present adjacent to Junction 22. Diversion Routes – No – the use of diversion routes while having the potential to disturb SPA features this will not lead to an impact on species diversity across the SPA.	Additional –While it has been determined that the use of diversion routes will not affect the diversity of species in the SPA diversion routes through the SPA will be avoided during March – August inclusive.	No adverse effect on site integrity
	Supporting habitat (both within and outside	Extent and distribution of supporting	Maintain the extent and distribution of habitat which supports the SPA	Proposed Scheme - Yes – habitat loss of SPA is however trivial and not considered to be used by majority of assemblage features. Wheatear,	Embedded – Construction works and vegetation clearance shall be confined to the minimum areas required, as defined	No adverse effect on site integrity

Species	Attributes		Target	Interaction with Proposed Scheme	Mitigation (embedded/additional)	Compliance
	the SPA): extent and distribution	breeding habitat	assemblage feature during all necessary stages (breeding, moulting, roosting, loafing, and feeding) of the breeding period.	whinchat, have some potential to be present (although 2014 surveys at Junction 22 recorded neither. Twite are known to be present and use verges for foraging. Extent of available habitat is considerable, and both whinchat and wheatear population ns in the SPA are small and favour more optimal habitat away from the M62. Diversion Routes - No	on the schedule of work areas during detailed design. Where habitat loss is required, suitable habitat will be reinstated post construction in accordance with the Environmental Masterplan. Where replacement habitat is provided, it shall be integrated with landscape planting using native species of local provenance to establish/enhance wildlife corridors.	
	Supporting habitat (both within and outside the SPA): minimising disturbance	Minimising disturbance caused by human activity	Restrict the frequency, duration and/or intensity of disturbance affecting nesting, roosting, foraging, feeding, moulting and/or loafing birds so that the SPA assemblage feature is not significantly disturbed	Proposed Scheme - Yes – only limited assemblage species (common sandpiper wheatear, whinchat, twite) have the potential to interact with the Proposed Scheme. These are all either not sensitive to disturbance or with common sandpiper restricted to reservoir complexes not influenced by the Proposed Scheme. 2014 survey data found none of these species to be present adjacent to Junction 22 Diversion Routes - Yes	Embedded – Where lighting, generators (and other noisy equipment) are required, these shall be located to avoid impacts to sensitive habitats and species. Lighting is to be directional and shielded to illuminate the works area only. Additional – Whilst it has been determined that there are no AESI with respect to SPA features, it is determined that demolition/construction works in areas east of Junction 22 should be timed, as far as practicable, to avoid the bird breeding season, i.e., March to August inclusive. Diversion routes through the SPA to be avoided during March – August inclusive.	No adverse effect on site integrity

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Appendix A. Screening Matrices

Habitats Regulations Assessment Screening Matrices

1.1.1. Three European Sites are considered in this section of the HRA report. These have been assessed using the screening matrices in Tables A-1, A-2 and A-3 below, which follow the format taken from Annex C: Screening Matrix, DMRB Volume 11 Section 4 Part 1 (HD 44/09).

Table A-1: South Pennine Moors SAC Screening Matrix

Scheme Name:	M62 Junction 20-25 Smart Motorways Programme	
European Site Consideration:	South Pennine Moors SAC (Designated April 2005)	
Date:	**Author (Name/Organisation)**	**Verified (Name/Organisation)**
22nd May 2019	Ian Ellis WSP Associate Director	Philip Davidson WSP Associate Director
Description of the scheme: Describe any likely direct, indirect or secondary impacts of the scheme (either alone or in combination with other plans or schemes) on the European Site by virtue of:		
Size and scale (road type and probable traffic volume)	The approximate 34.8 km length of the Proposed Scheme includes 1.3 km warning signs beyond the east and west extents of the core Scheme. This section of the M62 carries high volumes of heavy goods and other vehicles.	
Land-take	The Proposed Scheme will require minor land-take from within the boundary of the South Pennine Moors SAC. The maximum potential land-take predicted is 0.23 ha. This is predicted to comprise up to 0.2 ha of semi-improved neutral grassland (considered to constitute 'Site Fabric') and 0.03ha of modified dry bog (potentially qualifying as Annex I habitat). This 0.23 ha includes both temporary land-take during construction and permanent land-take associated with installation of infrastructure for the Proposed Scheme. Permanent land-take would be less than the total land-take required during construction. In the absence of detailed design proposals, which would be generated by the Delivery Partner once commissioned, it is not possible to provide more accurate figures for permanent land-take relative to temporary land-take. Taking a highly precautionary approach and assuming that all identified land-take would be permanent, the level of permanent habitat loss would equate to approximately 0.0003% by area of the SAC. The Natura 2000 datasheet for the SAC identifies that the SAC includes approximately 27,440 ha of blanket bog habitat. The limited extent of bog habitats identified within the Proposed Scheme footprint (up to 0.03 ha) is in poor condition and may not meet the criteria to be identified as such or be capable of restoration. Notwithstanding this, if assumed to be capable of contributing to the extent of Annex 1 habitat within the SAC, this would represent approximately 0.0001% of this habitat type within the SAC. In reality any permanent habitat loss would likely be less than this, and some habitat loss may be avoided altogether via the detailed design process.	

Distance from the European Site or key features of the site (from the edge of the scheme assessment corridor)	The M62 bisects and is adjacent to the SAC for 9.4 km, west of junction 22 (OS ref: SD 95448 14255) and ends east of Stott Hall Farm between junction 22 and junction 23 (OS ref: SE 03388 16272). The Proposed Scheme is hydrologically connected to the SAC as drainage from the existing motorway discharges to watercourses that run through the SAC into Booth Wood Reservoir via existing, fixed drainage channels and culverts to the north of the carriageway. The location of the SAC and the motorway is presented in Figure 2-2, Appendix A2. This includes the locations of watercourses crossed by the Proposed Scheme and the locations of outfalls that feed into watercourses flowing through the SAC.
Resource requirements (from the European Site or from areas in proximity to the site, where of relevance to consideration of impacts)	The Proposed Scheme does not require resources from this (or any other) European Site.

Emissions	**Construction** Construction traffic would primarily access working areas in the verge via the motorway network. There may however be occasional construction traffic movements via the existing road network but these would be substantially below the volume of traffic that would result in significant (or indeed detectable) changes in air quality along these routes. During the construction phase, the Proposed Scheme has potential to generate changes to air quality through localised air-borne pollution caused by construction activities. This could include generation of dust, particulates, hydrocarbons and other chemicals, and also emissions of NOx from construction traffic. Pollutants may be generated during gantry removal, site clearance, and construction of EAs, gantries and resurfacing. Airborne pollutants could disperse onto adjacent habitats, leading to deposition of dust and other particles onto vegetation present. Construction activities could also generate water-borne pollution, for example run-off from concrete casting operations or as a result of accidental spills of machine oils or fuels. Casting of concrete foundations for new gantries could lead to generation of alkaline run-off entering watercourses that drain the M62. Watercourses that flow through or are located in close proximity to the SAC and could receive road drainage from the M62, as identified in Tables 9-5 and 9-8 of Chapter 9 (Road Drainage and the Water Environment) of the EAR, include: • Moss Slack Brook (CH21100); • Castle Shore Clough (CH21100); • Longden End Brook (CH21050); • Rockingstone Moss Drain (CH22150); • Lads Grave Clough (north of Junction 22, does not cross Proposed Scheme); • Linsgreave Clough (CH23050); • Spa Clough (north of Junction 22, does not cross Proposed Scheme); • Catchwater Drain (flows parallel to the Proposed Scheme to the north along much of its length, before crossing the Proposed Scheme at CH26450); • Good Greave (CH23500); • Broad Shaw Graining (CH23850); • Broad Shaw Clough (CH24100); • Small Clough (CH23350); and • Burn Clough Grains (CH24550). No changes to the culverts or outfalls associated with watercourses crossing or running adjacent to the Proposed Scheme are proposed. The assessment presented in Chapter 9 (Road Drainage and the Water Environment) of the EAR (Section 9-8) predicts no significant effects on watercourses during construction. This is on the basis of standard best-practice measures being included within the Delivery Partner's Construction Environmental Management Plan (CEMP), which would be informed by the Outline Environmental Management Plan (OEMP). This is identified under clauses WAT018 to WAT021 and WAT042 to WAT043 of the OEMP, which are extracted below: • WAT018 - A surface water and/or groundwater pollution control plan and emergency response plan taking into account standard best practices will be put in place for works that could affect aquifers or watercourses. • WAT019 - Current pollution control measures that apply in relation to storage of any oil based materials (eg fuel storage) shall be defined in the CEMP. Stationary plant used by the Delivery Partner shall be

	fitted with measures such as drip trays to retain any leakage of oil or fuel. The Delivery Partner will empty trays at intervals to prevent overflow. Mobile plant should be refuelled in designated areas where there is a sealed drainage system. • WAT020 - The Delivery Partner will provide a suitable construction site drainage system with appropriately sized treatment facilities such as settlement or retention basins. • WAT021 - The Delivery Partner will consult with the statutory authorities regarding the measures to be implemented to contain and manage surface water runoff from the scheme construction and requirements for water quality monitoring of watercourses or groundwater potentially affected by construction works or discharge of surface water run-off. • WAT042 - The Water Management Plan within the CEMP shall include measures to ensure that no pollution pathways are created between the construction sites and watercourses via overland flow during rainfall events. Measures would include minimizing the period that subsoil is exposed, use of cut-off trenches and sediment lagoons as well as retention of vegetation along watercourses to aid attenuation. • WAT043 - Construction compounds should incorporate a closed drainage system with pollution control measures to prevent surface water and groundwater contamination. In addition, regardless of the implementation of a CEMP, construction phase impacts on water quality draining from the Proposed Scheme would have a negligible magnitude of impact on receiving watercourses. Existing engineered drainage channels, culverts and cloughs are directed off the motorway and away from the SAC (see Figure 2-2, Appendix A2). Whilst watercourses pass through limited extents of SAC habitats, the qualifying interest habitats designated for the SAC are fed primarily from rainfall rather than watercourses. Therefore, any potential event would be directed through existing drainage features, be subject to dilution and directed away from the SAC with no significant impact to the designated habitats, notwithstanding the embedded measures contained in the OEMP/CEMP. **Operation** Within 200 m of Lane 1 (typically the former hard shoulder) changes in emission levels from traffic using the M62 could result in air quality impacts on European Sites. The SAC is directly adjacent to the Proposed Scheme with the potential for it to therefore be negatively affected if the Proposed Scheme increases concentrations of nitrous oxides (NOx) or leads to increased rates of nitrogen deposition onto SAC habitats. A Technical Note[1] has been produced setting out the results of air quality modelling for the operational stage of the Proposed Scheme (see Appendix B1). This identifies predicted changes in NOx concentrations and nitrogen deposition arising from the Proposed Scheme. This assessment has been completed in combination with predicted changes in emissions arising from future changes to the UK vehicle fleet and other plans and projects. This Technical Note demonstrates that there will be an exceedance of the critical level for NOx over approximately 1.2 ha of the SAC where the Proposed Scheme contributes more than 1% of the Critical Level for NOx. This equates to approximately 0.002% of the SAC by area. The Technical Note also identifies that nitrogen deposition impacts more than 1% of critical load are predicted to occur over an area of the SAC amounting to at most 4 ha. This equates to approximately 0.006% of the SAC by area. This nevertheless exceeds 1% of Critical Load, which in accordance with DMRB LA 105 (Air Quality) requires consideration of potential significant effects.

	During operation of the Proposed Scheme, road drainage would continue to be discharged from the Proposed Scheme via the existing outfalls. This would result in no changes to the discharge rate of drainage leaving the Proposed Scheme. There would be an increased volume of traffic of up to 17% by 2039 at the M62 Junction 22 westbound slip-road. Other locations on the M62 adjacent to the SPA/SAC would experience reduced traffic growth relative to this. Therefore, it is possible that increased levels of pollutants could be generated as an incidental result of these increased traffic volumes. There would be some changes to the design of drainage within the existing carriageway, including the hard shoulder. The detailed drainage design would be determined at detailed design stage. The main changes to drainage design that can be identified at this stage of the Proposed Scheme are set out in Section 2.3 of the EAR (Chapter 2, The Proposed Scheme). These would comprise: • Removal of filter drains from the central reserve due to hardening of surface to support all-lane running; • Provision of surface water channels to receive and transport water from impermeable surfaces; and • Provision of sub-surface linear drainage systems to receive and transport water from impermeable surfaces, where surface water channels are not practicable. The operational drainage system will be designed, constructed and built entirely within the Proposed Scheme boundary (as shown on Figure 2-2 in Appendix B). No temporary or permanent works will be carried out within the SAC boundary, other than where the 'Construction and Operation footprint' (shown on Figure 2-2) overlaps with the SAC. As such, there will be no additional land take beyond that already identified under 'Land-take', above. The drainage system will be designed to accommodate a 1-year design storm without surcharge and a 5-year storm with surcharge with 20% allowance for climate change, as per IAN 161/15. Any new drainage system would incorporate catch pit gulley's and/or bypass interceptors as standard. These will provide a local betterment to the quality of water draining from the Proposed Scheme, as the current drainage on the M62 does not include these features. Any such features will be designed and constructed in accordance with IAN 161/15. As per IAN 161/15, spillage control measures will follow the requirements set out in DMRB HD33/06 'Surface and Sub-surface Drainage systems for Highways'. The Proposed Scheme will therefore maintain or improve the water quality of operational drainage into the SAC.

[1] Model Verification and Further Calculations of Changes in Nitrogen Deposition rates on the South Pennine Moors SAC/SPA/SSSI – HE551534-WSP-EAQ-SG-RP-LA-0006

Transportation requirements	**Construction** Construction of the Proposed Scheme may require some limited motorway closures at the weekend or at night, requiring the diversion of motorway traffic onto local roads. Of the 11 potential diversion routes, three traverse the South Pennine Moors SAC (refer to Figure 2-3, Appendix A3), namely: • Area 10 - Routecard F1 - non-HGV; • Area 10 - Routecard F4 - HGV; and • Area 10 - Routecard F4 – non-HGV. The remaining potential diversion routes do not traverse the SAC and all are a minimum of 400 m from the South Pennine Moors SAC boundary (refer to Figure 2-3, Appendix A3). **Operation** There will be no significant change in noise and vibration levels associated with operation of the Proposed Scheme. The maximum change in noise would be 1.6dB, as set out in Section 8.6 of Chapter 8 (Noise and Vibration) of the EAR[2], which demonstrates that changes in noise levels across the SAC will be negligible in the context of baseline levels. Noise levels in the future assessment year (2024), would also be similar with or without implementation of the Proposed Scheme.
Duration of construction, operation etc.	Main construction works are planned to commence in 2020 and will last for approximately 3-4 years.
Other	The Proposed Scheme will be lit throughout using new or existing LED luminaires lighting technology only, mounted on existing lighting columns where these can be reused. Where lighting columns are considered life expired, some sections will require column replacement also. Where old sodium luminaire lighting exists, replacement lighting will be provided in the form of efficient LED type lanterns that would be capable of being managed centrally allowing them to be dimmed or even switched off to minimize the environmental effects at low flow times in the middle of the night. These LED lanterns offer more directional lighting with full-cut off lanterns which do not emit any ultra violet output thus having a lower impact than the existing low pressure and high-pressure sodium lamps. There would therefore be no change or there would be reductions of lightspill onto SAC habitats relative to the existing situation. As such, no perceptible negative impacts would occur as a result of lighting the Proposed Scheme.
Description of Avoidance and/or Mitigation Measures:	
Nature of proposals	Not proposed at screening. To be considered at Stage 2 (appropriate assessment).
Location	Not proposed at screening. To be considered at Stage 2 (appropriate assessment)
Evidence for effectiveness	Not proposed at screening. To be considered at Stage 2 (appropriate assessment)
Mechanism for delivery (legal conditions, restrictions or other legally enforceable obligations)	Not proposed at screening. To be considered at Stage 2 (appropriate assessment)
Characteristics of European Site:	

[2] HE551534-WSP-EGN-SG-RP-LE-00001 Smart Motorways Programme Draft Environmental Assessment Report Chapter 8 – Noise and Vibration

Name of European Site and its EU code	South Pennine Moors SAC (UK0030280)
Location and distance of the European Site from the proposed works	M62 bisects and is adjacent to the SAC between junctions 22-23. The central OS grid reference of the SAC is approximately SK144960. The location of the SAC is presented in Figure 2-1, Appendix A1.
European Site size	64,983.13 ha (area)
Key features of the European Site including the primary reasons for selection and any other qualifying interests (Taken from Natura 2000 Standard Data Form[3])	The site is designated under article 4 (4) of the Directive (92/43/EEC) as it hosts the following habitats listed in Annex 1: • Blanket bogs; • European dry heaths; • Northern Atlantic wet heaths with *Erica tetralix*; • Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles; and • Transition mires and quaking bogs.
Vulnerability of the European Site – any information available from the standard data forms on potential effect pathways (taken from Natura 2000 standard Data form)	The key factors reported with important negative effects on the SAC are: • Air pollution, air-borne pollutants; • Fire and fire suppression; • Agricultural activities; • Human induced changes in hydraulic conditions; and • Outdoor sports and leisure activities, recreational activities.
European Site conservation objectives – where these are readily available	**The sites conservation objectives are to** "*ensure that the integrity of the site is maintained or restored as appropriate, and to ensure that the site contributes to achieving the Favorable 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."*

Assessment Criteria: Describe the individual elements of the scheme (either alone or in combination with other plans or schemes) likely to give rise to impacts on the European Site.

Construction

The identified construction impacts that need to be considered in relation to the South Pennine Moors SAC are:

- Land take (reduction in habitat area);
- Localised air quality impacts; and
- Water quality (pollution incidents affecting water quality or quantity in watercourses flowing through SAC habitats).

Operation

The identified construction impacts that need to be considered in relation to the South Pennine Moors SAC are:

- Emissions from traffic causing elevated levels of NOx and increased rates of nitrogen deposition over SAC habitats; and

• Changes in the quality or quantity of water flowing from the Proposed Scheme once it becomes operational.	
Initial Assessment: The key characteristics of the site and the details of the European Site should be considered in identifying potential impacts. Describe any likely changes to the site arising as a result of:	
Reduction in habitat area	The Proposed Scheme would result in land take from within the SAC of approximately 0.23 ha. This is predicted to comprise approximately 0.2 ha of semi-improved neutral grassland and 0.03ha of modified dry bog. This habitat loss would take place within the existing highways boundary, with a proportion of the habitat loss being temporary in nature (land required to facilitate construction of the Proposed Scheme). The long-term habitat loss would therefore be less than that presented above, but how much less cannot be quantified until detailed design. Being within the highways soft estate, much of the habitat affected is also on made ground and is not representative of Annex 1 habitats for which the SAC has been designated and is purely 'Site-fabric', incorporated to delineate the boundaries of the protected site and existing operating motorway. For example, much of the habitat present along the soft estate is comprised of semi-improved neutral grassland, which is not a qualifying interest of the South Pennine Moors SAC. The reduction in habitat area arising from the Proposed Scheme is equivalent to approximately 0.0003% of the SAC and up to 0.0001% of SAC qualifying interest habitats by area. This level of habitat loss is considered negligible, and so minimal that it could not combine appreciably with the effects of other plans or projects (to put this into context, around 3,000 schemes with the same land-take as the Proposed Scheme would be required to cause habitat loss equivalent to 1% of the SAC by area). The majority (0.2 of the total 0.23 ha) of the habitat affected is considered site fabric being semi-improved grassland; not a SAC qualifying interest. The 0.03 ha loss of modified bog is considered (on a highly precautionary basis) to comprise Annex I habitat and SAC qualifying interest feature on a precautionary basis. The condition of the habitat was considered poor during the Phase I Habitat survey undertaken and its location on the road 'fringe' is likely to limit its potential for restoration and functioning.
Disturbance to key species	The SAC is designated for the habitats it supports and does not have any Annex II Species identified as qualifying interests. There is therefore no potential for disturbance to key species.
Habitat or species fragmentation	The works will be constructed and operated entirely within the existing M62 boundary, with the exception of the temporary candidate site construction compounds. There will be negligible land-take from within the soft estate and boundary of the SAC, as described under 'Reduction in Habitat Area', above. There will therefore be no material fragmentation of SAC habitats.
Reduction in species density	Any reductions in species density resulting from construction or operation of the Proposed Scheme would be negligible in the context of the size of the SAC.
Changes in key indicators of conservation value (water quality, hydrological regime)	**Construction** During construction, the potential for localised air quality impacts has been identified, primarily the potential for dust generated by earthworks and construction to deposit onto SAC habitats. Any such impacts would be confined to the areas immediately surrounding the areas of construction. IAQM

	Guidance on assessing the impacts of construction dust on habitats[4] identifies that perceptible impacts are unlikely to extend more than 50 m from construction areas. Construction would also be of a relatively short duration in any one location along the Proposed Scheme (the programme for construction and commissioning of the Proposed Scheme is anticipated to take approximately three years 8 months, see Section 2.5 of Chapter 2 (The Proposed Scheme) of the EAR). The air quality assessment presented in the EAR concludes there would be no significant residual adverse effects as a result of air quality impacts. This conclusion was reached partly with consideration of embedded mitigation measures included in the OEMP. These are included in the OEMP as standard measures, provided regardless of the presence of any European Site. The relevant clauses are provided below: • Air001 - Appropriate mitigation measures - including those described in IAQM Guidance on the assessment of dust from demolition and construction shall be detailed in working Method Statements demonstrating how impacts on receptors will be avoided. Given the minor scale of impact and that mitigation for construction dust impacts is applied as a standard designed in measure, perceptible levels of dust deposition onto the South Pennine Moors SAC are not predicted to arise. The potential for pollution incidents to affect the quality of water draining from the M62 into SAC habitats could arise during construction, for example an accidental uncontrolled release of oils and/or fuels from construction plant. In the event of such an incident, water-borne pollutants would be captured by the existing drainage arrangements along the M62 or through construction phase drainage and into the network of watercourses that receive drainage from the M62 (see 'emissions' under Scheme description section, above). Between the western end of the Proposed Scheme and CH20+950 drainage would be captured by watercourses that do not flow into the SAC. Between CH20+950 and CH25+950 some drainage would be captured by stream and drainage channels that flow through the SAC. Although these watercourses drain through SAC habitat they are unlikely to play a key role in supplying SAC habitats with water, as they drain into watercourses and reservoirs outside the SAC (Figure 2-2, Appendix A2). These watercourses will play a more significant role in draining rather than supplying SAC habitats with water. Any pollution incidents that occurred (in the absence of mitigation) within the SAC would therefore have a minimal impact on the SAC, as the pathways for pollutants to reach SAC habitats is limited. Incidentally and not required as a protective measure, the Delivery Partner would be required to deliver the Proposed Scheme under a CEMP. This would contain standard best-practice measures for preventing and addressing pollution incidents in common with other Smart Motorway schemes, with the CEMP required to deliver Clauses WAT-018 to WAT-021 and WAT-042 to WAT-043, as specified in the OEMP. The potential for perceptible impacts to SAC habitats to result from construction phase changes in water quality is therefore considered negligible. With regards the potential use of diversion routes for overnight closures, the nature of SMP construction is such that these are only used occasionally. As construction activities would not require diversion routes beyond intermittent night time or weekend closures (between 73No. and 86No. closures), it is considered that the potential increased levels of traffic on the three diversion

[4] Holman et al (2014). IAQM Guidance on the assessment of dust from demolition and construction, Institute of Air Quality Management, London

	routes that traverse the SAC[5] would not cause NOx emissions and associated nitrogen deposition from vehicles using the routes to be adversely increased. Therefore, LSE are considered unlikely. **Operation** As set out under 'emissions' in the Proposed Scheme description section above, the Proposed Scheme (in-combination with other plans and projects) is predicted to lead to increased vehicle emissions. These have been modelled by the Air Quality specialist (see Appendix B1) and are predicted to exceed 1% of Critical Load across up to 0.006% of the SAC by area. Part of this impact occurs over the verges of the M62 where they coincide with the boundary of the SAC – in these areas semi-improved grassland (a non-SAC habitat) frequently dominates the habitats present, and the habitats are often in relatively poor condition. However, in some locations within 200m of the ARN, there is potential for blanket bog (EUNIS habitat code 7130), an Annex 1 habitat and qualifying feature of the SAC, to be present (see Figure 6-1 in Appendix B). No other Qualifying Interest habitats of the SAC have been identified within 200m of the SAC. The methodology in DMRB LA 105 has been followed[6], to determine whether the predicted impact of the Proposed Scheme could lead to the theoretical loss of one species. The maximum impact anywhere within the boundary of the SAC is 0.13kgN/ha/yr. Following the method within DMRB LA 105, a change of 3.3kgN/ha/yr is required to reduce species richness by one within bog habitats. The Proposed Scheme would lead to a maximum impact equivalent to less than 5% of this amount. As the predicted impact does not have the potential to lead to the loss of one species, in accordance with DMRB LA 105, Likely Significant effects are not predicted. As also set out under 'emissions' in the Proposed Scheme description above, the operational drainage design would include standard attenuation and treatment measures in accordance with IAN 161/15 and DMRB HD33/06. Such measures are not incorporated into the current drainage design of the existing M62 adjacent to the South Pennine Moors SAC. No negative impacts on the water quality of watercourses draining through the SAC are therefore predicted, and there is the potential for localised long-term improvements due to the introduction of drainage design measures in line with current standards (IAN 161/15 and DMRB HD33/06).

[5] The actual number of vehicles that may be diverted cannot be accurately predicted. However, based on a review of traffic data from Webtris observed data for 2018 (supplied by Atkins and reviewed by Arup, the traffic modelling suppliers for the project), total flows (combined light and heavy loads) for the period 2300-0500 to represent a full overnight closure to allow the installation and/or removal of portal gantry superstructure are estimated at 5,195 for J21 – 22, 5,344 for J22 – J23 and 5,171 at J23 – J24 respectively.

[6] Design Manual for Roads and Bridges (Nov 2019). Air Quality – Sections 2.98 to 2.102.

Climate change	Carbon emissions associated with SMP schemes are primarily determined by the vehicles using the motorway rather than the embodied carbon associated with Proposed Scheme's construction and maintenance. Therefore, embodied carbon is not reported. Climate change adaptive measures have been included within the Proposed Scheme design in accordance with IAN 161/15, as follows: • There will be no additional outfalls and existing outfalls will continue to discharge at existing established peak flow rates. The design will be for a 1:5-year return period (1:20 year critical locations) with no surface flooding (inclusive of 20% to allow for climate change) for any additional water arising as a result of the additional paved area only. • Attenuation is also to address the increased surface area associated with new hard standing such as EAs, with pollution control devices also included to address accidents and spillages. In light of the above, the Proposed Scheme is not expected to exacerbate the effects of climate change.
Interference with the key relationships that define the structure of the site	Interference with the relationships which define the structure of the habitats in the SAC are not expected due to the negligible magnitude of air quality and hydrological impacts.
Interference with the key relationships that define the function of the site	Function is taken here to mean the capacity of the SAC to support habitats of conservation concern, especially blanket bog and heathland. The quality and extent of habitats within the SAC will not be affected by the Proposed Scheme, due to the negligible magnitude of anticipated impacts. Therefore, interference with the habitat structure and the function of the site is not anticipated.
Indicate the significance as a result of the identification of impacts set out above in terms of:	
Reduction of habitat area	Potentially significant – although there will be a negligible reduction in habitat area within the SAC as a result of the construction of the Proposed Scheme, Natural England advised that any land take within a European Site boundary should be taken forward for Appropriate Assessment.
Disturbance to key species	N/A: the SAC does not have Annex II species on its citation.
Habitat or species fragmentation	Not significant - There will be negligible land take from the edge of the SAC and no severance or fragmentation of habitats or species will occur as the Proposed Scheme and associated works will be maintained within the highway boundary.
Disruption	Not significant - Construction or operation of the Proposed Scheme will not disrupt the structure or function of the key relationships within the SAC.
Disturbance	Not significant - Beyond the minimal area of the South Pennine Moors SAC affected by land take (taken forward for Appropriate Assessment as described above), there would be no disturbance of SAC habitats.
Change to key elements of the site (e.g. water quality, hydrological regime etc.)	Construction – potential for LSE via generation of construction dust Operation - Not significant - There will not be a significant change to key elements of the site due to the short-lived and relatively minor nature of construction works, the limited magnitude of impacts, and the standard design features (principally drainage) that are already in place will be incorporated into the Proposed Scheme. During operation, no perceptible changes in vegetation are expected to occur as a result of air quality impacts while no negative impacts on the water quality of watercourses draining through the SAC are predicted.

Describe from the above those elements of the scheme, or combination of elements, where the above impacts are likely to be significant or where the scale or magnitude of impacts is not known	
The Proposed Scheme is considered to have the potential for LSE in relation to construction phase air quality impacts.	
Outcome of screening stage (delete as appropriate)	Potential for likely significant effects due to habitat loss only. This site has been screened in for further assessment.
Are the appropriate statutory environmental bodies in agreement with this conclusion (delete as appropriate and attach relevant correspondence)	The HRA has been issued to Natural England for consultation as part of the PCF Stage 3 consultation process. It includes revisions following comments received at a meeting with Natural England held on the 13th May 2019 and will be reissued to them (along with the Statement to Inform the Appropriate Assessment (document reference HE551534-WSP-EGN-SG-RP-LE-00033)) to seek confirmation of agreement with the findings).

Table A-2: South Pennine Moors Phase 2 SPA Screening Matrix

Scheme Name:	M62 Junction 20-25 Smart Motorways Programme	
European Site Consideration:	South Pennine Moors Phase 2 SPA (Designated June 1997)	
Date:	**Author (Name/Organisation)**	**Verified (Name/Organisation)**
22nd May 2019	Ian Ellis WSP Associate Director	Philip Davidson WSP Associate Director
Description of the scheme: Describe any likely direct, indirect or secondary impacts of the scheme (either alone or in combination with other plans or schemes) on the European Site by virtue of:		
Size and scale (road type and probable traffic volume)	The approximately 34.8 km length of the Proposed Scheme includes 1.3 km warning signs beyond the east and west extents of the core scheme. This section of the M62 carries high volumes of heavy goods and other vehicles.	
Land-take	The Proposed Scheme will require minor land-take from within the boundary of the South Pennine Moors Phase 2 SPA. However, the majority of this land-take can be categorised as 'Site-fabric' (not meeting the criteria for qualifying interest feature and likely being included in the boundary for convenience during delineation). The maximum potential land-take predicted is approximately 0.23 ha. In the absence of mitigation, this could include approximately 0.2 ha of semi-improved neutral grassland and 0.03 ha of modified dry bog. This includes both temporary land-take during construction and permanent land-take associated with installation of infrastructure for the Proposed Scheme. Permanent land-take would be less than the total land-take required during construction. In the absence of detailed design proposals, which would be generated by the Delivery Partner once commissioned it is not possible to provide accurate figures for permanent land-take relative to temporary land-take. Taking a highly precautionary approach and assuming that all identified land-take would be permanent, the level of permanent habitat loss would equate to approximately 0.0003% by area of the SPA. In reality any permanent habitat loss would be less than this. It is considered highly unlikely that this level of habitat loss within the SPA boundary but adjacent to the road will significantly affect the SPA features. Due to SPA qualifying features sensitivity to disturbance (i.e. the existing M62) and the lack of suitable habitat, there is considered be no potential for the majority of SPA qualifying or assemblage features to be present at or adjacent to the area of potential habitat loss. The only species that are considered to have some potential to be nesting adjacent to the Proposed Scheme (but not within it), despite 2014 survey data finding their absence, are wheatear and whinchat, while twite may forage in this area. These species are all tolerant of disturbance and any loss of a foraging resource will be imperceptible considering the vast availability of more optimal habitat found elsewhere in the SPA.	

Distance from the European Site or key features of the site (from the edge of the scheme assessment corridor)	The M62 bisects and is adjacent to the SPA west of junction 22 (OS ref: SD 95448 14255) and ends east of Stott Hall Farm between junction 22 and junction 23 (OS ref: SE 03388 16272). The Proposed Scheme is hydrologically connected to the SPA as drainage from the existing motorway discharges to watercourses that run through the SPA into Booth Wood Reservoir via fixed drainage channels and culverts to the north of the carriageway. The location of the SPA and the motorway is presented in Figure 2-2, Appendix A2. This includes the locations of watercourses crossed by the Proposed Scheme and the locations of outfalls that feed into watercourses flowing through the SPA.
Resource requirements (from the European Site or from areas in proximity to the site, where of relevance to consideration of impacts)	The Proposed Scheme does not require resources from this (or any other) SPA.
Emissions	**Construction** Construction traffic would primarily access working areas in the verge via the motorway network. There may however be occasional construction traffic movements via the existing road network but these would be substantially below the volume of traffic that would result in significant (or indeed detectable) changes in air quality along these routes. During the construction phase, the Proposed Scheme has potential to generate changes to air quality through localised air-borne pollution caused by construction activities. This could include generation of dust, particulates, hydrocarbons and other chemicals, and also emissions of NOx from construction traffic. Pollutants may be generated during gantry removal, site clearance, and construction of EAs, gantries and resurfacing. Construction activities could also generate water-borne pollution, for example run-off from concrete casting operations or as a result of accidental spills of machine oils or fuels. Casting of concrete foundations for new gantries could lead to generation of alkaline run-off entering watercourses that drain the M62. Watercourses that flow through, or are in close proximity to, the SPA and could receive road drainage from the M62, are identified in Tables 9-5 and 9-8 of Chapter 9 (Road Drainage and the Water Environment) of the EAR. No changes to the culverts or outfalls associated with watercourses crossing or running adjacent to the Proposed Scheme are proposed. The assessment presented in Chapter 9 (Road Drainage and the Water Environment) of the EAR (Section 9-8) predicts no significant effects on watercourses during construction. This is on the basis of standard best-practice measures being included within the Delivery Partner's CEMP, which would be informed by the OEMP. This is identified under clauses WAT018 to WAT021 and WAT042 to WAT043 of the OEMP, which are extracted below: • WAT018 - A surface water and/or groundwater pollution control plan and emergency response plan taking into account standard best practices will be put in place for works that could affect aquifers or watercourses. • WAT019 - Current pollution control measures that apply in relation to storage of any oil based materials (eg fuel storage) shall be defined in the CEMP. Stationary plant used by the Delivery Partner shall be fitted with measures such as drip trays to retain any leakage of oil or fuel. The Delivery Partner will empty trays at intervals to prevent

	overflow. Mobile plant should be refuelled in designated areas where there is a sealed drainage system. • WAT020 - The Delivery Partner will provide a suitable construction site drainage system with appropriately sized treatment facilities such as settlement or retention basins. • WAT021 - The Delivery Partner will consult with the statutory authorities regarding the measures to be implemented to contain and manage surface water runoff from the scheme construction and requirements for water quality monitoring of watercourses or groundwater potentially affected by construction works or discharge of surface water run-off. • WAT042 - The Water Management Plan within the CEMP shall include measures to ensure that no pollution pathways are created between the construction sites and watercourses via overland flow during rainfall events. Measures would include minimizing the period that subsoil is exposed, use of cut-off trenches and sediment lagoons as well as retention of vegetation along watercourses to aid attenuation. • WAT043 - Construction compounds should incorporate a closed drainage system with pollution control measures to prevent surface water and groundwater contamination. In addition, regardless of the implementation of a CEMP, construction phase impacts on water quality draining from the Proposed Scheme would have a negligible magnitude of impact on receiving watercourses. Existing engineered drainage channels, culverts and cloughs are directed off the motorway and away from the SAC (see Figure 2-2, Appendix A2). Whilst watercourses pass through limited extents of SAC habitats, the qualifying interest habitats designated for the SAC are fed primarily from rainfall rather than watercourses. Therefore, any potential event would be directed through existing drainage features, be subject to dilution and directed away from the SAC with no significant impact to the designated habitats, notwithstanding the embedded measures contained in the OEMP/CEMP. **Operation** Within 200 m of Lane 1 (typically the former hard shoulder) changes in emission levels from traffic using the M62 could result in air quality impacts on European Sites. The SPA is directly adjacent to the Proposed Scheme with the potential for it to be negatively affected if the Proposed Scheme leads to increased concentrations of nitrous oxides (NOx) or increased rates of nitrogen deposition onto SPA habitats. A Technical Note[7] has been produced setting out the results of air quality modelling for the operational stage of the Proposed Scheme (see Appendix B1) This identifies predicted changes in NOx concentrations and nitrogen deposition arising from the Proposed Scheme. This assessment has been completed in combination with predicted changes in emissions arising from future changes to the UK vehicle fleet and other plans and projects. This Technical Note demonstrates that there will be an exceedance of the critical level for NOx over approximately 1.2 ha of the SAC where the Proposed Scheme contributes more than 1% of the Critical Level for NOx. This equates to approximately 0.002% of the SAC by area. The Technical Note also identifies that nitrogen deposition impacts more than 1% of critical load are predicted to occur over an area of the SAC amounting to at most 4 ha. This equates to approximately 0.006% of the SAC by area. This nevertheless exceeds 1% of Critical Load, which in accordance with DMRB LA 105 (Air Quality), requires consideration of potential significant effects.

[7] HE551534-WSP-EAQ-SG-RP-LA-0006: Model Verification and Further Calculations of Changes in Nitrogen Deposition Rates on the South Pennine Moors SAC/SPA/SSSI (Version P02, Mar 2019, plus supporting appendices).

	During operation of the Proposed Scheme, road drainage would continue to be discharged from the Proposed Scheme via the existing outfalls. This would result in no changes to the discharge rate of drainage leaving the Proposed Scheme. There would be an increased volume of traffic of up to 17% by 2039 at the M62 Junction 22 westbound slip-road. Other locations on the M62 adjacent to the SPA/SAC would experience reduced traffic growth relative to this. Therefore, it is possible that increased levels of pollutants could be generated as an incidental result of these increased traffic volumes. There would be some changes to the design of drainage within the existing carriageway, including the hard shoulder. The detailed drainage design would be determined at detailed design stage. The main changes to drainage design that can be identified at this stage of the Proposed Scheme are set out in Section 2.3 of the EAR (Chapter 2, The Proposed Scheme). These would comprise: • Removal of filter drains from the central reserve due to hardening of surface to support all-lane running; • Provision of surface water channels to receive and transport water from impermeable surfaces; and • Provision of sub-surface linear drainage systems to receive and transport water from impermeable surfaces, where surface water channels are not practicable. The operational drainage system will be designed, constructed and built entirely within the Proposed Scheme boundary (as shown on Figure 2-2 in Appendix B). No temporary or permanent works will be carried out within the SPA boundary, other than where the 'Construction and Operation footprint' (shown on Figure 2-2) overlaps with the SPA. As such, there will be no additional land take beyond that already identified under 'Land-take', above. The drainage system will be designed to accommodate a 1-year design storm without surcharge and a 5-year storm with surcharge with 20% allowance for climate change, as per IAN 161/15. Any new drainage system would incorporate catch pit gulley's and/or bypass interceptors as standard. These will provide a local betterment to the quality of water draining from the Proposed Scheme, as the current drainage on the M62 does not include these features. Any such features will be designed and constructed in accordance with IAN 161/15. As per IAN 161/15, spillage control measures will follow the requirements set out in DMRB HD33/06 'Surface and Sub-surface Drainage systems for Highways'. The Proposed Scheme will therefore maintain or improve the water quality of operational drainage into the SAC.
Transportation requirements	**Construction** Construction of the Proposed Scheme may require some limited motorway closures at the weekend or at night, requiring the diversion of motorway traffic onto local roads. Of the 11 potential diversion routes, three traverse the South Pennine Moors Phase 2 SPA (refer to Figure 2-3, Appendix A3) and would direct traffic through the SPA in the event of their use, namely: • Area 10 - Routecard F1 - non-HGV; • Area 10 - Routecard F4 - HGV; and • Area 10 - Routecard F4 – non-HGV. The remaining potential diversion routes do not lie within 400 m of the South Pennine Moors Phase 2 SPA boundary (refer to Figure 2-3, Appendix A3). The actual number of vehicles that may be diverted cannot be accurately predicted. However, based on a review of traffic data from Webtris observed data for 2018 (supplied by Atkins and reviewed by Arup, the traffic modelling suppliers for the project), total flows (combined light and heavy loads) for the

	period 2300-0500 to represent a full overnight closure to allow the installation and/or removal of portal gantry superstructure are estimated at 5,195 for Junction 21 – Junction 22, 5,344 for Junction 22 – Junction 23 and 5,171 at Junction 23 – Junction 24 respectively. One diversion route involves the use of the A58 which is already exposed to moderate traffic flow[8] although the closure and diversion of the motorway could represent a traffic increase of up to 700%. **Operation** There will be no significant change in noise and vibration levels associated with operation of the Proposed Scheme. This is set out in Chapter 8 (Noise and Vibration) of the EAR, which demonstrates that changes in noise levels across the SPA will be imperceptible in the context of baseline levels.
Duration of construction, operation etc.	Main construction works are planned to commence in 2020, and will last for approximately 3-4 years.
Other	The Proposed Scheme will be lit throughout using new LED luminaires lighting technology only, mounted on existing lighting columns where these can be reused. Where old sodium luminaire lighting exists, replacement lighting will be provided in the form of efficient LED type lanterns that would be capable of being managed centrally allowing them to be dimmed or even switched off to minimise the environmental effects at low flow times in the middle of the night. These LED lanterns offer more directional lighting with full-cut off lanterns which do not emit any ultra violet output thus having a lower impact than the existing low pressure and high-pressure sodium lamps. There would therefore be no change or there would be a reduction of lightspill onto SPA habitats relative to the existing situation. As such, no perceptible negative impacts would occur as a result of lighting of the Proposed Scheme The construction phase of the Proposed Scheme will see potential increases in noise, visual and vibration disturbance associated with the presence of plant and personnel during clearance and construction activities (including within the location of the candidate construction compounds). Noise disturbance will be due to resurfacing works of one to two-day duration with hard shoulder resurfacing taking place in period advised by the Delivery Partner (advance works contractor). Subsequent resurfacing of the four-lane highway will be undertaken by the main Delivery Partner. These activities could have adverse impacts on the bird species for which the SPA has been designated. The noise chapter of the EAR (see Chapter 8, Table 8-12) sets out the predicted impacts of construction noise. This shows that the predicted construction activities would lead to noise levels of at most 62 dB within 100 m of the SPA boundary, and at most of 54 dB within 200 m of the SPA. Piling activities have been included within this assessment, as percussive piling may be required at new gantry and Emergency Area locations. Visual disturbance may occur in suitable habitats of the SPA during construction at a distance up to 400 m in accordance with published research on the most sensitive relevant qualifying features[9]. It is considered however, that the majority of qualifying features are not present in this area due to disturbance from the existing M62 and the limited suitable breeding habitat. There will be no significant change in noise and vibration levels during operation of the Proposed Scheme. While traffic movement will be in effect marginally closer to the SPA, this is considered to represent no perceptible change in baseline conditions. This is further set out in Chapter 8 (Noise and

[8] Average 2 way traffic flow across all Links during a 6hr closure for all links is 732, while average 2 way traffic flow across all links during 6hr closure for the SPA links is 535 as sourced from Arup.

[9] M. Ruddock & D.P. Whitfield (2007). A Review of Disturbance Distances in Selected Bird Species.

	Vibration) of the EAR, which demonstrates that changes in noise levels across the SPA will be imperceptible in the context of baseline levels.
Description of Avoidance and/or Mitigation Measures:	
Nature of proposals	Not proposed at screening. To be considered at Stage 2 (appropriate assessment)
Location	Not proposed at screening. To be considered at Stage 2 (appropriate assessment)
Evidence for effectiveness	Not proposed at screening. To be considered at Stage 2 (appropriate assessment)
Mechanism for delivery (legal conditions, restrictions or other legally enforceable obligations)	Not proposed at screening. To be considered at Stage 2 (appropriate assessment)
Characteristics of European Site:	
Name of European Site and its EU code	South Pennine Moors Phase 2 SPA (UK9007022).
Location and distance of the European Site from the proposed works	M62 bisects and is adjacent to the SPA from west of junction 22 (OS ref: SD 95448 14255) and ends east of Stott Hall Farm between junction 22 and junction 23 (OS ref: SE 03388 16272). The central OS grid reference of the SPA is SK144960. The location of the SPA is presented in Figure 2-1, Appendix A1.
European Site size	20944.5 ha (area)
Key features of the European Site including the primary reasons for selection and any other qualifying interests (Taken from Natura 2000 Standard Data Form[10])	The Site qualifies under Article 4.1 (79/409/EEC). During the breeding season the area regularly supports important UK bird species: • Merlin (*Falco columbarius*) 2.2% of the GB breeding population as at 1995; and • Golden plover (*Pluvialis apricaria*) [North-western Europe - breeding] 1.3% of the GB breeding population. The site also qualifies under article 4.2 (79/409/EEC) by supporting important breeding bird assemblages characteristic of moorland and moorland-fringe species including *Actitis hypoleucos* (common sandpiper), *Calidris alpina schinzii* (dunlin), *Carduelis flavirostris* (twite), *Gallinago gallinago*, (snipe), *Numenius arquata* (curlew), *Oenanthe oenanthe*, (wheatear), *Saxicola rubetra* (whinchat), *Tringa totanus* (redshank*), Turdus torquatus* (ring ouzel), *Vanellus vanellus* (lapwing).
Vulnerability of the European Site – any information available from the standard data forms on potential effect pathways (taken from Natura 2000 standard Data form)	The key factors reported with important negative effects on the SPA are: • Air pollution, air-borne pollutants; • Fire and fire suppression; • Agriculture activities; • Hunting and collection of wild animals; • Reduced fecundity/genetic depression; and • Human induced changes in hydraulic conditions; and • Outdoor sports and leisure activities, recreational activities.
European Site conservation objectives – where these are readily available	*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;*

[10] Found at http://jncc.defra.gov.uk

	• *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.*
Assessment Criteria: Describe the individual elements of the scheme (either alone or in combination with other plans or schemes) likely to give rise to impacts on the European Site.	
Construction activities would be limited to the areas of land-take identified on Figure 2-2 in Appendix A2. The identified construction impacts that need to be considered in relation to the South Pennine Moors Phase 2 SPA are: • Land-take (reduction in habitat area); • Localised air quality Impacts; • Disturbance during construction; and • Water quality (pollution incidents affecting water quality in watercourses flowing through SPA habitats). **Operation** The identified operation impacts that need to be considered in relation to the South Pennine Moors Phase 2 SPA are: • Emissions from traffic causing elevated levels of NOx and increased rates of nitrogen deposition over SPA habitats, affecting their ability to support SPA bird species; and • Changes in the quality or quantity of water flowing from the Proposed Scheme once it becomes operational, affecting SPA habitats and their ability to support SPA bird species.	
Initial Assessment: The key characteristics of the site and the details of the European Site should be considered in identifying potential impacts. Describe any likely changes to the site arising as a result of:	
Reduction in habitat area	The Proposed Scheme would result in land-take from within the SPA up to a maximum of approximately 0.23 ha, comprising 0.2 ha of semi-improved grassland and 0.03 ha of modified dry bog. This habitat loss would take place within the existing highways boundary, with a proportion of the habitat loss being temporary in nature (land required to facilitate construction of the Proposed Scheme). The long-term habitat loss would therefore be less than that presented above, but how much less cannot be quantified until detailed design. Being within the highways soft estate, much of the habitat affected is also on made ground and is not representative of the upland habitats which form the typical habitat of the SPA bird species. For example, much of the habitat present along the soft estate is comprised of semi-improved neutral grassland, which is not a qualifying interest of the SPA, and does not comprise preferred habitat for the upland bird species for which the SPA is designated. The reduction in habitat area arising from the Proposed Scheme is equivalent to approximately 0.0003% of the SPA by area. This level of habitat loss is considered negligible, and so minimal that it could not combine appreciably with the effects of other plans or projects (to put this into context, around 3000 schemes with the same land-take as the Proposed Scheme would be required to cause habitat loss equivalent to 1% of the SPA by area). The majority (0.2 of the total 0.23 ha) of the habitat affected is considered site fabric being semi-improved grassland, not the high altitude moor favoured by the two qualifying features, merlin and golden plover. In addition, habitats within the soft estate are subject to very high existing levels of disturbance from existing traffic levels on the M62. Land-take associated with the Proposed Scheme (with the exception of the candidate construction compounds, see Figure 2-1 in Appendix A1 for indicative locations) would be confined to areas within 50 m of the existing carriageway of the M62, with the

	majority of land-take within the existing carriageway/hard shoulder (Figure 2-2, Appendix A2). Given this proximity to the active carriageways of the M62 and the nature of the habitats present, there is considered be no potential for the majority of SPA qualifying or assemblage features to be present at or adjacent to the area of potential habitat loss. The only species that are considered to have some potential to be nesting adjacent to the Proposed Scheme (but not within it), despite 2014 survey data finding their absence, are wheatear and whinchat, while twite may forage in this area. These species are all tolerant of disturbance and any loss of a foraging resource will be imperceptible considering the vast availability of more optimal habitat found elsewhere in the SPA.
Disturbance to key species	The SPA is designated as the area regularly supports >1% of the UK population of the following bird species: merlin and golden plover and also supports a bird assemblage characteristic of moorland and moorland-fringe, including lapwing, curlew, snipe, dunlin, redshank, common sandpiper, twite whinchat, wheatear and ring ouzel. Both construction and operation phases of the Proposed Scheme could have potential impacts with regards to elevated noise, visual and vibration disturbance. **Construction** During the construction phase of the Proposed Scheme, disturbance levels will be increased from various factors, including plant and machinery, night working and workforce. Various academic papers have been published with regards to potential disturbance impacts due to prolonged construction activities. Of note are papers by Hockin et. al. (1992)[11] and Pearce-Higgins et. al. (2009)[12] which looked at the human-induced disturbance and negative effects through prolonged startling effects on breeding bird success and impact distance. The Annex I bird species for which the SPA is designated are upland birds which typically avoid adverse disturbance levels. Distances over which these species would avoid adverse disturbance are up to 200 m for golden plover and up to 200-400 m for merlin. These species typically breed on the more remote elevated heather heathland and blanket bog sections of the moors, well away from existing disturbance and away from the alignment of the existing M62 (and hence the Proposed Scheme) through the SPA. Whilst potential for disturbance of Annex I species at their breeding sites is therefore limited, there is potential for increased disturbance of SPA breeding species, including birds foraging away from nest sites. The Article 4.2 breeding bird assemblage feature of the SPA includes species that are upland breeders (with the noted exception of twite) and are unlikely to breed in proximity to the M62 alignment, but disturbance of individual birds foraging away from breeding sites is possible. Specifically, for noise (rather than visual) disturbance, Chapter 8 of the EAR (Noise and Vibration) Table 8-12 indicates combined construction noise levels of up to 69 dB at 50 m with a maximum of 62 dB at 100 m and 53 dB at 200 m. This is within the tolerance levels indicated by a toolkit devised to inform impacts assessment on waterbirds (Cutts, Hemingway and Spencer, 2013[13]). This toolkit is typically used to assess impacts on estuarine bird species but has also been used to determine impacts on inland windfarm projects. The toolkit defines a tolerance of noise up to 72dB being acceptable at a bird's

[11] Hockin, D, Ounsted, M., Gorman, M., Hill., D., Keller, V. and Barker, M.A. (1992). Examination of the Effects of Disturbance on Birds with reference to its Importance in Ecological Assessments. Journal of Environmental Management (1992) 36, 253-286

[12] Pearce-Higgins, J. W., Stephen, L., Langston, R. H., Bainbridge, I. P. and Bullman, R. (2009), The distribution of breeding birds around upland wind farms. Journal of Applied Ecology, 46: 1323-1331.

[13] Cutts N, Hemingway K and Spencer J (2013). The Waterbird Disturbance Mitigation Toolkit Informing Estuarine Planning and Construction Projects. Produced by the Institute of Estuarine and Coastal Studies (IECS). Version 3.2.

	location, but with application of caution and professional judgement being used at levels above 55 dB (60dB in a highly disturbed area). It is noted that the M62 motorway was in place long before the SSSI was first notified in 1994 (SPA designated 1997, and the SAC in 2004). Any designated wildlife in the vicinity of the motorway will have already distributed itself in response to traffic disturbance. The construction activities that would generate the greatest levels of noise and vibration (percussive piling for Emergency Areas and gantry construction and stripping of existing surfacing) would also be short-lived in any one location. As set out in Section 8.5.17 of Chapter 8 (Noise and Vibration) of the EAR, piling activities at any location are expected to take between 1 – 2 weeks to complete. Stripping of existing road surfacing would be a transitory activity, with stripping works moving along the Proposed Scheme on a rolling basis where required. With regards the potential use of diversion routes for overnight closures, the nature of SMP construction is such that these are only used occasionally. It is considered that use of the three diversion routes that traverse the SPA would have the potential for disturbance of SPA qualifying interest species[14]. It is however noted that between August 2018 and March to July 2019, 21 carriageway and full motorway closures between Junctions 21 and 24 occurred during the bird breeding season, suggesting a level of ongoing disturbance to the SPA is part of baseline conditions. Nevertheless, a change in up to 700% traffic flow on diversion routes such as the A58 for between 73No. and 86No. additional closures is considered to have the potential to result in a material change. Conversely, it is considered that the use of the diversion routes beyond 400 m from the SPA boundary would not have the potential for disturbance of SPA qualifying interest species, and therefore LSE would not arise. **Operation** The alteration from three-lane to four-lane running motorway will have an increase in vehicular capacity during the operational phase with traffic moving marginally closer (up to five metres) to the SPA. EAR Chapter 8 (Noise and Vibration) Section 8.6.3 estimates a minor increase in noise level ranging from 1.0 to 1.6dB within proximity to the SPA. This noise level change sits at the lower end of the minor category defined in DMRB (see Table 8-3 in Chapter 8 of the EAR). This level of change is so minor that it is highly unlikely to lead to any perceptible change in the behavior of SPA bird species.
Habitat or species fragmentation	The works will be constructed and operated entirely within the existing M62 boundary, with the exception of the temporary candidate site construction compounds. No use would be made of the existing Highways England depot at Junction 22 to avoid any loss / fragmentation of habitat that could be used by SPA bird species. There will be negligible land-take from within the soft estate and boundary of the SPA, as described under 'Reduction in Habitat Area', above, while compounds will all be located outside of the SPA. There will therefore be no material fragmentation of SPA habitats.
Reduction in species density	A reduction in the species density could theoretically occur, if disturbance of SPA qualifying features occurred from repeated startling events during construction. Disturbance is therefore considered to only have the potential for LSE of birds breeding close to the Proposed Scheme during construction which could potentially lead to abandonment of nest sites due to increased levels of noise, and visual disturbance. Disturbance to birds foraging in this area may also occur, although species are considerably less sensitive than those

[14] The actual number of vehicles that may be diverted cannot be accurately predicted. However, based on a review of traffic data from Webtris observed data for 2018 (supplied by Atkins and reviewed by Arup, the traffic modelling suppliers for the project), total flows (combined light and heavy loads) for the period 2300-0500 to represent a full overnight closure to allow the installation and/or removal of portal gantry superstructure are estimated at 5,195 for J21 – 22, 5,344 for J22 – J23 and 5,171 at J23 – J24 respectively.

	constrained to a nest site (foraging birds also have alternative sites within which they can relocate). As set out in the section on 'Disturbance of Key Species' above, construction noise impacts are expected to drop to insignificant levels between 100–200 m from construction activities but visual disturbance may occur up to 400 m. In addition, most of the construction activities would be short-lived or transient in nature (i.e. construction impacts would occur at any one location for a limited duration only, for example one to two weeks in the case of any piling required in relation to Emergency Area or gantry construction). Notable exceptions to this would be the construction compounds, which would be in-situ for the period of construction.
Changes in key indicators of conservation value (water quality etc.)	**Construction** During construction, the potential for localised air quality impacts has been identified, primarily the potential for dust generated by earthworks and construction to deposit onto SPA habitats. Any such impacts would be confined to the areas immediately surrounding the areas of construction that are unlikely to be regularly used by SPA bird species due to the proximity to the existing M62. IAQM Guidance on assessing the impacts of construction dust on habitats[15] identifies that perceptible impacts are unlikely to extend more than 50 m from construction areas. Construction would also be of a relatively short duration in any one location along the Proposed Scheme (the programme for construction and commissioning of the Proposed Scheme is anticipated to take approximately two years, see Section 2.5 of Chapter 2 (The Proposed Scheme) of the EAR). The air quality assessment presented in the EAR (concludes there would be no significant residual adverse effects as a result of air quality impacts. This conclusion was reached partly with consideration of embedded mitigation measures included in the OEMP. These are included in the OEMP as standard measures, provided regardless of the presence of any European Site. The relevant clauses are provided below: • Air001 - Appropriate mitigation measures - including those described in IAQM Guidance on the assessment of dust from demolition and construction shall be detailed in working Method Statements demonstrating how impacts on receptors will be avoided. Given the minor scale of impact and that mitigation for construction dust impacts is applied as a standard designed in measure, perceptible levels of dust deposition onto the South Pennine Moors Phase 2 SPA are not predicted to arise. The potential for pollution incidents to affect the quality of water draining from the M62 into SPA habitats has been identified as a potential pathway for LSE to occur. This could arise in the event of a pollution incident during construction, for example an accidental uncontrolled release of oils and/or fuels from construction plant. In the event of such an incident, water-borne pollutants would be captured by the existing drainage arrangements along the M62 or through construction phase drainage and into the network of watercourses that receive drainage from the M62 (see 'emissions' under Scheme description section, above). Between the western end of the Proposed Scheme and CH20+950, drainage would be captured by watercourses that do not flow into the SPA. Between CH20+950 and CH25+950 some drainage would be captured by stream and drainage channels that flow through the SPA. Although these watercourses drain through SPA habitat they are unlikely to play a key role in supplying

[15] Holman et al (2014). IAQM Guidance on the assessment of dust from demolition and construction, Institute of Air Quality Management, London. www.iaqm.co.uk/text/guidance/construction-dust-2014.pdf

	SPA habitats with water, as they drain into watercourses and reservoirs outside the SPA (Figure 2-2, Appendix A2). These watercourses will play a more significant role in draining rather than supplying SPA habitats with water. Any pollution incidents that occurred (in the absence of mitigation) within the SPA would therefore have a minimal impact on the SPA, as the pathways for pollutants to reach SPA habitats is limited. Incidentally and not required as a protective measure, the Delivery Partner would be required to deliver the Proposed Scheme under a CEMP. This would contain standard best-practice measures for preventing and addressing pollution incidents in common with other Smart Motorway schemes, with the CEMP required to deliver Clauses WAT-018 to WAT-021 and WAT-042 to WAT-043, as specified in the OEMP. The potential for perceptible impacts to SPA habitats to result from construction phase changes in water quality is therefore considered negligible. With regards the potential use of diversion routes for overnight closures, the nature of SMP construction is such that these are only used occasionally. As construction activities would not require diversion routes beyond intermittent night time or weekend closures (between 73No. and 86No. closures), it is considered that the potential increased levels of traffic on the three diversion routes that traverse the SAC[16] would not cause NOx emissions and associated nitrogen deposition from vehicles using the routes to be adversely increased. Therefore, LSE are considered unlikely. **Operation** As set out under 'emissions' in the Proposed Scheme description section above, the Proposed Scheme (in-combination with other plans and projects) is predicted to lead to increased vehicle emissions. These have been modelled by the Air Quality specialist (see Appendix B1) and are predicted to exceed 1% of Critical Load across up to 0.006% of the SPA by area. The methodology in DMRB LA 105 has been followed[17], to determine whether the predicted impact of the Proposed Scheme could lead to the theoretical loss of one species. The maximum impact anywhere within the boundary of the SPA is 0.13kgN/ha/yr. Following the method within DMRB LA 105, a change of 3.3kgN/ha/yr is required to reduce species richness by one within bog habitats (the habitat which dominates areas within 200m of the ARN and has the lowest critical load range of the habitats present). The Proposed Scheme would lead to a maximum impact equivalent to less than 5% of this amount. As the predicted impact does not have the potential to lead to the loss of one species, in accordance with DMRB LA 105, Likely Significant effects are not predicted. As also set out under 'emissions' in the Proposed Scheme description above, the operational drainage design would include standard attenuation and treatment measures in accordance with IAN 161/15 and DMRB HD33/06. Such measures are not incorporated into the current drainage design of the existing M62 adjacent to the South Pennine Moors Phase 2 SPA. No negative impacts on the water quality of watercourses draining through the SPA are therefore predicted, and there is the potential for localised long-term improvements due to the introduction of drainage design measures in line with current standards (IAN 161/15 and DMRB HD33/06).

[16] The actual number of vehicles that may be diverted cannot be accurately predicted. However, based on a review of traffic data from Webtris observed data for 2018 (supplied by Atkins and reviewed by Arup, the traffic modelling suppliers for the project), total flows (combined light and heavy loads) for the period 2300-0500 to represent a full overnight closure to allow the installation and/or removal of portal gantry superstructure are estimated at 5,195 for J21 – 22, 5,344 for J22 – J23 and 5,171 at J23 – J24 respectively.

[17] Design Manual for Roads and Bridges (Nov 2019). Air Quality – Sections 2.98 to 2.102.

Climate change	Carbon emissions associated with SMP schemes are primarily determined by the vehicles using the motorway rather than the embodied carbon associated with scheme construction and maintenance. Therefore, embodied carbon is not reported (change in carbon emissions not considered to be significant). Climate change adaptive measures have been included within the Proposed Scheme design in accordance with IAN 161/15, as follows: • There will be no additional outfalls and existing outfalls will continue to discharge at existing established peak flow rates. The design will be for a 1:5 year return period (1:20 year for critical locations) with no surface flooding (inclusive of 20% to allow for climate change) for any additional water arising as a result of the additional paved area only. • Attenuation is also to address the increased surface area associated with new hard standing such as EAs, with pollution control devices also included to address accidents and spillages. In light of the above, the Proposed Scheme is not expected to exacerbate the effects of climate change.
Interference with the key relationships that define the structure of the site	Structure is taken to correspond to the distribution of habitats within the SPA which support SPA bird species. Interference with the relationships which define the structure of the habitats within the SPA are not expected to arise, due to the negligible magnitude of changes caused by the Proposed Scheme.
Interference with the key relationships that define the function of the site	Function is taken here to mean the capacity of the SPA to support SPA bird species. The quality and extent of habitats within the SPA will not be significantly affected by the Proposed Scheme, due to the negligible magnitude of anticipated impacts and the existing patterns of use of the SPA by qualifying interest bird species.
Indicate the significance as a result of the identification of impacts set out above in terms of:	
Reduction of habitat area	Likely Significant - there will be a negligible reduction in habitat area within the SPA, in areas within the Highways England boundary that have the potential to be used by SPA bird species due to disturbance as a result of the construction or operation of the Proposed Scheme. Species that may be present are likely limited to tolerant assemblage species, namely whinchat, wheatear and twite. As there is the possibility that SPA bird species may use the SPA, the potential for LSE is identified.
Disturbance to key species	Likely significant - There is potential for limited disturbance of SPA qualifying interest species as a result of construction of the Proposed Scheme, and through the use of the three diversion routes that traverse the SPA. During the operation phase no LSE are predicted to arise.
Habitat or species fragmentation	Not significant - There will be negligible land-take from the SPA and no severance or fragmentation of habitats or species would occur as the Proposed Scheme and associated works will be maintained within the highway boundary.
Loss	Not significant - There will be no loss of species as a result of the construction or operation of the Proposed Scheme.
Disruption	Not significant - Construction and operation of the Proposed Scheme are not expected to disrupt the structure or function of the key relationships within the SPA that support SPA bird species.
Disturbance	Potentially significant - Although short-lived and low-level disturbance from construction, further consideration is needed to confirm the absence of significant effects.
Change to key elements of the site (e.g. water quality, hydrological regime etc.)	Operation - Not significant - There will not be a significant change to key elements of the site due to the short-lived and relatively minor nature of construction works, the limited magnitude of impacts, and the standard design

	features that will be incorporated into the Proposed Scheme. During operation, no perceptible changes in vegetation are expected to occur as a result of air quality impacts while no negative impacts on the water quality of watercourses draining through the SPA are predicted.
Describe from the above those elements of the scheme, or combination of elements, where the above impacts are likely to be significant or where the scale or magnitude of impacts is not known	
The Proposed Scheme is considered to have likely significant effects on SPA features through disturbance impacts in the construction phase and potential for air quality impacts (dust) in the construction phase. All other effects are considered to be non-significant.	
Outcome of screening stage (delete as appropriate)	Likely significant effect as a result of habitat loss; and disturbance to birds (during construction). This site has been screened in for further assessment.
Are the appropriate statutory environmental bodies in agreement with this conclusion (delete as appropriate and attach relevant correspondence)	The HRA has been issued to Natural England for consultation as part of the PCF Stage 3 consultation process. It includes revisions following comments received at a meeting with Natural England held on the 13th May 2019 and will be reissued to them (along with the Statement to Inform the Appropriate Assessment (document reference HE551534-WSP-EGN-SG-RP-LE-00033)) to seek confirmation of agreement with the findings where possible.

Table A-3: Rochdale Canal SAC Screening Matrix

Scheme Name:	M62 Junction 20-25 Smart Motorways Programme	
European Site Consideration:	Rochdale Canal SAC	
Date:	**Author (Name/Organisation)**	**Verified (Name/Organisation)**
22nd May 2019	Ian Ellis WSP Associate Director	Philip Davidson WSP Associate Director
Description of the scheme: Describe any likely direct, indirect or secondary impacts of the scheme (either alone or in combination with other plans or schemes) on the European Site by virtue of:		
Size and scale (road type and probable traffic volume)	The 34.8 km length of the Proposed Scheme includes 1.3 km warning signs beyond the east and west extents of the core scheme. This section of the M62 carries high volumes of heavy goods and other vehicles.	
Land-take	The Proposed Scheme will not require any land take from the SAC.	
Distance from the European Site or key features of the site (from the edge of the scheme assessment corridor)	The Rochdale Canal SAC travels underneath the M62 in a north to south direction, located 1200 m west of junction 20. One outfall (SD8809_3084a) has been identified at the start of the Proposed Scheme boundary on the eastbound carriageway (CH10+150), with connection into the Rochdale Canal SAC. However, works on the Proposed Scheme commence 370 m east of the SAC which entail only modifications to an existing gantry. The SAC is within 200 m of the ARN. The location of the SAC and the ARN is presented in Figure 2-1, Appendix A1.	
Resource requirements (from the European Site or from areas in proximity to the site, where of relevance to consideration of impacts)	The Proposed Scheme does not require resources from this SAC.	
Emissions (Nitrogen Deposition - through atmospheric pollution)	**Construction** During the construction phase, the Proposed Scheme will not generate any significant changes to water and air quality through water-borne and air-borne pollution. This includes suspended solids and particulates, hydrocarbons and other chemicals which may arise from construction plant and activities, such as construction of EAs, gantries and resurfacing. There is no potential for construction phase air quality impacts as the closest construction works are 370 m east of the SAC. **Operation** Elevated nitrogen levels are already high within the immediate area of the SAC and M62 cross over. The nitrogen deposition modelling completed for the Air Quality assessment (see Table 5.6.3 of Appendix 5 of the EAR) predicts a maximum impact of the Proposed Scheme equivalent to 0.05KgN/Ha/yr at the boundary of the Proposed Scheme. The predicted impact equates to more than 1% of the lower end of the critical load range (3kgN/ha/yr) up to 50 m from the SAC boundary. This equates to up to 0.3% of the SAC by area. It should be noted that the Critical Load range for the SAC habitat is based on upland waterbodies. It is therefore of limited applicability to an artificial	

	waterbody in a lowland setting (such as the Rochdale Canal). It should also be noted that there is no deposition flux (rate) for the deposition of nitrogen onto aquatic habitats, with deposition onto a flat surface (i.e. the water surface of the canal) lower than the rate of deposition onto terrestrial habitats, as have been used in the air quality modelling. Pavement resurfacing and realignment works start 650 m east of the SAC. There will be no change to the drainage rate of the existing motorway (outfall SD8809_3084a) within the Proposed Scheme boundary.
Transportation requirements	**Construction** Construction traffic would access the construction areas via the existing road network and would not be of a volume that would result in significant changes in air quality leading to increases in nitrogen deposition along these routes. Considering the above, no significant impacts associated with construction transportation traffic (including increased noise, vibration, vehicle disturbance) are considered likely. Construction of the Proposed Scheme may require some limited motorway closures at the weekend or at night, requiring the diversion of motorway traffic onto local roads. Of the 11 potential diversion routes, five traverse the Rochdale Canal SAC (refer to Figure 2-3, Appendix A3), namely: • Area 10 - Routecard F1 - non-HGV; • Area 10 - Routecard F1 - HGV; • Area 10 - Routecard F4 - non-HGV; • Area 10 - Routecard F4 – HGV; and • Area 12 – Routecard. Two of the potential diversion routes do not traverse the SAC, but lie adjacent to the Rochdale Canal SAC boundary (refer to Figure 2-3, Appendix A3), namely: • Area 10 - J20-21 Eastbound; and • Area 10 - J21-20 Westbound. The remaining potential diversion routes do not traverse the SAC and all are a minimum of 400 m from the Rochdale Canal SAC boundary (refer to Figure 2-3, Appendix A3). **Operation** Pavement resurfacing and realignment works start 650 m east of the SAC. There will be no change to the drainage rates at the outfall SD8809_3084a of the existing motorway within the Proposed Scheme boundary which crosses over the SAC and impacts associated with the operation of traffic (including increased noise, vibration, and vehicle disturbance) post-construction.
Duration of construction, operation etc.	Main construction works are planned to commence in 2020 and will last for approximately 3-4 years.
Other	Lighting for the Proposed Scheme will remain similar to that currently present. This, coupled with the distance of the SAC from the Proposed Scheme means there will be no change / additional impacts to the conservation features of the SAC due to lighting or visual impacts from the construction and operational phases.
Description of Avoidance and/or Mitigation Measures:	
Nature of proposals	None proposed.
Location	N/A
Evidence for effectiveness	N/A

Mechanism for delivery (legal conditions, restrictions or other legally enforceable obligations)	N/A
Characteristics of European Site:	
Name of European Site and its EU code	Rochdale Canal SAC (UK0030266).
Location and distance of the European Site from the proposed works	Proposed Scheme crosses over the SAC and is located approx. 1.5km west of junction 20 of the M62. The OS grid reference of the SAC is SD893038. The location of the SAC is presented in Figure 2-1, Appendix A1.
European Site size	25.55 ha (area)
Key features of the European Site including the primary reasons for selection and any other qualifying interests (Taken from Natura 2000 Standard Data Form[18])	The site is designated under article 4(4) of the Directive (92/43/EEC) as it hosts the following species listed in Annex 2: • Floating water-plantain *Luronium natans.* 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.
Vulnerability of the European Site – any information available from the standard data forms on potential effect pathways (taken from Natura 2000 standard Data form)	The key factors reported with important negative effects on the SAC are: • Air pollution, air-borne pollutants; and • Human induced changes in hydraulic conditions.
European Site conservation objectives – where these are readily available	The SACs conservation objectives 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 maintain or restoring;* • *The extent and distribution of the habitats of qualifying species;* • *The structure and function of the habitats of the qualifying species;* • *The supporting processes on which the habitats of qualifying species rely;* • *The populations of each of the qualifying species, and* • *The distribution of the qualifying species within the site".*
Assessment Criteria: Describe the individual elements of the scheme (either alone or in combination with other plans or schemes) likely to give rise to impacts on the European Site.	
Pavement resurfacing and realignment works start 650 m east of the SAC. There will be no change associated with the operation of traffic post-construction and are not considered to have any significant impact upon the conservation interests of the designated site. Elevated nitrogen deposition already exists within the immediate area of the SAC and M62 cross over. High levels are also attributed to adjacent urban and agricultural influences. Increases of NO_x and nitrogen	

deposition over the SAC are predicted to be marginal, but do exceed 1% of the lower end of the critical load range up to 50m into the SAC.	
Initial Assessment: The key characteristics of the site and the details of the European Site should be considered in identifying potential impacts. Describe any likely changes to the site arising as a result of:	
Reduction in habitat area	The Proposed Scheme would not result in any land take or habitat loss from this SAC.
Disturbance to key species	No impact pathways involving disturbance have been identified that could lead to LSE.
Habitat or species fragmentation	There will be no land take from the SAC and no severance or fragmentation of habitats or species would occur as the Proposed Scheme and associated works will be maintained within the highway boundary.
Reduction in species density	A reduction in species density as a result of the Proposed Scheme will not occur due to the negligible magnitude of any impacts.
Changes in key indicators of conservation value (water quality etc.)	The Proposed Scheme boundary crosses over the SAC however the nearest works associated with the Proposed Scheme are located approximately 370 m east of the SAC and involve small scale replacement of signage to an existing gantry. The existing motorway which crosses the SAC is already ALR designation and no major works are intended within or in close proximity to the SAC, with only minor improvements to existing gantry situated 370 m east of the SAC. The conversion from 3-lane to 4-lane ALR will not occur until junction 20 (1.5 km east of the SAC). The nitrogen deposition modelling completed for the Air Quality assessment (see Table 5.6.3 of Appendix 5 of the EAR) predicts a maximum impact of the Proposed Scheme equivalent to 0.05KgN/Ha/yr at the boundary of the Proposed Scheme. The predicted impact equates to more than 1% of the lower end of the critical load range (3kgN/ha/yr) up to 50 m from the SAC boundary. The maximum predicted nitrogen deposition rate is 12.5% of the amount required to result in a theoretical reduction in species richness of one. Following the methodology in Table 2.98 of DMRB LA 105, this effect is not considered significant.
Climate change	Carbon emissions associated with SMP schemes are primarily determined by the vehicles using the motorway rather than the embodied carbon associated with Proposed Scheme's construction and maintenance. Therefore, embodied carbon is not reported (change in carbon emissions not considered to be significant). Therefore, there is no likely significant effect to the SAC due to climate change and its interactions with the Proposed Scheme.
Interference with the key relationships that define the structure of the site	Structure is taken to correspond to the distribution of habitats in the SAC which support Floating water-plantain. Interference with the relationships which define the structure of the habitats in the SAC, such as increased levels of NO_2 and nitrogen deposition during the construction and operational phases, will be negligible.
Interference with the key relationships that define the function of the site	Function is taken here to mean the capacity of the SAC to support Floating water-plantain for which the site is designated. The quality and extent of habitats within the SAC will not be affected by the Proposed Scheme. Therefore, no effect on the function of the site is anticipated.
Indicate the significance as a result of the identification of impacts set out above in terms of:	
Reduction of habitat area	Not significant - There will be no reduction in habitat area within the SAC as a result of the construction or operation of the Proposed Scheme.

Disturbance to key species	Not significant - There will be no disturbance of key species as a result of the construction or operation of the Proposed Scheme.
Habitat or species fragmentation	Not significant - There will be no land take from the SAC and no severance or fragmentation of habitats or species would occur as the Proposed Scheme and associated works will be maintained within the highway boundary.
Loss	Not significant - There will be no loss of species as a result of the construction or operation of the Proposed Scheme.
Disruption	Not significant - Construction or operation of the Proposed Scheme will not disrupt the structure or function of the key relationships within the SAC.
Disturbance	Not significant - Disturbance to the qualifying interests for which the SAC is designated will not occur.
Change to key elements of the site (e.g. water quality, hydrological regime etc.)	Not significant - There will not be a significant change to key elements of the site.
Describe from the above those elements of the scheme, or combination of elements, where the above impacts are likely to be significant or where the scale or magnitude of impacts is not known	
The Proposed Scheme will not have any significant effects on this SAC.	
Outcome of screening stage (delete as appropriate)	No likely significant effects. This site has been screened out of further assessment.
Are the appropriate statutory environmental bodies in agreement with this conclusion (delete as appropriate and attach relevant correspondence)	The HRA has been issued to Natural England for consultation as part of the PCF Stage 3 consultation process. It includes revisions following comments received at a meeting with Natural England held on the 13th May 2019 and will be reissued to them (along with the Statement to Inform the Appropriate Assessment (document reference HE551534-WSP-EGN-SG-RP-LE-00033)) to seek confirmation of agreement with the findings where possible.

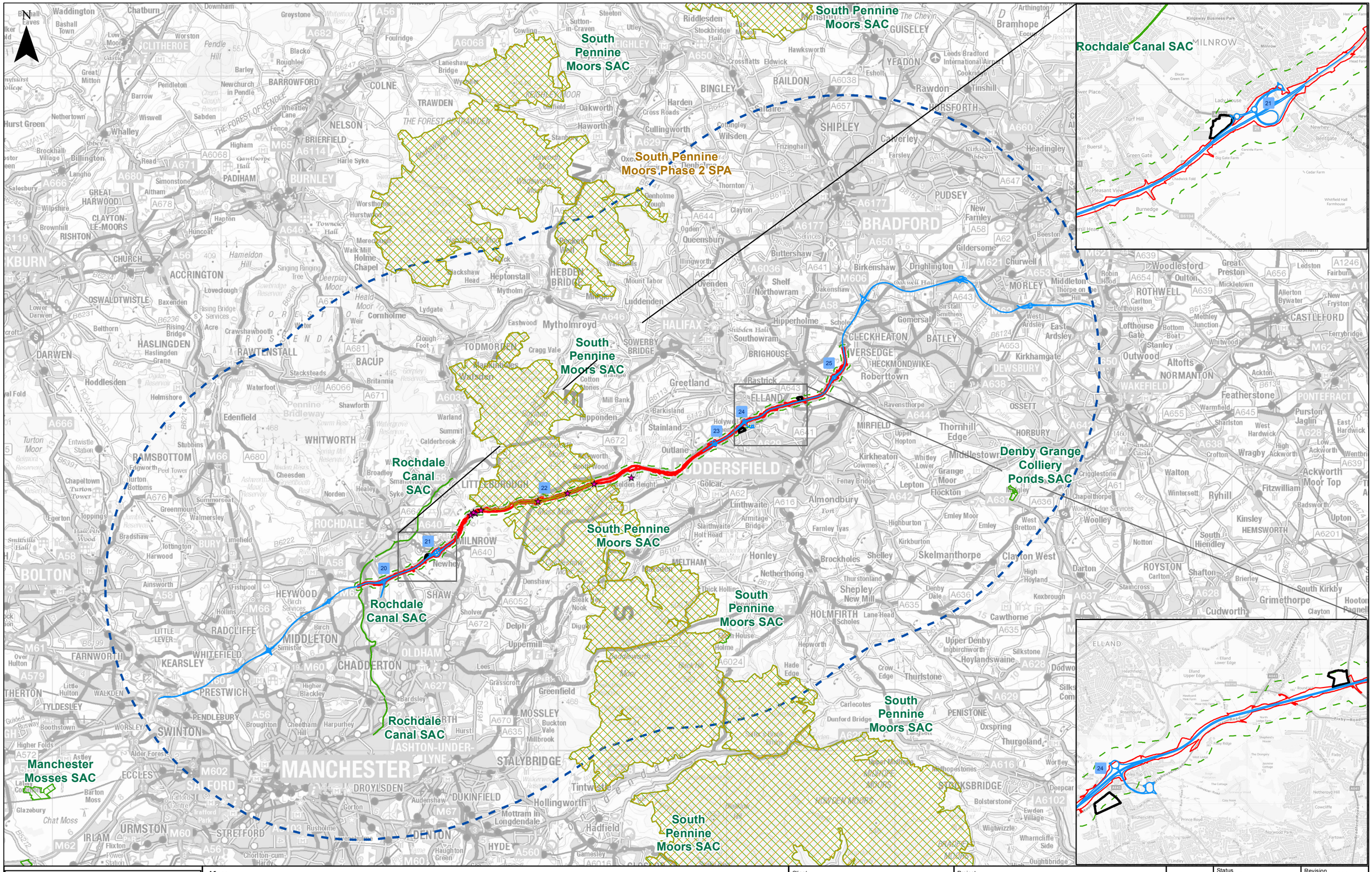
Appendix B. Figures

Figure 2-1 Scheme Location Affected Road Network and European Designated Sites

Figure 2-2 Scheme Overview

Figure 2-3 Signed/Unsigned Diversion Routes and SAC / SPA

Figure 6-1 Noise contours



0 5,000 10,000
Metres

Key

- Potential Compound / Work Areas
- Project Boundary
- 200m Buffer
- 15km Buffer
- Affected Route Network
- SPA
- SAC
- Candidate construction compound

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
		02/09/2019				

Client: highways england

wsp

Project: **M62 J20-25 Smart Motorway**

Drawing Title: **FIGURE 2-1 SCHEME LOCATION AFFECTED ROAD NETWORK AND EUROPEAN DESIGNATED SITES**

	Status: First issue	Revision: P08	
Scale: 1:200,000		Date: 02/09/2019	
Drawn By: JA			
Checked By: PB			
Approved By: MM			
Project No.: HE551534	Originator: WSP	Original Size: A3	

Drawing number	Volume	Location	Type	Role	Number
HE551534	EGN	SG	DR	LE	00032

Document Path: \\uk.wspgroup.com\Central Data\Projects\62241xxx\62241710 - CDF SMP Tranche 5\02 Discipline Inputs\GIS\Mxd\ECOLOGY\May 2019_62241710_20190604_FIGURE 4_1_JSdS.mxd

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N

Rochdale Canal SAC

Rochdale Canal

SD8809_3084a (Outfall 1)

G0-01

Ch 10+000
Ch 10+050
Ch 10+100
Ch 10+150
Ch 10+200
Ch 10+250
Ch 10+300
Ch 10+350
Ch 10+400
Ch 10+450
Ch 10+500
Ch 10+550
Ch 10+600
Ch 10+650
Ch 10+700
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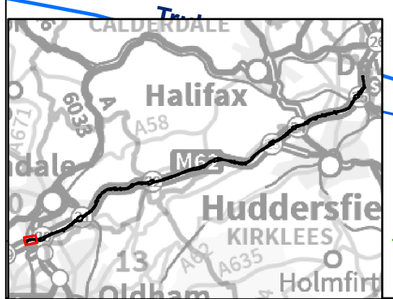
Ch 10+850
Ch 10+900
Ch 10+950



0 50 100
Metres

Key

- Outfall A (Very high)
- Flow Direction
- Watercourses
- Existing Gantry
- Proposed Gantry
- Road Markings
- Project Boundary
- SAC
- 200m Buffer
- Construction and operation footprint

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
		02/09/2019				

Client: highways england

Project: M62 J20-25 Smart Motorway

Drawing Title: FIGURE 2-2 SCHEME OVERVIEW PAGE 1 OF 11

Status	First issue	Revision	P08
Scale	1:2,500	Date	02/09/2019
Drawn By	AS		
Checked By	MM		
Approved By	MM		
Project No.	HE551534	Originator: WSP	
Original Size	A3		
Drawing number	Volume	Location	Type / Role / Number
HE551534	EGN	SG	DR / LE / 00031

Document Path: \\uk.wspgroup.com\Central Data\Projects\62241xxx\62241710 - CDF SMP Tranche 5\02 Discipline Inputs\GIS\Mxd\ECOLOGY\May 2019_62241710_20190604_FIGURE_2_1_Scheme Overview_JSdS.mxd

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N

South Pennine Moors Phase 2 SPA

South Pennine Moors SAC

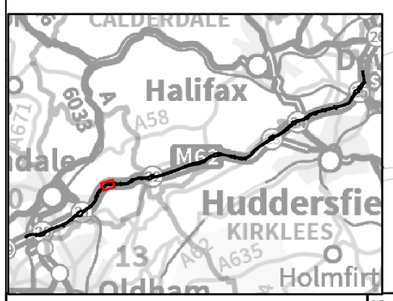
G2-09

G2-10

Ch 18+150
Ch 18+200
Ch 18+250
Ch 18+300
Ch 18+350
Ch 18+400
Ch 18+450
Ch 18+500
Ch 18+550
Ch 18+600
Ch 18+650
Ch 18+700
Ch 18+750
Ch 18+800
Ch 18+850
Ch 18+900
Ch 18+950
Ch 19+000
Ch 19+050
Ch 19+100
Ch 19+150
Ch 19+200

EA-WB-12

Longden End Brook



0 50 100
Metres

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
		02/09/2019				

Key

- Potential Compound / Work Areas
- Existing Electrical Interface Location
- CCTV
- Cabinet
- Flow Direction
- Watercourses
- Removed Gantry
- Proposed Gantry
- Road Markings
- Proposed EA locations
- Project Boundary
- SPA
- SAC
- 200m Buffer
- Construction and operation footprint
- Approximate Hard Shoulder / Lane 1 Re-surfacing
- 100mm plan and inlay

Client: highways england

WSP

Project: **M62 J20-25 Smart Motorway**

Drawing Title: **FIGURE 2-2 SCHEME OVERVIEW PAGE 2 OF 11**

Status	First issue	Revision	P08
Scale	1:2,500	Date	02/09/2019
Drawn By	AS		
Checked By	MM		
Approved By	MM		
Project No.	HE551534	Originator: WSP	Original Size A3

Drawing number: HE551534 — Volume: EGN — Location: SG — Type: DR — Role: LE — Number: 00031

Document Path: \\uk.wspgroup.com\Central Data\Projects\62241xxx\62241710 - CDF SMP Tranche 5\02 Discipline Inputs\GIS\Mxd\ECOLOGY\May 2019_62241710_20190604_FIGURE_2_1_Scheme Overview_JSdS.mxd

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N

South Pennine Moors Phase 2 SPA

South Pennine Moors SAC

G2-11

G2-12

G2-13

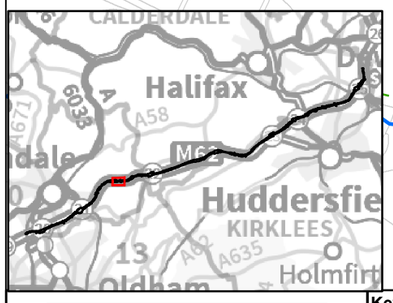
EA-WB-12

EA-WB-11

Ch 19+150
Ch 19+200
Ch 19+250
Ch 19+300
Ch 19+350
Ch 19+400
Ch 19+450
Ch 19+500
Ch 19+550
Ch 19+600
Ch 19+650
Ch 19+700
Ch 19+750
Ch 19+800
Ch 19+850
Ch 19+900
Ch 19+950
Ch 20+000
Ch 20+050
Ch 20+100

Longden End Brook

Lower Whiteley Dean Brook



0 50 100
Metres

Key

- CCTV
- Cabinet
- Flow Direction
- Watercourses
- Removed Gantry
- Proposed Gantry
- Road Markings
- Proposed EA locations
- Project Boundary
- SPA
- SAC
- 200m Buffer
- Construction and operation footprint

Approximate Hard Shoulder / Lane 1 Re-surfacing

- 100mm plan and inlay

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
		02/09/2019				

Client: highways england

WSP

Project: **M62 J20-25 Smart Motorway**

Drawing Title: **FIGURE 2-2 SCHEME OVERVIEW PAGE 3 OF 11**

	Status: First issue		Revision: P08
Scale	1:2,500		Date 02/09/2019
Drawn By	AS		
Checked By	MM		
Approved By	MM		
Project No. HE551534	Originator: WSP	Original Size	A3
Drawing number HE551534	Volume EGN / Location SG / Type DR / Role LE / Number 00031		

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N

South Pennine Moors Phase 2 SPA

South Pennine Moors SAC

G2-13

G2-14

G2-15

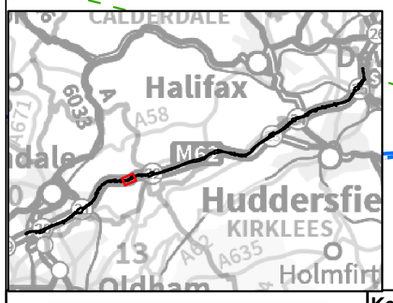
G2-16

EA-WB-11

EA-WB-10

Ch 20+050
Ch 20+100
Ch 20+150
Ch 20+200
Ch 20+250
Ch 20+300
Ch 20+350
Ch 20+400
Ch 20+450
Ch 20+500
Ch 20+550
Ch 20+600
Ch 20+650
Ch 20+700
Ch 20+750
Ch 20+800
Ch 20+850
Ch 20+900
Ch 20+950
Ch 21+000

Longden End Brook



0 50 100
Metres

Key

- CCTV
- Cabinet
- Flow Direction
- Watercourses
- Removed Gantry
- Proposed Gantry
- Road Markings
- Proposed EA locations
- Project Boundary
- SPA
- SAC
- 200m Buffer
- Construction and operation footprint
- Approximate Hard Shoulder / Lane 1 Re-surfacing
- 100mm plan and inlay
- Deeper treatment

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
		02/09/2019				

Client: highways england

WSP

Project: **M62 J20-25 Smart Motorway**

Drawing Title: **FIGURE 2-2 SCHEME OVERVIEW PAGE 4 OF 11**

	Status: First issue	Revision: P08	
Scale: 1:2,500	Date: 02/09/2019		
Drawn By: AS			
Checked By: MM			
Approved By: MM			
Project No.: HE551534	Originator: WSP	Original Size: A3	
Drawing number: HE551534	Volume: EGN	Location: SG	Type: DR / Role: LE / Number: 00031

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N

Moss Slack Brook

Longden End Brook

South Pennine Moors Phase 2 SPA

South Pennine Moors SAC

G2-17

G2-18

G2-19

EA-WB-10

Castle Shore Clough

Ch 20+900

Ch 20+950

Ch 21+000

Ch 21+050

Ch 21+100

Ch 21+150

Ch 21+200

Ch 21+250

Ch 21+300

Ch 21+350

Ch 21+400

Ch 21+450

Ch 21+500

Ch 21+550

Ch 21+600

Ch 21+650

Ch 21+700

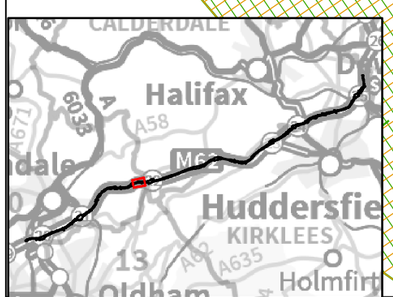
Ch 21+750

Ch 21+800

Ch 21+850

Ch 21+900

Ch 21+950



0 50 100
Metres

Key

- CCTV
- Cabinet
- Flow Direction
- Watercourses
- Removed Gantry
- Proposed Gantry
- Road Markings
- Proposed EA locations
- Project Boundary
- SPA
- SAC
- 200m Buffer
- Construction and operation footprint
- Approximate Hard Shoulder / Lane 1 Re-surfacing
- 100mm plan and inlay
- Deeper treatment

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
		02/09/2019				

Client: highways england

WSP

Project: **M62 J20-25 Smart Motorway**

Drawing Title: **FIGURE 2-2 SCHEME OVERVIEW PAGE 5 OF 11**

	Status: First issue	Revision: P08	
Scale	1:2,500	Date 02/09/2019	
Drawn By	AS		
Checked By	MM		
Approved By	MM		
Project No. HE551534	Originator: WSP	Original Size	A3
Drawing number	Volume / Location / Type / Role / Number		
HE551534	EGN / SG / DR / LE / 00031		

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Rockingstone Moss Drain

Lads Grave Clough

Spa Clough

South Pennine Moors SAC

South Pennine Moors Phase 2 SPA

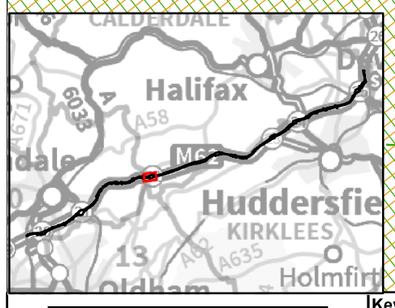
G2-19

G2-20

G3-01

Location for micro-siting

Ch 21+850 Ch 21+900 Ch 21+950 Ch 22+000 Ch 22+050 Ch 22+100 Ch 22+150 Ch 22+200 Ch 22+250 Ch 22+300 Ch 22+350 Ch 22+400 Ch 22+450 Ch 22+500 Ch 22+550 Ch 22+600 Ch 22+650 Ch 22+700 Ch 22+750 Ch 22+800



0 50 100
Metres

Key

- Potential Compound / Work Areas
- Existing Electrical Interface Location
- CCTV
- Cabinet
- Flow Direction
- Watercourses
- Removed Gantry
- Existing Gantry
- Proposed Gantry
- Road Markings
- Proposed EA locations
- Project Boundary
- SPA
- SAC
- 200m Buffer
- Construction and operation footprint
- Approximate Hard Shoulder / Lane 1 Re-surfacing
- 100mm plan and inlay
- Deeper treatment

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
		02/09/2019				

Client: highways england

WSP

Project: **M62 J20-25 Smart Motorway**

Drawing Title: **FIGURE 2-2 SCHEME OVERVIEW PAGE 6 OF 11**

	Status: First issue	Revision: P08	
Scale	1:2,500	Date 02/09/2019	
Drawn By	AS		
Checked By	MM		
Approved By	MM		
Project No. HE551534	Originator: WSP	Original Size	A3
Drawing number HE551534	Volume EGN / Location SG / Type DR / Role LE / Number 00031		

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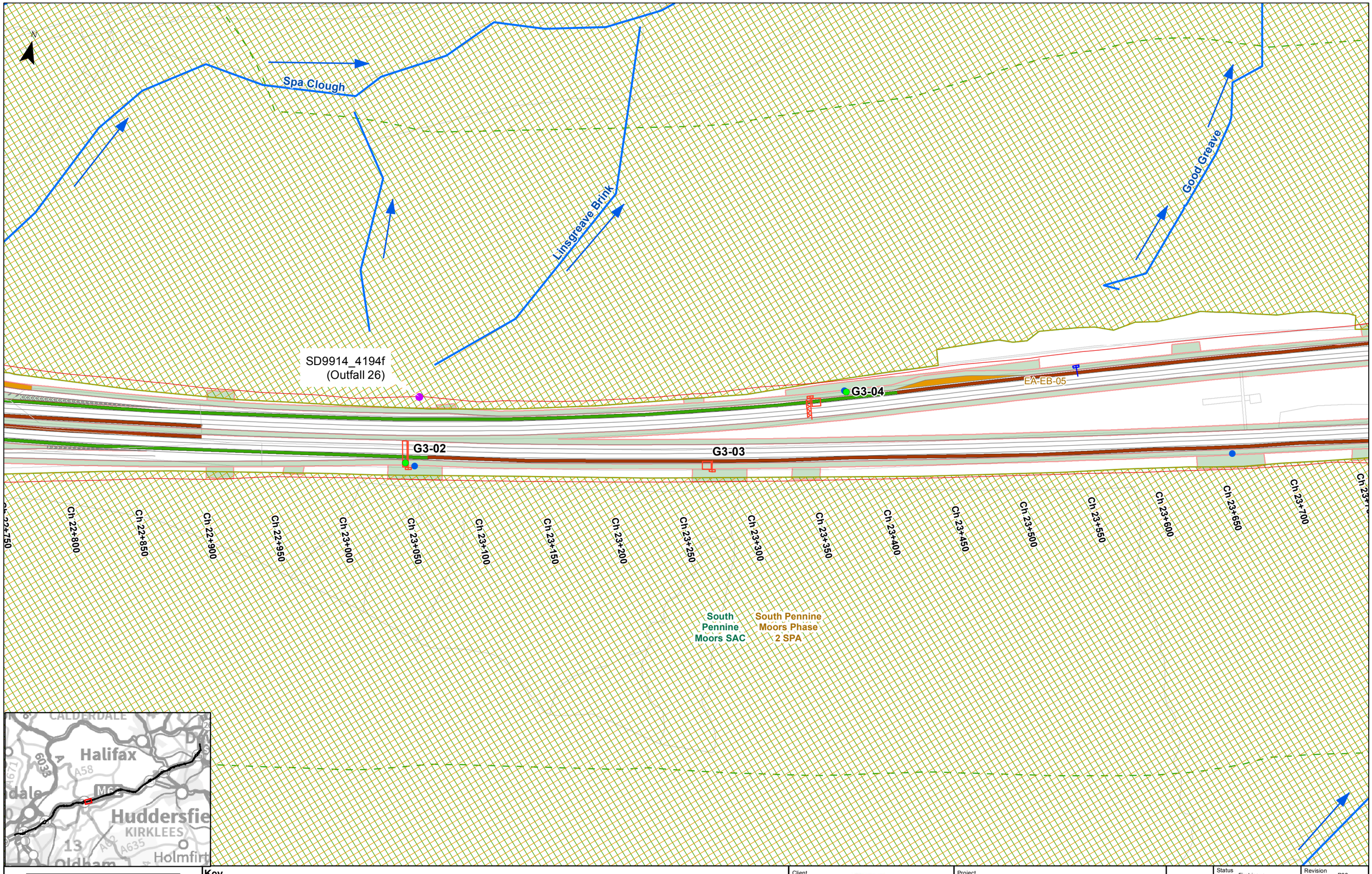

0 50 100
Metres

Key

- Outfall B (High)
- CCTV
- Cabinet
- Flow Direction
- Watercourses
- Removed Gantry
- Proposed Gantry
- Road Markings
- Proposed EA locations
- Project Boundary
- SPA
- SAC
- 200m Buffer
- Construction and operation footprint

Approximate Hard Shoulder / Lane 1 Re-surfacing
- 100mm plan and inlay
- Deeper treatment

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
		02/09/2019				

Client: highways england

WSP

Project: **M62 J20-25 Smart Motorway**

Drawing Title: **FIGURE 2-2 SCHEME OVERVIEW PAGE 7 OF 11**

Status	First issue	Revision	P08
Scale	1:2,500	Date	02/09/2019
Drawn By	AS		
Checked By	MM		
Approved By	MM		
Project No.	HE551534	Originator: WSP	
Drawing number	HE551534	Volume: EGN; Location: SG; Type: DR; Role: LE; Number: 00031	Original Size: A3

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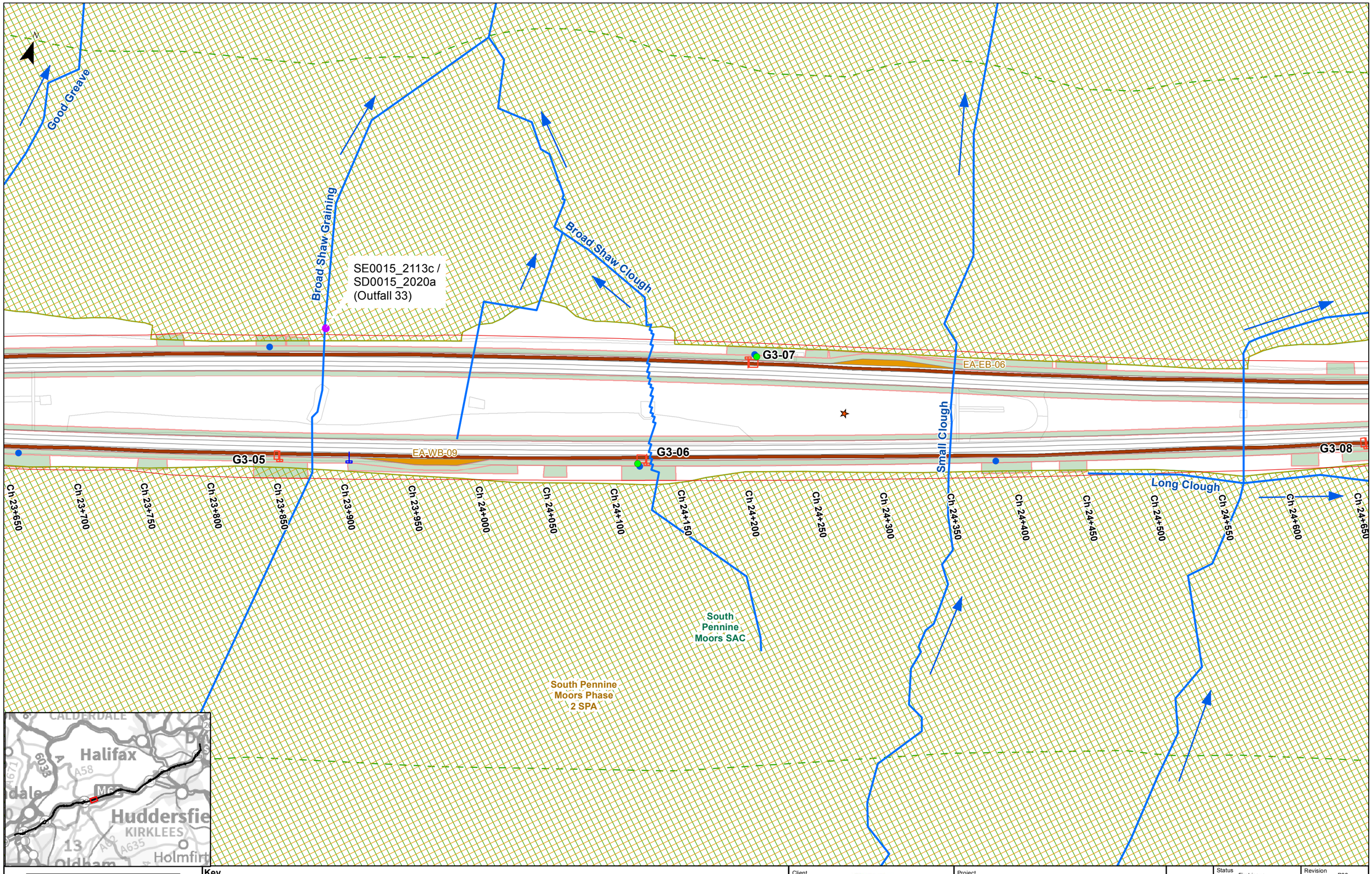

0 50 100
Metres

Key

- Potential Compound / Work Areas
- Outfall B (High)
- CCTV
- Cabinet
- Flow Direction
- Watercourses
- Removed Gantry
- Proposed Gantry
- Road Markings
- Proposed EA locations
- Project Boundary
- SPA
- SAC
- 200m Buffer
- Construction and operation footprint
- Approximate Hard Shoulder / Lane 1 Re-surfacing
- 100mm plan and inlay

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
		02/09/2019				

Client: highways england

WSP

Project: **M62 J20-25 Smart Motorway**

Drawing Title: **FIGURE 2-2 SCHEME OVERVIEW PAGE 8 OF 11**

	Status: First issue	Revision: P08	
Scale	1:2,500	Date 02/09/2019	
Drawn By	AS		
Checked By	MM		
Approved By	MM		
Project No. HE551534	Originator: WSP	Original Size	A3
Drawing number HE551534	Volume: EGN / Location: SG / Type: DR / Role: LE / Number: 00031		

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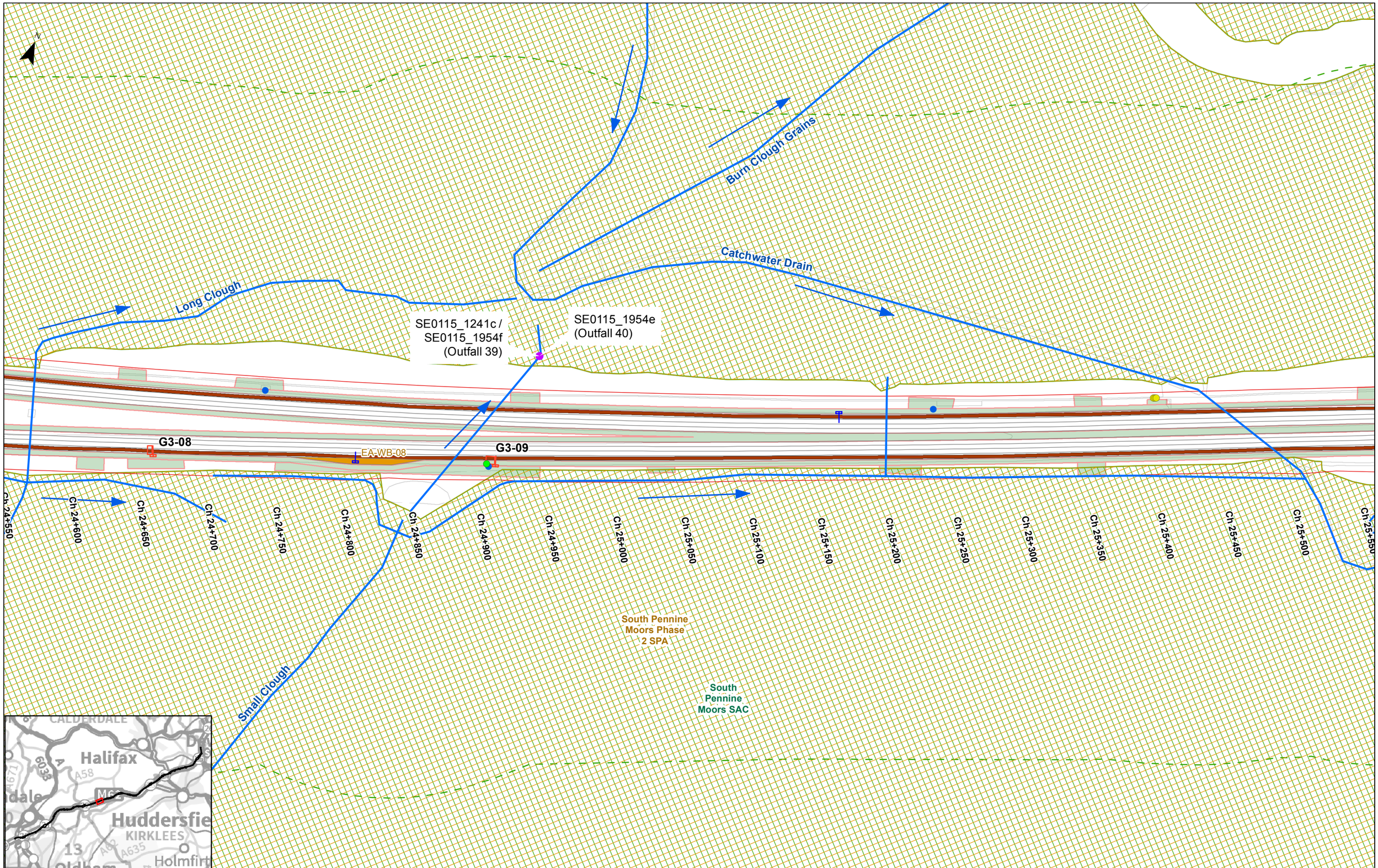

0 50 100
Metres

Key

- Outfall B (High)
- Existing Electrical Interface Location
- CCTV
- Cabinet
- Flow Direction
- Watercourses
- Removed Gantry
- Proposed Gantry
- Road Markings
- Proposed EA locations
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- SAC
- 200m Buffer
- Construction and operation footprint
- Approximate Hard Shoulder / Lane 1 Re-surfacing
- 100mm plan and inlay

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
		02/09/2019				

Client: highways england

Project: **M62 J20-25 Smart Motorway**

Drawing Title: **FIGURE 2-2 SCHEME OVERVIEW PAGE 9 OF 11**

Status	First issue	Revision	P08
Scale	1:2,500	Date	02/09/2019
Drawn By	AS		
Checked By	MM		
Approved By	MM		
Project No.	HE551534	Originator: WSP	
Original Size	A3		
Drawing number	Volume: EGN	Location: SG	Type: DR / Role: LE / Number: 00031
HE551534			

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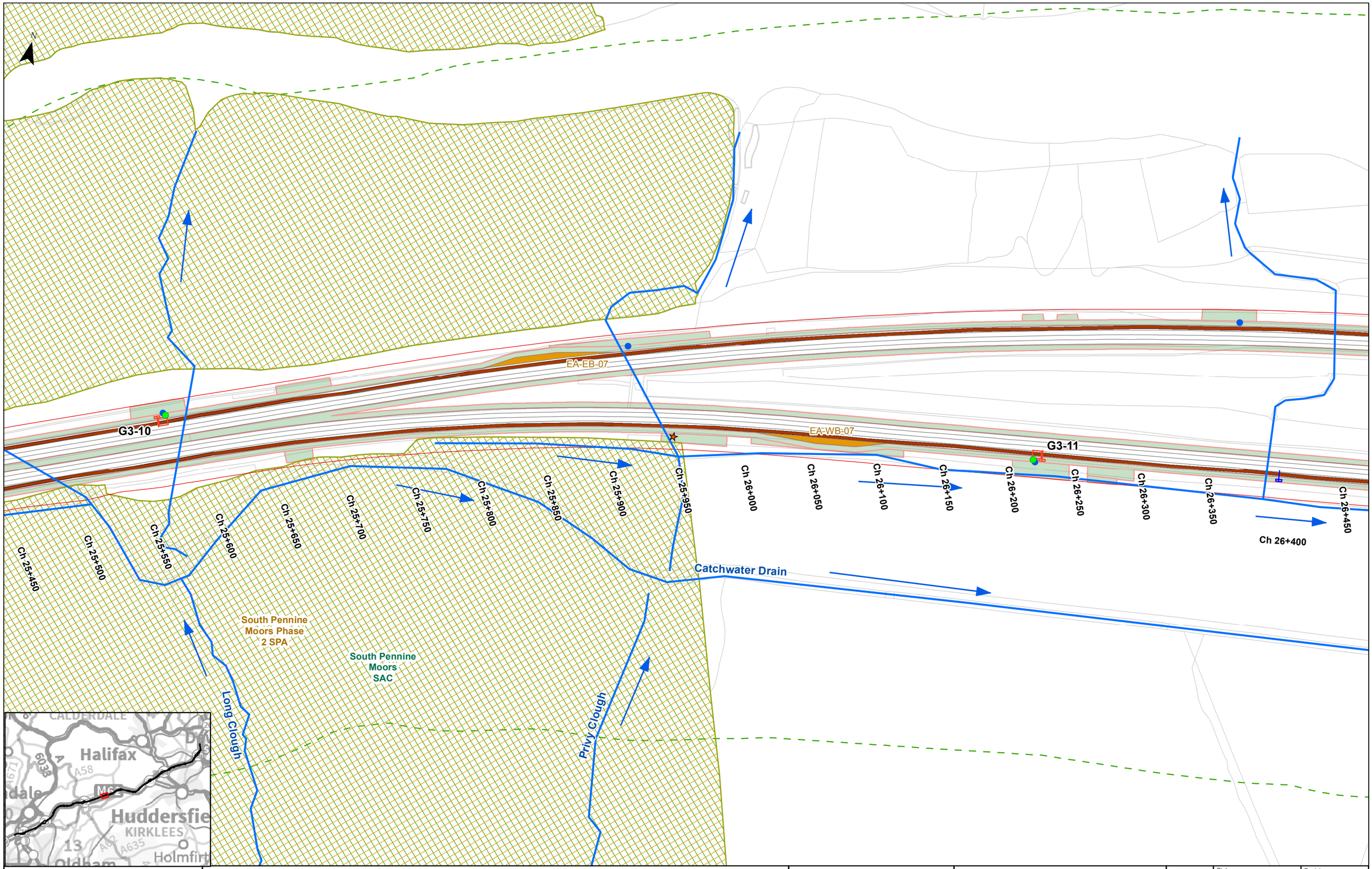

0 50 100
Metres

Key

- Potential Compound / Work Areas
- CCTV
- Cabinet
- Flow Direction
- Watercourses
- Removed Gantry
- Proposed Gantry
- Road Markings
- Proposed EA locations
- Project Boundary
- SPA
- SAC
- 200m Buffer
- Construction and operation footprint

Approximate Hard Shoulder / Lane 1 Re-surfacing
- 100mm plan and inlay

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
		02/09/2019				

Client: highways england

WSP

Project: **M62 J20-25 Smart Motorway**

Drawing Title: **FIGURE 2-2 SCHEME OVERVIEW PAGE 10 OF 11**

Status	First issue	Revision	P08
Scale	1:2,500	Date	02/09/2019
Drawn By	AS		
Checked By	MM		
Approved By	MM		
Project No.	HE551534	Originator: WSP	Original Size A3
Drawing number	Volume / Location / Type / Role / Number		
HE551534	EGN / SG / DR / LE / 00031		

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N

G3-12

EA-EB-08

EA-WB-06

Ch 26+400

Ch 26+450

Ch 26+500

Ch 26+550

Ch 26+600

Ch 26+650

Ch 26+700

Ch 26+750

Ch 26+800

Ch 26+850

Ch 26+900

Ch 26+950

Ch 27+000

Ch 27+050

Ch 27+100

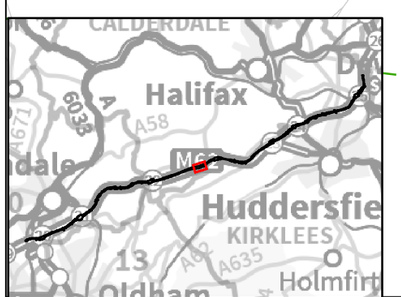
Ch 27+150

Ch 27+200

Ch 27+250

Ch 27+300

Catchwater Drain



South Pennine Moors Phase 2 SPA

South Pennine Moors SAC

0 50 100
Metres

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
		02/09/2019				

Key

- Existing Electrical Interface Location
- CCTV
- Cabinet
- Flow Direction
- Watercourses
- Removed Gantry
- Proposed Gantry
- Road Markings
- Proposed EA locations
- Project Boundary
- SPA
- SAC
- 200m Buffer
- Construction and operation footprint
- Approximate Hard Shoulder / Lane 1 Re-surfacing
- 100mm plan and inlay

Client: highways england

WSP

Project: **M62 J20-25 Smart Motorway**

Drawing Title: **FIGURE 2-2 SCHEME OVERVIEW PAGE 11 OF 11**

	Status: First issue	Revision: P08	
Scale	1:2,500	Date 02/09/2019	
Drawn By	AS		
Checked By	MM		
Approved By	MM		
Project No. HE551534	Originator: WSP	Original Size	A3

Drawing number	Volume	Location	Type	Role	Number
HE551534	EGN	SG	DR	LE	00031

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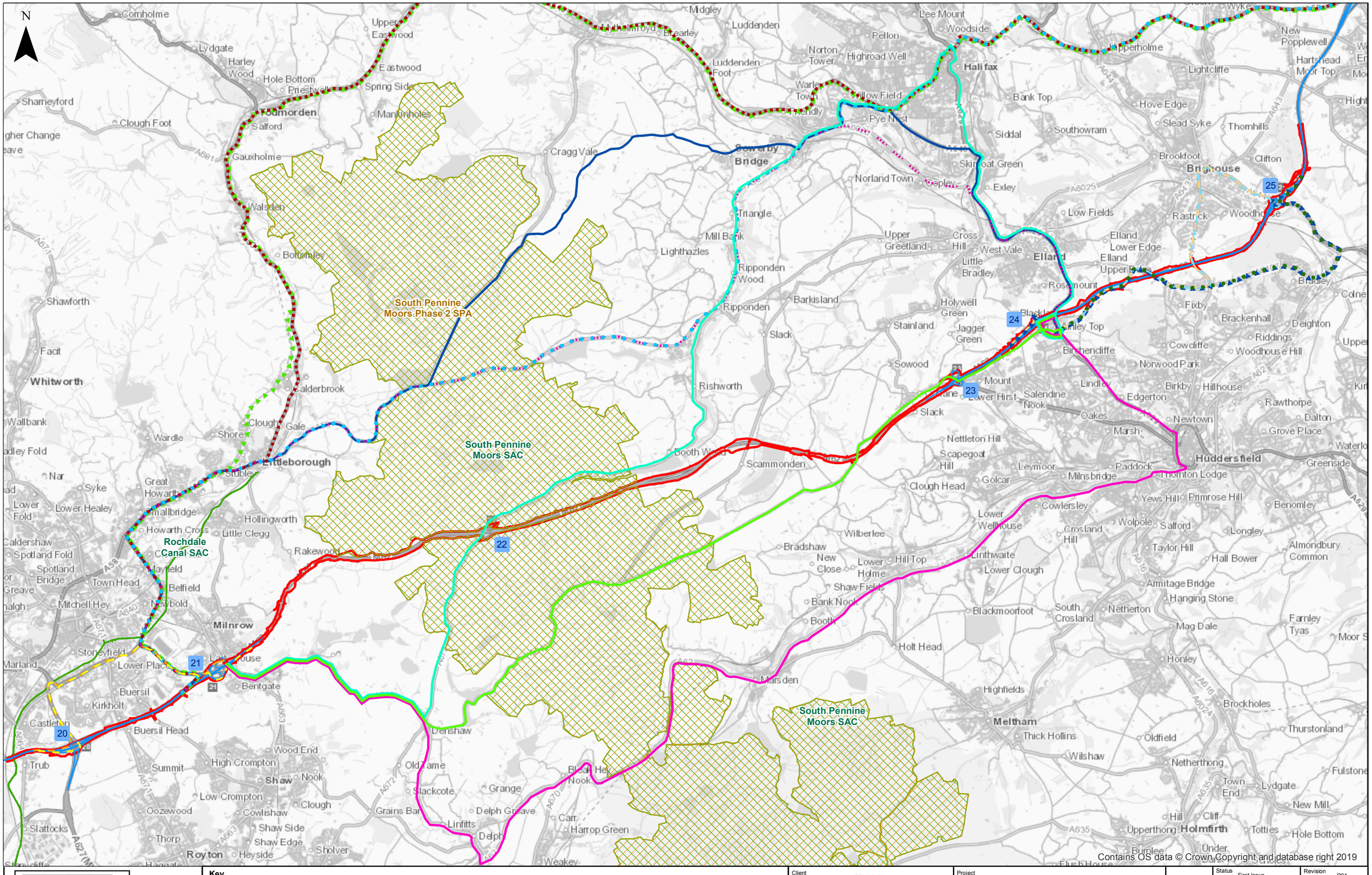
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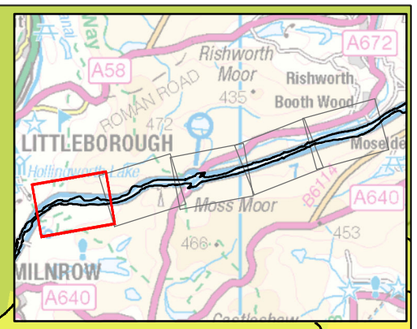
South Pennine Moors Phase 2 SPA
South Pennine Moors SAC
Rochdale Canal SAC
South Pennine Moors SAC
Todmorden
Littleborough
Milnrow
Rochdale
Sowerby Bridge
Halifax
Brighouse
Huddersfield
Elland
Meltham
Holmfirth
Marsden
Whitworth
Ripponden
Rishworth
Barkisland
Triangle
Lighthazles
Cragg Vale
Norland Town
Luddenden
Luddenden Foot
Pellon
Norton Tower
Highroad Well
Lee Mount
Woodside
Upper Edwood
Eastwood
Lydgate
Harley Wood
Hole Bottom
Spring Side
Mankinholes
Shameyford
Clough Foot
Gauxholme
Walsden
Bottomley
Shawforth
Facit
Wallbank
Cloughfold
Nar
Lower Fold
Spotland Fold
Spotland Bridge
Town Head
Mitchell Hey
Stonefield
Lower Place
Buersil
Kirkholt
Castleton
Buersil Head
Trub
Summit
High Crompton
Wood End
Shaw
Nook
Low Crompton
Oozewood
Cowlishaw
Clough
Shaw Side
Shaw Edge
Thorp
Slattocks
Royton
Heyside
Sholver
Haggate
Wardle
Shore
Clough
Gale
Calderbrook
Stubley
Great Howarth
Smallbridge
Howarth Cross
Hollingworth
Little Clegg
Rakewood
Maythield
Belfield
Newbold
Milnrow
Lodge House
Bentgate
Denshaw
Old Lame
Slackcote
Grange
Delph Greave
Linfitts
Delph
Grains Bar
Booth Wood
Scammonden
Weakey
Carr
Harrop Green
Black Hey Nook
Wilberlee
Bradshaw
New Close
Lower Holme
Hill Top
Shaw Fields
Bank Nook
Booth
Holt Head
Blackmoorfoot
Linthwaite
Lower Clough
Lower Wellhouse
Golcar
Clough Head
Scapegoat Hill
Nettleton Hill
Slack
Lower Hirst
Mount
Jagger Green
Stainland
Holywell Green
Sowood
Ripponden Wood
Mill Bank
Upper Greetland
Cross Hill
West Vale
Little Bradley
Rosemount
Elland Upper Edge
Elland Lower Edge
Low Fields
Exley
Skircoat Green
Siddal
Bank Top
Pye Nest
Willow Field
Warley Town
Windy
Norton Tower
Highroad Well
Pellon
Lee Mount
Woodside
Upperholme
New Popplewell
Hartshead Moor Top
Lightcliffe
Hove Edge
Slead Syke
Thornhills
Southowram
Brookfoot
Clifton
Rastrick
Woodhouse
Bradley
Colne
Fixby
Brackenhall
Deighton
Riddings
Cowcliffe
Woodhouse Hill
Norwood Park
Birkby
Hillhouse
Edgerton
Rawthorpe
Dalton
Grove Place
Newtown
Oakes
Marsh
Lindley
Birchencliffe
Blackley
Linley Top
Salendine Nook
Leymoor
Golcar
Milnsbridge
Paddock
Thornton Lodge
Greenside
Cowlersley
Yews Hill
Primrose Hill
Benomley
Wilshaw
Thick Hollins
Oldfield
Netherthong
Town End
Lydgate
New Mill
Upperthong
Totties
Hole Bottom
Under Bank
Brockholes
Thurstonland
Honley
Highfields
Mag Dale
Hanging Stone
Armitage Bridge
Taylor Hill
Hall Bower
Almondbury Common
Longley
Crosland Hill
Wolpole
Salford
Netherton
South Crosland
Farnley Tyas
Moor S
Lower Wellhouse
Crosland Hill
Wolpole
Salford
Longley
Taylor Hill
Hall Bower
Almondbury Common
Hanging Stone
Armitage Bridge
Mag Dale
Farnley Tyas
Honley
Brockholes
Thurstonland
Netherthong
Fulstone
Town End
Lydgate
New Mill
Upperthong
Totties
Hole Bottom
Under Bank
Holmfirth
Hill
Cliff
Yews Hill
Primrose Hill
Benomley
Cowlersley
Golcar
Milnsbridge
Paddock
Thornton Lodge
Greenside
Leymoor
Clough Head
Scapegoat Hill
Nettleton Hill
Slack
Lower Hirst
Mount
Jagger Green
Stainland
Holywell Green
Sowood
Ripponden Wood
Mill Bank
Upper Greetland
Cross Hill
West Vale
Little Bradley
Rosemount
Elland Upper Edge
Elland Lower Edge
Low Fields
Exley
Skircoat Green
Siddal
Bank Top
Pye Nest
Willow Field
Warley Town
Windy
Norton Tower
Highroad Well
Pellon
Lee Mount
Woodside
Upperholme
New Popplewell
Hartshead Moor Top
Lightcliffe
Hove Edge
Slead Syke
Thornhills
Southowram
Brookfoot
Clifton
Rastrick
Woodhouse
Bradley
Colne
Fixby
Brackenhall
Deighton
Riddings
Cowcliffe
Woodhouse Hill
Norwood Park
Birkby
Hillhouse
Edgerton
Rawthorpe
Dalton
Grove Place
Newtown
Oakes
Marsh
Lindley
Birchencliffe
Blackley
Linley Top
Salendine Nook
Leymoor
Golcar
Milnsbridge
Paddock
Thornton Lodge
Greenside
Cowlersley
Yews Hill
Primrose Hill
Benomley
Wilshaw
Thick Hollins
Oldfield
Netherthong
Town End
Lydgate
New Mill
Upperthong
Totties
Hole Bottom
Under Bank
Holmfirth
Hill
Cliff
Brockholes
Thurstonland
Honley
Highfields
Mag Dale
Hanging Stone
Armitage Bridge
Taylor Hill
Hall Bower
Almondbury Common
Longley
Crosland Hill
Wolpole
Salford
Netherton
South Crosland
Farnley Tyas
Moor S
Lower Wellhouse
Linthwaite
Lower Clough
Blackmoorfoot
Holt Head
Bradshaw
New Close
Lower Holme
Hill Top
Shaw Fields
Bank Nook
Booth
Wilberlee
Rakewood
Maythield
Belfield
Newbold
Milnrow
Lodge House
Bentgate
Denshaw
Old Lame
Slackcote
Grange
Delph Greave
Linfitts
Delph
Grains Bar
Booth Wood
Scammonden
Weakey
Carr
Harrop Green
Black Hey Nook
Wilberlee
Bradshaw
New Close
Lower Holme
Hill Top
Shaw Fields
Bank Nook
Booth
Holt Head
Blackmoorfoot
Linthwaite
Lower Clough
Lower Wellhouse
Golcar

N



Key

Potential Noise Disturbance Area for Birds
Proposed Scheme Extents
5db Contour Lines

Construction Noise
LAeq, T, dB

40-45
45-50
50-55
55-60
60-65
65-70
70-75
>75

Broadleaved woodland - semi-natural
Broadleaved woodland - plantation
Scrub - dense/continuous
Neutral grassland - semi-improved
Other tall herb and fern - ruderal
Dry modified bog
Running water
Cultivated/disturbed land - arable
Buildings
Other habitat

0 100 200
Metres

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd

Client: highways england

wsp

Project: **M62 J20-25 Smart Motorway**

Drawing Title: **FIGURE 6-1 CONSTRUCTION NOISE CONTOURS**

Status	First issue	Revision	P03
Scale	1:5,000	Date	24/09/2019
Drawn By	COC		
Checked By	JA		
Approved By	EH		
Project No.	HE551534	Originator: WSP	Original Size A3
Drawing number	Volume EGN	Location SG	Type DR / Role LE / Number 00035
	HE551534		

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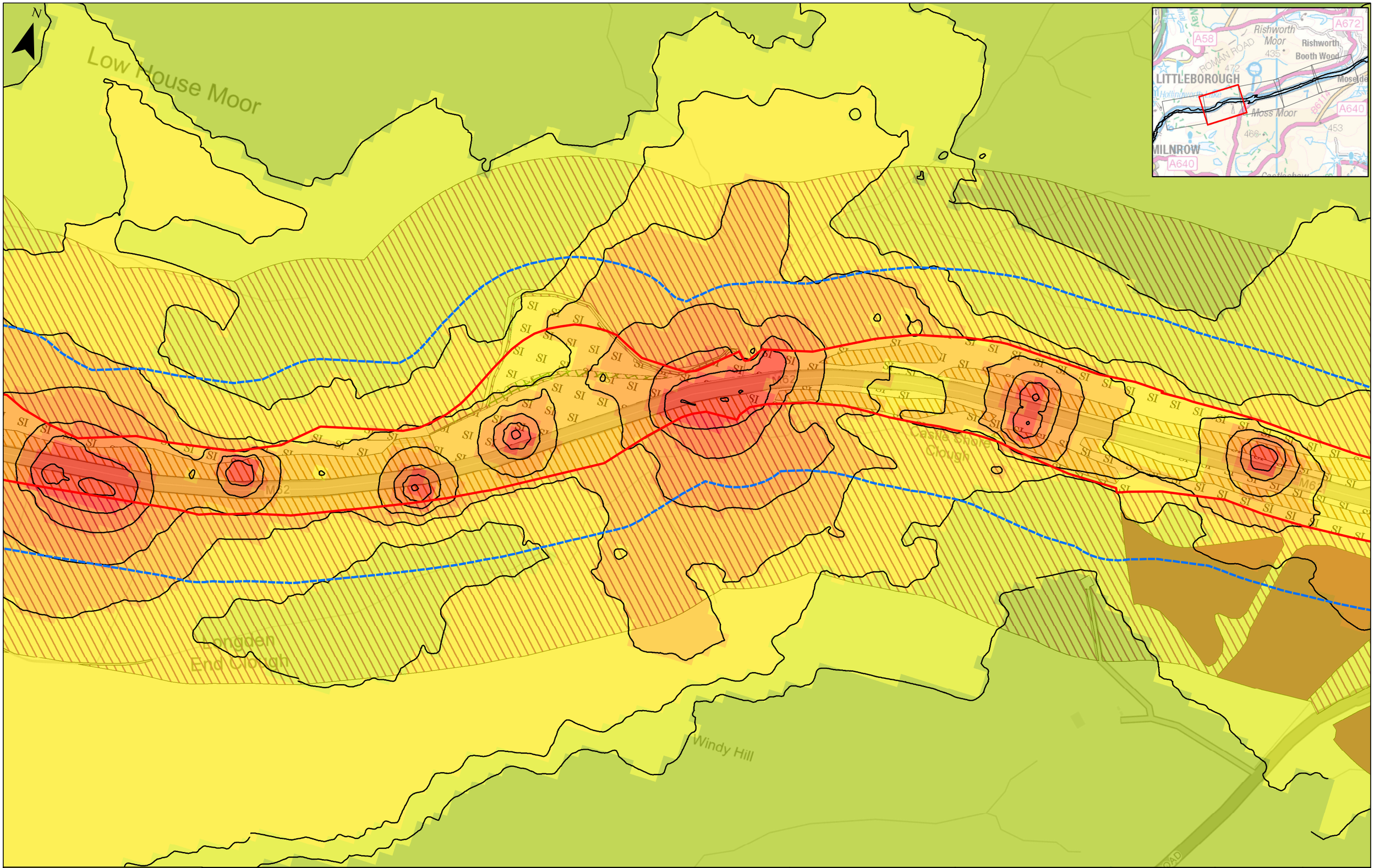

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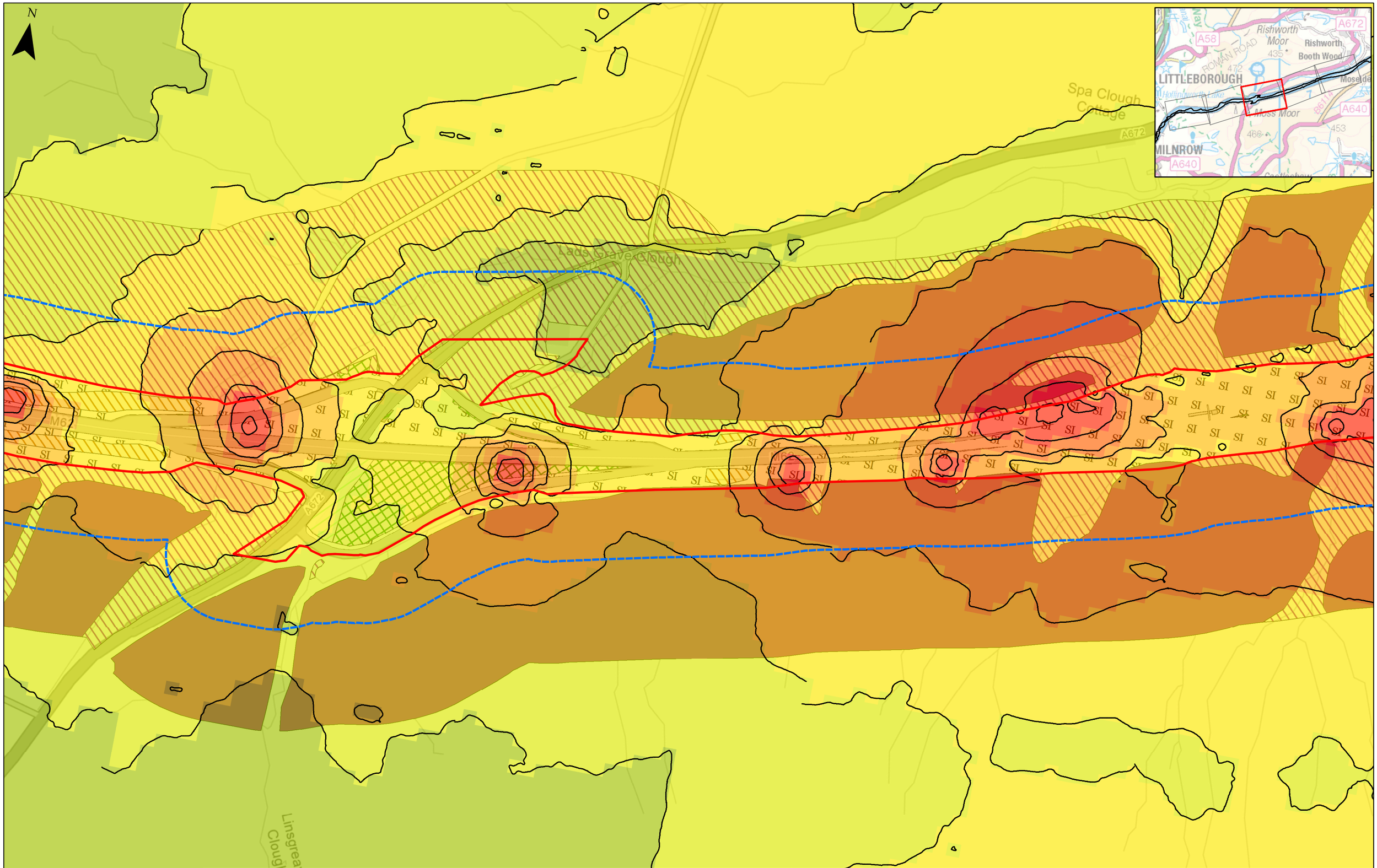

0 100 200
Metres

Key

- Potential Noise Disturbance Area for Birds
- Proposed Scheme Extents
- 5db Contour Lines

Construction Noise
LAeq, T, dB

- 45-50
- 50-55
- 55-60
- 60-65
- 65-70
- 70-75
- >75
- Coniferous woodland - plantation
- Scrub - dense/continuous
- SI Neutral grassland - semi-improved
- Other tall herb and fern - ruderal
- Blanket sphagnum bog
- Dry modified bog
- Other habitat

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd

Client: highways england

wsp

Project: **M62 J20-25 Smart Motorway**

Drawing Title: **FIGURE 6-1 CONSTRUCTION NOISE CONTOURS**

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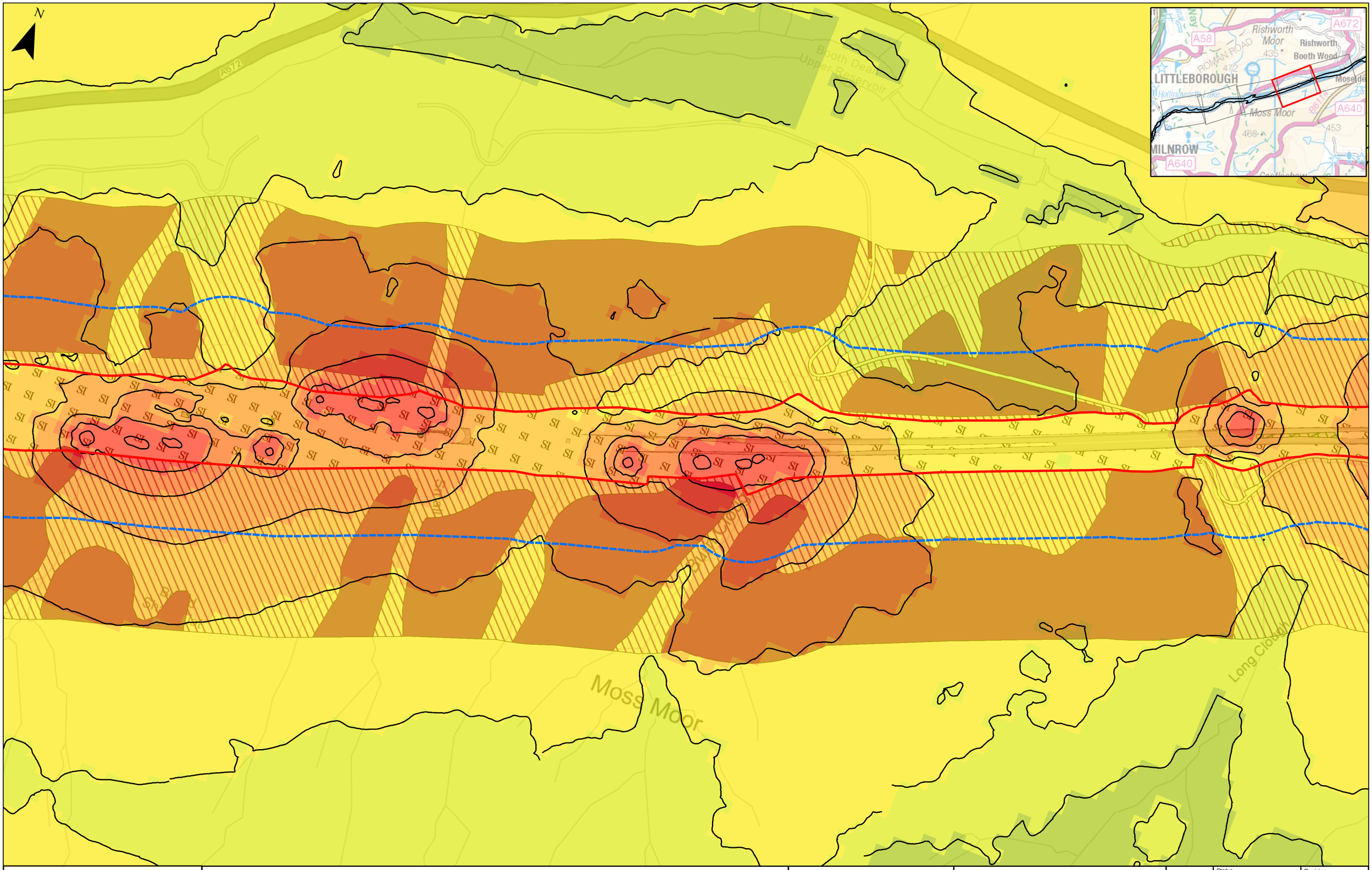

Key

- Potential Noise Disturbance Area for Birds
- Proposed Scheme Extents
- 5db Contour Lines

Construction Noise
LAeq, T, dB

- 45-50
- 50-55
- 55-60
- 60-65
- 65-70
- 70-75
- >75
- Scrub - dense/continuous
- Neutral grassland - semi-improved
- Blanket sphagnum bog
- Dry modified bog
- Running water
- Other habitat

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd

Client: highways england

wsp

Project: **M62 J20-25 Smart Motorway**

Drawing Title

FIGURE 6-1
CONSTRUCTION NOISE CONTOURS

Status	First issue	Revision	P03
Scale	1:5,000	Date	24/09/2019
Drawn By	CÓC		
Checked By	JA		
Approved By	EH		
Project No.	HE551534	Originator: WSP	Original Size A3

Drawing number	Volume	Location	Type	Role	Number
HE551534	EGN	SG	DR	LE	00035

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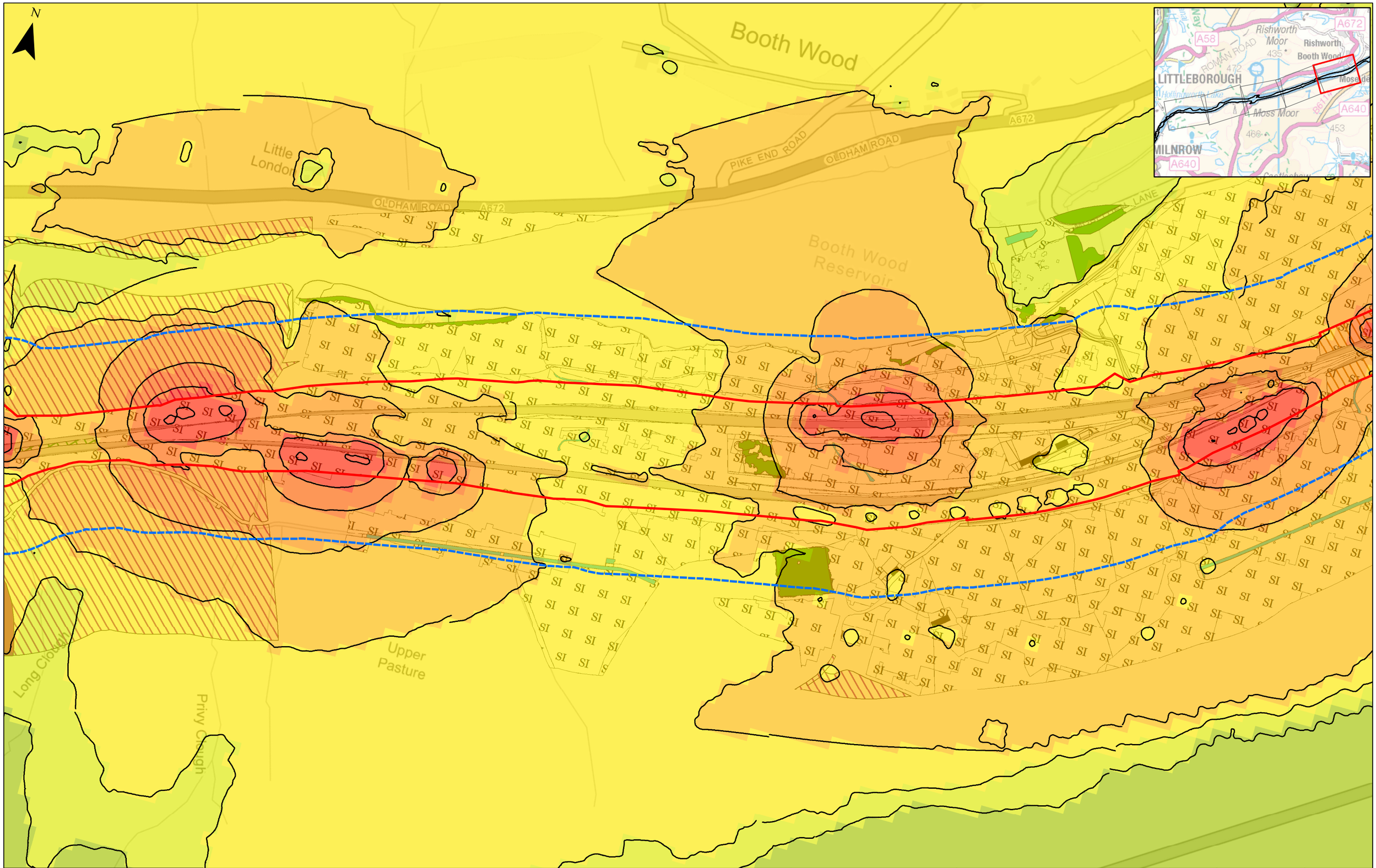

0 100 200
Metres

Key

- Potential Noise Disturbance Area for Birds
- Proposed Scheme Extents
- 5db Contour Lines

Construction Noise
LAeq, T, dB

- 45-50
- 50-55
- 55-60
- 60-65
- 65-70
- 70-75
- >75
- Broadleaved woodland - semi-natural
- Scrub - dense/continuous
- Neutral grassland - semi-improved
- Other tall herb and fern - ruderal
- Blanket sphagnum bog
- Dry modified bog
- Running water
- Cultivated/disturbed land - arable
- Buildings
- Other habitat

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd

Client: highways england

WSP

Project: **M62 J20-25 Smart Motorway**

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Appendix C. Consultation

Appendix C1

Natural England meeting minutes of 13/05/2019

M62 J20-25 Habitat Regulations Assessment 13 May

Name	Representing	
Oliver Walton (OW)	Natural England	
Alice Noble (AN)	Natural England	
Alicia Henderson (AH)	Natural England	
Andrew Thornhill (AT)	WSP	
Ian Ellis (IE)	WSP	
Phil Davidson (PD)	WSP	
Apologies	None	

Distribution: All of the above

1.	Introduction and Objective	Action owner
1.1	AT introduced the project and explained the background and basis of Smart Motorway Schemes. AT explained that the M62, in common with other Schemes of its kind, involves modifications/creation to physical infrastructure (potential local hard shoulder strengthening for conversion to running lane, Emergency Areas, gantries) to make these suitable for four-lane operation. The Scheme would be constructed entirely within the boundary of the existing HE Estate, making use of the existing infrastructure as far as practicable with all works within the carriageway and soft estate.	
1.2	AT explained that a decision on the Scheme proceeding for permitted development was due to be made on 10 June 2019 and that one of the prerequisites for the decision was completion of HRA works for the scheme. AT stated that we were keen to obtain NE input into the assessment following conclusion of the screening assessment.	
1.3	AT also highlighted that at this stage in the project (prior to appointment of a Contractor to deliver the Scheme) details such as construction timing, detailed design, specific construction methodologies and the location of construction compounds could not be confirmed	

2.	**HRA Screening Assessment**	
2.1.	PD/AT/IE then provided an overview of the impacts considered in the HRA screening assessment.	
2.2.	<u>Land take</u> PD confirmed that the draft HRA screening had reached a conclusion of no LSE in relation to land take of the SPA. This was on the basis of the minimal proportion (0.3ha of 65,000ha) potentially lost to the Scheme (Note land take is within Highways England operational land). PD explained that this was a precautionary assessment that included both temporary (construction) and permanent land take. As it was not possible to define which land take would be temporary at this stage in the project, all land take had been considered to be permanent. AN requested information on the habitats, within the Highways England boundary but 'within' the SAC/SPA designation specifically that would be affected by land take. PD stated that this could be provided to add further weight to the assessment. AN/AH confirmed that they would be happy to look at additional information such as habitat mapping data independently of an updated HRA report, and that this information would be beneficial to fully inform the determination of no LSE for landtake. **Action: PD to Provided Habitat data**	PD
2.3	<u>Air Quality</u> PD summarised the assessment of AQ impacts on designated ecological sites presented in the HRA. PD explained that construction dust had been assessed on the basis of Institute of Air Quality Management (IAQM) guidance, which indicated the potential for significant effects to be considered up to 50 m from a source of construction dust. OW challenged this, stating NE considered screening for effects up to 200m from source of dust, distance dependent primarily on particle size. OW and PD agreed to exchange relevant guidance. PD queried if the NE guidance was internal only and hence whether it could be released. OW stated that an extract could be provided. PD highlighted that the assessment for operational air quality impacts (NOx levels and N deposition) was based on a cumulative assessment of air quality impacts. AT identified that this was based on the HE regional traffic model, which included input from other schemes and local planning authorities plans along with various assumptions for wider traffic growth across the network. PD stated that considerably less than 1% of any European Site (by area) experienced an exceedance of 1% of the relevant air quality standard (Critical Levels and Critical Load). AN requested more detailed information on the habitats experiencing impacts. PD stated this could be provided, but considered it would not make a significant difference	PD/OW

	to the assessment due to the assessment being based on the most conservative critical load for any of the SAC qualifying interest features. It was accepted that, subject to some further habitat data, that operational AQ was likely to be of limited concern for the HRA and that screening out Likely Significant Effect (LSE) was likely to be appropriate (subject to NE review of final draft). **Action: PD provide IAQM guidance and look at providing AQ impacts overlay on habitat mapping. (NB – Issued 14/5/19)** **OW to provide extract of NE guidance on assessing dust impacts. (NB – Received 14/5/19)**	
2.4	<u>Hydrology</u> PD stated that due to the hydrology of peatland habitats (primarily rainfed) inputs from the Scheme into drainage channels/watercourses were unlikely to have a significant impact on SAC / SPA habitats. AT also highlighted that the Scheme would not led to any significant change in the volume/rate of water discharging from the Scheme. AT and PD also highlighted that there would likely be some limited long-term improvement in the quality of water discharging from drainage along the proposed Scheme. This was predicted to occur, because any drainage replaced/created to capture surface water would need to be constructed to modern standards, including features such as shut off valves / oil interceptors. Current drainage along this section of the M62 did not include such features. It was agreed by AH that hydrology was likely to be of less concern for the HRA and that screening out LSE was likely to be appropriate (subject to NE review of final draft).	
2.5	<u>Lighting</u> AT stated that there was not anticipated to be a material change in lighting due to the Scheme. PD confirmed that as such LSE were not expected. It was agreed by all present that operational lighting was unlikely to be a consideration, but that this should continue to be considered in relation to construction impacts, e.g. site lighting/night working. AH mentioned that due consideration should be given to SPA features that may forage at night such as golden plover.	
2.6	<u>Disturbance of SPA bird species</u> AN/AH/OW advised that given proximity to the South Pennine Moors SPA along much of the length of the scheme, construction-phase disturbance of SPA bird species should be subject to Appropriate Assessment, to fully evaluate the potential impacts. IE/PD stated that additional information will be provided in terms of overlaying habitat mapping with noise impacts modelling, to support	IE

	refinement of the assessment. This will then be used to demonstrate the habitats present along the verges of the M62 and their suitability (or lack thereof) for SPA bird species. OW highlighted that proceeding to Appropriate Assessment for this impact in particular, would allow reference to specific mitigation measures such as screening and timing controls for construction to be included, which would help the assessment in light of People Over Wind caselaw. AN highlighted that as well as suitability for breeding, suitability of habitat for foraging should be considered. PD/IE confirmed that more clarity over split of habitats and their suitability for SPA bird species will be provided in an updated assessment. IE sought confirmation with NE that the provision of additional information on noise impact locations and habitat suitability information, would then be sufficient so as not to require the assessment to be further informed by bird survey data. AH/AN confirmed that providing the habitat assessment and disturbance analysis details presented were robust with a highly precautionary approach taken and all SPA bird species considered, survey information was not anticipated to be required. PD and AT highlighted that access to some areas of HE soft estate and adjacent to the scheme was limited by access and health and safety constraints, and survey work in some locations was not possible. PD mentioned that our habitat mapping for the scheme was a combination of field data and remote-sensing/Lidar based automatic habitat classification using 'machine learning' supplemented by field assessment where possible. **Action: WSP/HE to review splitting of impacts between those with no LSE, and taking forward others (principally construction-phase disturbance of birds) to AA. To include overlay of acoustic impacts modelling with habitat types.**	
2.7	NE made the general observation that the screening report was hard to follow, with information on one impact split across several sections that were not easy to move between. PD/IE/AT stated this was due to the requirement to use DMRB templates, but would feedback on this to HE and try to simplify the screening as far as possible for future iterations, with signposting to relevant sections in other correspondence where helpful. **Action: AT to feedback to HE/WSP project team.**	AT
2.8	OW confirmed that the Rochdale Canal SAC falls outside the Natural England Yorkshire team's area, and confirmed that they will liaise with their colleagues in the Lancashire/ Cheshire team on this issue. From initial discussions on the schemes very limited construction works and changes in this area they noted that it was unlikely to generate an LSE but this would need confirmation by the appropriate NE area team. **Action: OW to liaise with Northwest Area team**	OE
3.	**Any Other Business**	

3.1.	Next Meeting - An invitation will be issued if an additional meeting is required.	

Appendix C2

Dr Tim Melling (RSPB) – evaluation and response regarding potential disturbance impacts on bird species associated with South Pennine Moors (Phase 2) SPA (email 24/04/19)

Bonney, Peter

From:	Tim Melling <tim.melling@rspb.org.uk>
Sent:	24 April 2019 11:38
To:	Bonney, Peter
Cc:	Katrina Aspin
Subject:	RE: M62 smart motorway upgrade and South Pennine Moors SAC/SPA

Hi Peter

The M62 motorway was in place long before the SSSI was first notified in 1994 (SPA designated 1997, and the SAC in 2004). So any designated wildlife in the vicinity of the motorway will have already distributed itself in response to traffic disturbance (ie birds are unlikely to nest immediately adjacent to the M62). If upgrading to a Smart Motorway involves utilising the hard shoulders with no landtake from the designated sites, then the impact is likely to be minimal as birds have already adapted to the presence of (noisy) traffic.

The assemblage feature of the SPA involves all moorland birds mentioned in the SSSI citation, which includes common species like Meadow Pipit, as well as rarer ones like Twite, Curlew and Dunlin.

Twite already nest within c300m of the M62 Motorway and are unlikely to be affected if works are undertaken on the motorway in this area. Twite nest in moorland vegetation (especially bracken litter and heather) but do almost all of their feeding in grassland off the moor, usually within 2.5km of the nest. These grasslands are usually haymeadows on the nearby farmland, but they also feed on road verges.

Twite feed entirely on seed, and use a succession of plant species that set seed at different times in the breeding season. When they first arrive on the moors in March they usually feed on seeds of Annual Meadow Grass (Poa annua) which often grows along rough tracks. In April and May they feed on developing seeds of Dandelion (Taraxacum agg.), then in late May and June they feed on Common Sorrel (Rumex acetosa), although Sheep's Sorrel (R. acetosella) is also used. Sorrel is one of the most important foodplants as its seeding coincides with the time when Twite are feeding their chicks. By late June, thistles are starting to set seed (Marsh Thistle Cirsium palustre is usually the earliest but all thistles are used). But there are is no shortage of thistles, and these set seed after the young are flying so they are not tied to the moorland edge. In late summer, other composites are also used, especially Autumn Hawkbit (Leontodon autumnalis). If you are planting or restoring roadside verges in the vicinity of the M62, by far the two most important plants are Dandelion and Common Sorrel.

We also discussed the fact that there are three Twite feeding stations, which are very small areas where Niger seed is put out by volunteers in order to catch and ring Twite as part of a scientific study. But only one is in the vicinity of the M62, in Derby Delph Quarry at SE019161.

Hope this answers your questions.

Best wishes

Tim

Dr Tim Melling
Senior Conservation Officer
RSPB North England Region

From: Bonney, Peter [mailto:peter.bonney@wsp.com]
Sent: 24 April 2019 10:33

To: Tim Melling <tim.melling@rspb.org.uk>
Subject: Re: M62 smart motorway upgrade and South Pennine Moors SAC/SPA

Morning Tim,

Thank you for taking my call this morning. To follow on, comments have been received from NE regarding potential impact pathways to Article 4.2 breeding bird assemblages and the SPA and twite feeding areas between J22 and J23. We have already evaluated that given that the works are confined to existing carriageway and site fabric and motorway soft estate there would be no impact to any of the Article 4.1 and 4.2 species. The works consist of replacing and updating gantries and land take constrained to the soft estate for creation of new emergency areas. What overlaps there are regarding SPA boundary and HE boundary are very minimal and of no significance.

On another note could you possibly give advice on plant species selection for feeding twite on restoration of motorway soft estate areas.

Once again, many thanks for your help on this.

Regards

Peter Bonney *BSc(Hons)*
Principal Ecologist

Advance Notice of annual leave from 5th April – 23rd April

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Appendix D. European Site Citations and Conservation Objectives

EC Directive 79/409 on the Conservation of Wild Birds: Special Protection Area

SOUTH PENNINE MOORS
(SOUTH PENNINE MOORS, PHASE 2)

The South Pennine Moors proposed Special Protection Area is an upland of international importance. It provides habitat for an important assemblage of breeding moorland and moorland fringe birds.

The South Pennine Moors (phase 2) qualifies under Article 4.1 of the EC Directive on the Conservation of Wild Birds (79/409) by supporting nationally important breeding populations of two species listed in Annex 1. The most recent count is of 28 pairs of merlin *Falco columbarius* (4.3% of the British breeding population) and 292 pairs of golden plover *Pluvialis apricaria* (1.2%). The density of breeding golden plover is high compared to other regional populations in northern England and Scotland.

The site qualifies under Article 4.2 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 alpina*, snipe *Gallinago gallinago*, curlew, redshank *Tringa totanus*, common sandpiper *Actitis hypoleucos*, short-eared owl *Asio flammeus*, whinchat *Saxicola rubetra*, wheatear *Oenanthe oenanthe*, ring ouzel *Turdus torquatus* 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 South Pennine Moors support the southernmost assemblage in Britain of breeding merlin, red grouse *Lagopus lagopus*, golden plover, dunlin, short-eared owl and twite. These species are either extremely local, rare or absent further south. Together with the scattered populations of merlin, golden plover, dunlin and twite in Ireland these are the most southwestern breeding populations in the world. The South Pennine Moors thus have an important role in maintaining the breeding range of these species.

CAR
January 1995

This citation / map relates to a site entered in the Register of European sites for Great Britain.
Register reference number UK9008022
Date of registration 03 SEP 1998
Signed .....
on behalf of the Secretary of State for the Environment

European Site Conservation Objectives for South Pennine Moors Phase 2 Special Protection Area Site Code: UK9007022

With regard to the SPA and the individual species and/or assemblage of species for which the site has been classified (the 'Qualifying Features' listed below), and subject to natural change;

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.**

This document should be read in conjunction with the accompanying *Supplementary Advice* document, which provides more detailed advice and information to enable the application and achievement of the Objectives set out above.

Qualifying Features:

A098 *Falco columbarius*; Merlin (Breeding)

A140 *Pluvialis apricaria*; European golden plover (Breeding)

Breeding bird assemblage

Explanatory Notes: European Site Conservation Objectives

These Conservation Objectives are those referred to in the Conservation of Habitats and Species Regulations 2017 (as amended) ('the Habitats Regulations'). They must be considered when a competent authority is required to make a 'Habitats Regulations Assessment' including an Appropriate Assessment, under the relevant parts of this legislation.

These Conservation Objectives, and the accompanying Supplementary Advice (where this is available), will also provide a framework to inform the management of the European Site and the prevention of deterioration of habitats and significant disturbance of its qualifying features

These Conservation Objectives are set for each bird feature for a Special Protection Area (SPA).

Where these objectives are being met, the site will be considered to exhibit a high degree of integrity and to be contributing to achieving the aims of the Wild Birds Directive.

Publication date: 28 October 2019 (version 4). This document updates and replaces an earlier version dated 21 February 2019 to clarify the qualifying features.

European Site Conservation Objectives: Supplementary advice on conserving and restoring site features

South Pennine Moors (Phase 2) Special Protection Area (SPA)
Site Code: UK9007022



Photo credit: Andrew Clark

Date of Publication: 19 November 2018

About this document

This document provides Natural England's supplementary advice for the European Site Conservation Objectives relating to South Pennine Moors Phase 2 SPA. This advice should therefore be read together with the SPA Conservation Objectives available here.

Where this site overlaps with other European Site(s), you should also refer to the separate European Site Conservation Objectives and Supplementary Advice (where available) provided for those sites.

You should use the Conservation Objectives, this Supplementary Advice and any case-specific advice given by Natural England, when developing, proposing or assessing an activity, plan or project that may affect this site.

The tables provided below bring together the findings of the best available scientific evidence relating to the site's qualifying features, which may be updated or supplemented in further publications from Natural England and other sources. The local evidence used in preparing this supplementary advice has been cited. The references to the national evidence used are available on request. Where evidence and references have not been indicated, Natural England has applied ecological knowledge and expert judgement. You may decide to use other additional sources of information.

This Supplementary Advice to the Conservation Objectives presents attributes which are ecological characteristics of the designated species and habitats within a site. The listed attributes are considered to be those that best describe the site's ecological integrity and which, if safeguarded, will enable achievement of the Conservation Objectives. Each attribute has a target which is either quantified or qualitative depending on the available evidence. The target identifies as far as possible the desired state to be achieved for the attribute.

In many cases, the attribute targets shown in the tables indicate whether the current objective is to 'maintain' or 'restore' the attribute. This is based on the best available information, including that gathered during monitoring of the feature's current condition. As new information on feature condition becomes available, this will be added so that the advice remains up to date.

The targets given for each attribute do not represent thresholds to assess the significance of any given impact in Habitats Regulations Assessments. You will need to assess this on a case-by-case basis using the most current information available.

Some, but not all, of these attributes can also be used for regular monitoring of the actual condition of the designated features. The attributes selected for monitoring the features, and the standards used to assess their condition, are listed in separate monitoring documents, which will be available from Natural England.

These tables do not give advice about SSSI features or other legally protected species which may also be present within the European Site.

If you have any comments or queries about this Supplementary Advice document please contact your local Natural England adviser or email HDIRConservationObjectivesNE@naturalengland.org.uk

About this site

European Site information

Name of European Site	South Pennine Moors (Phase 2) Special Protection Area (SPA)
Location	Lancashire, North Yorkshire, West Yorkshire, Greater Manchester
Site Map	The designated boundary of this site can be viewed here on the MAGIC website
Designation Date	June 1997
Qualifying Features	See section below
Designation Area	20,994.46 hectares
Designation Changes	n/a
Feature Condition Status	Details of the feature condition assessments made at this site can be found using Natural England's Designated Sites System
Names of component Sites of Special Scientific Interest (SSSIs)	South Pennine Moors SSSI
Relationship with other European or International Site designations	The site overlaps with part of the South Pennine Moors SAC
Other information	Natura 2000 Standard Data Form

Site background and geography

The South Pennine Moors SPA (Phases 1 and 2) include the major moorland blocks of the South Pennines from Ilkley in the north to Leek and Matlock in the south. They lie in the Southern Pennines National Character Area, which forms part of the Pennine ridge of hills lying between the Peak District National Park and Yorkshire Dales National Park. This is a landscape of large-scale sweeping moorland and pastures enclosed by drystone walls, with gritstone-dominated settlements contained within narrow valleys.

The Phase 2 SPA includes two discrete blocks of moorland, one south of Ilkley and another on the watershed between Bradford and Burnley and stretching south to Marsden at the northern edge of the Peak District. It covers extensive tracts of semi-natural moorland habitats including upland heath and blanket mire.

The soils within the SPA are generally acidic in nature and nutrient-poor and consist of varying depths of peat overlying a geology of sandstone, gritstone and sedimentary rock. The geomorphology and landscape is one of large expanses of uplands and valleys with associated crags, ledges and escarpments.

The site is of European importance for several upland breeding species of bird, including birds of prey and waders. Habitats around the moorland provide key feeding areas for some key moorland-breeding species in particular both Merlin *Falco columbarius* and Golden Plover *Pluvialis apricaria*. The northern end of the South Pennine Moors SPA is within 10 km of the North Pennine Moors SPA which supports a similar assemblage of upland breeding species.

The South Pennine Moors Phase 2 SPA is flanked on two sides by large urban areas, which means that large numbers of people use the area for access and recreation.

The South Pennine Moors Phase 2 SPA contains the only UK breeding sites for the Twite (also known locally as the ‘Pennine Finch’). Nesting in long heather and bracken beds, this species breeds in colonies and returns to the same location year on year. The food source for this species is solely seeds and the functionally linked meadow land on the in-bye (usually within 2.5km of a breeding colony) is critical to the future success of this species.

Maintenance of the ecosystems on which the birds depend relies on appropriate land management. Management of grazing is complicated by the presence of a large number of commons within the SPA and overgrazing by sheep is a key pressure on the site. Pressures outside the site, in particular the loss of bird feeding areas through agricultural intensification and housing development, increase the vulnerability of the bird populations.

About the qualifying features of the SPA

The following section gives you additional, site-specific information about this SPA's qualifying features. These are the individual species of wild birds listed on Annex I of the European Wild Birds Directive, and/or the individual regularly-occurring migratory species, and/or the assemblages (groups of different species occurring together) of wild birds for which the SPA was classified for.

Qualifying individual species of the SPA:

During the breeding season the SPA regularly supports:

- **Merlin *Falco columbarius***

  At the time of its classification, the SPA supported 28 breeding pairs of merlin, which represented 4.3% of the British breeding population.

  In the UK, merlin is confined as a breeding species to heather moorland areas, mainly in the uplands of Northern Ireland, Scotland, Wales and northern England, with small numbers in South-west England.

  A majority of merlin in the UK nest in a shallow scrape on the ground, lined with small twigs, pieces of heather, bracken and other material and concealed by heather. Territories are traditional, and are used repeatedly from year to year by successive generations of birds. Eggs are laid between May and early June and the young in a ground nest will often leave the nest at 18-20 days and scatter into the surrounding undergrowth. They fledge at 25-32 days, and are independent about a month later. One brood a year is raised. Replacement clutches are laid after early egg loss

- **Golden plover *Pluvialis apricaria***

  At the time of its classification, the SPA supported 292 breeding pairs of golden plover, which represented 1.2 % of the British breeding population.

  In Britain, the species is distributed widely throughout upland areas, with concentrations in northern and western Scotland and the north and south Pennines, and smaller outlying groups breeding in Wales and south-west England The English and Welsh populations breed at the southern edge of the species' global range.

  Golden plover nest in a shallow scrape on the ground often hidden by moorland vegetation, favouring a mosaic of dense and short vegetation and large open areas for breeding. Rombalds moor particularly Burley moor region in the north, Oxenhope moor, Stairs swamp and Harry side in the central block of the SPA support good breeding densities of Golden plover whilst the southern block of the SPA supports fewer breeding numbers. Food consists of invertebrates, mainly beetles and earthworms, and so marginal or low-intensity agricultural pastures, adjacent to or nearby moorland nesting habitat, are important feeding grounds in the summer. Eggs are typically laid between April-mid-May and one brood is raised per year.

At this SPA the principal habitats supporting these qualifying species are: Blanket bogs, dry heaths, wet heaths and acid grassland.

Qualifying assemblage of species:

During the breeding season, the SPA regularly supports;

- **an assemblage of characteristic moorland and moorland-fringe species** including *Pluvialis apricaria* (golden plover), *Actitis hypoleucos* (common sandpiper), *Calidris alpina schinzii* (dunlin), *Carduelis flavirostris* (twite), *Gallinago gallinago,* (snipe), *Numenius arquata* (curlew), *Oenanthe oenanthe,* (wheatear), *Saxicola rubetra* (whinchat), *Tringa totanus (*redshank), *Turdus torquatus* (ring ouzel), *Vanellus vanellus* (lapwing), and *Asio flammeus* (short-eared owl).

Common sandpiper predominantly use the dense vegetation in close proximity to the major reservoir complexes in the SPA; Widdop/Gorple, Warley Moor, Walshaw Dean and Warland/ White reservoir's. The central block of the SPA support the core breeding area for Dunlin, predominantly using Lord's and will's allotments and Nab Hill. Twite predominantly use the southern block of the SPA, with the core breeding area being north of the M62 on the edges of Soyland and Rishworth Moor. Snipe use the eastern side of the central block predominantly Pickles rough and Warley moor. Curlew are present throughout the SPA with Oxenhope Moor and Heptonstall Moor supporting high densities during the breeding season. Golden plover use the blanket bog habitat within the SPA and are more common on the higher, flatter and more remote bogs with a mosaic of short and dense vegetation with the area around Oxenhope Moor maintaining high breeding densities. Whinchat are scarce across the SPA and therefore difficult to determine local use across the site. Redshank can be found in the damp moorland fringe habitat near to Oxenhope Moor and Heptonstall Moor. Ring ouzel are scarce across the SPA and therefore difficult to determine local use across the site. Lapwing predominantly use the moorland fringe with shorter vegetation and Oxenhope moor supports the highest breeding pairs on the site. Short-eared owl use the long heather and tall rushes on open moorland to provide cover for the nests predominantly in the central belt of the South Pennine Moors and regularly observed on Wadsworth Moor

At this SPA the principal habitats supporting the assemblage of species are: Blanket bogs, European dry heaths, Acid grassland, Northern Atlantic wet heaths and dense bracken beds when associated with populations of Twite.

Site-specific seasonality of qualifying SPA features

The table below highlights in grey those months in which significant numbers of each mobile qualifying feature are most likely to be present at the SPA during a typical calendar year. This table is provided as a general guide only.

Unless otherwise indicated, the months shown below are primarily based on information relating to the general months of occurrence of the feature in the UK. Where site-based evidence is available and has been used to indicate below that significant numbers of the feature are typically present at this SPA outside of the general period, the site-specific references have been added to indicate this.

Applicants considering projects and plans scheduled in the periods highlighted in grey would benefit from early consultation with Natural England given the greater scope for there to be likely significant effects that require consideration of mitigation to minimise impacts to qualifying bird features during the principal periods of site usage by those features. The months which are *not* highlighted in grey are not ones in which the features are necessarily absent, rather that features may be present in less significant numbers in typical years. Furthermore, in any given year, features may occur in significant numbers in months in which typically they do not. Thus, applicants should not conclude that projects or plans scheduled in months not highlighted in grey cannot have a significant effect on the features. There may be a lower likelihood of significant effects in those months which nonetheless will also require prior consideration.

Any assessment of potential impacts on the features must be based on up-to-date count data and take account of population trends evident from these data and any other available information. Additional site-based surveys may be required.

Feature	Season	Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Site-specific references where available
Merlin	Breeding	Summer													
Golden Plover	Breeding	Summer													
Assemblage of moorland birds	Breeding	Summer													

Guide to terms:
Breeding – present on a site during the normal breeding period for that species
Non-breeding - present on a site outside of the normal breeding period for that species (includes passage and winter periods).
Summer – the period generally from April to July inclusive
Passage - the periods during the autumn and spring when migratory birds are moving between breeding areas and wintering areas. These periods are not strictly defined but generally include the months of July – October inclusive (autumn passage) and March – April inclusive (spring passage).
Winter - the period generally from November to February inclusive.

Table 1: Supplementary Advice for Qualifying features: A098 *Falco columbarius*; Merlin (breeding)

Attributes		Targets	Supporting and/or Explanatory Notes	Sources of site-based evidence (where available)
Supporting habitat (both within and outside the SPA): function/ supporting process	Conservation measures	Restore management or other measures (whether within and/or outside the site boundary as appropriate) necessary to restore the structure, function and/or the supporting processes associated with breeding Merlin and its supporting habitats.	Active and ongoing conservation management is often needed to protect, maintain or restore this feature at this site. Other measures may also be required, and in some cases, these measures may apply to areas outside of the designated site boundary in order to achieve this target. Further details about the necessary conservation measures for this site can be provided by Natural England. This information will typically be found within, where applicable, supporting documents such as Natura 2000 Site Improvement Plan, Site Management Strategies or Plans, the Views about Management Statement for the underpinning SSSI and/or management agreements. Maintain and extend areas of mature and degenerate heather for provision of nesting habitat. Areas of supporting habitat (within and outside the SPA) should be managed in order to provide prey species such as meadow pipit	NATURAL ENGLAND, 2009. NVC/Habitat survey of South Pennine Moors 2009. Unpublished data. ENGLISH NATURE, 2005. Views about the management of South Pennine Moors SSSI. At http://www.sssi.naturalengland.org.uk/Special/sssi/vam/VAM%201007196.pdf NATURAL ENGLAND, 2014. Site Improvement Plan: South Pennine Moors (SIP225) At http://publications.naturalengland.org.uk/publication/5412834661892096
Supporting habitat (both within and outside the SPA):	Air quality	Restore as necessary the concentrations and deposition of air pollutants to below the site-relevant Critical Load or Level values given for this	The structure and function of the habitats which support this SPA feature may be sensitive to changes in air quality. Exceeding critical values for air pollutants may result in changes to the chemical status of a supporting habitats' substrate, accelerating or damaging	More information about site-relevant Critical Loads and Levels for this SPA is available by

Attributes		Targets	Supporting and/or Explanatory Notes	Sources of site-based evidence (where available)
function/supporting process		feature of the site on the Air Pollution Information System (www.apis.ac.uk).	plant growth, altering vegetation structure and composition and thereby affecting the quality and availability of nesting, feeding or roosting habitats. Critical Loads and Levels are thresholds below which such harmful effects on sensitive UK habitats will not occur to a noteworthy level, according to current levels of scientific understanding. There are critical levels for ammonia (NH3), oxides of nitrogen (NOx) and sulphur dioxide (SO2), and critical loads for nutrient nitrogen deposition and acid deposition. It is recognised that achieving this target may be subject to the development, availability and effectiveness of abatement technology and measures to tackle diffuse air pollution, within realistic timescales. There are currently no critical loads or levels for other pollutants such as Halogens, Heavy Metals, POPs, VOCs or Dusts. These should be considered as appropriate on a case-by-case basis. Ground level ozone is regionally important as a toxic air pollutant but flux-based critical levels for the protection of semi-natural habitats are still under development. The critical values for the supporting habitats of the SPAs are currently being exceeded (November 2018).	using the 'search by site' tool on the Air Pollution Information System (www.apis.ac.uk).
Supporting habitat (both within and outside the SPA): predation	Predation	Reduce and restrict the predation of and associated disturbance of breeding Merlin by native and non-native predators	This will ensure that breeding productivity (number of chicks per pair) and survival are sustained at rates that maintain or restore the abundance of the feature. Impacts to breeding productivity can result directly from predation of eggs, chicks, juveniles and adults, and also from significant disturbance. The presence of predators can influence bird behaviours, such as abandonment of nest sites or reduction of effective feeding. Where evidence suggests predator management is required, measures can include their exclusion through fencing and scaring or by direct control. Any such measures must consider the legal protection of some predators, as well as the likely effects of such control on other qualifying features.	BROWN, A.F & SHEPHERD, K. B. (1991). Breeding birds of the South Pennine Moors. JNCC Report No 7. SHEPHERD, K. B. (2005). South Pennine Moors Breeding Bird Survey 2005. Unpublished report presented to English Nature. KEYSTONE ECOLOGY (2014) South Pennine

Attributes		Targets	Supporting and/or Explanatory Notes	Sources of site-based evidence (where available)
				Moors SSSI/SPA Phase 2. Breeding Bird Surveys 2014. Unpublished report to Natural England.
Breeding population	Population abundance	Restore the size of the breeding Merlin population to a level which is consistently above 28 pairs, whilst avoiding deterioration from its current level as indicated by the latest mean peak count or equivalent.	This will sustain the site's population and ensures it contributes to a viable local, national and bio-geographic population. Due to the mobility of birds and the dynamic nature of population change, the target value given for the abundance of this feature is considered to be the minimum standard for conservation/ restoration measures to achieve. This minimum value may be revised where there is evidence to show that a population's size has significantly changed as a result of natural factors or management measures and has been stable at or above a new level over a considerable period. The values given here may also be updated in future to reflect any strategic objectives which may be set at a national level for this feature. Given the likely fluctuations in numbers over time, any impact assessments should focus on the current abundance of the site's population, as derived from the latest known or estimated level established using the best available data. This advice accords with the obligation to avoid deterioration of the site or significant disturbance of the species for which the site is classified, and seeks to avoid plans or projects that may affect the site giving rise to the risk of deterioration. Similarly, where there is evidence to show that a feature has historically been more abundant than the stated minimum target and its current level, the ongoing capacity of the site to accommodate the feature at such higher levels in future should also be taken into account. Maintaining or restoring bird abundance depends on the suitability of the site. However, factors affecting suitability can also determine other demographic rates of birds using the site including survival (dependent on factors such as body condition which influences the ability to breed or make foraging and / or migration movements) and breeding productivity. Adverse anthropogenic impacts on either of these rates may precede changes in population abundance (e.g. by changing proportions of birds of different ages) but eventually may negatively affect abundance. These rates can be measured/estimated to inform judgements of likely impacts on	JNCC SPA citation KEYSTONE ECOLOGY (2014) South Pennine Moors SSSI/SPA Phase 2. Breeding Bird Surveys 2014. Unpublished report to Natural England. BROWN, A.F & SHEPHERD, K. B. (1991). Breeding birds of the South Pennine Moors. JNCC Report No 7. SHEPHERD, K. B. (2005). South Pennine Moors Breeding Bird Survey 2005. Unpublished report presented to English Nature.

Attributes		Targets	Supporting and/or Explanatory Notes	Sources of site-based evidence (where available)
			abundance targets. Unless otherwise stated, the population size will be that measured using standard methods such as peak mean counts or breeding surveys. This value is also provided recognising there will be inherent variability as a result of natural fluctuations and margins of error during data collection. Whilst we will endeavour to keep these values as up to date as possible, local Natural England staff can advise on whether the figures stated are the best available.	
Supporting habitat (both within and outside the SPA): extent and distribution	Extent and distribution of supporting breeding habitat	Restore the extent, distribution and availability of suitable breeding habitat which supports breeding Merlin for all necessary stages of its breeding cycle (courtship, nesting, feeding)	Conserving or restoring the extent of supporting habitats and their range will be key to maintaining the site's ability and capacity to support the SPA population. The information available on the extent and distribution of supporting habitat used by the feature may be approximate depending to the nature, age and accuracy of data collection. This target will apply to any critical supporting habitat which is known to occur outside the site boundary. It is likely that merlin hunt in habitats around the moorland edge and changes in prey abundance here could affect breeding performance. These issues should be considered for development proposals on land around the SPA. The extent/condition of required habitats was not known at time of designation	NATURAL ENGLAND, 2009. NVC/Habitat survey of South Pennine Moors 2009. Unpublished data, Natural England. South Pennine Moors In-bye bird survey (Bradford South Pennines moorland fringe bird survey 2013 , Calderdale South Pennines moorland fringe bird survey 2010 & 2012, Kirklees South Pennines moorland fringe bird survey 2012)
Supporting habitat (within the SPA): structure	Vegetation characteristics	Restore a high proportion of medium to tall (>50 cm) ground vegetation within nesting habitat.	The height, cover, variation and composition of vegetation are often important characteristics of habitats supporting this feature which enable successful nesting/rearing/concealment/roosting. Many bird species will have specific requirements that conservation measures will aim to maintain, for others such requirements will be less clear. Activities that may directly or indirectly affect the vegetation of supporting habitats and modify these characteristics may	NATURAL ENGLAND, 2009.NVC/Habitat survey of South Pennine Moors 2009. Unpublished

Attributes		Targets	Supporting and/or Explanatory Notes	Sources of site-based evidence (where available)
			adversely affect the feature.	data, Natural England.
Supporting habitat (both within and outside the SPA): disturbance	Minimising disturbance caused by human activity	Restrict and reduce the frequency, duration and/or intensity of disturbance to nesting, feeding and/or communal roosting birds so that the Merlin population is not significantly disturbed during the breeding period.	The nature, scale, timing and duration of some human activities can result in the disturbance of birds at a level that may substantially affect their behaviour, and consequently affect the long-term viability of the population. Disturbing effects can for example result in changes to feeding or roosting behaviour, increases in energy expenditure due to increased flight, abandonment of nest sites and desertion of supporting habitat (both within or outside the designated site boundary where appropriate). This may undermine successful nesting, rearing, feeding and/or roosting, and/or may reduce the availability of suitable habitat as birds are displaced and their distribution within the site contracts. Disturbance associated with human activity may take a variety of forms including noise, light, sound, vibration, trampling, and presence of people, animals and structures. Ground-nesting birds can be at particular risk from disturbance. Merlin are thought to be particularly sensitive to disturbance in the early spring when selecting nest sites.	
Supporting habitat (both within and outside the SPA): structure	Landscape	Maintain a high proportion of open and unobstructed terrain within and around nesting and feeding areas.	This feature is known to favour large areas of open terrain, largely free of obstructions, in and around its nesting, roosting and feeding areas. Often there is a need to maintain an unobstructed line of sight within nesting, feeding or roosting habitat to detect approaching predators, or to ensure visibility of displaying behaviour. The merlin requires extensive open ground for hunting. It feeds chiefly on small birds caught in open country and hunts by perching in an elevated position to locate prey, usually on rocks or tree stumps. Once prey is sighted, it is usually caught after a short distance surprise attack, following a low flight from the perch. Other hunting techniques include prolonged persistent chasing and vertical stooping. An open landscape may also be required to facilitate movement of birds between the SPA and any off-site supporting habitat.	NATURAL ENGLAND, 2009. NVC/Habitat survey of South Pennine Moors 2009. Unpublished data, Natural England.
Supporting habitat (both within and outside the SPA):	Food availability within supporting habitat	Maintain a high availability of small birds and day-flying moths during the breeding season.	The availability of an abundant food supply is critically important for successful breeding, adult fitness and survival and the overall sustainability of the population. The merlin feeds chiefly on small birds caught in open country, though small	NATURAL ENGLAND, 2009. NVC/Habitat survey of South Pennine Moors

Attributes		Targets	Supporting and/or Explanatory Notes	Sources of site-based evidence (where available)
function/ supporting process			mammals and insects are often important. Prey is usually caught in the air close to or on the ground, and is plucked and decapitated before being brought to the nest. As a result, inappropriate management and direct or indirect impacts which may affect the distribution, abundance and availability of prey may adversely affect the population.	2009. Unpublished data, Natural England.
Version Control Advice last updated: n/a				
Variations from national framework of integrity-guidance: Water quality/quantity (target removed) as species or their prey species are not dependent on this target.				

Table 2: Supplementary Advice for Qualifying features: A140 *Pluvialis apricaria*; Golden plover (breeding)

Attributes		Targets	Supporting and/or Explanatory Notes	Sources of site-based evidence (where available)
Supporting habitat (both within and outside the SPA): function/ supporting process	Water quality/ quantity	Where the supporting habitats of the SPA feature are dependent on surface water, maintain water quality and quantity at standards which provides the necessary conditions to support breeding Golden Plover	For many SPA features which are dependent on wetland habitats supported by surface water, maintaining the quality and quantity of water supply will be critical, especially at certain times of year during key stages of their life cycle. Poor water quality and inadequate quantities of water can adversely affect the availability and suitability of breeding, rearing, feeding and roosting habitats. Typically, meeting the surface water and groundwater environmental standards set out by the Water Framework Directive (WFD 2000/60/EC) will also be sufficient to support the SPA Conservation Objectives but in some cases more stringent standards may be needed to support the SPA feature. Further site-specific investigations may be required to establish appropriate standards for the SPA.	NATURAL ENGLAND, 2009. NVC/Habitat survey of South Pennine Moors 2009. Unpublished data, Natural England.
Supporting habitat (both within and outside the SPA): function/ supporting process	Conservation measures	Restore management or other measures (whether within and/or outside the site boundary as appropriate) necessary to restore the structure, function and/or the supporting processes associated with breeding Golden Plover and its supporting habitats.	See notes for the attribute in table 1 above. Breeding occurs on upland blanket bogs, wet heaths and acid grassland. Marginal pasture land adjacent to SPA are known to be important feeding grounds. This off site, supporting habitat, feeding ground is functionally linked to the SPA and key to success of breeding on the moorland. Golden plover usually feed on short grazed pastures and molehill abundance can be a good surrogate measure for food availability (i.e. earthworm density). Wetter, undrained pastures are also preferred for feeding as this can increase Tipulid abundance (May-June main food supply). Additionally larger, more level fields are preferred compared to steep slopes.	NATURAL ENGLAND, 2009. NVC/Habitat survey of South Pennine Moors 2009. Unpublished data, Natural England. South Pennine Moors In-bye bird survey (Bradford South Pennines moorland fringe bird survey 2013, Calderdale South Pennines moorland fringe bird survey 2010 & 2012, Kirklees South Pennines moorland fringe bird survey 2012) ENGLISH NATURE, 2005. Views about the management of South Pennine Moors SSSI. At

Attributes		Targets	Supporting and/or Explanatory Notes	Sources of site-based evidence (where available)
				http://www.sssi.naturalengland.org.uk/Special/sssi/vam/VAM%201007196.pdf NATURAL ENGLAND, 2014. Site Improvement Plan: South Pennine Moors (SIP225) At http://publications.naturalengland.org.uk/publication/5412834661892096
Supporting habitat (both within and outside the SPA): function/ supporting process	Air quality	Restore as necessary the concentrations and deposition of air pollutants to below the site-relevant Critical Load or Level values given for this feature of the site on the Air Pollution Information System (www.apis.ac.uk).	See notes for the attribute in table 1 above	More information about site-relevant Critical Loads and Levels for this SPA is available by using the 'search by site' tool on the Air Pollution Information System (www.apis.ac.uk).
Supporting habitat (both within and outside the SPA): predation	Predation	Reduce or restrict the predation and associated disturbance of breeding Golden Plovers caused by native and non-native predators.	This will help to ensure that breeding productivity (the number of chicks per pair) and survival are sustained at rates that maintain or restore the abundance of the feature. Impacts to breeding productivity can result directly from predation of eggs, chicks, juveniles and adults, and also from significant disturbance. The presence of predators can influence bird behaviours, such as abandonment of nest sites or reduction of effective feeding. Where evidence suggests predator management is required, measures can include their exclusion through fencing and scaring or by direct control. Any such measures must consider the legal protection of some predators, as well as the likely effects of such control on other qualifying features.	JNCC SPA citation BROWN, A.F & SHEPHERD, K. B. (1991). Breeding birds of the South Pennine Moors. JNCC Report No 7. SHEPHERD, K. B. (2005). South Pennine Moors Breeding Bird Survey 2005. Unpublished report presented to English Nature. KEYSTONE

Attributes		Targets	Supporting and/or Explanatory Notes	Sources of site-based evidence (where available)
				ECOLOGY (2014) South Pennine Moors SSSI/SPA Phase 2. Breeding Bird Surveys 2014. Unpublished report to Natural England.
Breeding population	Population abundance	Maintain the size of the breeding Golden Plover population at a level which is consistently above 292 pairs, whilst avoiding deterioration from its current level as indicated by the latest mean peak count or equivalent.	See notes for this attribute above in table 1.	JNCC SPA citation KEYSTONE ECOLOGY (2014) South Pennine Moors SSSI/SPA Phase 2. Breeding Bird Surveys 2014. Unpublished report to Natural England. BROWN, A.F & SHEPHERD, K. B. (1991). Breeding birds of the South Pennine Moors. JNCC Report No 7. Breeding Birds of the South Pennine Moors, Brown & Shepherd 1990. SHEPHERD, K. B. (2005). South Pennine Moors Breeding Bird Survey 2005. Unpublished report presented to English Nature.
Supporting habitat (both within and outside the SPA): extent	Extent and distribution of supporting breeding habitat	Restore the extent, distribution and availability of suitable breeding habitat which supports breeding Golden Plover for all necessary stages of its breeding	Conserving or restoring the extent of supporting habitats and their range will be key to maintaining the site's ability and capacity to support the SPA population. The information available on the extent and distribution of supporting habitat used by the feature may be approximate depending to the nature, age and accuracy of data collection.	NATURAL ENGLAND, 2009. NVC/Habitat survey of South Pennine Moors 2009. Unpublished data,

Attributes		Targets	Supporting and/or Explanatory Notes	Sources of site-based evidence (where available)
and distribution		cycle (courtship, nesting, feeding)	This objective will apply to any critical supporting habitat which is known to occur outside the site boundary. Golden Plover may travel up to 4 km from their nesting sites to feed. Marginal pastures adjacent to the SPA are also known to be likely important feeding grounds for this feature. Where this off-site but supporting habitat is regularly used and strongly 'functionally-linked' to the SPA, it will be key to breeding success on the moorland. Golden plover nest in a shallow scrape on the ground often hidden by moorland vegetation, favouring a mosaic of dense and short vegetation and large open areas for breeding. Rombalds moor particularly Burley moor region in the north of the site, Oxenhope moor, Stairs swamp and Harry side in the central block of the SPA support good breeding densities of Golden plover whilst the southern block of the SPA supports fewer breeding numbers. Golden plover usually feed on short grazed and invertebrate-rich pastures and molehill abundance can be a good surrogate measure for food availability (i.e. earthworm density). Wetter, un-drained pastures are also preferred for feeding as this can increase cranefly (Tipulid) abundance (during May-June this is their main food supply). Additionally larger, more level fields are preferred compared to steep slopes.	Natural England.
Supporting habitat (both within and outside the SPA): function/supporting process	Hydrology	Restore the area of damp or waterlogged habitat used for feeding by breeding Golden Plover	Changes in source, depth, duration, frequency, magnitude and timing of water supply or flow can have important implications for this feature. Such changes may affect the quality and suitability of habitats used by birds for nesting, drinking, preening, rearing, feeding or roosting. Unless these have already been undertaken, further site-specific investigations may be required to fully inform conservation measures for this feature and/or the likelihood of impacts on this attribute. Grip blocking schemes to re-wet moorland areas will help restore previous water table levels and contribute to restoration of suitable habitat for this feature.	
Supporting habitat (within the SPA): structure	Vegetation characteristics	Restore a mosaic (typically a 1:3 ratio) of short (<5 cm) to tall (10-15 cm) vegetation within breeding areas used by Golden Plover.	The height, cover, variation and composition of vegetation are often important characteristics of habitats supporting this feature which enable successful nesting/rearing/concealment/roosting. Many bird species will have specific requirements that conservation measures will aim to maintain, for others such requirements will be less clear.	NATURAL ENGLAND, 2009. NVC/Habitat survey of South Pennine Moors 2009. Unpublished data,

Attributes		Targets	Supporting and/or Explanatory Notes	Sources of site-based evidence (where available)
			Activities that may directly or indirectly affect the vegetation of supporting habitats and modify these characteristics may adversely affect the feature.	Natural England.
Supporting habitat (both within and outside the SPA): minimising disturbance	Minimising disturbance caused by human activity	Restrict and reduce the frequency, duration and/or intensity of disturbance affecting nesting, roosting, and/or foraging birds so that the Golden Plover population is not significantly disturbed during the breeding period.	The nature, scale, timing and duration of some human activities can result in the disturbance of birds at a level that may substantially affect their behaviour, and consequently affect the long-term viability of the population. Such disturbing effects can for example result in changes to feeding or roosting behaviour, increases in energy expenditure due to increased flight, abandonment of nest sites and desertion of supporting habitat (both within or outside the designated site boundary where appropriate). This may undermine successful nesting, rearing, feeding and/or roosting, and/or may reduce the availability of suitable habitat as birds are displaced and their distribution within the site contracts. Disturbance associated with human activity may take a variety of forms including noise, light, sound, vibration, trampling, and presence of people, animals and structures. Ground-nesting birds such as waders can be at particular risk from disturbance. This feature is particularly sensitive to disturbance and can be affected by people over 200 metres away.	
Supporting habitat (both within and outside the SPA): structure	Landscape	Maintain open and unobstructed terrain within and around nesting, roosting and feeding sites used by breeding Golden Plover.	This feature is known to favour large areas of open terrain, largely free of obstructions, in and around its nesting, roosting and feeding areas. Often there is a need to maintain an unobstructed line of sight within nesting, feeding or roosting habitat to detect approaching predators, or to ensure visibility of displaying behaviour. An open landscape may also be required to facilitate movement of birds between the SPA and any off-site supporting habitat.	NATURAL ENGLAND, 2009. NVC/Habitat survey of South Pennine Moors 2009. Unpublished data, Natural England.
Supporting habitat (both within and outside the SPA): function/ supporting process	Connectivity with supporting habitats	Maintain the safe passage of birds moving between nesting and feeding areas used by breeding Golden Plover.	The ability of the feature to safely and successfully move to and from nesting and feeding areas is critical to their breeding success and to the adult fitness and survival. This target will apply within the site boundary and where birds regularly move to and from off-site habitat where this is relevant.	
Supporting habitat (both within and outside the SPA):	Food availability within supporting habitat	Maintain the availability of key prey items (e.g. earthworms, leatherjackets, beetles, spiders) at prey sizes preferred by Golden Plover.	The availability of an abundant food supply is critically important for successful breeding, adult fitness and survival and the overall sustainability of the population. As a result, inappropriate management and direct or indirect impacts which may affect the distribution, abundance and availability of prey may adversely affect the population.	PIERCE HIGGINS, J.W. *et al* (2009). Impacts of climate on prey abundance account for

Attributes		Targets	Supporting and/or Explanatory Notes	Sources of site-based evidence (where available)
function/ supporting process			Wetter, undrained fields with a shallow gradient are preferred feeding sites for golden plover. They usually feed on earthworms in March to April and crane-fly adults and larvae between May to June. The number of molehills can be generally correlated with earthworm density. Impacts that affect soil moisture may be particularly relevant.	fluctuations in a population of a northern wader at the southern edge of its range. Global Change Biology,
Version Control Advice last updated: N/A				
Variations from national framework of integrity-guidance: N/A				

Table 3: Supplementary Advice for Qualifying features: internationally important breeding bird assemblage

Attributes		Targets	Supporting and/or Explanatory Notes	Sources of site-based evidence (where available)
Supporting habitat (both within and outside the SPA): function/supporting process	Water quality/quantity	Where the supporting habitats of the SPA feature are dependent on surface water ensure water quality and quantity is maintained to a standard which provides the necessary conditions to support the assemblage feature.	For many SPA features which are dependent on wetland habitats supported by surface water, maintaining the quality and quantity of water supply will be critical, especially at certain times of year during key stages of their life cycle. Poor water quality and inadequate quantities of water can adversely affect the availability and suitability of breeding, rearing, feeding and roosting habitats. Typically, meeting the surface water and groundwater environmental standards set out by the Water Framework Directive (WFD 2000/60/EC) will also be sufficient to support the SPA Conservation Objectives but in some cases more stringent standards may be needed to support the SPA feature. Further site-specific investigations may be required to establish appropriate standards for the SPA.	NATURAL ENGLAND, 2009. NVC/Habitat survey of South Pennine Moors 2009. Unpublished data, Natural England.
Assemblage of species	Assemblage abundance	Maintain the presence of the breeding bird assemblage associated with upland moorland and its fringes and the abundance of each of its component populations, whilst avoiding deterioration from current levels of abundance as indicated by the latest mean peak counts or equivalent.	This will sustain the assemblage population and contribute to viable local, national and bio-geographic populations of its component species. Due to the dynamic nature of assemblage component populations, this target may be subject to periodic review. However, the continued presence of the assemblage and its component populations is considered to be the minimum standard for conservation or restoration measures and therefore where at any time the assemblage abundance is greater than the target value given, any measure or impact assessment should take account of the greater abundance. This meets with the obligation to avoid deterioration of a European site or significant disturbance of the species for which the site is classified, and seeks to avoid plans or projects giving rise to the risk of such deterioration or disturbance. Similarly, where there is evidence to show that a feature has historically been more abundant than the stated minimum target and its current level, the ongoing capacity of the site to accommodate the feature at such higher levels in future should also be taken into account. Whether to maintain or restore depends on the overall presence of the assemblage and its component populations and should only change in response to this, excepting natural change. Fluctuations of individual assemblage component species alone should not necessarily change the target.	BROWN, A.F & SHEPHERD, K. B. (1991). Breeding birds of the South Pennine Moors. JNCC Report No 7. SHEPHERD, K. B. (2005). South Pennine Moors Breeding Bird Survey 2005. Unpublished report presented to English Nature. KEYSTONE ECOLOGY (2014) South Pennine Moors SSSI/SPA Phase 2. Breeding Bird Surveys 2014 CROWTHER & WILKINSON

Attributes		Targets	Supporting and/or Explanatory Notes	Sources of site-based evidence (where available)
			Whilst we will endeavour to keep these values as up to date as possible, local Natural England staff can advise on whether the figures stated are the best available.	(2008) Breeding twite survey in the South Pennines. RSPB. RSPB, 2010. Breeding twite survey in the South Pennines - additional sites RSPB. .
Assemblage of species	Diversity of species	Maintain the overall species diversity of the SPA assemblage.	This will ensure the bird assemblage reflects the diversity of species the SPA supports. Assemblage diversity is a product of species richness (the number of different species present), abundance (population size of each assemblage component species) and relative 'importance' (an assessment of the conservation status of each assemblage component, described below). Each component makes a different contribution to the diversity of the assemblage, and changes to some components may be considered to affect diversity more than others. Negative changes to small numbers of relatively important assemblage components may have a similar overall effect to negative changes in larger numbers of less important components. The populations of each of the 'main component' assemblage species to be maintained or restored will be those bird species strongly characteristic of the particular SPA habitat, including those 'named components' listed on the SPA citation. In addition to the main components, other components should be considered as these contribute collectively to the assemblage diversity, in particular proportionally abundant populations of species of conservation importance. Examples are those 'red-listed' as Birds of Conservation Concern and/or those listed on Sections 41/42 of the Natural Environment & Rural Communities Act 2006. The species composition of an assemblage may change over time. However, to meet this target, the total number of all native bird species contributing to the assemblage species richness should not decline significantly. At the time of its classification, the SPA assemblage included key breeding populations of merlin, golden plover, twite, lapwing, curlew, short-eared owl, dunlin, snipe, redshank, common sandpiper whinchat, ring ouzel and wheatear.	
Supporting habitat (both within and	Extent and distribution of	Maintain the extent and distribution of habitat which	Conserving or restoring the extent of supporting habitats and their range will be key to maintaining the site's ability and capacity to support the SPA	NATURAL ENGLAND, 2009.

Attributes		Targets	Supporting and/or Explanatory Notes	Sources of site-based evidence (where available)
outside the SPA): extent and distribution	supporting breeding habitat	supports the SPA assemblage feature during all necessary stages (breeding, moulting, roosting, loafing, and feeding) of the breeding period.	population. The information available on the extent and distribution of supporting habitat used by the feature may be approximate depending to the nature, age and accuracy of data collection. This target will apply to any supporting habitat which is known to occur outside the site boundary such as off-site feeding/foraging grounds. The principal habitats known or likely to support the assemblage feature at this SPA are: blanket bog, dry heath, wet heath, acid grassland. Habitats that form a small part of the total extent of the SPA and / or are not primary reasons for the SAC or SSSI designation may be important for some species, for example bracken areas are important for Twite. The extent of supporting habitat was not known at designation of site.	NVC/Habitat survey of South Pennine Moors 2009. Unpublished data, Natural England.
Supporting habitat (both within and outside the SPA): minimising disturbance	Minimising disturbance caused by human activity	Restrict the frequency, duration and/or intensity of disturbance affecting nesting, roosting, foraging, feeding, moulting and/or loafing birds so that the SPA assemblage feature is not significantly disturbed	The nature, scale, timing and duration of some human activities can result in the disturbance of birds at a level which may significantly affect their behaviour, and consequently impact on the long-term viability of their population. Such disturbing effects can for example result in changes to feeding or roosting behaviour, increased energy expenditure due to more frequent flights, abandonment of nest sites, disrupted incubation of eggs and desertion of supporting habitat (both within or outside the designated site boundary where appropriate). Anthropogenic disturbance of birds may in effect reduce the availability to the birds of suitable habitat through temporary or long-lasting displacement of birds from affected areas and may result in their redistribution within the site or displacement from it. Disturbance associated with human activity may take a variety of forms including noise, light, sound, vibration, trampling and sight of people, animals and structures.	
Supporting habitat (both within and outside the SPA): structure/function	Quality of supporting breeding habitat	Maintain the structure, function and availability of the following habitats which support the main component species of the SPA assemblage feature for all stages (nesting, moulting, roosting, loafing, feeding) of the breeding period;	The site's ability to support and sustain an assemblage comprising a distinct or diverse mix of species will be reliant on the overall quality and diversity of the habitats that support them. The feeding and roosting habitats which support the assemblage will occur within, and in some cases outside, the site boundary. This target is applicable to both circumstances. Due to the large number of species and natural fluctuations in the overall composition of an assemblage, it is not practical to provide specific targets relating to each supporting habitat relevant to the assemblage. Generally speaking, the specific attributes of each supporting habitat may include	NATURAL ENGLAND, 2009. NVC/Habitat survey of South Pennine Moors 2009. Unpublished data, Natural England. CSM visits by

Attributes		Targets	Supporting and/or Explanatory Notes	Sources of site-based evidence (where available)
		blanket bog, dry heath, wet heath and acid grassland.	vegetation characteristics and structure, surface water depth, food availability, connectivity between nesting, roosting and feeding areas both within and outside the SPA. Further advice will be provided by Natural England on a case by case basis. The main component-species of the assemblage at this SPA include: twite, lapwing, curlew, short-eared owl, dunlin, snipe, redshank, common sandpiper whinchat, ring ouzel and wheatear.	Natural England
Supporting habitat (both within and outside the SPA): function/supporting process	Conservation measures	Maintain management or other measures (whether within and/or outside the site boundary as appropriate) necessary to maintain the structure, function and/or the supporting processes associated with the SPA assemblage feature and its supporting habitats.	Active and ongoing conservation management is often needed to protect, maintain or restore this feature at this site. Other measures may also be required, and in some cases, these measures may apply to areas outside of the designated site boundary in order to achieve this target. Further details about the necessary conservation measures for this site will typically be found within, where applicable, supporting documents such as Natura 2000 Site Improvement Plan, Site Management Strategies or Plans, the Views about Management Statement for the underpinning SSSI and/or management agreements. Manage to maintain areas of mature heather on dry heath and wet heath. Manage to maintain hydrological functionality of blanket bog and to restore degraded blanket bog	NATURAL ENGLAND, 2009. NVC/Habitat survey of South Pennine Moors 2009. Unpublished data. CSM visits by Natural England ENGLISH NATURE, 2005. Views about the management of South Pennine Moors SSSI. At http://www.sssi.naturalengland.org.uk/Special/sssi/vam/VAM%201007196.pdf NATURAL ENGLAND, 2014. Site Improvement Plan: South Pennine Moors (SIP225) At

Attributes		Targets	Supporting and/or Explanatory Notes	Sources of site-based evidence (where available)
				http://publications.naturalengland.org.uk/publication/5412834661892096
Assemblage of species	Predation	Reduce or restrict predation and disturbance of the species comprising the SPA assemblage caused by native and non-native predators.	This will ensure that breeding productivity (the number of chicks per pair) and survival are sustained at rates that maintain or restore the abundance and diversity of the feature. Impacts to breeding productivity can result directly from predation of eggs, chicks, juveniles and adults, and also from significant disturbance. The presence of predators can influence bird behaviours, such as abandonment of nest sites or reduction of effective feeding. Where evidence suggests predator management is required, measures can include their exclusion through fencing and scaring or by direct control. Any such measures must consider the legal protection of some predators, as well as the likely effects of such control on other qualifying features.	KEYSTONE ECOLOGY (2014) South Pennine Moors SSSI/SPA Phase 2. Breeding Bird Surveys 2014. Unpublished report to Natural England. BROWN, A.F & SHEPHERD, K. B. (1991). Breeding birds of the South Pennine Moors. JNCC Report No 7. SHEPHERD, K. B. (2005). South Pennine Moors Breeding Bird Survey 2005. Unpublished report presented to English Nature. CROWTHER & WILKINSON (2008) Breeding twite survey in the South Pennines. RSPB. RSPB, 210. Breeding twite

Attributes		Targets	Supporting and/or Explanatory Notes	Sources of site-based evidence (where available)
				survey in the South Pennines - additional sites.
Version Control Advice last updated: N/A				
Variations from national framework of integrity-guidance: N/A				

NATURA 2000 – STANDARD DATA FORM

Special Areas of Conservation under the EC Habitats Directive (includes candidate SACs, Sites of Community Importance and designated SACs).

Each Natura 2000 site in the United Kingdom has its own Standard Data Form containing site-specific information. The data form for this site has been generated from the Natura 2000 Database submitted to the European Commission on the following date:

22/12/2015

The information provided here, follows the officially agreed site information format for Natura 2000 sites, as set out in the Official Journal of the European Union recording the Commission Implementing Decision of 11 July 2011 (2011/484/EU).

The Standard Data Forms are generated automatically for all of the UK's Natura 2000 sites using the European Environment Agency's Natura 2000 software. The structure and format of these forms is exactly as produced by the EEA's Natura 2000 software (except for the addition of this coversheet and the end notes). The content matches exactly the data submitted to the European Commission.

Please note that these forms contain a number of codes, all of which are explained either within the data forms themselves or in the end notes.

Further technical documentation may be found here
http://bd.eionet.europa.eu/activities/Natura_2000/reference_portal

As part of the December 2015 submission, several sections of the UK's previously published Standard Data Forms have been updated. For details of the approach taken by the UK in this submission please refer to the following document:
http://jncc.defra.gov.uk/pdf/Natura2000_StandardDataForm_UKApproach_Dec2015.pdf

More general information on Special Areas of Conservation (SACs) in the United Kingdom is available from the SAC home page on the JNCC website. This webpage also provides links to Standard Data Forms for all SACs in the UK.

Date form generated by the Joint Nature Conservation Committee
25 January 2016.

NATURA 2000 - STANDARD DATA FORM

For Special Protection Areas (SPA),
Proposed Sites for Community Importance (pSCI),
Sites of Community Importance (SCI) and
for Special Areas of Conservation (SAC)

SITE **UK0030280**

SITENAME **South Pennine Moors**

TABLE OF CONTENTS

- 1. SITE IDENTIFICATION
- 2. SITE LOCATION
- 3. ECOLOGICAL INFORMATION
- 4. SITE DESCRIPTION
- 5. SITE PROTECTION STATUS AND RELATION WITH CORINE BIOTOPES
- 6. SITE MANAGEMENT

1. SITE IDENTIFICATION

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1.1 Type	1.2 Site code
B	UK0030280

1.3 Site name

South Pennine Moors

1.4 First Compilation date	1.5 Update date
2001-03	2015-12

1.6 Respondent:

Name/Organisation: Joint Nature Conservation Committee

Address: Joint Nature Conservation Committee Monkstone House City Road Peterborough PE1 1JY

Email:

Date site proposed as SCI:	2001-03
Date site confirmed as SCI:	2004-12
Date site designated as SAC:	2005-04
National legal reference of SAC designation:	Regulations 11 and 13-15 of the Conservation of Habitats and Species Regulations 2010 (http://www.legislation.gov.uk/uksi/2010/490/contents/made).

2. SITE LOCATION

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2.1 Site-centre location [decimal degrees]:

Longitude	Latitude
-1.783055556	53.46027778

2.2 Area [ha]:

65024.32

2.3 Marine area [%]

0.0

2.4 Sitelength [km]:

0.0

2.5 Administrative region code and name

NUTS level 2 code	Region Name
UKD4	Lancashire
UKF1	Derbyshire and Nottinghamshire
UKE2	North Yorkshire
UKE4	West Yorkshire
UKG2	Shropshire and Staffordshire
UKD2	Cheshire
UKE3	South Yorkshire
UKD3	Greater Manchester

2.6 Biogeographical Region(s)

Atlantic (100.0 %)

3. ECOLOGICAL INFORMATION

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3.1 Habitat types present on the site and assessment for them

Annex I Habitat types						Site assessment			
Code	PF	NP	Cover [ha]	Cave [number]	Data quality	A|B|C|D	A|B|C		
						Representativity	Relative Surface	Conservation	Global
4010			4356.63		G	C	C	C	C
4030			25229.44		G	C	B	C	B
7130	X		27440.26		G	C	C	C	B
7140			325.12		G	C	B	C	C
91A0									

			650.24		M	C	C	C	B

- **PF:** for the habitat types that can have a non-priority as well as a priority form (6210, 7130, 9430) enter "X" in the column PF to indicate the priority form.
- **NP:** in case that a habitat type no longer exists in the site enter: x (optional)
- **Cover:** decimal values can be entered
- **Caves:** for habitat types 8310, 8330 (caves) enter the number of caves if estimated surface is not available.
- **Data quality:** G = 'Good' (e.g. based on surveys); M = 'Moderate' (e.g. based on partial data with some extrapolation); P = 'Poor' (e.g. rough estimation)

4. SITE DESCRIPTION

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4.1 General site character

Habitat class	% Cover
N10	4.8
N07	42.7
N21	0.1
N16	1.0
N09	4.8
N19	0.1
N06	1.0
N08	45.5
Total Habitat Cover	100

Other Site Characteristics

1 Terrestrial: Soil & Geology: sandstone,sedimentary,basic,peat,acidic,nutrient-poor 2 Terrestrial: Geomorphology and landscape: upland,hilly,crags/ledges,slope,valley

4.2 Quality and importance

Northern Atlantic wet heaths with Erica tetralix for which the area is considered to support a significant presence. European dry heaths for which this is considered to be one of the best areas in the United Kingdom. Transition mires and quaking bogs for which the area is considered to support a significant presence. Old sessile oak woods with Ilex and Blechnum in the British Isles for which this is considered to be one of the best areas in the United Kingdom. Blanket bogs for which this is considered to be one of the best areas in the United Kingdom.

4.3 Threats, pressures and activities with impacts on the site

The most important impacts and activities with high effect on the site

Negative Impacts			
Rank	Threats and pressures [code]	Pollution (optional) [code]	inside/outside [i|o|b]
H	H04		B
H	J01		I
H	A11		B
H	J02		B
H	G01		I

Positive Impacts			
Rank	Activities, management [code]	Pollution (optional) [code]	inside/outside [i|o|b]
H	A03		I
H	A02		I
H	B02		I
H	B06		I
H	A04		I
H	D05		I
H	A06		I

Rank: H = high, M = medium, L = low

Pollution: N = Nitrogen input, P = Phosphor/Phosphate input, A = Acid input/acidification,
T = toxic inorganic chemicals, O = toxic organic chemicals, X = Mixed pollutions
i = inside, o = outside, b = both

4.5 Documentation

Conservation Objectives - the Natural England links below provide access to the Conservation Objectives (and other site-related information) for its terrestrial and inshore Natura 2000 sites, including conservation advice packages and supporting documents for European Marine Sites within English waters and for cross-border sites. See also the 'UK Approach' document for more information (link via the JNCC website).

Link(s): http://jncc.defra.gov.uk/pdf/Natura2000_StandardDataForm_UKApproach_Dec2015.pdf

http://publications.naturalengland.org.uk/category/3212324
http://publications.naturalengland.org.uk/category/6490068894089216

5. SITE PROTECTION STATUS (optional)

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5.1 Designation types at national and regional level:

Code	Cover [%]	Code	Cover [%]	Code	Cover [%]
UK04	100.0				

6. SITE MANAGEMENT

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6.1 Body(ies) responsible for the site management:

Organisation:	Natural England
Address:	
Email:	

6.2 Management Plan(s):

An actual management plan does exist:

☐	Yes
☐	No, but in preparation
X	No

6.3 Conservation measures (optional)

For available information, including on Conservation Objectives, see Section 4.5.

EXPLANATION OF CODES USED IN THE NATURA 2000 STANDARD DATA FORMS

The codes in the table below are also explained in the official European Union guidelines for the Standard Data Form. The relevant page is shown in the table below.

1.1 Site type

CODE	DESCRIPTION	PAGE NO
A	Designated Special Protection Area	53
B	SAC (includes candidates Special Areas of Conservation, Sites of Community Importance and designated SAC)	53
C	SAC area the same as SPA. Note in the UK Natura 2000 submission this is only used for Gibraltar	53

3.1 Habitat representativity

CODE	DESCRIPTION	PAGE NO
A	Excellent	57
B	Good	57
C	Significant	57
D	Non-significant presence	57

3.1 Habitat code

CODE	DESCRIPTION	PAGE NO
1110	Sandbanks which are slightly covered by sea water all the time	57
1130	Estuaries	57
1140	Mudflats and sandflats not covered by seawater at low tide	57
1150	Coastal lagoons	57
1160	Large shallow inlets and bays	57
1170	Reefs	57
1180	Submarine structures made by leaking gases	57
1210	Annual vegetation of drift lines	57
1220	Perennial vegetation of stony banks	57
1230	Vegetated sea cliffs of the Atlantic and Baltic Coasts	57
1310	Salicornia and other annuals colonizing mud and sand	57
1320	Spartina swards (Spartinion maritimae)	57
1330	Atlantic salt meadows (Glauco-Puccinellietalia maritimae)	57
1340	Inland salt meadows	57
1420	Mediterranean and thermo-Atlantic halophilous scrubs (Sarcocornetea fruticosi)	57
2110	Embryonic shifting dunes	57
2120	Shifting dunes along the shoreline with Ammophila arenaria ("white dunes")	57
2130	Fixed coastal dunes with herbaceous vegetation ("grey dunes")	57
2140	Decalcified fixed dunes with Empetrum nigrum	57
2150	Atlantic decalcified fixed dunes (Calluno-Ulicetea)	57
2160	Dunes with Hippopha□ rhamnoides	57
2170	Dunes with Salix repens ssp. argentea (Salicion arenariae)	57
2190	Humid dune slacks	57
21A0	Machairs (* in Ireland)	57
2250	Coastal dunes with Juniperus spp.	57
2330	Inland dunes with open Corynephorus and Agrostis grasslands	57
3110	Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae)	57
3130	Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanojuncetea	57
3140	Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.	57
3150	Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation	57

CODE	DESCRIPTION	PAGE NO
3160	Natural dystrophic lakes and ponds	57
3170	Mediterranean temporary ponds	57
3180	Turloughs	57
3260	Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation	57
4010	Northern Atlantic wet heaths with Erica tetralix	57
4020	Temperate Atlantic wet heaths with Erica ciliaris and Erica tetralix	57
4030	European dry heaths	57
4040	Dry Atlantic coastal heaths with Erica vagans	57
4060	Alpine and Boreal heaths	57
4080	Sub-Arctic Salix spp. scrub	57
5110	Stable xerothermophilous formations with Buxus sempervirens on rock slopes (Berberidion p.p.)	57
5130	Juniperus communis formations on heaths or calcareous grasslands	57
6130	Calaminarian grasslands of the Violetalia calaminariae	57
6150	Siliceous alpine and boreal grasslands	57
6170	Alpine and subalpine calcareous grasslands	57
6210	Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)	57
6230	Species-rich Nardus grasslands, on silicious substrates in mountain areas (and submountain areas in Continental Europe)	57
6410	Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)	57
6430	Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels	57
6510	Lowland hay meadows (Alopecurus pratensis, Sanguisorba officinalis)	57
6520	Mountain hay meadows	57
7110	Active raised bogs	57
7120	Degraded raised bogs still capable of natural regeneration	57
7130	Blanket bogs (* if active bog)	57
7140	Transition mires and quaking bogs	57
7150	Depressions on peat substrates of the Rhynchosporion	57
7210	Calcareous fens with Cladium mariscus and species of the Caricion davallianae	57
7220	Petrifying springs with tufa formation (Cratoneurion)	57
7230	Alkaline fens	57
7240	Alpine pioneer formations of the Caricion bicoloris-atrofuscae	57
8110	Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani)	57
8120	Calcareous and calcshist screes of the montane to alpine levels (Thlaspietea rotundifolii)	57
8210	Calcareous rocky slopes with chasmophytic vegetation	57
8220	Siliceous rocky slopes with chasmophytic vegetation	57
8240	Limestone pavements	57
8310	Caves not open to the public	57
8330	Submerged or partially submerged sea caves	57
9120	Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (Quercion robori-petraeae or Ilici-Fagenion)	57
9130	Asperulo-Fagetum beech forests	57
9160	Sub-Atlantic and medio-European oak or oak-hornbeam forests of the Carpinion betuli	57
9180	Tilio-Acerion forests of slopes, screes and ravines	57
9190	Old acidophilous oak woods with Quercus robur on sandy plains	57
91A0	Old sessile oak woods with Ilex and Blechnum in the British Isles	57
91C0	Caledonian forest	57
91D0	Bog woodland	57
91E0	Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)	57
91J0	Taxus baccata woods of the British Isles	57

3.1 Relative surface

CODE	DESCRIPTION	PAGE NO
A	15%-100%	58
B	2%-15%	58
C	< 2%	58

3.1 Conservation status habitat

CODE	DESCRIPTION	PAGE NO
A	Excellent conservation	59
B	Good conservation	59
C	Average or reduced conservation	59

3.1 Global grade habitat

CODE	DESCRIPTION	PAGE NO
A	Excellent value	59
B	Good value	59
C	Significant value	59

3.2 Population (abbreviated to 'Pop.' in data form)

CODE	DESCRIPTION	PAGE NO
A	15%-100%	62
B	2%-15%	62
C	< 2%	62
D	Non-significant population	62

3.2 Conservation status species (abbreviated to 'Con.' in data form)

CODE	DESCRIPTION	PAGE NO
A	Excellent conservation	63
B	Good conservation	63
C	Average or reduced conservation	63

3.2 Isolation (abbreviated to 'Iso.' in data form)

CODE	DESCRIPTION	PAGE NO
A	Population (almost) Isolated	63
B	Population not-isolated, but on margins of area of distribution	63
C	Population not-isolated within extended distribution range	63

3.2 Global Grade (abbreviated to 'Glo.' Or 'G.' in data form)

CODE	DESCRIPTION	PAGE NO
A	Excellent value	63
B	Good value	63
C	Significant value	63

3.3 Assemblages types

CODE	DESCRIPTION	PAGE NO
WATR	Non breeding waterfowl assemblage	UK specific code
SBA	Breeding seabird assemblage	UK specific code
BBA	Breeding bird assemblage (applies only to sites classified pre 2000)	UK specific code

4.1 Habitat class code

CODE	DESCRIPTION	PAGE NO
N01	Marine areas, Sea inlets	65
N02	Tidal rivers, Estuaries, Mud flats, Sand flats, Lagoons (including saltwork basins)	65
N03	Salt marshes, Salt pastures, Salt steppes	65
N04	Coastal sand dunes, Sand beaches, Machair	65
N05	Shingle, Sea cliffs, Islets	65
N06	Inland water bodies (Standing water, Running water)	65
N07	Bogs, Marshes, Water fringed vegetation, Fens	65
N08	Heath, Scrub, Maquis and Garrigue, Phygrana	65
N09	Dry grassland, Steppes	65
N10	Humid grassland, Mesophile grassland	65
N11	Alpine and sub-Alpine grassland	65
N14	Improved grassland	65
N15	Other arable land	65
N16	Broad-leaved deciduous woodland	65
N17	Coniferous woodland	65
N19	Mixed woodland	65
N21	Non-forest areas cultivated with woody plants (including Orchards, groves, Vineyards, Dehesas)	65
N22	Inland rocks, Screes, Sands, Permanent Snow and ice	65
N23	Other land (including Towns, Villages, Roads, Waste places, Mines, Industrial sites)	65
N25	Grassland and scrub habitats (general)	65
N26	Woodland habitats (general)	65

4.3 Threats code

CODE	DESCRIPTION	PAGE NO
A01	Cultivation	65
A02	Modification of cultivation practices	65
A03	Mowing / cutting of grassland	65
A04	Grazing	65
A05	Livestock farming and animal breeding (without grazing)	65
A06	Annual and perennial non-timber crops	65
A07	Use of biocides, hormones and chemicals	65
A08	Fertilisation	65
A10	Restructuring agricultural land holding	65
A11	Agriculture activities not referred to above	65
B01	Forest planting on open ground	65
B02	Forest and Plantation management & use	65
B03	Forest exploitation without replanting or natural regrowth	65
B04	Use of biocides, hormones and chemicals (forestry)	65
B06	Grazing in forests/ woodland	65
B07	Forestry activities not referred to above	65
C01	Mining and quarrying	65
C02	Exploration and extraction of oil or gas	65
C03	Renewable abiotic energy use	65
D01	Roads, paths and railroads	65
D02	Utility and service lines	65
D03	Shipping lanes, ports, marine constructions	65
D04	Airports, flightpaths	65
D05	Improved access to site	65
E01	Urbanised areas, human habitation	65
E02	Industrial or commercial areas	65

CODE	DESCRIPTION	PAGE NO
E03	Discharges	65
E04	Structures, buildings in the landscape	65
E06	Other urbanisation, industrial and similar activities	65
F01	Marine and Freshwater Aquaculture	65
F02	Fishing and harvesting aquatic ressources	65
F03	Hunting and collection of wild animals (terrestrial), including damage caused by game (excessive density), and taking/removal of terrestrial animals (including collection of insects, reptiles, amphibians, birds of prey, etc., trapping, poisoning, poaching, predator control, accidental capture (e.g. due to fishing gear), etc.)	65
F04	Taking / Removal of terrestrial plants, general	65
F05	Illegal taking/ removal of marine fauna	65
F06	Hunting, fishing or collecting activities not referred to above	65
G01	Outdoor sports and leisure activities, recreational activities	65
G02	Sport and leisure structures	65
G03	Interpretative centres	65
G04	Military use and civil unrest	65
G05	Other human intrusions and disturbances	65
H01	Pollution to surface waters (limnic & terrestrial, marine & brackish)	65
H02	Pollution to groundwater (point sources and diffuse sources)	65
H03	Marine water pollution	65
H04	Air pollution, air-borne pollutants	65
H05	Soil pollution and solid waste (excluding discharges)	65
H06	Excess energy	65
H07	Other forms of pollution	65
I01	Invasive non-native species	65
I02	Problematic native species	65
I03	Introduced genetic material, GMO	65
J01	Fire and fire suppression	65
J02	Human induced changes in hydraulic conditions	65
J03	Other ecosystem modifications	65
K01	Abiotic (slow) natural processes	65
K02	Biocenotic evolution, succession	65
K03	Interspecific faunal relations	65
K04	Interspecific floral relations	65
K05	Reduced fecundity/ genetic depression	65
L05	Collapse of terrain, landslide	65
L07	Storm, cyclone	65
L08	Inundation (natural processes)	65
L10	Other natural catastrophes	65
M01	Changes in abiotic conditions	65
M02	Changes in biotic conditions	65
U	Unknown threat or pressure	65
XO	Threats and pressures from outside the Member State	65

5.1 Designation type codes

CODE	DESCRIPTION	PAGE NO
UK00	No Protection Status	67
UK01	National Nature Reserve	67
UK02	Marine Nature Reserve	67
UK04	Site of Special Scientific Interest (UK)	67

European Site Conservation Objectives for South Pennine Moors Special Area of Conservation Site code: UK0030280

With regard to the SAC and the natural habitats and/or species for which the site has been designated (the 'Qualifying Features' listed below), and subject to natural change;

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**

This document should be read in conjunction with the accompanying *Supplementary Advice* document, which provides more detailed advice and information to enable the application and achievement of the Objectives set out above.

Qualifying Features:

H4010. Northern Atlantic wet heaths with *Erica tetralix*; Wet heathland with cross-leaved heath

H4030. European dry heaths

H7130. Blanket bogs*

H7140. Transition mires and quaking bogs; Very wet mires often identified by an unstable `quaking` surface

H91A0. Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles

* denotes a priority natural habitat or species (supporting explanatory text on following page)

*** Priority natural habitats or species**

Some of the natural habitats and species for which UK SACs have been selected are considered to be particular priorities for conservation at a European scale and are subject to special provisions in the Habitats Regulations. These priority natural habitats and species are denoted by an asterisk (*) in Annex I and II of the Habitats Directive. The term 'priority' is also used in other contexts, for example with reference to particular habitats or species that are prioritised in UK Biodiversity Action Plans. It is important to note however that these are not necessarily the priority natural habitats or species within the meaning of the Habitats Regulations.

Explanatory Notes: European Site Conservation Objectives

These Conservation Objectives are those referred to in the Conservation of Habitats and Species Regulations 2017 as amended from time to time (the "Habitats Regulations"). They must be considered when a competent authority is required to make a 'Habitats Regulations Assessment', including an Appropriate Assessment, under the relevant parts of this legislation.

These Conservation Objectives and the accompanying Supplementary Advice (where available) will also provide a framework to inform the measures needed to conserve or restore the European Site and the prevention of deterioration or significant disturbance of its qualifying features.

These Conservation Objectives are set for each habitat or species of a Special Area of Conservation (SAC). Where the objectives are met, the site will be considered to exhibit a high degree of integrity and to be contributing to achieving Favourable Conservation Status for that species or habitat type at a UK level. The term 'favourable conservation status' is defined in regulation 3 of the Habitats Regulations.

Publication date: 27 November 2018 (version 3). This document updates and replaces an earlier version dated 30 June 2014 to reflect the consolidation of the Habitats Regulations in 2017.

European Site Conservation Objectives: Supplementary advice on conserving and restoring site features

South Pennine Moors Special Area of Conservation (SAC)
Site Code: UK0030280



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About this document

This document provides Natural England's supplementary advice about the European Site Conservation Objectives relating to South Pennine Moors SAC. This advice should therefore be read together with the SAC Conservation Objectives available here.

This site overlaps with other European Sites. You should also refer to the separate European Site Conservation Objectives and Supplementary Advice (where available) provided for those sites.

You should use the Conservation Objectives, this Supplementary Advice and any case-specific advice given by Natural England, when developing, proposing or assessing an activity, plan or project that may affect this site.

This Supplementary Advice to the Conservation Objectives presents attributes which are ecological characteristics of the designated species and habitats within a site. The listed attributes are considered to be those that best describe the site's ecological integrity and which, if safeguarded, will enable achievement of the Conservation Objectives. Each attribute has a target which is either quantified or qualitative depending on the available evidence. The target identifies as far as possible the desired state to be achieved for the attribute.

The tables provided below bring together the findings of the best available scientific evidence relating to the site's qualifying features, which may be updated or supplemented in further publications from Natural England and other sources. The local evidence used in preparing this supplementary advice has been cited. The references to the national evidence used are available on request. Where evidence and references have not been indicated, Natural England has applied ecological knowledge and expert judgement. You may decide to use other additional sources of information.

In many cases, the attribute targets shown in the tables indicate whether the current objective is to 'maintain' or 'restore' the attribute. This is based on the best available information, including that gathered during monitoring of the feature's current condition. As new information on feature condition becomes available, this will be added so that the advice remains up to date.

The targets given for each attribute do not represent thresholds to assess the significance of any given impact in Habitats Regulations Assessments. You will need to assess this on a case-by-case basis using the most current information available.

Some, but not all, of these attributes can also be used for regular monitoring of the actual condition of the designated features. The attributes selected for monitoring the features, and the standards used to assess their condition, are listed in separate monitoring documents, which will be available from Natural England.

These tables do not give advice about SSSI features or other legally protected species which may also be present within the European Site.

If you have any comments or queries about this Supplementary Advice document please contact your local Natural England adviser or email HDIRConservationObjectivesNE@naturalengland.org.uk

About this site

European Site information

Name of European Site	South Pennine Moors Special Area of Conservation (SAC)
Location	Barnsley, Bradford, Calderdale, Cheshire, Derbyshire, Kirklees, Lancashire, Leeds, North Yorkshire, Oldham, Rochdale, Sheffield, Staffordshire, Tameside
Site Map	The designated boundary of this site can be viewed here on the MAGIC website
Designation Date	1 April 2005
Qualifying Features	See section below
Designation Area	64983.13 ha
Designation Changes	N/A
Feature Condition Status	Details of the feature condition assessments made at this site can be found using Natural England's Designated Sites System
Names of component Sites of Special Scientific Interest (SSSIs)	Dark Peak SSSI, Eastern Peak District Moors SSSI, Goyt Valley SSSI, Leek Moors SSSI, South Pennine Moors SSSI
Relationship with other European or International Site designations	South Pennine Moors (Phase II) SPA (UK9007022) Peak District Moors (South Pennine Moors Phase 1) SPA (UK9007021)

Site background and geography

This site covers the key moorland blocks of the Southern Pennines from Ilkley Moor in the north to the Peak District in the south. The moorlands are on a rolling dissected plateau formed from rocks of Millstone Grit at altitudes of between 300m – 600m and a high point of over 630m at Kinder Scout. The greater part of the gritstone is overlain by blanket peat with the coarse gravely mineral soils and shales occurring only on the lower slopes. The moorlands as a whole support a breeding bird community of national and international importance.

This site is characterised by extensive areas of blanket bog although the bog vegetation communities are botanically poor, impoverished by pollution, grazing and burning. Hare's-tail cottongrass *Eriophorum vaginatum* is, often, overwhelmingly dominant and the usual bog-building *Sphagnum* mosses are scarce. Where the blanket peats are slightly drier, heather *C. vulgaris*, crowberry *Empetrum nigrum* and bilberry *V. myrtillus* become more prominent. The cranberry *Vaccinium oxycoccus* and the uncommon cloudberry *Rubus chamaemorus* is locally abundant in bog vegetation. Bog pools provide diversity and are often characterised by common cottongrass *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 (up to 9000 years) of the South Pennine peats, but the picture is complex with a number of factors contributing to peat loss.

The site is representative of upland dry heath which 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 *Calluna vulgaris* –

Deschampsia flexuosa heath and *C. vulgaris – Vaccinium myrtillus* heath with the *Vaccinium vitis-idaea* sub-community evident on the eastern slopes. More rarely *C. vulgaris – Ulex gallii* heath and *C. vulgaris – Erica cinerea* heath are found. On the higher, more exposed ground *V. myrtillus – D. flexuosa* heath becomes more prominent. The smaller area of wet heath is characterised by cross-leaved heath *Erica tetralix* and purple moor grass *Molinia caerulea*. The site also supports extensive areas of acid grassland largely derived from both dry and wet heath. 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.

Around the fringes of the upland heath and areas of bog are blocks of old sessile oak woods, usually on slopes and particularly cloughs. These tend to be drier 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 air pollution from the early 1800's to the 1970's). 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.

The moorland also supports a range of flush and fen habitats associated with bogs, cloughs, rivers and streams. Although generally small scale features they have a specialised flora and fauna, which makes a great contribution to the overall biodiversity of the moors. Acid flushes are the most common type and these include transition mires and quaking bogs characterised by a luxuriant carpet of bog mosses *Sphagnum* spp., rushes and sedges.

The South Pennine Moors SAC is largely enclosed on two sides by large industrial urban areas, which means that large numbers of people use the area for recreational activities. Around two-thirds of the site is within the Peak District National Park. Land management is primarily driven by drinking water collection (reservoirs are frequent in and around the site), rough grazing for sheep (and some cattle), and grouse-shooting and, more recently, recreational activities including rambling, rock climbing mountain biking and paragliding.

Access management has been a key issue, and with proposals under the Countryside and Rights of Way Act, will continue as such. Mechanisms for addressing access management issues include a range of fora, research and the role of organisations such as the Peak District National Park Authority and its Ranger Service. Accidental fires can cause extensive damage to vegetation. As well as private ownership through estates and farms, The National Trust owns a significant area of moorland, as does the National Park Authority and the regional water companies.

South Pennine Moors SAC is part of the National Character Area Profiles: 36 Southern Pennines (NE323); 51 Dark Peak (NE378) & 53 South West Peak (NE453).

About the qualifying features of the SAC

The following section gives you additional, site-specific information about this SAC's qualifying features. These are the natural habitats and/or species for which this SAC has been designated.

Qualifying habitats:

- **H4010. Northern Atlantic wet heaths with *Erica tetralix*; Wet heathland with cross-leaved heath**

Wet heath usually occurs on acidic, nutrient-poor substrates, such as shallow peats or sandy soils with impeded drainage. The vegetation is typically dominated by mixtures of cross-leaved heath *Erica tetralix*, heather *Calluna vulgaris*, grasses, sedges and *Sphagnum* bog-mosses.

Wet heaths occur in several types of ecological gradient. In the uplands they occur most frequently in gradients between dry heath or other dry, acid habitats and H7130 Blanket bogs. Flushed wet heaths are especially frequent in areas of high rainfall, and occur as topogenous fens, usually in channels within heath or grassland vegetation. It is considered likely that wet heath habitat has been lost to wet acid grassland and other vegetation communities and may be under-represented given the extent of blanket bog habitat.

Wet heath is an important habitat for a range of vascular plant and bryophyte species of an oceanic or Atlantic distribution in Europe, several of which have an important part of their EU and world distribution in the UK.

In the South Pennines this vegetation corresponds to the following NVC types:

M15 *Scirpus cespitosus – Erica tetralix* wet heath
M16 *Erica tetralix – Sphagnum compactum* wet heath

Northern Atlantic wet heaths with *Erica tetralix* is a qualifying feature for this SAC but not the primary reason for designation.

- **H4030. European dry heaths**

European dry heaths typically occur on freely-draining, acidic to circumneutral soils with generally low nutrient content. Ericaceous dwarf-shrubs dominate the vegetation; the most common and widespread is heather *Calluna vulgaris*, which often occurs in combination with bilberry *Vaccinium spp*. or bell heather *Erica cinerea*, though other dwarf-shrubs are important locally.

At low to moderate altitudes in warm oceanic parts of southern Britain, the typical form of the habitat is H8 *Calluna – Ulex* heath, characterised by abundant *Calluna, U. gallii and E. cinerea. U. gallii* becomes scarce in the cooler oceanic climate further north, where *E. cinerea* and Calluna are abundant together in H10 *Calluna – Erica* heath, especially on more southerly-facing slopes; E. cinerea becomes dominant in the hyper-oceanic fringes of the north-west. On more sheltered, humid slopes there are H21 *Calluna – Vaccinium* – Sphagnum heaths with a high cover of bog-mosses Sphagnum spp. and Hypnaceous mosses, which are best-developed in Scotland. At low to moderate elevations in the less oceanic areas of north-east England and the Midlands there are often extensive species-poor heaths (H9 *Calluna – Deschampsia* heaths) with an overwhelming dominance of Calluna and frequent wavy hair-grass *Deschampsia flexuosa*. These are often the least diverse of all UK heaths. In upland regions further north, there are sub-montane Calluna-dominated heaths with abundant bilberry *Vaccinium myrtillus* and crowberry *Empetrum nigrum* ssp. nigrum (H12 *Calluna – Vaccinium*).

Nearly all dry heath is semi-natural, being derived from woodland through a long history of grazing and burning. Most dry heaths in the English Uplands are managed as grouse moors or on occasion for livestock grazing.

In the South Pennines this vegetation corresponds to the following NVC types:

H8 Calluna *vulgaris* – *Ulex gallii* heath
H9 Calluna *vulgaris* – *Deschampsia flexuosa* heath
H10 Calluna *vulgaris* – *Erica cinerea* heath
H12 Calluna vulgaris – Vaccinium myrtillus heath
H18 Vaccinium *myrtillus* – *Deschampsia flexuosa* heath

South Pennine Moors SAC 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 H7130 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, typically above 500m and on north and east facing slopes on Black Hill, 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.

- **H7130. Blanket bogs (*priority feature when active)**

These extensive peatlands have formed in areas where there is a climate of high rainfall and a low level of evapotranspiration, allowing peat to develop not only in wet hollows but as a blanket over large expanses of undulating ground. Blanket bogs show a complex pattern of variation related to climatic factors, particularly illustrated by the variety of patterning of the bog surface in different parts of the UK. Such climatic factors also influence the floristic composition of bog vegetation.

'Active' blanket bog supports a significant area of vegetation that is normally peat-forming. Typical species include the important peat-forming species, such as bog-mosses Sphagnum spp. and cotton-grasses *Eriophorum spp*., or purple moor-grass *Molinia caerulea* in certain circumstances, together with heather *Calluna vulgaris* and other ericaceous species.

Heather *Calluna vulgaris*, cross-leaved heath *Erica tetralix*, cotton-grasses *Eriophorum* spp., deer-grass *Trichophorum cespitosum* and bog-mosses such as *S. papillosum*, *S. tenellum* and *S. capillifolium* are characteristic of blanket bog throughout its UK range. Other species are more characteristic of, or more abundant in, certain areas. For example, the higher, drier eastern bogs typically support a higher proportion of hare's-tail cotton-grass *Eriophorum vaginatum* and bilberry *Vaccinium myrtillus*. Similarly, purple moor-grass *Molinia caerulea* and bog-myrtle *Myrica gale* are much more widespread and typical on western bogs.

Where managed burning for grouse has been adopted the vegetation assumes some characteristics of dry heath most typically H9 *Calluna vulgaris – Deschampsia flexuosa* heath

South Pennine Moors SAC represents blanket bog in the South Pennines, the most south-easterly occurrence of the habitat in Europe. The bog vegetation communities are botanically poor. Hare's-tail cottongrass *Eriophorum vaginatum* is often overwhelmingly dominant and the usual bog-building Sphagnum mosses are scarce. Where the blanket peats are slightly drier, heather *Calluna vulgaris*, crowberry *Empetrum nigrum* and bilberry *Vaccinium myrtillus* become more prominent. Where surface peats are too dry to sustain blanket bog vegetation and where managed burning is practiced a species poor variant of the H9 *Calluna vulgaris – Deschampsia flexuosa* dry heath community is established. The uncommon cloudberry *Rubus chamaemorus* is locally abundant in bog vegetation. Bog pools provide diversity and are often characterised by common cottongrass 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.

The most abundant NVC blanket bog types on South Pennines Moors SAC are:

M3 *Eriophorum angustifolium* bog pool community
M19 *Calluna vulgaris – Eriophorum vaginatum* blanket mire
M20 *Eriophorum vaginatum* blanket and raised mire
M25 *Molinia caerulea – Potentilla erecta* mire.

- **H7140 Transition mires and quaking bogs; Very wet mires often identified by an unstable 'quaking' surface**

The term 'transition mire' relates to vegetation that in floristic composition and general ecological characteristics is transitional between acid bog and H7230 Alkaline fens, in which the surface conditions range from markedly acidic to slightly base-rich. The vegetation normally has intimate mixtures of species considered to be acidophile and others thought of as calciphile or basophile. In some cases the mire occupies a physically transitional location between bog and fen vegetation, as for example on the marginal lagg of raised bog or associated with certain valley and basin mires. In other cases these intermediate properties may reflect the actual process of succession, as peat accumulates in groundwater-fed fen or open water to produce rainwater-fed bog isolated from groundwater influence. Many of these systems are very unstable underfoot and can therefore also be described as 'quaking bogs'.

Transition mires and quaking bogs can occur in a variety of situations, related to different geomorphological processes: in flood plain mires, valley bogs, basin mires and the lagg zone of raised bogs, and as regeneration surfaces within mires that have been cut-over for peat or areas of mineral soil influence within H7130 Blanket bogs.

The following NVC types form the core of transition mire vegetation within South Pennine Moors SAC:

M4 *Carex rostrata – Sphagnum recurvum* mire
M5 *Carex rostrata – Sphagnum squarrosum* mire
M9 *Carex rostrata – Calliergon cuspidatum/giganteum* mire
S27 *Carex rostrata – Potentilla palustre* tall-herb fen.

H7140 Transition mires and quaking bogs is a qualifying feature, but not the primary reason for South Pennine Moors SAC being designated.

- **H91A0. Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles; Western acidic oak woodland**

This habitat type comprises a range of woodland types dominated by mixtures of oak (*Quercus robur* and/or *Q. petraea*) and birch (*Betula pendula* and/or *B. pubescens*). It is characteristic of base-poor soils in areas of at least moderately high rainfall in northern and western parts of the UK.

The habitat shows considerable variation across its range, in terms of the associated ground flora and the richness of bryophyte communities. There is also a continuous spectrum of variation between oak-dominated and birch-dominated stands. Often these local variations reflect factors such as rainfall, slope, aspect, soil depth, and past and present woodland management (e.g. coppicing, planting, grazing). The most distinctive forms of the habitat have a ground flora dominated by bryophytes, such as *Dicranum majus*, *Hylocomium splendens*, *Isothecium myosuroides*, *Plagiothecium undulatum*, *Rhytidiadelphus loreus*, *Bazzania trilobata* and *Plagiochila spinulosa*. Other variants include stands in which the ground flora is characterised by the prominence of dwarf shrubs, such as bilberry *Vaccinium myrtillus*; grasses, such as wavy hair-grass *Deschampsia flexuosa*, common bent *Agrostis capillaris* and sweet vernal-grass *Anthoxanthum odoratum*; and plants indicative of more mesophytic conditions, including bluebell *Hyacinthoides non-scripta*, bramble *Rubus fruticosus*, scaly male-fern *Dryopteris affinis*.

Birch-dominated woodlands which contain at least some oak, and which either (a) occur as part of an intimate mosaic with oak-dominated stands, or (b) are clearly successional stages which are reverting to oak woodland, are included in the Annex I definition.

Frequently the oak woodland occurs as part of a mosaic of woodland types (including other Annex I habitats, such as 9180 *Tilio-Acerion* forests of slopes, screes and ravines and 91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*)) that varies with position on the slope, occurrence of streams or other waterbodies, and local soil enrichment. These transitions are important in maintaining the structure and function of the habitat type and differ across the country.

A key feature of European importance is the rich Atlantic bryophyte communities that are often well-developed within this Annex I type. These include numerous rare species, such as *Campylopus setifolius*, *Sematophyllum demissum*, *Adelanthus decipiens*, *Leptoscyphus cuneifolius* and *Plagiochila atlantica*.

The habitat corresponds broadly to the 'western oakwoods' described in previous accounts of UK woodlands. Within the South Pennine Moors SAC, the following NVC types make up this feature:

W10e *Quercus robur – Pteridium aquilinum – Rubus fruticosus* woodland*, Acer pseudoplatanus – Oxalis acetosella* sub-community
W11 *Quercus petraea – Betula pubescens – Oxalis acetosella* woodland
W16b *Quercus spp. – Betula spp. – Deschampsia flexuosa* woodland*, Vaccinium myrtillus – Dryopteris dilatata* sub-community

Around the fringes of the upland heath and bog of the south Pennine Moors 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.

This woodland habitat is found to be a sparsely distributed habitat within the South Pennines SAC, mostly located on the side of steep valleys (cloughs). Relatively few woodland areas remain, and although most SSSIs have some parcels of woodland remaining they are, with a few exceptions in the Dark Peak, all small and fragmented in nature. Given the very high biodiversity associated with this habitat type, and its spatially poor representation in the South Pennines, expansion of this habitat along with a more natural woodland edge is a key restoration target.

Qualifying Species:

N/A

References

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Table 1: Supplementary Advice for Qualifying Features: H4010. Northern Atlantic wet heaths with *Erica tetralix*; Wet heathland with cross-leaved heath.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Extent and distribution of the feature	**Extent of the feature within the site**	Maintain the total extent of the feature to the extent baseline-value of 4356.63 hectares.	There should be no measurable reduction (excluding any trivial loss) in the extent and area of this feature, and in some cases, the full extent of the feature may need to be restored. The baseline-value of extent given has been generated using data gathered from the listed site-based surveys. Area measurements given may be approximate depending on the methods, age and accuracy of data collection, and as a result this value may be updated in future to reflect more accurate information. The extent of an Annex I habitat feature covers the sum extent of all of the component vegetation communities present and may include transitions and mosaics with other closely-associated habitat features. Where a feature is susceptible to natural dynamic processes, there may be acceptable variations in its extent through natural fluctuations. Where a reduction in the extent of a feature is considered necessary to meet the Conservation Objective for another Annex I feature, Natural England will advise on this on a case-by-case basis. H4010. Northern Atlantic wet heaths with *Erica tetralix* cover 6.7% of the SAC and are recorded frequently in mosaics with other Upland habitats within all five underpinning SSSIs.	JNCC.2011. UK SAC data form – South Pennine Moors SAC. Available from Natural England JNCC. 2016. NATURA 2000 – Standard Data Form. Available here
Extent and distribution of the feature	**Spatial distribution of the feature within the site**	Maintain or restore as appropriate the distribution and configuration of the H4010 feature, including where applicable its component vegetation types, across the site.	A contraction in the range, or geographic spread, of the feature (and its component vegetation and typical species, plus transitional communities) across the site will reduce its overall area, the local diversity and variations in its structure and composition, and may undermine its resilience to adapt to future environmental changes. This may also reduce and break up the continuity of a habitat	This attribute will be periodically monitored as part of Natural England's site condition assessments

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			within a site and how well its typical species are able to move around the site to occupy and use habitat. Such fragmentation can impact on their viability and the wider ecological composition of the Annex I habitat. Smaller fragments of habitat can typically support smaller and more isolated populations which are more vulnerable to extinction. These fragments also have a greater amount of open edge habitat which will differ in the amount of light, temperature, wind, and even noise that it receives compared to its interior. These conditions may not be suitable for some of the typical and more specialist species associated with the Annex I habitat feature.	
Structure and function (including its typical species)	**Vegetation community transitions**	Maintain any areas of transition between H4010 feature and communities which form other heathland-associated habitats, such as dry and humid heaths, mires, acid grasslands, scrub and woodland.	Transitions between adjacent but different vegetation communities are usually related to naturally-occurring changes in soil, aspect or slope. Such 'ecotones' retain characteristics of each bordering community and can add value in often containing species not found in the adjacent communities. Retaining such transitions can provide further diversity to the habitat feature, and support additional flora and fauna. This is an important attribute as many characteristic heathland species utilise the transitions between vegetation types or use different vegetation types during different stages of their life cycle. Throughout South Pennine Moors SAC, there are occasional areas of reasonably intact wet heath vegetation. However, more frequent are wet heath transitions with dry heath, blanket bog, mosaics of soligenous mires (M4, M6, M11), scrub and damp acid grassland.	Natural England. 2009. South Pennine Moors SSSI FCT - Draft. English Nature. 1995. South Pennine Moors SAC An Integrated Management Strategy. And Conservation Action Programme. Available from Natural England. This attribute will be periodically monitored as part of Natural England's site condition assessments
Structure and function (including its typical species)	**Vegetation community composition**	Ensure the component vegetation communities of the feature are referable to and characterised by the following National Vegetation Classification types:	This habitat feature will comprise a number of associated semi-natural vegetation types and their transitional zones, reflecting the geographical location of the site, altitude, aspect, soil conditions (especially base-status and drainage) and vegetation management. In the UK these have been categorised by the National Vegetation Classification (NVC).	Rodwell J.S. 1991. British Plant Communities Volumes 1-5. Cambridge University Press, Cambridge.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		M15 - *Scirpus cespitosus - Erica tetralix* wet heath M16 - *Erica tetralix - Sphagnum compactum* wet heath.	Maintaining or restoring these characteristic and distinctive vegetation types, and the range of types as appropriate, will be important to sustaining the overall habitat feature. This will also help to conserve their typical plant species (i.e. the constant and preferential species of a community), and therefore that of the SAC feature, at appropriate levels (recognising natural fluctuations). Many examples of wet heath on South Pennine Moors appear to be moderately or heavily degraded, probably by a combination of past burning and heavy grazing, and as a consequence their flora is very impoverished. This has left many sites being almost totally dominated by *Molinia caerulea*. Thus there is frequently little in appearance to be easily distinguished without going into a micro scale between the two NVC communities found for wet heath on South Pennine Moors SAC. Furthermore, the geographical location of South Pennine Moors appears to be somewhat intermediate between the drier eastern and southern lowland M16 samples, and the wetter northern and western M15 samples at moderate altitudes, described in Rodwell (1991).	
Structure and function (including its typical species)	**Vegetation structure: cover of dwarf shrubs**	Maintain or restore as appropriate to achieve an overall cover of dwarf shrub species which is typically between 25-90%	Variations in the structure of the heathland vegetation (vegetation height, amount of canopy closure, and patch structure) is needed to maintain high niche diversity and hence high species richness of characteristic heathland plants and animals. Many species also utilise the transitions between vegetation types or use different vegetation types during different stages of their life cycle. The structural character of the heathland feature is strongly influenced by the growing habits of its dominant species which in most cases will be ericoids (i.e. plants that look like heathers, including members of the Ericaceae and Empetraceae families). The ericaceous species heather or ling *Calluna vulgaris*, bell heather *Erica cinerea*, cross-leaved heath *Erica tetralix*, bilberry or blaeberry *Vaccinium myrtillus* and cowberry	This attribute will be periodically monitored as part of Natural England's site condition assessments Natural England. 2014. South Pennine Moors SAC Site Improvement Plan. Available here

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			Vaccinium vitis-idaea are the commonest and most characteristic dwarf-shrubs. *Erica tetralix* should be present within a 20m radius of any point within this H4010 wet heath habitat. However, in parts of the H4010 feature *Erica tetralix* is found infrequently. The cover of dwarf shrubs is variable and should be assessed on site on a case by case basis. Generally many management and external influences has impacted on dwarf shrubs on site. These include hydrological changes, overgrazing, management changes, historic burning, recreational disturbances during waterlogged conditions and previously atmospheric pollution over the last few hundred years has impacted dwarf-shrubs growth.	
Structure and function (including its typical species)	**Vegetation structure: heather age structure**	Maintain or restore as appropriate a diverse age structure amongst the ericaceous shrubs typically found on the site	Each phase of growth associated with the characteristic heathers which dominate this feature also represents different microclimatic conditions and microhabitats which may provide shelter or food to other organisms. Therefore, it is important to maintain a mosaic of heather in different phases of growth. Typically this age structure will consist of between 10-40% cover of (pseudo) pioneer heathers; 20-80% cover of building/mature heathers; <30% cover of degenerate heathers and less than <10% cover of dead heathers	This attribute will be periodically monitored as part of Natural England's site condition assessments
Structure and function (including its typical species)	**Vegetation structure: cover of gorse**	Cover of common gorse is low typically at <10%	Gorse as a component of heathland is a very valuable wildlife habitat, and often a marker of relict heath and common. Both dense and spiny, it provides good, protected cover for many wildlife species: birds, mammals and reptiles; breeding habitat for rare or declining bird species, and excellent winter roosting. The flowers, borne at a time of year when other sources of pollen or nectar are in short supply, are particularly good for insects and other invertebrate pollinators. However gorse may cause problems if unchecked by dominating an area, eliminating other typical heathland species. Mature stands en	This attribute will be periodically monitored as part of Natural England's site condition assessments

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			masse may also be serious fire hazards. Scrub encroachment is fairly low within this SAC with exception from peripheral areas where there is some accepted woodland expansion, which provides a fragmented habitat for birds. However, for a few locations gorse is a concern and appropriate management should be put in place to manage it on a case by case basis.	
Structure and function (including its typical species)	**Vegetation structure: tree cover**	Maintain or restore as appropriate the open character of the feature, with a typically scattered and low cover of trees and scrub (<20% cover)	Scrub (mainly trees or tree saplings above 1 m in height) and isolated trees are usually very important in providing warmth, shelter, cover, foodplants, perches, territorial markers and sources of prey for typical heathland invertebrates and vertebrates. But overall cover of scrub and trees across this habitat feature should be maintained or restored to a fairly sparse level, with a structurally complex edge and with characteristic heathland vegetation as ground cover. If scrub is locally important for any associated species with their own specific conservation objectives, then a higher level of cover will be acceptable. The area of scrub/tree cover should be stable or not increasing as a whole. Overall, there is a low cover of encroaching shrubs and trees on H4010 wet heath habitat. However, in some localised areas scrub and birch *Betula spp*. encroachment is a concern and needs regular monitoring.	This attribute will be periodically monitored as part of Natural England's site condition assessments
Structure and function (including its typical species)	**Vegetation composition: bracken cover**	Maintain or restore as appropriate a cover of dense bracken which is low, typically at <5%	The spread of bracken *Pteridium aquilinum* is a problem on many lowland heathlands. The unpalatable nature and density of bracken as a tall-herb fern, and its decomposing litter, can smother and shade out smaller and more characteristic heathland vegetation. Usually active management of bracken is required to reduce or contain its cover across this habitat feature. But this fern has some nature conservation value, with bracken stands providing	This attribute will be periodically monitored as part of Natural England's site condition assessments

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			habitat supporting twite, ring ouzel and stonechat. Bracken encroachment is a concern for some parts of the site and should be managed on a case by case basis.	
Structure and function (including its typical species)	**Key structural, influential and/or distinctive species**	Maintain or restore as appropriate the abundance of the typical species listed below to enable each of them to be a viable component of the Annex 1 habitat; Heather *Calluna vulgaris,* Cross leaved heath *Erica tetralix,* Billberry *Vaccinium spp.* Carnation sedge *Carex panicea,* Common cottongrass *Eriophorum angustifolium,* Deergrass *Trichophorum cespitosum.* Sundew *Drosera spp.,*	Some plant or animal species (or related groups of such species) make a particularly important contribution to the necessary structure, function and/or quality of an Annex I habitat feature at a particular site. These species will include; • **Structural species** which form a key part of the Annex I habitat's structure or help to define that habitat on a particular SAC (see also the attribute for 'vegetation community composition'). • **Influential species** which are likely to have a key role affecting the structure and function of the habitat (such as bioturbators (mixers of soil/sediment), grazers, surface borers, predators or other species with a significant functional role linked to the habitat) • **Site-distinctive species** which are considered to be a particularly special and distinguishing component of an Annex I habitat on a particular SAC. There may be natural fluctuations in the frequency and cover of each of these species. The relative contribution made by them to the overall ecological integrity of a site may vary, and Natural England will provide bespoke advice on this as necessary. The list of species given here for this Annex I habitat feature at this SAC is not necessarily exhaustive. The list may evolve, and species may be added or deleted, as new information about this site becomes available. Many South Pennine examples appear to be moderately or heavily degraded, probably by a combination of past burning and heavy grazing, and as a consequence their flora is very impoverished with many sites being almost totally dominated by *Molinia caerulea.*	This attribute will be periodically monitored as part of Natural England's site condition assessments

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Structure and function (including its typical species)	**Vegetation: undesirable species**	Maintain or restore as appropriate the frequency/cover of the following undesirable species to within acceptable levels and prevent changes in surface condition, soils, nutrient levels or hydrology which may encourage their spread;	Undesirable non-woody and woody vascular plants species may require active management to avert an unwanted succession to a different and less desirable state. Often they may be indicative of a negative trend relating to another aspect of a site's structure and function. These species will vary depending on the nature of the particular feature, and in some cases these species may be natural/acceptable components or even dominants. Undesirable species may include: Common bent *Agrostis capillaris,* Yorkshire fog *Holcus lanatus,* Common reed *Phragmites australis,* Bracken *Pteridium aquilinum,* Rhododendron *Rhododendron ponticum,* Creeping buttercup *Ranunculus repens,* Common nettle *Urtica spp,* Willowherb *Epilobium spp. (*excl. *E. palustre),* Creeping thistle *Cirsium arvense,* Soft rush *Juncus effusus.* Acrocarpous mosses <occasional.	This attribute will be periodically monitored as part of Natural England's site condition assessments
Structure and function (including its typical species)	**Functional connectivity with wider landscape**	Maintain or restore as appropriate the overall extent, quality and function of any supporting features within the local landscape which provide a critical functional connection with the site	This recognises the potential need at this site to maintain or restore the connectivity of the site to its wider landscape in order to meet the conservation objectives. These connections may take the form of landscape features, such as habitat patches, hedges, watercourses and verges, outside of the designated site boundary which are either important for the migration, dispersal and genetic exchange of those typical species closely associated with qualifying Annex I habitat features of the site. These features may also be important to the operation of the supporting ecological processes on which the designated site and its features may rely. In most cases increasing actual and functional landscape-scale connectivity would be beneficial. Where there is a lack of detailed knowledge of the connectivity requirements of the qualifying feature, Natural England will advise as to whether these are applicable on a case by case basis. The extent and connectivity of H4010 wet heath habitat is	English Nature. 1995. South Pennine Moors - An Integrated Management Strategy. And Conservation Action Programme. Available from Natural England.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			frequently found in small patches within H430 dry heath habitat or H7130 blanket bog habitat. This has resulted in difficulty in ascertaining the connectivity of this feature with the wider landscape. However, the small patches of H4010 wet heaths, acid grassland semi-improved mosaics on the edge of the moors provide connectivity and important habitat for curlew *Numenius arquata*, snipe *Gallinago gallinago* and lapwing *Vanellus vanellus* breeding sites.	
Structure and function (including its typical species)	**Adaptation and resilience**	Restore the feature's ability, and that of its supporting processes, to adapt or evolve to wider environmental change, either within or external to the site	This recognises the increasing likelihood of natural habitat features to absorb or adapt to wider environmental changes. Resilience may be described as the ability of an ecological system to cope with, and adapt to environmental stress and change whilst retaining the same basic structure and ways of functioning. Such environmental changes may include changes in sea levels, precipitation and temperature for example, which are likely to affect the extent, distribution, composition and functioning of a feature within a site. The vulnerability and response of features to such changes will vary. Using best available information, any necessary or likely adaptation or adjustment by the feature and its management in response to actual or expected climatic change should be allowed for, as far as practicable, in order to ensure the feature's long-term viability. The overall vulnerability of this SAC to climate change has been assessed by Natural England (2015) as being moderate, taking into account the sensitivity, fragmentation, topography and management of its habitats and supporting habitats. This means that this site is considered to be vulnerable overall, but moderately so. Some adaptation action for specific issues may be required, such as reducing habitat fragmentation, creating more habitat to buffer the site or expand the habitat	Natural England, 2015. Climate Change Theme Plan and supporting National Biodiversity Climate Change Vulnerability assessments ('NBCCVAs') for SACs and SPAs in England [Available at http://publications.naturalengland.org.uk/publication/4954594591375360].

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			into more varied landscapes and addressing particular management and condition issues. Individual species may be more or less vulnerable than their habitat itself. In many cases, change will be inevitable so appropriate monitoring would be advisable. In general terms, the relative sensitivity of this feature is considered to be moderate.	
Supporting processes (on which the feature relies)	**Conservation measures**	Maintain or restore as appropriate the management measures which are necessary to maintain or restore as appropriate the structure, functions and supporting processes associated with the feature	Active and ongoing conservation management is needed to protect, maintain or restore this feature at this site. Further details about the necessary conservation measures for this site can be provided by contacting Natural England. This information will typically be found within, where applicable, supporting documents such as Natura 2000 Site Improvement Plan, Site Management Strategies or Plans, the Views about Management Statement for the underpinning SSSI and/or management agreements. The principal management measures on this site are: • Ensure burning does not take place on sensitive areas. • Continually monitor the hydrology of the site including monitoring the re-vegetation and success of grips and plastic dams and where necessary repair or replace. • Maintain appropriate stocking densities to prevent overgrazing. • Maintain public access to the site through maintaining designated walking routes. • Monitor vehicle access on site and prevent vehicle use on sensitive areas of the site. To help achieve favourable conservation status an ecosystem approach is desirable to recognise the interdependence of ecosystem services and optimal habitat condition including developing greater flexibility within existing funding streams deriving support for management across a range of interests.	Natural England. 2014. South Pennine Moors SAC Site Improvement Plan. Available here Natural England. 2009. South Pennines Moor SSSI FCT - Draft. Natural England. 2007. Dark Peak SSSI FCT - Draft Natural England. 2011. Eastern Peak District Moors SSSI FCT – Consultation Draft Natural England. 2004. Goyt Valley SSSI FCT – Draft NATURAL England. 2004. Leek Moors FCT – Draft This attribute will be periodically monitored as part of Natural England's site condition assessments

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Supporting processes (on which the feature relies)	**Soils, substrate and nutrient cycling**	Restore the properties of the underlying soil types, including structure, bulk density, total carbon, pH, soil nutrient status and fungal: bacterial ratio, to within typical values for the habitat.	Soil is the foundation of basic ecosystem function and a vital part of the natural environment. Its properties strongly influence the colonisation, growth and distribution of those plant species which together form vegetation types, and therefore provides a habitat used by a wide range of organisms. Soil biodiversity has a vital role to recycle organic matter. Changes to natural soil properties may therefore affect the ecological structure, function and processes associated with this Annex I feature. This Annex 1 habitat has essentially raw soils with little humus and low nutrient status. There are large areas of shallow peat (<50cm in depth) in the South Pennines which may once have been wet heath. These are typically on gently sloping ground with some water movement preventing stagnation. These areas have become dominated, almost exclusively in some areas, by Molinia (although sparse heather or cross-leaved heath may remain).	Natural England. 2009. South Pennines Moor SSSI FCT - Draft. Natural England. 2007. Dark Peak SSSI FCT - Draft Natural England. 2011. Eastern Peak District Moors SSSI FCT – Consultation Draft Natural England. 2004. Goyt Valley SSSI FCT – Draft NATURAL England. 2004. Leek Moors FCT – Draft This attribute will be periodically monitored as part of Natural England's site condition assessments
Supporting processes (on which the feature relies)	**Air quality**	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 (www.apis.ac.uk). As a staged recovery the target for South Pennine Moors SAC should be to transition to the next lower class of critical load exceedance ie, for Acidity reduce deposition to 0.5-1.0 keq/ha/yr And for nutrient Nitrogen reduce deposition to between 7-14 kgN/ha/yr	This habitat type is considered sensitive to changes in air quality. Exceedance of these critical values for air pollutants may modify the chemical status of its substrate, accelerating or damaging plant growth, altering its vegetation structure and composition and causing the loss of sensitive typical species associated with it. Critical Loads and Levels are recognised thresholds below which such harmful effects on sensitive UK habitats will not occur to a significant level, according to current levels of scientific understanding. There are critical levels for ammonia (NH3), oxides of nitrogen (NOx) and sulphur dioxide (SO2), and critical loads for nutrient nitrogen deposition and acid deposition. There are currently no critical loads or levels for other pollutants such as Halogens, Heavy Metals, POPs, VOCs or Dusts. These should be considered as appropriate on a case-by-case	More information about site-relevant Critical Loads and Levels for this SAC is available by using the 'search by site' tool on the Air Pollution Information System (www.apis.ac.uk). JNCC.2011. UK SAC data form – South Pennine Moors SAC. Available from Natural England - http://uk-air.defra.gov.uk/data CEH. Trends in critical load exceedance in UK – Report to DEFRA

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			basis. Ground level ozone is regionally important as a toxic air pollutant but flux-based critical levels for the protection of semi-natural habitats are still under development. It is recognised that achieving this target may be subject to the development, availability and effectiveness of abatement technology and measures to tackle diffuse air pollution, within realistic timescales. Atmospheric pollution over the last few hundred years has depleted the lichen and bryophyte flora and may be affecting dwarf-shrubs.	
Supporting processes (on which the feature relies)	**Water quality**	Where the feature is dependent on surface water and/or groundwater, maintain water quality and quantity to a standard which provides the necessary conditions to support the feature.	For many SAC features which are dependent on wetland habitats supported by surface and/or ground water, maintaining the quality and quantity of water supply will be critical, especially at certain times of year. Poor water quality and inadequate quantities of water can adversely affect the structure and function of this habitat type. Typically, meeting the surface water and groundwater environmental standards set out by the Water Framework Directive (WFD 2000/60/EC) will also be sufficient to support the achievement of SAC Conservation Objectives but in some cases more stringent standards may be needed. Further site-specific investigations may be required to establish appropriate water quality standards for the SAC.	
Supporting processes (on which the feature relies)	**Hydrology**	At a site, unit and/or catchment level (as appropriate), restore a hydrological regime to provide the conditions necessary to sustain the H4010 feature within the site	Defining and maintaining the appropriate hydrological regime is a key step in moving towards achieving the conservation objectives for this site and sustaining this feature. Changes in source, depth, duration, frequency, magnitude and timing of water supply can have significant implications for the assemblage of characteristic plants and animals present. This target is generic and further site-specific investigations may be required to fully inform conservation measures and/or the likelihood of impacts.	Pennine Moors SAC Site Improvement Plan. Available here Dark Peak SSSI FCT This attribute will be periodically monitored as part of Natural England's site condition assessments and the relevant Favourable Condition Tables for the underpinning SSSs.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			The complexity of the pattern of degraded hydrology from surface vegetation to subterranean pipes and artificial hydrological changes (drains and grips) means that the production of a restoration plan for each wet heath can only be achieved through factoring in multiple factors on a case by case basis. This includes maintaining or restoring as appropriate a high water table.	
Version Control: N/A				
Variations from national feature-framework of integrity-guidance: The objectives for some of the attributes listed above include both 'maintain' and 'restore' targets. This is because this SAC is an extensive complex of geographically-separate component sites which currently vary in their condition status. Overall, both objectives will currently be applicable to the SAC but these will differ between each component site depending on its particular circumstances. Natural England will be able to provide further advice on request.				

Table 2: Supplementary Advice for Qualifying Features: H4030. European dry heaths

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Extent and distribution of the feature	**Extent of the feature within the site**	Maintain the total extent of the H4030. European dry heaths feature.	See general explanatory notes for this attribute in Table 1. European Dry Heath H4030 is a feature found throughout the SAC. Further, dry heath exists within mosaics of bracken beds, rushy flushes, acid grassland and stands of Molinia. Therefore the accurate extend of this habitat is difficult to define. Within the following component SSSIs H4030 dry heath covers the following extent: 294.5ha – Leek Moor SSSI 3141.7ha – South Pennine Moors SSSI Not currently available at a site level - Eastern Peak District Moors SSSI, Goyt Valley SSSI and The Dark Peak SSSI	JNCC.2011. UK SAC data form – South Pennine Moors SAC. Available from Natural England JNCC. 2016. NATURA 2000 – STANDARD DATA FORM. Available here This attribute will be periodically monitored as part of Natural England's site condition assessments and the relevant Favourable Condition Tables for the underpinning SSSs.
Extent and distribution of the feature	**Spatial distribution of the feature within the site**	Maintain and restore the distribution and configuration of the feature, including where applicable its component vegetation types, across the site	A contraction in the range, or geographic spread, of the feature (and its component vegetation and typical species, plus transitional communities) across the site will reduce its overall area, the local diversity and variations in its structure and composition, and may undermine its resilience to adapt to future environmental changes. This may also reduce and break up the continuity of a habitat within a site and how well its typical species are able to move around the site to occupy and use habitat. Such fragmentation can impact on their viability and the wider ecological composition of the Annex I habitat. Smaller fragments of habitat can typically support smaller and more isolated populations which are more vulnerable to extinction. These fragments also have a greater amount of open edge habitat which will differ in the amount of light, temperature, wind, and even noise that it receives compared to	Natural England. 2014. South Pennine Moors SAC Site Improvement Plan. Available here This attribute will be periodically monitored as part of Natural England's site condition assessments and the relevant Favourable Condition Tables for the underpinning SSSs.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			its interior. These conditions may not be suitable for some of the typical and more specialist species associated with the Annex I habitat feature. This site has pressures of fragmentation from burning; wildfires, bracken encroachment; succession; erosion through walkers, recreation including public access, estates vehicles and sheep, cattle, rabbit and deer grazing.	
Structure and function (including its typical species)	**Vegetation community composition**	Ensure the component vegetation communities of the feature are referable to and characterised by the following National Vegetation Classification types: H8 *Calluna vulgaris-Ulex gallii* heath including H8e - *Calluna vulgaris – Ulex gallii heath, Vaccinium myrtilus* sub-community H9 - *Calluna vulgaris – Deschampsia flexuosa* heath H12 *Calluna vulgaris-Vaccinium myrtillus* heath.	This habitat feature will comprise a number of associated semi-natural vegetation types and their transitional zones, reflecting the geographical location of the site, altitude, aspect, soil conditions (especially base-status and drainage) and vegetation management. In the UK these have been categorised by the National Vegetation Classification (NVC). Maintaining or restoring these characteristic and distinctive vegetation types, and the range of types as appropriate, will be important to sustaining the overall habitat feature. This will also help to conserve their typical plant species (i.e. the constant and preferential species of a community), and therefore that of the SAC feature, at appropriate levels (recognising natural fluctuations). H8, H9 and H12 are the main NVC habitats found for dry heath within South Pennine Moors SAC. However, heather / grass mosaic. (H9 heath / U4 / U5 grassland mosaic) and Bilberry / grass mosaics. (H12 heath / U4 / U5 grassland mosaic) occur extensively over the site.	Natural England. 2014. South Pennine Moors SAC Site Improvement Plan. Available here This attribute will be periodically monitored as part of Natural England's site condition assessments and the relevant Favourable Condition Tables for the underpinning SSSs.
Structure and function (including its typical species)	**Vegetation community transitions**	Maintain or restore as appropriate any areas of transition between this and communities which form other heathland-associated habitats, such as dry and humid heaths, mires, acid grasslands, scrub and woodland.	Transitions between adjacent vegetation communities are usually related to naturally-occurring changes in soil, aspect or slope. Such 'ecotones' retain characteristics of each bordering community and can add value in often containing species not found in the adjacent communities. Retaining such transitions can provide further diversity to the habitat feature, and support additional flora and fauna. This is an important attribute as many characteristic heathland	Natural England. 2017. Dark Peak SSSI FCT. Available here JNCC.2011. UK SAC data form – South Pennine Moors SAC. Available from Natural England This attribute will be periodically monitored as part of Natural

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			species utilise the transitions between vegetation types or use different vegetation types during different stages of their life cycle. Over this site, may transitions in habitat occur, especially around edge areas These include dry heath transitioning into wet *Molinia* dominated grassland or dry acid grassland or bracken and following flush lines, soft rush flushes grading into degraded heathland. H4030 dry heath is created and maintained mostly through human management by grazing, cutting and burning. If this habitat had no management and was left purely to natural processes, then they it is likely that it would transition into thick scrub or secondary forest. However some fluctuations, transitions and variations from year to year are normal and acceptable.	England's site condition assessments and the relevant Favourable Condition Tables for the underpinning SSSs.
Structure and function (including its typical species)	**Vegetation structure: cover of dwarf shrubs**	Maintain or restore as appropriate an overall cover of dwarf shrub species which is typically between 25-90%	Variations in the structure of the heathland vegetation (vegetation height, amount of canopy closure, and patch structure) is needed to maintain high niche diversity and hence high species richness of characteristic heathland plants and animals. Many species also utilise the transitions between vegetation types or use different vegetation types during different stages of their life cycle. The structural character of the heathland feature is strongly influenced by the growing habits of its dominant species which in most cases will be ericoids (i.e. plants that look like heathers, including members of the Ericaceae and Empetraceae families). The most common characteristic dwarf-shrubs in this H4030 habitat are heather or ling *Calluna vulgaris* and to a lesser extent bilberry *Vaccinium myrtillus.* Localised areas of heath with *E.cinerea* and *Vaccinium vitis-idaea* occur occasionally on the steep slopes. Low species diversity of dwarf shrubs (excluding *Calluna vulgaris*) is a concern locally. In some areas this lower cover of dwarf shrubs is due to excessive burning or overgrazing.	Natural England. 2014. Deer Impact Assessment 2014 on Big Moor. Eastern Moors Partnership. Available from Natural England This attribute will be periodically monitored as part of Natural England's site condition assessments and the relevant Favourable Condition Tables for the underpinning SSSs.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			Fenced off areas on site, provide the most diverse mix of dwarf shrubs with grazing pressures still an issue in unfenced areas leading to these areas having less shrub diversity.	
Structure and function (including its typical species)	**Vegetation composition: bracken cover**	Restore a cover of dense bracken which is low, typically at <5%.	The spread of bracken *Pteridium aquilinum* is a problem on many lowland heathlands. The unpalatable nature and density of bracken as a tall-herb fern, and its decomposing litter, can smother and shade out smaller and more characteristic heathland vegetation. Usually some active management of bracken is required to reduce or contain its cover across this habitat feature. But this fern has nature conservation value on this site, for example on as nesting habitat for twite *Linaria flavirostris*, ring ouzel *Turdus torquatus* and stonechat *Saxicola rubicola.* There are extensive and spreading stands of bracken across sections of South Pennine Moors SAC. Largely bracken control is managed through Moorland Management Plans and through individual higher level stewardships and should be managed on a case by case basis. The presence of bracken is likely to indicate soils suitable for scrubby woodland cover. However, a small portion of bracken should also be retained at specific locations as an important structure on heathland.	This attribute will be periodically monitored as part of Natural England's site condition assessments and the relevant Favourable Condition Tables for the underpinning SSSs.
Structure and function (including its typical species)	**Vegetation structure: cover of gorse**	Maintain cover of common gorse *Ulex europaeus* at <25% and the combined cover of *U. europaeus* and *U. gallii* at <50%	Gorse as a component of heathland is a very valuable wildlife habitat, and often a marker of relict heath and common. Both dense and spiny, it provides good, protected cover for many wildlife species: birds, mammals and reptiles; breeding habitat for rare or declining bird species, and excellent winter roosting. The flowers, borne at a time of year when other sources of pollen or nectar are in short supply, are particularly good for insects and other invertebrate pollinators. However gorse may cause problems if unchecked by dominating an area, eliminating other typical heathland species. Mature stands en masse may also be serious fire hazards.	This attribute will be periodically monitored as part of Natural England's site condition assessments and the relevant Favourable Condition Tables for the underpinning SSSs. Natural England. 2014. South Pennine Moors SAC Site Improvement Plan. Available here

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			Gorse species support a rich invertebrate and vertebrate fauna. However, the can affect the soil characteristics. There has been no excessive quantities of gorse recorded on site or encroaching on to areas of H4030, and as such is currently not considered a concern.	
Structure and function (including its typical species)	**Vegetation structure: tree cover**	Restore the open character of the feature, with a typically scattered and low cover of trees and scrub (<25% cover)	Scrub (mainly trees or tree saplings above 1 m in height) and isolated trees are usually very important in providing shelter, cover, as foodplants, perches, territorial markers and sources of prey for typical heathland invertebrates and vertebrates. But overall cover of scrub and trees across this habitat feature should be maintained or restored to a fairly sparse level, with a structurally complex edge and with characteristic heathland vegetation as ground cover. If scrub is locally important for any associated species with their own specific conservation objectives, then a higher level of cover will be acceptable. The area of scrub/tree cover should be stable or not increasing as a whole within heathland communities. In some parts of South Pennine Moors SAC, notably near conifer plantations and old burn sites, the level of tree regeneration needs to be monitored and controlled, if necessary, if stock do not keep on top of it. However, in other parts of the site, especially around the edges of dry heath to native woodland fringe, native tree species can encouraged to create more structural diversity and more dynamic moorland fringe vegetation for birds and invertebrates. Therefore, the extent of tree and scrub cover should be assessed and maintained on a case by case basis.	This attribute will be periodically monitored as part of Natural England's site condition assessments and the relevant Favourable Condition Tables for the underpinning SSSs. Natural England. 2014. South Pennine Moors SAC Site Improvement Plan. Available here
Structure and function (including its typical species)	**Vegetation structure: heather age structure**	Restore a diverse age structure amongst the ericaceous shrubs typically found on the site	Each phase of growth associated with the characteristic heathers which dominate this feature also represents different microclimatic conditions and microhabitats which may provide shelter or food to other organisms. Therefore, it is important to maintain a mosaic of heather in different phases of growth.	This attribute will be periodically monitored as part of Natural England's site condition assessments and the relevant Favourable Condition Tables for

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			Typically this age structure will consist of between 10-40% cover of (pseudo) pioneer heathers; 20-80% cover of building/mature heathers; <30% cover of degenerate heathers and less than <10% cover of dead heathers. A diverse age structure is highly dependent on level of management intervention through burning and sheep grazing and is therefore highly variable across the site. Historic over-grazing and burning are the main reason for the presence of pioneer heathers rather than natural regeneration of dead or late mature stands. In some areas of the dry heath where high grazing pressure exists, the dwarf shrub species while frequent, are grazed to a uniform low level, or to characteristic stunted forms. However, the removal or reduction of grazing in some parts of the SAC through agri-environment schemes and/or the implementation of Moorland Management Plans have allowed the dwarf shrub component to thrive, the tall vegetation making ideal nesting habitat for merlin *Falco columbarius* and short-eared owl *Asio flammeus*.	the underpinning SSSs.
Structure and function (including its typical species)	**Vegetation: undesirable species**	Restore the frequency/cover of the following undesirable species to within acceptable levels and prevent changes in surface condition, soils, nutrient levels or hydrology which may encourage their spread. Undesirable species include: Creeping thistle *Cirsium arvense;* Spear thistle *Cirsium vulgare;* Common sorrel *Rumex acetosa;* Creeping buttercup *Ranunculus repens;* or	Undesirable non-woody and woody vascular plants species may require active management to avert an unwanted succession to a different and less desirable state. Often they may be indicative of a negative trend relating to another aspect of a site's structure and function. These species will vary depending on the nature of the particular feature, and in some cases these species may be natural/acceptable components or even dominants. Overall, the occurrence of undesirable species is minimal and below <1%. Exceptionally, and at a local level, this figure is far exceeded and the feature will be threatened unless an action plan is implemented. Monitoring should continue on site, especially on bare ground areas which are more susceptible to the growth of undesirable species.	This attribute will be periodically monitored as part of Natural England's site condition assessments and the relevant Favourable Condition Tables for the underpinning SSSs. EMP. 2014. Deer Impact Assessment 2014 on Big Moor. Eastern Moors Partnership. Available from Natural England Natural England. 2014. South Pennine Moors SAC Site Improvement Plan. Available here

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		Common nettle *Urtica dioica* Less than 10% of the vegetation cover should consist of *Juncus effusus.* All invasive non-native species including specifically to this site *Rhododendron ponticum,* Salal *Gaultheria shallon,* Japanese knotweed *Fallopia japonica* are included as undesirable species	The grassy marginal edge around some of the dry heath habitat should be periodically monitored to ensure grasses and undesirable herbs are not encroaching onto the dry heath. Soft rush *Juncus effuses* encroachment is a localised issue on some of the site and should be monitored. Rush control is largely managed through Moorland Management plans and through individual higher level stewardships but would benefit from periodical review to ascertain levels of spread as appropriate and should be monitored Other undesirable species of concern on site include the fungus-like pathogen Phytophthora spp. which is known to be killing various species within the SAC. Species effected included Hybrid Bilberry *Vaccinium x intermedium* and Bilberry *Vaccinium myrtillus.* Few control mechanisms exist for the disease so early detection and proper disposal of infected plant material are essential. Additionally outbreaks of the Heather beetle *Lochmaea suturalis* have been recorded in localised areas within the SAC. Steps to control this beetle are cited in Moorland Management Plans.	
Structure and function (including its typical species)	**Key structural, influential and/or distinctive species**	Maintain or restore as appropriate the abundance of the typical species listed below to enable each of them to be a viable component of the Annex 1 habitat: Heather *Calluna vulgaris,* Cross leaved heath *Erica tetralix,* Bell heather *E.cinerea,* Bilberry *Vaccinium myrtillus,* Crowberry *Empetrum nigrum* and Cowberry *V. vitis-idaea*.	See general explanatory notes for this attribute in Table 1. It is particularly important for example to ensure that distinctive species growing on the low lying accessible areas of the site are not over grazed or trampled by sheep and walkers. In areas of high visitor use, footpath improvements may need to be carried out. Heather seed scattering and brash spreading may need to be carried out along footpaths on a case by case basis. Other notable species on site are Adder (*Vipera berus*) which is a notable species on the Eastern Peak District Moors SSSI, as mentioned in the SSSI citation.	Mclay. A. 2015. A Waxcap Grassland Survey of land at New High Laithe Farm, Hardcastle Crags Estate and a Waxcap Grassland Survey of land at Hollin Hall, Hardcastle Crags Estate. Natural England and National Trust. Available on request. Sorby Natural History Society Sheffield. 2014. The Sorby Record No. A Journal of Natural History for the Sheffield Area.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			The site has a particularly good beetle fauna with seven nationally scarce terrestrial beetles and four nationally scarce water beetles and very many species of local interest recorded. Good numbers of craneflies, including several local and four nationally scarce species have been recorded from different localities and habitats. Further nationally rare waxcaps have been recorded on the fringe habitats bordering acid grassland. The moorlands are known for their bird species and also support nationally important numbers of golden plover *Pluvialis apricaria*, curlew *Numenius arquata*, merlin *Falco columbarius* and twite *Carduelis flavirostris*.	Available from Natural England Eastern Moors Partnership. 2013. Hewetts Bank Adder Survey. Available from Natural England Lincolnshire Naturalists' Union 2018. Eastern Moors (SK27) Invertebrate Species List - Ramsley Moor (SK2875) and Bar Brook (SK2774). Available from Natural England Strawbridge. K. Ecological Monitoring Summary. 2014. Eastern Moors Partnership. RSPB and NT. Available from Natural England Natural England. 1994. South Pennine Moors SSSI Citation. Available here Natural England. 1994. Eastern Peak District Moors SSSI Citation. Available here
Structure and function (including its typical species)	**Functional connectivity with wider landscape**	Maintain the overall extent, quality and function of any supporting features within the local landscape which provide a critical functional connection with the site	This recognises the potential need at this site to maintain or restore the connectivity of the site to its wider landscape in order to meet the conservation objectives. These connections may take the form of landscape features, such as habitat patches, hedges, watercourses and verges, outside of the designated site boundary which are either important for the migration, dispersal and genetic exchange of those typical species closely associated with qualifying Annex I habitat features of the site. These features may also be important to the operation of the supporting ecological processes on which the designated site and its features may rely. In most cases increasing actual and	This attribute will be periodically monitored as part of Natural England's site condition assessments and the relevant Favourable Condition Tables for the underpinning SSSs. Natural England. 2012. National Character Area Profiles: 36 Southern Pennines (NE323); 51 Dark Peak (NE378) & 53 South West Peak (NE453).These profiles can be viewed here

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			functional landscape-scale connectivity would be beneficial. Where there is a lack of detailed knowledge of the connectivity requirements of the qualifying feature, Natural England will advise as to whether these are applicable on a case by case basis. The plant communities within this habitat type are found often within the lag habitat of H4010 Northern Atlantic Wet Heaths and to a lesser extent H7130 Blanket Bog. Therefore this habitat may have high connectivity within localised areas.	
Structure and function (including its typical species)	**Adaptation and resilience**	Restore the feature's ability, and that of its supporting processes, to adapt or evolve to wider environmental change, either within or external to the site	See general explanatory notes for this attribute in Table 1.	Natural England, 2015a. Climate Change Theme Plan and supporting NBCCV Assessments for SACs and SPAs [both available at http://publications.naturalengland.org.uk/publication/4954594591375360]. Peak District National Park: Climate Change – Adaption and Mitigation, available **here**
Structure and function (including its typical species)	**Soils, substrate and nutrient cycling**	Maintain the properties of the underlying soil types, including structure, bulk density, total carbon, pH, soil nutrient status and fungal: bacterial ratio, to within typical values for the habitat.	Soil is the foundation of basic ecosystem function and a vital part of the natural environment. Its properties strongly influence the colonisation, growth and distribution of those plant species which together form vegetation types, and therefore provides a habitat used by a wide range of organisms. Soil biodiversity has a vital role to recycle organic matter. Changes to natural soil properties may therefore affect the ecological structure, function and processes associated with this Annex I feature. Soils vary across the site – some are thin and derived from the shattered rock and associated landslips, while others are discrete lenses of deep peat which have developed where topography allows. Some gullies are prone to erosion and bear	Natural England. 2014. South Pennine Moors SAC Site Improvement Plan. Available here This attribute will be periodically monitored as part of Natural England's site condition assessments and the relevant Favourable Condition Tables for the underpinning SSSs.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			peat but are not causing a significant impact at present. However, it must also be noted that a range of invertebrates and plants require bare ground/peat where it is not too frequently disturbed by vehicles or feet. Bare ground should form a patchwork with vegetation and be present mainly in south-facing slopes. Exclude rock, stone or litter. Tracks or paths can also be a source or bare ground for nesting invertebrates. A higher percentage of bare ground is acceptable if the site is important for certain bird species, e.g. curlews *Numenius arquata*, woodlarks *Lullula arborea*, nightjars *Caprimulgus europaeus*.	
Supporting processes (on which the feature relies)	Conservation measures	Maintain or restore as appropriate the management measures (either within and/or outside the site boundary as appropriate) which are necessary for the structure, functions and supporting processes associated with the feature	Active and ongoing conservation management is needed to protect, maintain or restore this feature at this site. Further details about the necessary conservation measures for this site can be provided by contacting Natural England. This information will typically be found within, where applicable, supporting documents such as Natura 2000 Site Improvement Plan, Site Management Strategies or Plans, the Views about Management Statement for the underpinning SSSI and/or management agreements. Management that may be relevant to this feature includes maintaining low nutrient levels to maintain high numbers of species through the management activities of grazing, burning, mowing, sod-cutting and scrub/tree cutting. Management of succession is a critical aspect of management for this habitat, by a combination of active processes and grazing/cutting. A range of invertebrates and plants require bare ground/peat where it is not too frequently disturbed by vehicles or feet. The site management (including the burning regime) provides a mosaic of habitats suitable for a range of moorland birds. However, managed burning on dry heath can have both positive and negative impacts on the habitat for SPA birds through changes to vegetation. Further, low grazing levels should be maintained to aid regeneration in burn areas and it	This attribute will be periodically monitored as part of Natural England's site condition assessments and the relevant Favourable Condition Tables for the underpinning SSSs. Natural England. 2014. South Pennine Moors SAC Site Improvement Plan. Available here Natural England. 2014. Moorland Habitat Monitoring of South Pennine Moors SSSI: A resurvey of Selected Moorland Agri-environment Agreement Sites: Site reports – No.17. Available on request.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			should be ensured that burns are cool and do not go into the moss layer. Specific on-site erosion through walkers, off road bikers and estate vehicles is a further concern for reducing connectivity across the SAC. Specific areas of this SAC have had problems with overgrazing and this is still a concern in certain areas. Stocking rates should be reviewed as part of any new Management Plans and Stewardship agreements. Further high populations of rabbits and deer on localised areas can also lead to degradation of this habitat and should be controlled. Rush control and some bracken control is a consideration for the management of H4030 on this site.	
Supporting processes (on which the feature relies)	**Air quality**	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 (www.apis.ac.uk). As a staged recovery the target for Peak District Moors SPA should be to transition to the next lower class of critical load exceedance ie, for Acidity reduce deposition to 0.5-1.0 keq/ha/yr And for nutrient Nitrogen reduce deposition to between 7-14 kgN/ha/yr	See general explanatory notes for this attribute in Table 1. Nitrogen deposition currently (2014) exceeds site relevant critical loads.	More information about site-relevant Critical Loads and Levels for this SAC is available by using the 'search by site' tool on the Air Pollution Information System (www.apis.ac.uk). Natural England. 2014. South Pennine Moors SAC Site Improvement Plan. Available here CEH. 2015. Trends in critical load exceedance in UK - report to Defra
Supporting processes (on which the feature relies)	**Water quality**	Where the feature is dependent on surface water and/or groundwater, restore water quality and quantity to a standard	For many SAC features which are dependent on wetland habitats supported by surface and/or ground water, maintaining the quality and quantity of water supply will be critical, especially at certain times of year. Poor water quality and	Moors for the Future. 2016. Moscar Science Project: Annual Report for 2015/16. Available from Natural England

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		which provides the necessary conditions to support the feature.	inadequate quantities of water can adversely affect the structure and function of this habitat type. Typically, meeting the surface water and groundwater environmental standards set out by the Water Framework Directive (WFD 2000/60/EC) will also be sufficient to support the achievement of SAC Conservation Objectives but in some cases more stringent standards may be needed. Further site-specific investigations may be required to establish appropriate water quality standards for the SAC. On moorland edge sites the water quality in steams and depressions show a significant negative correlation between dissolved oxygen content and pH.	
Supporting processes (on which the feature relies)	**Hydrology**	At a site, unit and/or catchment level (as necessary, restore natural hydrological processes to provide the conditions necessary to sustain the feature within the site	Defining and maintaining the appropriate hydrological regime is a key step in moving towards achieving the conservation objectives for this site and sustaining this feature. Changes in source, depth, duration, frequency, magnitude and timing of water supply can have significant implications for the assemblage of characteristic plants and animals present. This target is generic and further site-specific investigations may be required to fully inform conservation measures and/or the likelihood of impacts. There are still some old grips on site, especially on the plateau that drain the peat making this system dry out.	This attribute will be periodically monitored as part of Natural England's site condition assessments and the relevant Favourable Condition Tables for the underpinning SSSs. Penny Anderson Associates. 2010. Yorkshire Water Keighley Moor Restoration Implementation Plan. Available from Natural England.
Version Control: N/A				
Variations from national feature-framework of integrity-guidance: The objectives for some of the attributes listed above include both 'maintain' and 'restore' targets. This is because this SAC is an extensive complex of geographically-separate component sites which currently vary in their condition status. Overall, both objectives will currently be applicable to the SAC but these will differ between each component site depending on its particular circumstances. Natural England will be able to provide further advice on request.				

Table 3: Supplementary Advice for Qualifying Features: H7130. Blanket bogs. *

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Extent and distribution of the feature	**Extent of the feature within the site**	Restore the total extent of the habitat feature at or to feature extent baseline-value of just under 20,000ha.	See general explanatory notes for this attribute in Table 1. Blanket bog H7130 was a feature throughout this SAC within all five underpinning SSSIs, accounting for about 40% of the total habitat area of this SAC. South Pennine Moors contains 15708ha of blanket bog alone. The blanket bogs of much of South Pennine Moors SAC are characterised by evidence of significant long term decline, caused by a range of natural and human induced factors. The most significant feature of this decline is the large area of bare and eroding peat and associated damaged vegetation. Currently from the Priority Habitats Inventory extent estimate for blanket bog is: South Pennine Moors 12464ha; Dark Peak 18867ha; Leek Moors 1786ha; Eastern Peak District Moors 1729 and Goyt Valley 888ha.	Natural England. 2014. South Pennine Moors SSSI NVC maps. Available on request South Pennine Moors - An Integrated Management Strategy. And Conservation Action Programme.1995. English Nature. Available from Natural England. JNCC.2011. UK SAC data form – South Pennine Moors SAC. Available from Natural England JNCC. 2016. NATURA 2000 – STANDARD DATA FORM. Available here This attribute will be periodically monitored as part of Natural England's site condition assessments Natural England. 2018. Priority Habitats Inventory – extent estimates for underpinning SSSIs.
Extent and distribution of the feature	**Spatial distribution of the feature within the site**	Restore the distribution and configuration of the feature, including where applicable its component vegetation types, across the site	This feature is defined by the presence of deep peat (>40cm depth) and features associated with that soil type. Conceptually the creation of this habitat within the timeframe of this advice is difficult and so habitat creation and spread of range can only be imagined as restoration of a former condition (that enabled the accumulation of peat) over deep peat not currently functioning as active blanket bog and additionally not	MoorLIFE. 2015. AfterLIFE Plan (LIFE08 NAT/UK/00202). Available from Natural England Crouch, T. 2015. Land Cover Map of the South Pennine Moors Special Area of Conservation. Moors for the Future Partnership

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			supporting blanket bog vegetation as described. A contraction in the range, or geographic spread, of the feature (its component vegetation and typical species, plus transitional communities) across the site will reduce its overall area, the local diversity and variations in its structure and composition, and may undermine its resilience to adapt to future environmental changes. This may also reduce and break up the continuity of a habitat within a site and how well its typical species are able to move around the site to occupy and use habitat. Such fragmentation can impact on their viability and the wider ecological composition of the Annex I habitat. Smaller fragments of habitat can typically support smaller and more isolated populations which are more vulnerable to extinction. These fragments also have a greater amount of open edge habitat which will differ in the amount of light, temperature, wind, and even noise that it receives compared to its interior. These conditions may not be suitable for some of the typical and more specialist species associated with the Annex I habitat feature. Fragmentation of blanket bog is common with areas drying out through drainage, and burning encouraging a species-poor community dominated typically by *Calluna vulgaris* or *Molinia caerulea*. True bog species become fragmented or are lost. Hydrological fragmentation of the bog system can also occur. The Blanket Bog feature covers over half the SAC area making it the most extensive habitat type within the site. Therefore due to the scale of this habitat over many SSSIs, there are different sites having different threats and management options in place. However, largely important issues to get right on this feature are blocking the grips, the grazing pressure, atmospheric pollution and monitoring the extent and regeneration of areas previously burnt intentionally and through wildfires (and assisting through sphagnum inoculation on a case by case basis where funding allows).	MoorLIFE. 2015. AfterLIFE Plan (LIFE08 NAT/UK/00202). Available from Natural England Natural England. 2014. South Pennine Moors SAC Site Improvement Plan. Available here

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			Over the last few years efforts have been made to correct the hydrology, reduce bare peat and increase species diversity through changes to grazing regimes through Environmental Stewardship Schemes, Catchment Management Plans, Lottery funding and the a series of EU Life projects. Further, fragmentation and damage to the habitat has occurred through popular public rights of way with people walking off the paths especially in wetter times of the year, resulting in enlarging areas of bare peat. This has been exacerbated by vehicle and bike use. Roads have also divided sections of Upland habitat.	
Structure and function (including its typical species)	**Vegetation community composition**	Ensure the component vegetation communities of the feature are referable to and characterised by the following National Vegetation Classification types: M3 *Eriophorum angustifolium* bog pool community, M19 *Calluna vulgaris – Eriophorum vaginatum* blanket mire, M20 *Eriophorum vaginatum* blanket and raised mire and M25 *Molinia caerulea – Potentilla erecta* mire	This habitat feature will comprise a number of associated semi-natural vegetation types and their transitional zones, reflecting the geographical location of the site, altitude, aspect, soil conditions (especially base-status and drainage) and vegetation management. In the UK these have been categorised by the National Vegetation Classification (NVC). Maintaining or restoring these characteristic and distinctive vegetation types, and the range of types as appropriate, will be important to sustaining the overall habitat feature. This will also help to conserve their typical plant species (i.e. the constant and preferential species of a community), and therefore that of the SAC feature, at appropriate levels (recognising natural fluctuations). As blanket bog 'blankets' extensive areas it is not surprising that the habitat supports a range of different vegetation communities .Transitions can occur between bog pools, wetter Sphagnum lawns, through to more mixed terrestrial bog communities associated with both hummocks and hollows. At its margins (normally on the steeper slopes), blanket bog communities will gradually be lost and replaced by wet heath and dry heath communities. Blanket bog communities can be heavily influenced by land management, notably drainage, managed rotational burning and grazing. In these situations typical blanket bog communities are replaced by a variety of	This attribute will be periodically monitored as part of Natural England's site condition assessments and the relevant Favourable Condition Tables for the underpinning SSSs. Moors for the Future. 2015. Trials to investigate the diversification of Molinia using flailing and Sphagnum propagules – setting up and baseline surveys , Available from Natural England.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			degraded mire (M25), dry heath (H9, H12) or acid grassland (U6) vegetation types. Where these vegetation types occur on deeper peats, they should be assessed as blanket bog and restoration back to blanket bog in favourable condition should be the objective. Note: Blanket bog vegetation can sometimes become established on peats shallower than 0.4m. or may grade into dry heath on shallow peats that have arisen through transformation from wet heath (M15) On this SAC the majority of the blanket bog areas that require restoration are due to loss of function arising from long-term structural problems of human induced change such as pollution, fire, and grazing, which in turn has led to poor species diversity including low sphagnum cover and/or extensive bare peat.	
Structure and function (including its typical species)	**Invasive, non-native and/or introduced species**	Ensure invasive and introduced non-native species are either rare or absent, but if present are causing minimal damage to the feature.	Invasive or introduced non-native species can be a serious potential threat to the structure and function of these habitats, because they are able to exclude, damage or suppress the growth of their associated typical species, reduce structural diversity of the habitat and prevent the natural regeneration of characteristic site-native species. Once established, the measures to control such species may also impact negatively on the features of interest (e.g. use of broad spectrum herbicides). *Rhododendron ponticum* needs to be controlled on a wider scale across the site to avoid the suppression of the SAC H7130 feature. This work will need to bring together various land owners, occupiers and organisations. Given the decades elapsed to arrive at the current levels of coverage, slowing or reversing the process will be long term with consistency and persistence from all parties being key.	Natural England. 2014. South Pennine Moors SAC Site Improvement Plan. Available here This attribute will be periodically monitored as part of Natural England's site condition assessments and the relevant Favourable Condition Tables for the underpinning SSSs.
Structure and function (including its	**Presence/ cover of woody**	Maintain a low cover (<10% of the area) of scrub or trees within stands of H7130.	Native trees and shrubs which can tolerate permanently waterlogged conditions can occur naturally on bog and fen surfaces. An abundance of scrub and trees on bogs and fens	This attribute will be periodically monitored as part of Natural England's site condition

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
typical species)	**species**		is sometimes regarded as detrimental because water is lost by evapotranspiration from the trees and, as the tree canopies develop and close, water is further prevented from reaching the bog surface by interception. This can reduce the amount of water reaching the bog surface. Birch, pine, willow and rhododendron (an invasive non-native species) are the main species of concern. The seeds of most invasive woody species are wind dispersed, so trees are able to establish on raised bog and fen surfaces. Encroachment of tree cover onto the bog area including conifers such as Sitka spruce *Picea sitchensis* is only a very localised concern within areas of the SAC close to plantations and access routes. Overall, tree cover is not over the 10% threshold target for this SAC. At the edges of H7130 habitat a low cover of native trees and shrubs is desirable and will be beneficial for many of the species that use the mires including black grouse, *Tetrao tetrix* passerine birds and many invertebrate species.	assessments and the relevant Favourable Condition Tables for the underpinning SSSs.
Structure and function (including its typical species)	**Vegetation composition: undesirable species**	The following undesirable competitive species should be absent or rare (individually and collectively less than 1% of vegetation cover); Common bent-grass *Agrostis capillaris,* Yorkshire fog *Holcus lanatus*, Common reed *Phragmites australis,* Bracken *Pteridium aquilinum*, Creeping buttercup *Ranunculus repens.*	These are species not considered to be a desirable part of the blanket bog vegetation community as they may spread and out-compete more sensitive typical species Bracken *Pteridium aquilinum* is a concern for some parts of the SAC and needs to be controlled across the site to avoid the suppression of the SAC H7130 feature. This work will need to bring together various land owners, occupiers and organisations. Given the decades elapsed to arrive at the current levels of coverage, slowing or reversing the process will be long term with consistency and persistence from all parties being key. In some areas of this SAC, there is an increase in grass species as a consequence of overgrazing. Stocking rates need to be monitored to ensure that a proportion of ericaceous species remain.	This attribute will be periodically monitored as part of Natural England's site condition assessments and the relevant Favourable Condition Tables for the underpinning SSSs.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			Rush *Juncus effusus* invasion is a localised concern for some sections of the H7130 blanket bog feature of the SAC and would benefit from further management. There have also been records of some heather beetle *Lochmaea suturalis* damage on a proportion of the SAC. Further, *Polytrichum commune* has become widespread on localised areas of the SAC which have been historically subjected to heavy grazing and burning. This has reduced the presence of positive blanket bog indicator species. It is difficult to see how these areas can be restored without significant intervention, it is however important to monitor the spread of Polytrichum and ensure grazing / burning / disturbance levels in these areas are minimised. *Polytrichum* and *Juncus* are often concentrated in disturbed areas within the feature or more typically in transformations of associated features such as acid flushes and transition mires.	
Structure and function (including its typical species)	**Structural diversity**	Restore the full range of typical structural features associated with the feature at this site, e.g. vegetation cover, surface patterning and hydrological zonations	Bogs in particular show varying degrees of structural variation and surface patterning reflecting hydrological gradations (which may be natural or the result of previous damage). These can occur at different macro and micro scales across the habitat and include alternative aquatic and terrestrial surface features, such as pools and hummocks, and terrestrial features such as ridges and hollows. These features will support distinctive patterns of bog vegetation, and so will be sensitive to changes in topography and hydrology. These can be modified or disrupted by activities such as drainage, burning, grazing, vehicular access and peat digging. These are likely to be missing or poorly represented in degraded blanket bog systems. These components may include areas with noticeably uneven structure, at a spatial scale of around 1m^2 or less. The unevenness should be the result of Sphagnum hummocks, lawns and hollows, or mixtures	Natural England. 2014. South Pennine Moors SAC Site Improvement Plan. Available here This attribute will be periodically monitored as part of Natural England's site condition assessments and the relevant Favourable Condition Tables for Dark Peak SSSI FCT; Eastern Peak District Moors SSSI FCT; Goyt Valley SSSI FCT and Leek Moors FCT

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			of well-developed cotton-grass tussocks and spreading bushes of dwarf-shrubs. Overgrazing has already adversely affected blanket bog. This historical overgrazing still negatively impacting the habitats of the breeding birds; causing habitat change from heath to grassland and causes water run-off and erosion. This has led to long term impact leading to unfavourable condition for bog and heath communities. Burning (intentional and more recently wildfire) is also an issue in many areas. Dry bogs will support vigorous *Calluna* growth. However with a move to cutting to achieve the varied dwarf shrub structure required by the Upland Estates, more of this feature should slowly start to return to a functioning state. Long-term changes to hydrology should reduce the vigour and uniformity of the dry bog vegetation reducing the need for intervention and increasing fire resilience. However, unpredicted wildfire damage remains a concern for this site. Erosion, fire damage (intentional burn and wildfire), historic air pollution, overgrazing, public access routes and vehicle access are the main concerns on this site.	
Structure and function (including its typical species)	**Physical structure: ground disturbance (and peat erosion)**	Significant areas of disturbed and eroding bare ground should not be present. Where present, any affected areas should typically not exceed 1% of the total feature, and be considered only as a temporary stage.	Bare ground and eroding peat not only affects the hydrology of bog systems and its associated biodiversity but can also have wider environmental impacts on e.g. water quality. There will also be a carbon loss from the system. 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. However, over other areas peat erosion is a result of anthropogenic processes. Historic air pollution and wildfires have contributed to areas of bare and eroding peat, surface gullying and sub-surface peat pipes, loss of peat forming species. In many areas peatland restoration work has been undertaken to attempt to encourage these areas to re-vegetate, such work has been funded through the LIFE project,	Natural England. 2014. South Pennine Moors SAC Site Improvement Plan. Available here JNCC. 2016. UK Biodiversity Action Plan Priority Habitat Descriptions – Blanket Bog. Available here Penny Anderson Associates. 2010. Yorkshire Water Keighley Moor Restoration Implementation Plan. Available from Natural England.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			HLS agreements or the Sphagnum Propagation Project. In some areas of the SAC where here is extensive peat erosion have been fenced to exclude sheep and the areas are to be seeded with a mixture of heath species or sphagnum. The vegetation is slowly recovering there. In the worst areas heather brash has been spread which is also helping to stabilise the peat.	MoorLIFE. 2015. AfterLIFE Plan (LIFE08 NAT/UK/00202). Available from Natural England Moors for the Future. 2015. Trials to investigate the diversification of *Molinia* using flailing and Sphagnum propagules – setting up and baseline surveys , Available from Natural England.
Structure and function (including its typical species)	**Soils, substrate and nutrient cycling**	Restore the properties of the underlying soil types, including structure, bulk density, total carbon, pH, soil nutrient status and fungi: bacteria ratio, to within typical values for the habitat. For this feature the peat substrate should consist of both acrotelm and catotelm layers.	Soil is the foundation of basic ecosystem function and a vital part of the natural environment. Its properties strongly influence the colonisation, growth and distribution of those plant species which together form vegetation types, and therefore provides a habitat used by a wide range of organisms. Soil biodiversity has a vital role to recycle organic matter. Changes to natural soil properties may therefore affect the ecological structure, function and processes associated with this Annex I feature. Peat is a soil distinguished from other soil types by its high content of organic matter (30%-100%). The organic matter content results form a combination of plant growth and waterlogging, the latter reducing oxygen diffusion to levels which are so slow that decomposition of the dead plant matter uses up this oxygen faster than it can be supplied. Consequently conditions rapidly become anaerobic, which reduces decomposition rates and the semi-decomposed plant material builds up over time to form peat. An active blanket bog should be made up of two layers, an acrotelm and a catotelm. The thin (5-75cm) upper layer or acrotelm consists of living plant material and is a zone of fluctuating water table, where relatively rapid plant decomposition occurs. Below this is the catotelm, a much thicker layer of peat (up to 10m), consisting of broken down plant material, and which is always below the water table.	Natural England. 2014. South Pennine Moors SAC Site Improvement Plan. Available here

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			Degraded (through e.g. drainage and rotational burning) blanket bogs may have lost the acrotelm layer, and now has layer of damaged catotelm (haplotelm) at the surface. Agricultural drainage has affected some sites as well as erosion from public access. Increased prolonged dry weather and drought increase the risk of damage to peat soils through wildfire.	
Structure and function (including its typical species)	**Adaptation and resilience**	Restore the feature's ability, and that of its supporting processes, to adapt or evolve to wider environmental change, either within or external to the site	See general explanatory notes for this attribute in Table 1. Rotational burning, drainage and atmospheric deposition can all compromise this feature's ability to adapt, especially in response to the effects of climate change.	Natural England, 2015a. Climate Change Theme Plan and supporting NBCCV Assessments for SACs and SPAs [both available at http://publications.naturalengland.org.uk/publication/4954594591375360] Peak District National Park: Climate Change – Adaption and Mitigation, available here
Structure and function (including its typical species)	**Key structural, influential and/or distinctive species**	Restore the abundance of the typical species listed below to enable each of them to be a viable component of the Annex 1 habitat; Heather *Calluna vulgaris,* Cross leaved heath *Erica tetralix,* Bell heather *E. cinerea,* Bilberry *Vaccinium myrtillus,* Crowberry *Empetrum nigrum,* Cowberry *V.vitis-idaea,* Common cottongrass *Eriophorum angustifolium,* hare's-tail cottongrass E. vaginatum	See general explanatory notes for this attribute in Table 1. Within South Pennine Moors SAC the bog vegetation communities are for the most part botanically poor. Hare's-tail cottongrass *Eriophorum vaginatum* is often overwhelmingly dominant and the usual bog-building Sphagnum mosses are scarce. 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 cottongrass *E. angustifolium*. There is some good habitat for breeding birds including golden plover in the naturally shorter areas of cottongrass as well as more tussocky wetter vegetation that would suit curlew and snipe. Short vegetation on some areas of blanket bog and the	Rosenburgh, A., and Caporn. A. 2013. Sphagnum reintroduction trials on Molinia Grassland, Manchester Metropolitan Peatland Ecological Advisory and Technical Sorby Natural History Society Sheffield. 2014. The Sorby Record No. A Journal of Natural History for the Sheffield Area. Available from Natural England Lincolnshire Naturalists' Union 2018. Eastern Moors (SK27) Invertebrate Species List - Ramsley Moor (SK2875) and Bar

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		Limited assemblage of *Sphagnum* mosses.	surrounding lagg area combined with open aspect make it suitable for Dunlin and Golden Plover. Further, the H7130 blanket bog supports a range of invertebrate assemblages including the Golden dragonfly *Cordulegaster boltonii* and the Spikefly *Odonata, cordulegasteridae.*	Brook (SK2774). Available from Natural England Strawbridge. K. Ecological Monitoring Summary 2014. Eastern Moors Partnership. RSPB and NT. Available from Natural England Natural England. Citations for underpinning SSSIs. Available here This attribute will be periodically monitored as part of Natural England's site condition assessments and the relevant Favourable Condition Tables
Supporting processes (on which the feature relies)	**Air quality**	Restore as much as possible, 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 (APIS). As a staged recovery the target for Peak District Moors SPA should be to transition to the next lower class of critical load exceedance ie, for Acidity reduce deposition to 0.5-1.0 keq/ha/yr And for nutrient Nitrogen reduce deposition to between 7-14 kgN/ha/yr	See general explanatory notes for this attribute in Table 1. Atmospheric pollution from the last few hundred years has depleted the lichen and bryophyte flora and may be affecting dwarf-shrubs. Further, on site Nitrogen deposition is exceeding site critical loads.	More information about site-relevant Critical Loads and Levels for this SAC is available by using the 'search by site' tool on the Air Pollution Information System (www.apis.ac.uk). JNCC.2011. UK SAC data form – South Pennine Moors SAC. Available from Natural England http://uk-air.defra.gov.uk/data CEH. 2015. Trends in critical load exceedance in UK, CEH report to Defra
Supporting processes (on which the	**Hydrology**	At a site, unit and/or catchment level (as necessary), restore the natural hydrological processes to	Defining and maintaining the appropriate hydrological regime is a key step in moving towards achieving the conservation objectives for this site and sustaining this feature. Changes in	Natural England. 2014. South Pennine Moors SAC Site Improvement Plan. Available here

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
feature relies)		provide consistently near-surface water levels necessary to sustain the feature within the site	source, depth, duration, frequency, magnitude and timing of water supply can have significant implications for the assemblage of characteristic plants and animals present. This target is generic and further site-specific investigations may be required to fully inform conservation measures and/or the likelihood of impacts. For this feature, various land management activities may impact on and interrupt natural hydrological processes and water levels, including artificial drainage, managed burning, wildfires; track construction; afforestation; and compaction by trampling and vehicular use. The loss of the acrotelm layer normally reflects significant changes to the hydrology of the bog. An increase in the cover of heather on the bog surface will also indicate a drying out of the bog, and can lead to further drying out through an increase in sub-surface peat pipes. Fire influences the near-surface hydrological functioning of peatland. This leads to enhanced overland flow and higher streamflow peaks and, in combination with a removed vegetation cover, can exacerbate surface erosion. There have been several historic hot wildfires which have impacted negatively on the site. Recovery from fire needs to be continually monitored and appropriate management practices put in place. The extent of restoration to improve the condition of the H7130feature cannot be fully quantified. The complexity of the pattern of degraded hydrology from surface vegetation to subterranean pipes means that several management practices are required; the production of a restoration plan for each blanket bog unit should provide the necessary detail. Restoration work is ongoing within South Pennine Moors SAC including gully blocking, stone dams to collect peat, re-profiling the larger gullies to encourage re-vegetation and using heather bales. Some restoration work has occurred on site under the MoorLIFE project.	Penny Anderson Associates. 2010. Yorkshire Water Keighley Moor Restoration Implementation Plan. Available from Natural England. MoorLIFE. 2015. AfterLIFE Plan (LIFE08 NAT/UK/00202). Available from Natural England This attribute will be periodically monitored as part of Natural England's site condition assessments and the relevant Favourable Condition Tables for the underpinning SSSs

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			Further, the water quality on site is being improved through The Peatland Restoration Project which aims to improve water quality by halving the amount of peat entering water systems in the Ashop and Alport river catchments. This is a joint initiative between the National Trust and the Moors for the Future Partnership on Rivers Alport and Ashop.	
Supporting processes (on which the feature relies)	**Conservation measures**	Maintain or restore as appropriate the management measures (either within and/or outside the site boundary as appropriate) which are necessary to maintain the structure, functions and supporting processes associated with the feature	Active and ongoing conservation management is needed to protect, maintain or restore this feature at this site. Further details about the necessary conservation measures for this site can be provided by contacting Natural England. This information will typically be found within, where applicable, supporting documents such as Natura 2000 Site Improvement Plan, Site Management Strategies or Plans, the Views about Management Statement for the underpinning SSSI and/or management agreements. Combined with historical overgrazing, burning (accidental and deliberate), drainage and locally trampling, large areas of blanket bog have become de-vegetated and eroded. It is unclear at this stage whether the effects are irreversible. Attempts over recent decades to reverse these processes have achieved mixed and limited results. The condition of blanket bog habitat in particular is under pressure from changes in: recreational use, land management (commercial grouse moor management, farming and restoration practices availability of agreement packages) and some illegal activity. To help achieve favourable conservation status an ecosystem approach is desirable to recognise the interdependence of ecosystem services and optimal habitat condition including developing greater flexibility within existing funding streams deriving support for management across a range of interests. Peat exposed by wildfire is at increased risk to wind and water erosion, with water run-off from uplands potentially resulting in downstream flooding, sedimentation of water courses and	JNCC.2011. UK SAC data form – South Pennine Moors SAC. Available from Natural England Natural England. 2014. South Pennine Moors SAC Site Improvement Plan. Available here Natural England. 2014. Moorland Habitat Monitoring of South Pennine Moors SSSI: A resurvey of Selected Moorland Agri-environment Agreement Sites: Site reports – No.17. Available on request. This attribute will be periodically monitored as part of Natural England's site condition assessments and the relevant Favourable Condition Tables for the underpinning SSSs

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			discolouration of drinking water. Wildfire varies from year to year depending on the condition of the vegetation (drier etc.) and this will result in varying levels of impact. The cause of ignition is generally accepted to be of human origin with deliberate intent a pattern on some parts of the site and elsewhere careless behaviour near to footpaths and car parks appear to be the chief cause of ignition. The National Park Authority has produced a strategic Fire Plan and areas are close to the public at times of high fire risk. The principal management measures on this site are: • Prevent where possible and if not manage the risk of wildfires. • Ensure deliberate burning does not occur on blanket bog and deep peat. • Control bracken spread on site. • Actively manage and monitor the hydrology of the site including assessing the re-vegetation and success of grips and plastic dams and where necessary repair or replace. • Maintain appropriate stocking densities to prevent overgrazing. • Maintain public access to the site through maintaining designated walking routes and working with the local authorities to prevent litter and fly tipping. • Monitor vehicle and recreational users (rock climbers, Hang gliders etc.) access on site and prevent vehicle use on sensitive areas of the site. Atmospheric pollution over the last few hundred years has depleted the lichen and bryophyte flora and may be affecting dwarf-shrubs. The impact has arguably been greatest on blanket bog, wet heath and transition mire where the bog-building *Sphagnum* mosses have been largely lost. Combined with historical overgrazing, burning (accidental and deliberate), drainage and locally trampling, large areas of blanket bog have become de-vegetated and eroded. It is unclear at this stage whether the effects are irreversible. Attempts over recent	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			decades to reverse these processes have achieved mixed and limited results. Whilst all efforts can be made to control current factors such as current grazing and burning patterns, current atmospheric pollutant levels and access impacts, it is unclear whether this can fully mitigate the long-term influence of the historical factors such as atmospheric pollution, past burning and overgrazing. The situation is further complicated by a view that some erosion features can be considered natural phenomena of intrinsic interest. It may not therefore always be appropriate to try and revegetate bare peat even if suitable techniques exist.	
Version Control: N/A				
Variations from national feature-framework of integrity-guidance: The objectives for some of the attributes listed above include both 'maintain' and 'restore' targets. This is because this SAC is an extensive complex of geographically-separate component sites which currently vary in their condition status. Overall, both objectives will currently be applicable to the SAC but these will differ between each component site depending on its particular circumstances. Natural England will be able to provide further advice on request.				

Table 4: Supplementary Advice for Qualifying Features: H7140. Transition mires and quaking bogs; Very wet mires often identified by an unstable 'quaking' surface.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Extent and distribution of the feature	**Extent of the feature within the site**	Maintain the total extent of the feature	See general explanatory notes for this attribute in Table 1. H7140. 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. H7140 Transition mires and quaking bogs are often small in extent and their boundaries may be difficult to determine. Their extent may also vary in relation to season and/or recent rainfall events. These should be taken into account when making an assessment on condition.	This attribute will be periodically monitored as part of Natural England's site condition assessments Natural England. 2004. Favourable Condition Tables - Leek Moors SSSI Draft. JNCC.2011. UK SAC data form – South Pennine Moors SAC. Available from Natural England
Extent and distribution of the feature	**Spatial distribution of the feature within the site**	Maintain or restore as appropriate the distribution and configuration of the feature, including where applicable its component vegetation types, across the site	Distribution includes the spatial pattern or arrangement of this habitat feature, and its component vegetation types, across the site. Changes in distribution may affect the nature and range of the vegetation communities present, the operation of the physical, chemical, and biological processes in the system and the resiliency of the site and its features to changes or impacts. Transition mires have not been mapped for this site and records of its existence are poor.	
Structure and function (including its typical species)	**Vegetation community composition**	Ensure the component vegetation communities of the feature are referable to and characterised by the following National Vegetation Classification type: M4 *Carex rostrata – Sphagnum recurvum* mire M9 *Carex rostrata - Calliergon*	This habitat feature will comprise a number of associated semi-natural vegetation types and their transitional zones, reflecting the geographical location of the site, altitude, aspect, soil conditions (especially base-status and drainage) and vegetation management. In the UK these have been categorised by the National Vegetation Classification (NVC). Maintaining or restoring these characteristic and distinctive vegetation types, and the range of types as appropriate, will be important to sustaining the overall habitat feature.	This attribute will be periodically monitored as part of Natural England's site condition assessments Natural England. 2004. Favourable Condition Tables - Leek Moors SSSI Draft.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		cuspidatum/giganteum mire		
Structure and function (including its typical species)	**Key structural, influential and/or distinctive species**	Maintain the abundance of the typical species listed below to enable each of them to be a viable component of the Annex 1 habitat; Sedges including: *Carex diandra, C. lasiocarpa, C. rostrata, C. limosa, C. panicea, C. nigra,* Common cottongrass *Eriophorum angustifolium:,* *Bryophytes including Calliergon giganteum, Campylium stellatum, Scorpidium scorpioides, Drepanocladus revolvens, Bryum pseudotriquetrum, Palustriella commutata, Cratoneuron filicinum, Ctenidium molluscum:* Other notable species: Bogbean *Menyanthes trifoliate* Water mint *Mentha aquatica* Red-rattle *Pedicularis palustris* *Marsh willowherb* Epilobium palustre, Marsh cinquefoil *Potentilla palustris* Cuckoo Flower *Cardamine pratensis* Marsh marigold *Caltha palustris* A prominent bryophyte carpet is a feature of all but the very wettest stands.	See general explanatory notes for this attribute in Table 1.	This attribute will be periodically monitored as part of Natural England's site condition assessments Natural England. 2004. Favourable Condition Tables - Leek Moors SSSI Draft.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Structure and function (including its typical species)	**Invasive, non-native and/or introduced species**	Ensure invasive and introduced non-native species are either rare or absent, but if present are causing minimal damage to the feature	Invasive or introduced non-native species can be a serious potential threat to the structure and function of these habitats, because they are able to exclude, damage or suppress the growth of their associated typical species, reduce structural diversity of the habitat and prevent the natural regeneration of characteristic site-native species. Once established, the measures to control such species may also impact negatively on the features of interest (e.g. use of broad spectrum pesticides). The undesirable species for H7140 Transition mires and quaking bogs include all invasives and the following undesirable species: Common reed *Phragmites australis,* Canary grass *Phalaris arundinacea,* Great manna grass *Glyceria maxima,* Hairy willowherb *Epilobium hirsutum,* Common nettle *Urtica dioica,* Rough stalked feather moss *Brachythecium rutabulum,* Common feather moss *Eurhynchium praelongum.* Further not more than one of this group of species and that account for <5% cover: Bracken *Pteridium aquilinum*, Bramble *Rubus fruticosus*, and Purple moor-grass *Molinia caerulea*	This attribute will be periodically monitored as part of Natural England's site condition assessments Natural England. 2004. Favourable Condition Tables - Leek Moors SSSI Draft.
Structure and function (including its typical species)	**Presence/ cover of woody species**	Maintain a low cover (<10% of the area) of scrub or trees within stands of H7140	Native trees and shrubs occur naturally on bog and fen surfaces but an abundance of scrub and trees on bogs and fens is sometimes regarded as detrimental because they are indicators and perpetrators of drying out and may cause damage to vegetation structure through shading effects. Birch, pine, willow and rhododendron (an invasive non-native species) are the main species of concern. The seeds of most invasive woody species are wind dispersed, so trees are able to establish on raised bog and fen surfaces. Scrub and woodland are integral components of many systems and may be particularly important for invertebrates. However invasion by woody species and their development to maturity may indicate drying out, dereliction, disturbance and/or	This attribute will be periodically monitored as part of Natural England's site condition assessments

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			enrichment for both fen. Trees and shrubs may also exacerbate drying out.	
Structure and function (including its typical species)	**Exposed substrate**	Maintain a low cover of exposed substrate of between 5% & 10% across feature.	For this wetland habitat type, maintaining some continuous extent of exposed, open ground surface is required to support the establishment and supply of those component species which often rely on wet and sparsely-vegetated conditions. A high frequency and cover of exposed substrate will usually be undesirable and may indicate, inter alia, over-grazing, and water scour. More than 25% litter cover indicates insufficient removal of biomass by grazing.	This attribute will be periodically monitored as part of Natural England's site condition assessments
Structure and function (including its typical species)	**Hydrology**	At a site, unit and/or catchment level (as necessary, maintain natural hydrological processes to provide the conditions necessary to sustain the feature within the site	Defining and maintaining the appropriate hydrological regime is a key step in moving towards achieving the conservation objectives for this site and sustaining this feature. Changes in source, depth, duration, frequency, magnitude and timing of water supply can have significant implications for the assemblage of characteristic plants and animals present. This target is generic and further site-specific investigations may be required to fully inform conservation measures and/or the likelihood of impacts. Wheeler *et al*. (2009) provide range and mean for summer & winter water levels for those wetland NVC types constituting Annex 1 habitats. This provides a rough guide to appropriate levels, but it is critical that individual sites and their needs are considered as there is considerable variation within the NVC communities listed and recorded water levels. The hydrological integrity of Transition mires and quaking bogs (H7140) has been adversely affected across the site by a range of external factors, principally historic air pollution and wild fires which in some areas has been added to by historical and continuing land use management practices. Ensuring that the correct hydrological regime is maintained is important for this feature.	Wheeler, BD, Shaw, SC, and Tanner, KA. 2009. Wetland Framework for Impact Assessment at Statutory Sites. McBride *et al*. 2011. Environment Agency Science report. Fen Management Handbook Natural England. 2014. South Pennine Moors SAC Site Improvement Plan. Available here

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Structure and function (including its typical species)	**Water chemistry**	Maintain the surface water and groundwater supporting the hydrology of the bog at a low nutrient status.	UKTAG (2012) provides threshold values for nitrate concentration in groundwaters for different wetland types. The threshold values will mainly be used in the characterisation of GWDTE status for the WFD, primarily as a risk screening tool, to assess if sites are 'at risk' or 'not at risk' from groundwater mediated nutrient pressure. Due to the complex cycling of nutrients within many GWDTE, these threshold values are less well suited for application within sites but rather just to groundwater that is directly feeding the site.	
Structure and function (including its typical species)	**Hydrology**	Maintain a high piezometric head and permanently high water table (allowing for natural seasonal fluctuations) on groundwater dependent sites.	Defining and maintaining the appropriate hydrological regime is a key step in moving towards achieving the conservation objectives for this site and sustaining this feature. Changes in source, depth, duration, frequency, magnitude and timing of water supply can have significant implications for the assemblage of characteristic plants and animals present. This target is generic and further site-specific investigations may be required to fully inform conservation measures and/or the likelihood of impacts. Some examples of H7140 may be wholly or partly groundwater dependent. Others have a greater dependence on surface water or rain water inputs. It is critically important to understand the ecohydrological context of all sites.	
Structure and function (including its typical species)	**Adaptation and resilience**	Maintain the feature's ability, and that of its supporting processes, to adapt or evolve to wider environmental change, either within or external to the site	See general explanatory notes for this attribute in Table 1.	Natural England, 2015a. Climate Change Theme Plan and supporting NBCCV Assessments for SACs and SPAs [both available at http://publications.naturalengland.org.uk/publication/4954594591375360] Peak District National Park: Climate Change – Adaption and

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				Mitigation, available here
Structure and function (including its typical species)	**Supporting off-site habitat**	Maintain the extent, quality and spatial configuration of land or habitat surrounding or adjacent to the site which is known to support the feature.	The structure and function of the qualifying habitat, including its typical species, may rely upon the continued presence of areas which surround and are outside of the designated site boundary. Changes in surrounding land-use may adversely (directly/indirectly) affect the functioning of the feature and its component species. 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.	
Supporting processes (on which the feature relies)	**Air quality**	Maintain 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 (www.apis.ac.uk).	See general explanatory notes for this attribute in Table 1. Atmospheric pollution over the last few hundred years has depleted the lichen and bryophyte flora and may be affecting dwarf-shrubs. The impact has arguably been greatest on blanket bog, wet heath and transition mire where the bog-building *Sphagnum* mosses have been largely lost.	More information about site-relevant Critical Loads and Levels for this SAC is available by using the 'search by site' tool on the Air Pollution Information System (www.apis.ac.uk). JNCC.2011. UK SAC data form – South Pennine Moors SAC. Available from Natural England Natural England. 2014. South Pennine Moors SAC Site Improvement Plan. Available here
Supporting processes (on which the feature relies)	**Conservation measures**	Maintain the management measures (either within and/or outside the site boundary as appropriate) which are necessary to the structure, functions and supporting processes associated with the feature	Active and ongoing conservation management is needed to protect, maintain or restore this feature at this site. Further details about the necessary conservation measures for this site can be provided by contacting Natural England. This information will typically be found within, where applicable, supporting documents such as Natura 2000 Site Improvement Plan, Site Management Strategies or Plans, the Views about	Natural England. 2014. South Pennine Moors SAC Site Improvement Plan. Available here

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			Management Statement for the underpinning SSSI and/or management agreements. This habitat in most cases requires ongoing cutting or grazing maintain its open character. The exact condition of H7140 Transition mires and quaking bogs is currently unclear but it is likely to be under pressure from changes in recreational use, public legal and illegal access on site, wildfires, land management (commercial grouse moor management, farming and restoration practices availability of agreement packages) and some illegal activity. To help maintain this feature an ecosystem approach is desirable to recognise the interdependence of ecosystem services and optimal habitat condition including developing greater flexibility within existing funding streams deriving support for management across a range of interests.	
Version Control N/A				
Variations from national feature-framework of integrity-guidance: The objectives for some of the attributes listed above include both 'maintain' and 'restore' targets. This is because this SAC is an extensive complex of geographically-separate component sites which currently vary in their condition status. Overall, both objectives will currently be applicable to the SAC but these will differ between each component site depending on its particular circumstances. Natural England will be able to provide further advice on request.				

Table 5: Supplementary Advice for Qualifying Features: H91A0. Old sessile oak woods with Ilex and Blechnum in the British Isles

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Extent and distribution of the feature	**Extent of the feature within the site**	Maintain the total extent of the feature at the baseline-value of 650 hectares. Restore other relict woodland sites and establish new native woodland at suitable locations across the SAC.	See general explanatory notes for this attribute in Table 1. For this feature tree roots (particularly of veteran trees) can extend a considerable distance beyond the boundary of the site - they can be impacted by soil compaction (such as caused by vehicles or construction works); agricultural operations or other soil disturbance (like trenches); and agro chemicals or other chemicals which get into the soil. Any loss of woodland area - whether at the edge or in the middle of a site will reduce the core woodland area where woodland conditions are found - these support significant assemblages of species dependent on woodland conditions (e.g. lichens and bryophytes - being one example). Loss of any woodland area which fragments a site into different parts will clearly disturb the movement of species between the remaining parts of the woodland. However, this woodland type is found in fragments mainly within Dark Peak SSSI and Eastern Peak District Moors SSSI and only very locally within South Pennine Moors SSSI so this estimated figure may be over or under estimated. Some areas where tree cover has been lost but some woody species and typical ground flora remain should be restored. Elsewhere some regeneration identifies suitable areas for woodland habitat expansion. Care should be taken in site selection to avoid loss of other feature habitat such as dry heath.	JNCC.2011. UK SAC data form – South Pennine Moors SAC. Available from Natural England JNCC. 2016. NATURA 2000 – Standard Data Form. Available here Moors for the Future Partnership and Forestry Commission. 2013. Clough Woodland Project Guiding Principles Forestry Commission. 1995. Establishing New Native Woodland, Bulletin 112
Extent and distribution of the feature	**Spatial distribution of the feature within the site**	Restore the distribution and configuration of the feature, including where applicable its component vegetation types, across the site through enhancement of existing feature	A contraction in the range, or geographic spread, of the feature (and its component vegetation and typical species, plus transitional communities) across the site will reduce its overall area, the local diversity and variations in its structure and composition, and may undermine its resilience to adapt to future environmental changes. This may also reduce and break	JNCC.2011. UK SAC data form – South Pennine Moors SAC. Available from Natural England This attribute will be periodically monitored as part of Natural

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		and creation of new habitat.	up the continuity of a habitat within a site and how well its typical species are able to move around the site to occupy and use habitat. Such fragmentation can impact on their viability and the wider ecological composition of the Annex I habitat. Smaller fragments of habitat can typically support smaller and more isolated populations which are more vulnerable to extinction. These fragments also have a greater amount of open edge habitat which will differ in the amount of light, temperature, wind, and even noise that it receives compared to its interior. These conditions may not be suitable for some of the typical and more specialist species associated with the Annex I habitat feature. The largest stands of H91A0 Old sessile oak woods are found in Dark Peak and Eastern Peak District Moors SSSI with small areas of planting occurring on three underpinning SSSIs. However, the previous extensive cover of woodland has declined over many centuries to the point that it is fragmented, relatively small-scale and largely restricted to steeper valley sides. There is no woodland included in the site to the north of the National Park.	England's site condition assessments Natural England. 2007. Dark Peak SSSI FCT Draft Natural England. 2011. Eastern Peak District Moors SSSI FCT Consultation Draft
Structure and function (including its typical species)	**Vegetation community composition**	Ensure the component vegetation communities of the feature are referable to and characterised by the following National Vegetation Classification types: W10e *Quercus robur – Pteridium aquilinum – Rubus fruticosus* woodland*, Acer pseudoplatanus – Oxalis acetosella* sub-community W11 *Quercus petraea – Betula pubescens – Oxalis acetosella*	This habitat feature will comprise a number of associated semi-natural vegetation types and their transitional zones, reflecting the geographical location of the site, altitude, aspect, soil conditions (especially base-status and drainage) and vegetation management. In the UK these have been categorised by the National Vegetation Classification (NVC). Maintaining or restoring these characteristic and distinctive vegetation types, and the range of types as appropriate, will be important to sustaining the overall habitat feature. This will also help to conserve their typical plant species (i.e. the constant and preferential species of a community), and therefore that of the SAC feature, at appropriate levels (recognising natural fluctuations). W16b is typically quite moist, leading to the development of a	English Nature. 2005. South Pennine Moors SAC citation. Available here This attribute will be periodically monitored as part of Natural England's site condition assessments Natural England. 2007. Dark Peak SSSI FCT Draft Natural England. 2011. Eastern Peak District Moors SSSI FCT

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		woodland W16b *Quercus spp. – Betula spp. – Deschampsia flexuosa* woodland*, Vaccinium myrtillus – Dryopteris dilatata* sub-community W17 *Quercus petraea-Betula pubescens-Dicranum majus* woodland	fairly well-developed bryophyte flora, although this is often offset in the southern Pennines by atmospheric pollution.	Consultation Draft
Structure and function (including its typical species)	**Vegetation structure - canopy cover**	Restore an appropriate tree canopy cover across the feature, which will typically be between 40-90% of the feature	Canopy cover is the overall proportion of vegetative cover consisting of any woody layer ranging from established regeneration to mature and veteran stages. Woodland canopy density and structure is important because it affects ecosystem function and in particular microclimate, litterfall, soil moisture, nutrient turnover and shading; this in turn influences the composition of plants and animals in lower vegetation layers and soil. Open canopies with just scattered trees will have less of a woodland character and reduced diversity of woodland-dependent species (although they may be still be important as a form of woodland-pasture). Completely closed canopies across the whole woodland are not ideal either however, as they cast heavier shade and support fewer species associated with edges, glades and open grown trees, and have little space where tree regeneration could occur. In general, the woodland canopy of this feature should provide a core of woodland interior conditions with some open and edge habitat as well. The extent of canopy covers varies from location to location within this SAC with some areas supporting extensive closed oak / or birch canopies made up of multiple mature oaks/ birch. Whereas other areas support just a few standard oak and the lack of regeneration has resulted in limited overall canopy	Natural England. 2003. SSSI Whole Site Objective Statements – Dark Peak SSSI and Eastern Peak District Moors SSSI. Available from Natural England. This attribute will be periodically monitored as part of Natural England's site condition assessments Natural England. 2007. Dark Peak SSSI FCT Draft Natural England. 2011. Eastern Peak District Moors SSSI FCT Consultation Draft

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			extent. Further, in coppiced stands a lower canopy cover (of standards) can be accepted,	
Structure and function (including its typical species)	**Vegetation structure - open space**	Restore areas of permanent/temporary open space within the woodland feature, typically to cover approximately 10%of area	Woodland structure includes variations in age, tree form, layering, the distribution and abundance of open space and dead wood. It plays a critical role in woodland ecosystem functioning. The targets set within this attribute will reflect the most appropriate structure for the woodland feature on a particular site, taking account of its known interest, history, past management and the landscape context. Having some open, sunlit and largely tree-less areas as part of the woodland community is often important to facilitate natural tree and shrub regeneration and also to provide supporting habitat for specialist woodland invertebrates, birds, vascular and lower plants. Such open space can be permanent or temporary and may consist of managed grazed areas, linear rides and glades, or naturally-produced gaps caused by disturbance events such as windthrow/fire/tree falling over/snow damage. Overgrazing, resulting in the low natural regeneration of trees and shrubs, has been one of the main concerns for this habitat. This has resulted in stock proof fences being put up around old woodlands and deer management in place. Thus, for a lot of the more scattered woodland, the extent of open space without regenerating trees can be viewed as too extensive due to the single age class of remaining mature trees. Active management to plant these areas are in place on all underpinning SSSIs, which will in time alter the open spaces available.	This attribute will be periodically monitored as part of Natural England's site condition assessments Natural England. 2007. Dark Peak SSSI FCT Draft Natural England. 2011. Eastern Peak District Moors SSSI FCT Consultation Draft
Structure and function (including its typical	**Vegetation structure - old growth**	Maintain or restore as appropriate the extent and continuity of undisturbed, mature/old growth stands	Good woodland structure includes variations in age, tree form, layering, the distribution and abundance of open space and dead wood. It plays a critical role in woodland ecosystem functioning.	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
species)		(typically comprising at least 20% of the feature at any one time) and the assemblages of veteran and ancient trees (typically >10 trees per hectare).	The targets set within this attribute will reflect the most appropriate structure for the woodland feature on a particular site, taking account of its known interest, history, past management and the landscape context. For this habitat type, old or over-mature elements of the woodland are particularly characteristic and important features, and their continuity should be a priority.	
Structure and function (including its typical species)	**Vegetation structure - dead wood**	Maintain or restore as appropriate the continuity and abundance of standing or fallen dead and decaying wood, typically between 30 - 50 m3 per hectare of standing or fallen timber or 3-5 fallen trees >30cm per hectare, and >10 standing dead trees per hectare	Woodland structure includes variations in age, tree form, layering, the distribution and abundance of open space and dead wood. It plays a critical role in woodland ecosystem functioning. The targets set within this attribute will reflect the most appropriate structure for the woodland feature on a particular site, taking account of its known interest, history, past management and the landscape context. Dead and actively decaying wood, either as part of a standing tree or as a fallen tree on the woodland floor, is an important component of woodland ecosystems, and supports a range of specialist invertebrates, fungi, lichens and bryophytes, and associated hole-nesting birds and roosting bats, all of which may be very typical of the feature.	This attribute will be periodically monitored as part of Natural England's site condition assessments Natural England. 2007. Dark Peak SSSI FCT Draft Natural England. 2011. Eastern Peak District Moors SSSI FCT Consultation Draft
Structure and function (including its typical species)	**Vegetation structure - age class distribution**	Maintain or restore as appropriate at least 3 age classes (pole stage/ medium/ mature) spread across the average life expectancy of the commonest trees.	A distribution of size and age classes of the major site-native tree and shrub species that indicate the woodland will continue in perpetuity, and will provide a variety of the woodland habitats and niches expected for this type of woodland at the site in question. The lack of age structure was variable throughout this feature. On the areas where the lack of age structure was a concern, changes in grazing pressure have been trialled. Fencing off areas of woodland to encourage natural regeneration and replanting accessible areas should be encouraged where appropriate. Further, replacing sheep with cattle have been trialled on a few	This attribute will be periodically monitored as part of Natural England's site condition assessments Natural England. 2007. Dark Peak SSSI FCT Draft Natural England. 2011. Eastern Peak District Moors SSSI FCT Consultation Draft

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			locations to prevent excessive grazing of tree seedlings and to open up scrub or overgrown areas to tree seedling growth. Deer browsing is also an issue affecting recruitment of new trees. Controlling bracken is also key on certain locations to allow space for young tree growth.	
Structure and function (including its typical species)	**Vegetation structure - shrub layer**	Maintain an Understorey shrubs covering 20 - 60% of the stand area (this will vary with light levels and site objectives)	Woodland structure includes variations in age, tree form, layering, the distribution and abundance of open space and dead wood. It plays a critical role in woodland ecosystem functioning. The targets set within this attribute will reflect the most appropriate structure for the woodland feature on a particular site, taking account of its known interest, history, past management and the landscape context. The scrub layer on this SAC is largely a mix of native tree canopy species plus hawthorn *Crataegus monogyna* and hazel *Corylus avellana.* The ground flora consists of a mix of heather Calluna vulgaris ferns (male fern, *Dryopteris filix-mas*, Broad buckler fern *Dryopteris dilatata* and hard fern *Blechnum spicant*), grasses (including wavy hair grass *Deschampsia flexuosa* and purple moor grass *Molinia caerulea*), bilberry *Vaccinium myrtillus* and bracken *Pteridium aquilinum*.	This attribute will be periodically monitored as part of Natural England's site condition assessments Natural England. 2007. Dark Peak SSSI FCT Draft Natural England. 2011. Eastern Peak District Moors SSSI FCT Consultation Draft
Structure and function (including its typical species)	**Vegetation structure - woodland edge**	Maintain a graduated woodland edge into adjacent semi-natural open habitats, other woodland/wood-pasture types or scrub.	Woodland edge is defined as being the transitional zone between the forest feature and adjacent but different habitat types - the best woodland edges will have a varied structure in terms of height and cover. Many typical forest species make regular use of the edge habitats for feeding due to higher herb layer productivity and larger invertebrate populations. Grasslands / arable fields managed with high doses of agro-chemicals could potentially not allow this gradation of woodland edge and could have other impacts on the integrity of the site (pollution/ nutrient enrichment etc.).	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Structure and function (including its typical species)	**Adaptation and resilience**	Restore the resilience of the feature by ensuring a diversity (at least 2 species) of site-native trees (e.g. sessile oak, birch, holly) across the site.	See general explanatory notes for this attribute in Table 1. As well as restoring existing stands of woodland there is an emphasis on re-creation to expand and link fragments which inevitably involves changing existing habitats. This requires a balance of vegetation types on the site. The flora of woodlands, quality as with bog and heath, has suffered from poor air quality. Again, it is less clear what can be done to reverse this situation other than to try and ensure continued improvements in air quality to allow affected species to recolonise if they can.	JNCC.2011. UK SAC data form – South Pennine Moors SAC. Available from Natural England Natural England, 2015. Climate Change Theme Plan and supporting National Biodiversity Climate Change Vulnerability assessments ('NBCCVAs') for SACs and SPAs in England [Available at http://publications.naturalengland.org.uk/publication/4954594591375360]. Peak District National Park: Climate Change – Adaption and Mitigation, available here
Structure and function (including its typical species)	**Browsing and grazing by herbivores**	Maintain or restore as appropriate browsing at a (low) level that allows well developed understorey with no obvious browse line, & lush ground vegetation with some grazing sensitive species evident (bramble, ivy etc), and tree seedlings and sapling common in gaps.	Herbivores, especially deer, are an integral part of woodland ecosystems. They are important in influencing woodland regeneration, composition and structure and therefore in shaping woodland wildlife communities. In general, both light grazing and browsing is desirable to promote both a diverse woodland structure and continuous seedling establishment. Short periods with no grazing at all can allow fresh natural regeneration of trees, but a long-term absence of herbivores can result in excessively dense thickets of young trees which shade out ground flora and lower plant species. However, heavy grazing by deer or sheep prevents woodland regeneration, and can cause excessive trampling and/or poaching damage, canopy fragmentation, heavy browsing, barkstripping and a heavily grazed field layer devoid of some species. Several sections of woodland are or have had problems due to overgrazing from sheep, deer and rabbits preventing natural regeneration. Changes in grazing pressure such as fencing off areas of woodland to encourage natural regeneration and	EMP. 2014. Deer Impact Assessment 2014 on Big Moor. Eastern Moors Partnership. Available from Natural England Natural England. 2014. South Pennine Moors SAC Site Improvement Plan. Available here

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			replanting accessible areas is in place in some areas but need long term monitoring to gauge their success. Another alternative trialled on site is replacing sheep with Highland cattle, this has been trialled to prevent excessive grazing of tree seedlings and to open up niches for seed establishment	
Structure and function (including its typical species)	**Regeneration potential**	Maintain the potential for sufficient natural regeneration of desirable trees and shrubs; typically tree seedlings of desirable species (measured by seedlings and <1.3m saplings - above grazing and browsing height) should be visible in sufficient numbers in gaps, at the wood edge and/or as regrowth as appropriate.	The regeneration potential of the woodland feature must be maintained if the wood is to be sustained and survive, both in terms of quantity of regeneration and in terms of appropriate species. This will Include regeneration of the trees and shrubs from saplings or suckers, regrowth from coppice stools or pollards, and where appropriate planting. Browsing and grazing levels must permit regeneration at least in intervals of 5 years every 20. The level of regeneration is variable across South Pennine Moors SAC. In areas where stock fencing has been installed, natural regeneration is highest. Other issues in addition to overgrazing affecting natural regeneration on site include: The extent of bracken as a large covering of bracken tends to make any regeneration of seedlings difficult in the growing season. Cover of rhododendron preventing natural tree regeneration Tight canopy preventing any light reaching the ground and suppressing natural regeneration. Possible management needed on a location by location basis to thin and let more light in. The level of native tree planting and management on the woodland including cutting to encourage coppicing.	JNCC.2011. UK SAC data form – South Pennine Moors SAC. Available from Natural England Natural England. 2014. South Pennine Moors SAC Site Improvement Plan. Available here
Structure and function (including its	**Tree and shrub species composition**	Maintain a canopy and under-storey of which 95% is composed of trees and shrubs native to the	Native trees and shrubs in general support a greater diversity of associated species than non-native species, especially amongst groups of invertebrates which depend directly on trees	Natural England. 2014. South Pennine Moors SAC Site Improvement Plan. Available here

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
typical species)		site.	for food and shelter. There are many plants and animals which use or co-exist with non-native trees, but many rare and threatened woodland species are specialists adapted to one or a few native trees or shrub species (birches, willows and oaks, are examples of trees that host many specialist insect species). Overall, most areas of woodland support high levels of native tree and shrub species with bracken encroachment one of the major concerns.	This attribute will be periodically monitored as part of Natural England's site condition assessments Natural England. 2007. Dark Peak SSSI FCT Draft Natural England. 2011. Eastern Peak District Moors SSSI FCT Consultation Draft
Structure and function (including its typical species)	**Key structural, influential and/or distinctive species**	Maintain the abundance of the typical species listed below to enable each of them to be a viable component of the Annex 1 habitat; Trees / scrub include: Sessile oak *Quercus petraea* holly *Ilex aquilinum* alder *Alnus glutinosa* (frequently on lower wetter slopes) birch *Betula spp.* (primarily *Betula pubescens*) hazel *Corylus avellana* elder *Sambucus nigra* rowan *Sorbus aucuparia* hawthorn *Crataegus monogyna* and willows *Salix caprea* and *S. cinerea* And occasional aspen *Populus tremula* and beech Fagus sylvatica	See general explanatory notes for this attribute in Table 1. Other typical species within this habitat on site include: Common bent *Agrostis capillaris;* Sweet vernal grass *Anthoxanthum odoratum;* Hard-fern *Blechnum spicant;* Stag's-horn clubmoss *Lycopodium clavatum;* Wavy hair-grass *Deschampsia flexuosa;* Greater folk-moss *Dicranum majus;* Creeping soft-grass *Holcus mollis;* Glittering wood-moss *Hylocomium splendens;* Woodrush *Luzula spp.,;* Wood sorrel *Oxalis acetosella* and Bilberry *Vaccinium myrtillus*	This attribute will be periodically monitored as part of Natural England's site condition assessments Natural England. 2007. Dark Peak SSSI FCT Draft Natural England. 2011. Eastern Peak District Moors SSSI FCT Consultation Draft

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Structure and function (including its typical species)	**Invasive, non-native and/or introduced species**	Ensure invasive and introduced non-native species are either rare or absent, but if present are causing minimal damage to the feature	Invasive or introduced non-native species are a serious potential threat to the biodiversity of native and ancient woods, because they are able to exclude, damage or suppress the growth of native tree, shrub and ground species (and their associated typical species), reduce structural diversity and prevent the natural regeneration of characteristic site-native species. Once established, the measures to control such species may also impact negatively on the features of interest (e.g use of broad spectrum pesticides). Such species can include rhododendrons, snowberry, Japanese knotweed, giant hogweed and Himalayan balsam, for example. Similarly, this would include pheasants, rabbits and non-native invertebrate 'pest' species. There are a few planted blocks of mature conifers (mainly larch *Larix decidua* Sitka spruce *Picea sitchensis* and pine *Pinus spp*.) nearby the feature H91A0 old sessile oak woods. This is more of a concern for seed spread and conifer regeneration. Further, stands of Rhododendron have also been recorded within and nearby to woodland stands. The fungus-like pathogen *Phytophthora spp*. is known to be killing various species within the SAC. Few control mechanisms exist for the disease so early detection and proper disposal of infected plant material are essential. Plant species known to be affected or that have been affected or may require future monitoring are: Hybrid Bilberry *Vaccinium x intermedium* , Bilberry *Vaccinium myrtillus*, Common alder *Alnus glutinosa*, Common ash *Fraxinus excelsior*, English oak *Quercus robur*, Sessile oak *Quercus petraea*, Moor birch *Betula pubescens,* and Rhododendrons.	Natural England. 2014. South Pennine Moors SAC Site Improvement Plan. Available here This attribute will be periodically monitored as part of Natural England's site condition assessments Natural England. 2007. Dark Peak SSSI FCT Draft Natural England. 2011. Eastern Peak District Moors SSSI FCT Consultation Draft
Structure and function (including its typical species)	**Soils, substrate and nutrient cycling**	Maintain the properties of the underlying soil types, including structure, bulk density, total carbon, pH, soil nutrient status and fungal: bacterial ratio, to within typical values for the habitat.	Soil is the foundation of basic ecosystem function and a vital part of the natural environment. Its properties strongly influence the colonisation, growth and distribution of those plant species which together form vegetation types, and therefore provides a habitat used by a wide range of organisms. Soil biodiversity has a vital role to recycle organic matter.	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			Changes to natural soil properties may therefore affect the ecological structure, function and processes associated with this Annex I feature. There is currently no specific data on soil condition of this feature within this SAC.	
Structure and function (including its typical species)	**Root zones of ancient trees**	Maintain the soil structure within and around the root zones of the mature and ancient tree cohort in an un-compacted condition	The management of land within and around forest habitats which are characterised by ancient trees can be crucial to their individual welfare and long-term continuity, and the landscape they are part of can be just as or even more important. The condition of the soil surrounding such trees will affect their roots, associated mycorrhizal fungi and growth. Plants have difficulty in compacted soil because the mineral grains are pressed together, leaving little space for air and water which are essential for root growth. Unless carefully managed, activities such as construction, forestry management and trampling by grazing livestock and human feet during recreational activity may all contribute to excessive soil compaction around ancient trees.	
Supporting processes (on which the feature relies)	**Air quality**	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 (www.apis.ac.uk).	See general explanatory notes for this attribute in Table 1. Atmospheric pollution over the last few hundred years has depleted the lichen and bryophyte flora and may be affecting woodland ground flora. Currently nitrogen deposition is also still exceeding site relevant critical loads for certain soil types.	More information about site-relevant Critical Loads and Levels for this SAC is available by using the 'search by site' tool on the Air Pollution Information System (www.apis.ac.uk). JNCC.2011. UK SAC data form – South Pennine Moors SAC. Available from Natural England Natural England. 2014. South Pennine Moors SAC Site Improvement Plan. Available here
Supporting processes (on which the	**Hydrology**	At a site, unit and/or catchment level (as necessary, maintain natural hydrological processes to	Defining and maintaining the appropriate hydrological regime is a key step in moving towards achieving the conservation objectives for this site and sustaining this feature. Changes in	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
feature relies)		provide the conditions necessary to sustain the feature within the site	source, depth, duration, frequency, magnitude and timing of water supply can have significant implications for the assemblage of characteristic plants and animals present. This target is generic and further site-specific investigations may be required to fully inform conservation measures and/or the likelihood of impacts. This is included as disruption/ damage to hydrological processes could be caused by activities at some distance from the site boundary. E.g. through extraction of ground or surface waters; diverting or damming river channels; pollution of water source; channel alignment that disrupts natural geomorphological processes; tunnelling etc.	
Supporting processes (on which the feature relies)	**Illumination**	Ensure artificial light is maintained to a level which is unlikely to affect natural phenological cycles and processes to the detriment of the feature and its typical species at this site.	Woodland biodiversity has naturally evolved with natural patterns of light and darkness, so disturbance or modification of those patterns can influence numerous aspects of plant and animal behaviour. For example, light pollution (from direct glare, chronically increased illumination and/or temporary, unexpected fluctuations in lighting) can affect animal navigation, competitive interactions, predator-prey relations, and animal physiology. Flowering and development of trees and plants can also be modified by un-natural illumination which can disrupt natural seasonal responses.	
Version Control: N/A				
Variations from national feature-framework of integrity-guidance: The objectives for some of the attributes listed above include both 'maintain' and 'restore' targets. This is because this SAC is an extensive complex of geographically-separate component sites which currently vary in their condition status. Overall, both objectives will currently be applicable to the SAC but these will differ between each component site depending on its particular circumstances. The Dark Peak SSSI component has an objective to conserve and enhance this feature and an active programme of habitat creation is underway. Natural England will be able to provide further advice on request.				

EC Directive 92/43 on the Conservation of Natural Habitats and of Wild Fauna and Flora

Citation for Special Area of Conservation (SAC)

Name:	Rochdale Canal
Unitary Authority/County:	Manchester, Oldham, Rochdale
SAC status:	Designated on 1 April 2005
Grid reference:	SD893038
SAC EU code:	UK0030266
Area (ha):	25.55
Component SSSI:	Rochdale Canal SSSI

Site description:
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*. 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.

Qualifying species: The site is designated under **article 4(4)** of the Directive (92/43/EEC) as it hosts the following species listed in Annex II:

- Floating water-plantain *Luronium natans*

This citation relates to a site entered in the Register of European Sites for Great Britain.
Register reference number: UK0030266
Date of registration: 14 June 2005
Signed: Trevor Salmon
On behalf of the Secretary of State for Environment, Food and Rural Affairs

European Site Conservation Objectives for Rochdale Canal Special Area of Conservation Site code: UK0030266

With regard to the SAC and the natural habitats and/or species for which the site has been designated (the 'Qualifying Features' listed below), and subject to natural change;

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.**

This document should be read in conjunction with the accompanying *Supplementary Advice* document, which provides more detailed advice and information to enable the application and achievement of the Objectives set out above.

Qualifying Features:

S1831. *Luronium natans*; Floating water-plantain

Explanatory Notes: European Site Conservation Objectives

These Conservation Objectives are those referred to in the Conservation of Habitats and Species Regulations 2017 as amended from time to time (the “Habitats Regulations”). They must be considered when a competent authority is required to make a ‘Habitats Regulations Assessment’, including an Appropriate Assessment, under the relevant parts of this legislation.

These Conservation Objectives and the accompanying Supplementary Advice (where available) will also provide a framework to inform the measures needed to conserve or restore the European Site and the prevention of deterioration or significant disturbance of its qualifying features.

These Conservation Objectives are set for each habitat or species of a Special Area of Conservation (SAC). Where the objectives are met, the site will be considered to exhibit a high degree of integrity and to be contributing to achieving Favourable Conservation Status for that species or habitat type at a UK level. The term ‘favourable conservation status’ is defined in regulation 3 of the Habitats Regulations.

Publication date: 27 November 2018 (version 3). This document updates and replaces an earlier version dated 30 June 2014 to reflect the consolidation of the Habitats Regulations in 2017.

European Site Conservation Objectives: Supplementary advice on conserving and restoring site features

Rochdale Canal Special Area of Conservation (SAC) UK0030266



Image take from Canal and Rivers Trust

Date of Publication: 25 January 2019

About this document

This document provides Natural England's supplementary advice about the European Site Conservation Objectives relating to Rochdale Canal SAC. This advice should therefore be read together with the SAC Conservation Objectives available here.

You should use the Conservation Objectives, this Supplementary Advice and any case-specific advice given by Natural England when developing, proposing or assessing an activity, plan or project that may affect this site'

This Supplementary Advice to the Conservation Objectives presents attributes which are ecological characteristics of the designated species and habitats within a site. The listed attributes are considered to be those that best describe the site's ecological integrity and which, if safeguarded, will enable achievement of the Conservation Objectives. Each attribute has a target which is either quantified or qualitative depending on the available evidence. The target identifies as far as possible the desired state to be achieved for the attribute.

The tables provided below bring together the findings of the best available scientific evidence relating to the site's qualifying features, which may be updated or supplemented in further publications from Natural England and other sources. The local evidence used in preparing this supplementary advice has been cited. The references to the national evidence used are available on request. Where evidence and references have not been indicated, Natural England has applied ecological knowledge and expert judgement. You may decide to use other additional sources of information.

In many cases, the attribute targets shown in the tables indicate whether the current objective is to 'maintain' or 'restore' the attribute. This is based on the best available information, including that gathered during monitoring of the feature's current condition. As new information on feature condition becomes available, this will be added so that the advice remains up to date.

The targets given for each attribute do not represent thresholds to assess the significance of any given impact in Habitats Regulations Assessments. You will need to assess this on a case-by-case basis using the most current information available.

Some, but not all, of these attributes can also be used for regular monitoring of the actual condition of the designated features. The attributes selected for monitoring the features, and the standards used to assess their condition, are listed in separate monitoring documents, which will be available from Natural England.

These tables do not give advice about SSSI features or other legally protected species which may also be present within the European Site.

If you have any comments or queries about this Supplementary Advice document please contact your local Natural England adviser or email HDIRConservationObjectivesNE@naturalengland.org.uk

About this site

European Site information

Name of European Site	Rochdale Canal Special Area of Conservation (SAC)
Location	Greater Manchester
Site Map	The designated boundary of this site can be viewed here on the MAGIC website
Designation Date	*1st April 2005*
Qualifying Features	See section below
Designation Area	*25.55ha*
Designation Changes	*N/A*
Feature Condition Status	Details of the feature condition assessments made at this site can be found using Natural England's Designated Sites System
Names of component Sites of Special Scientific Interest (SSSIs)	*Rochdale Canal SSSI*
Relationship with other European or International Site designations	N/A

Site background and geography

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*. 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.

Opened in 1804, the Rochdale Canal became the first of Manchester's three trans-Pennine canals and principal cargoes included coal, agricultural produce and materials for the textiles industry (Canal & River Trust, ND).

The canal is situated within the Manchester conurbation National Character Area (NCA) which is a predominantly urban area, bringing together a number of large settlements. The Manchester Pennine Fringe NCA wraps around the conurbation to the east and to the north. The Mersey Valley NCA lies to the west of the area, while the Shropshire, Cheshire and Staffordshire Plain NCA extends to the south. The high-rise buildings of Manchester city centre serve as a visual orientation point within the surrounding urban context, and can be seen from many viewpoints in the conurbation and in surrounding NCAs. Further information on this NCA can be found here

About the qualifying features of the SAC

The following section gives you additional, site-specific information about this SAC's qualifying features. These are the natural habitats and/or species for which this SAC has been designated.

Qualifying Species:

- **S1831 Floating water-plantain *Luronium natans***

Floating water-plantain *Luronium natans* 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 *Luronium natans* in a botanically diverse water-plant community. This population of *Luronium* is representative of the formerly more widespread canal populations of north-west England.

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.

Table 1: Supplementary Advice for Qualifying Features: S1831. *Luronium natans*; Floating water-plantain

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Population (of the feature)	**Population abundance**	Maintain the abundance of the population where there is no decline >50 % in cover of *Luronium natans* within an occupied habitat area and within occupied habitat areas >2/3 of site open water cover provided by *Luronium natans*, whilst avoiding deterioration from its current level as indicated by the latest mean peak count or equivalent.	This will ensure there is a viable population of the feature which is being maintained at or increased to a level that contributes as appropriate to its Favourable Conservation Status across its natural range in the UK. Due to the dynamic nature of population change, the target-value given for the population size or presence of this feature is considered to be the minimum standard for conservation/restoration measures to achieve. This minimum-value may be revised where there is evidence to show that a population's size or presence has significantly changed as a result of natural factors or management measures and has been stable at or above a new level over a considerable period (generally at least 10 years). The values given here may also be updated in future to reflect any strategic objectives which may be set at a national level for this feature. Given the likely fluctuations in numbers over time, any impact-assessments should focus on the current size of the site's population, as derived from the latest known or estimated level established using the best available data. This advice accords with the obligation to avoid deterioration of the site or significant disturbance of the species for which the site is designated, and seeks to avoid plans or projects that may affect the site giving rise to the risk of deterioration. Similarly, where there is evidence to show that a feature has historically been more abundant than the stated minimum target and its current level, the ongoing capacity of the site to accommodate the feature at such higher levels in future should also be taken into account in any assessment. Unless otherwise stated, the population size or presence will be that measured using standard methods, such as peak mean counts or breeding surveys. This value is also provided recognising there will be inherent variability as a result of natural fluctuations and margins of error during data collection. Whilst we will endeavour to keep these values as up to date as possible, local Natural England staff can advise that the figures	Natural England (2012) Definition of Favourable Condition – Rochdale Canal SSSI (Available on request from Natural England)

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			stated are the best available. Many annual species undergo significant population fluctuations, unless there are fewer than 100 individuals (when an individual count is generally possible) counting is not going to be simple, partly as it is difficult to define functional individuals with a stoloniferous plant producing many plantlets. Discrete populations of *L. natans* must be greater than 50 m apart. Many habitats where L. natans is present may be subject to periodic major disturbance events and these may be important in enabling populations to persist at a site. Thus, there may naturally be considerable fluctuations in population size at a given site between monitoring visits and so only major fluctuations should be noted.	
Supporting habitat: extent and distribution	**Distribution of supporting habitat**	Maintain the distribution and continuity of the feature and its supporting habitat, including where applicable its component vegetation types and associated transitional vegetation types, across the site	A contraction in the range, or geographic spread, of the feature (and its component vegetation) across the site will reduce its overall area, the local diversity and variations in its structure and composition, and may undermine its resilience to adapt to future environmental changes. Contraction may also reduce and break up the continuity of a habitat within a site and how well the species feature is able to occupy and use habitat within the site. Such fragmentation may have a greater amount of open edge habitat which will differ in the amount of light, temperature, wind, and even noise that it receives compared to its interior. These conditions may not be suitable for this feature and this may affect its viability.	
Supporting habitat: extent and distribution	**Extent of supporting habitat**	Maintain] the total extent of the habitats which support the feature to: 25.7ha of canal	In order to contribute towards the objective of achieving an overall favourable conservation status of the feature at a UK level, it is important to maintain or if appropriate restore the extent of supporting habitats and their range within this SAC. The information available on the extent and distribution of supporting habitat used by the feature may be approximate depending on the nature, age and accuracy of data collection, and may be subject to periodic review in light of improvements in data.	Natural England (2012) Definition of Favourable Condition – Rochdale Canal SSSI (Available on request from Natural England)
Supporting habitat: structure/	**Habitat structure**	Ensure the supporting water bodies are sufficiently free of other competing vegetation to	Luronium is intolerant of competition and occurs in a range of freshwater habitats – oligotrophic and mesotrophic lakes, slow flowing rivers and associated floodplain pools and small pools	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
function		allow space for this early successional species to thrive.	in heathland. There are also large populations in a number of disused or recently restored canals.	
Supporting habitat: structure/ function	**Substrate**	Maintain a habitat substrate characterised by cohesive sediments which are not too coarse In areas of *L. natans*: Sediments cohesive and not coarser than 50/50 silt/sand.	Fine unconsolidated sediments are an unsuitable rooting medium and plants may be subject to uprooting. Conversely, where sediment is too coarse and mineral there may be scouring and poor root anchorage. Soft mineral sediments may support diverse vegetation provided boat traffic is low or absent. When boat traffic increases, fine unconsolidated sediments are an unsuitable rooting medium and plants may be subject to uprooting. Furthermore, under high boat traffic levels fine sediments are readily re-suspended leading to high turbidity levels and smothering of plant surfaces. Large quantities of leaf litter may lead to highly anoxic conditions unsuitable for plants and other organisms. Actual sediments are dependent on input of suspended solids in canal water supply, erosion within the canal and navigational requirements.	Natural England (2012) Definition of Favourable Condition – Rochdale Canal SSSI (Available on request from Natural England)
Supporting habitat: structure/ function	**Vegetation composition: invasive non-native species**	Ensure the following invasive non-native species are absent from the site or being contained at a level which does not significantly affect the feature; *Crassula helmsii, Hydrocotyle ranunculoides, Myriophyllum aquaticum, Azolla filiculoides*,	These alien plant species are highly competitive and will impact negatively on Luronium, which is not competitive. Other introduced species may have effects on ecosystem functioning through the food web or via direct effects on the plant community, e.g. artificially large waterfowl populations or non-native crayfish species. *Luronium natans* is particularly sensitive to competition from other species. Whilst competitive interactions are very difficult to measure, a simple judgement on the height of associated vegetation can give an indication of the likelihood of competitive exclusion. Other introduced species may have effects on ecosystem functioning through the food web or via direct effects on the plant community, e.g. large waterfowl populations or non-native crayfish species. Further negative indicators which should cause concern if present are bottom-feeding fish.	Natural England (2012), Rochdale Canal Favourable Condition Table. Data may be available from Natural England upon request Lansdown & Wade (2003)

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Supporting habitat: structure/ function	**Vegetation structure**	Ensure supporting habitat is free of shade or competitive vegetation; taller species associated with *Luronium* patches should be no more than occasional.	Excessive overhanging vegetation both results in shading of aquatic vegetation and large inputs of organic matter in the form of leaf litter. 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.	Natural England (2014), Site Improvement Plan
Supporting habitat: structure/ function	**Water clarity**	Maintain a high degree of water clarity, typically the canal bed should be clearly visible in water 1m deep in summer (where depth of canal allows).	Elevated turbidity levels as a result of, for example, high boat traffic densities, high phytoplankton densities, or the presence of benthic-feeding fish will have adverse impacts on submerged plant communities. Although *Luronium* may occur in naturally dystrophic waters with humic staining, this may be exacerbated by acidification, reducing water clarity further.	Natural England (2012) Definition of Favourable Condition – Rochdale Canal SSSI (Available on request from Natural England)
Supporting habitat: structure/ function	**Water levels/ hydrology**	Maintain water levels which are sufficient to maintain or restore populations; iIn shallow pools natural fluctuations in water level should be allowed to occur. There should be no drop in overall depth of more than 10% throughout the canal and water level fluctuations minimised during April to October	In shallow pools and similar sites plants often flower and fruit on draw-down zones as summer water levels recede. These processes should not be artificially interrupted, but will vary greatly from year to year depending on weather. Canals have small flows of water due to leakage and boat movements through locks. These flows can be essential elements in maintaining good water quality. Consistently low water levels may stress emergent and aquatic vegetation. High levels of lock usage on navigated canals can result in large fluctuations in water levels and associated scouring of bed sediments and aquatic vegetation.	Natural England (2012) Definition of Favourable Condition – Rochdale Canal SSSI (Available on request from Natural England)
Supporting habitat: structure/ function	**Water quality/ quantity**	Maintain water quality and quantity to a standard which provides the necessary conditions to support the feature	For many SAC features which are dependent on wetland habitats supported by surface and/or ground water, maintaining the quality and quantity of water supply will be critical, especially at certain times of year during key stages of their life cycle. Poor water quality and inadequate quantities of water can adversely affect the availability and suitability of breeding, rearing and feeding habitats. Typically, meeting the surface water and groundwater environmental standards set out by the Water Framework	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			Directive (WFD 2000/60/EC) will also be sufficient to support the SAC Conservation Objectives but in some cases more stringent standards may be needed to support the SAC feature. Further site-specific investigations may be required to establish appropriate standards for the SAC. L.uronium 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 although links between presence/persistence and water quality are not yet understood. As such the water quality targets set out for freshwater habitats should be sufficient to protect populations from adverse impacts.	
Supporting processes (on which the feature and/or its supporting habitat relies)	**Adaptation and resilience**	Restore the feature's ability, and that of its supporting habitat, to adapt or evolve to wider environmental change, either within or external to the site	The overall vulnerability of this SAC to climate change has been assessed by Natural England (2015) as being high, taking into account the sensitivity, fragmentation, topography and management of this habitat. This means that this site is considered to be the most vulnerable sites overall and are likely to require the most adaptation action, most urgently. A site based assessment should be carried out as a priority. This means that action to address specific issues is likely. Individual species may be more or less vulnerable than their habitat itself. In many cases, change will be inevitable so appropriate monitoring would be advisable.	NATURAL ENGLAND, 2015. Climate Change Theme Plan and supporting National Biodiversity Climate Change Vulnerability assessments ('NBCCVAs') for SACs and SPAs in England [Available at http://publications.naturalengland.org.uk/publication/4954594591375360].
Supporting processes (on which the feature and/or its supporting habitat relies)	**Air quality**	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 (www.apis.ac.uk).	The supporting habitat of this feature is considered sensitive to changes in air quality. Exceedance of these critical values for air pollutants may modify the chemical status of its substrate, accelerating or damaging plant growth, altering its vegetation structure and composition (including food-plants) and reducing supporting habitat quality and population viability of this feature. Critical Loads and Levels are recognised thresholds below which such harmful effects on sensitive UK habitats will not occur to a significant level, according to current levels of scientific understanding. There are critical levels for ammonia (NH3), oxides of nitrogen (NOx) and sulphur dioxide (SO2), and critical loads for nutrient nitrogen deposition and acid deposition. There are currently no critical loads or levels for other pollutants such as Halogens, Heavy Metals, POPs, VOCs or Dusts. These should be considered as appropriate on a	More information about site-relevant Critical Loads and Levels for this SAC is available by using the 'search by site' tool on the Air Pollution Information System (www.apis.ac.uk). Natural England (2014), Site Improvement Plan

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			case-by-case basis. Ground level ozone is regionally important as a toxic air pollutant but flux-based critical levels for the protection of semi-natural habitats are still under development. It is recognised that achieving this target may be subject to the development, availability and effectiveness of abatement technology and measures to tackle diffuse air pollution, within realistic timescales.	
Supporting processes (on which the feature and/or its supporting habitat relies)	**Conservation measures**	Maintain the management measures (either within and/or outside the site boundary as appropriate) which are necessary to maintain the structure, functions and supporting processes associated with the feature and/or its supporting habitats.	Active and ongoing conservation management is needed to protect, maintain or restore this feature at this site. Further details about the necessary conservation measures for this site can be provided by contacting Natural England. This information will typically be found within, where applicable, supporting documents such as Natura 2000 Site Improvement Plan, site management strategies or plans, the Views about Management Statement for the underpinning SSSI and/or management agreements.	English Nature (2004), Views About Management Natural England (2014), Site Improvement Plan
Supporting processes (on which the feature and/or its supporting habitat relies)	**Disturbance from human activity**	The duration, intensity and/or frequency of disturbance events should not affect the environmental conditions necessary to support the feature	The loss or reduction in the disturbance regime (for example, grazing, water-level fluctuations, flood scouring, dredging and boat traffic) that would normally arrest succession is particularly significant.	
Supporting processes (on which the feature and/or its supporting habitat relies)	**Regeneration**	Maintain the regenerative ability of the population, indicated by a range of different plant sizes being present.	This implies effective ageing and recruitment of plants.	
Supporting processes (on which the feature and/or its supporting habitat relies)	**Regeneration (sexual)**	Ensure that, in shallow pools, there is a sufficient number of flowering and seeding plants each year	An increase in the presence of perennial vegetative plants may be associated with prolonged wetness or site permanence. In the case of populations of annual plants in shallow pools it is important to obtain evidence of sexual reproduction. The mere presence of plants only confirms the quality of seed set from previous generations. However, the degree of seed dormancy in L. natans is unknown and repeated recruitment from the seedbank without effective replenishment will reduce the long-term stability of the population.	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Supporting processes (on which the feature and/or its supporting habitat relies)	**Regeneration (vegetative)**	Maintain sufficient areas of shallow and still water for the development of ascending stolons bearing chains of plantlets, and for the production of floating leaves.	Canal populations are sterile clones that only reproduce vegetatively. Floating water-plantain has a number of apparently discrete reproductive strategies, annual flowering, perennial flowering, and perennial vegetative. It also occurs in dynamic metapopulations that contain different populations with different reproductive strategies. Any monitoring or conservation programme that does not take account of the dynamics of metapopulations and the requirements of the different reproductive strategies will not adequately represent the requirements of the species. Monitoring will provide a means by which data can be fed back into the system to refine conservation action. Further research is needed to explain the ecological requirements of some populations.	Lansdown & Wade (2003)
Supporting processes (on which the feature and/or its supporting habitat relies)	**Water quantity/ quality**	Where the feature or its supporting habitat is dependent on surface water and/or groundwater, maintain water quality and quantity to a standard which provides the necessary conditions to support the feature	For many SAC features which are dependent on wetland habitats supported by surface and/or ground water, maintaining the quality and quantity of water supply will be critical, especially at certain times of year. Poor water quality and inadequate quantities of water can adversely affect the structure and function of this habitat type. Typically, meeting the surface water and groundwater environmental standards set out by the Water Framework Directive (WFD 2000/60/EC) will also be sufficient to support the achievement of SAC Conservation Objectives but in some cases more stringent standards may be needed to reflect the ecological needs of the species feature. Further site-specific investigations may be required to establish appropriate water quality standards for the SAC.	
Version Control Advice last updated: N/A				
Variations from national feature-framework of integrity-guidance: Attribute relating to soils and nutrients have been removed as not considered relative to this feature.				

References

Canal and River Trust (ND), Rochdale Canal. Available From: https://canalrivertrust.org.uk/enjoy-the-waterways/canal-and-river-network/rochdale-canal?gclid=CjwKCAjworfdBRA7EiwAKX9HeKffxQ0s03NVxRSMdIjiai5urptR1jgk4UNUNgPDGs1H6MqIh7epThoCadYQAvD_BwE

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Lansdown RV & Wade PM (2003) Ecology of the Floating Water-plantain, Conserving Natura 2000 Rivers Ecology Series No. 9. Available from: http://www.google.co.uk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=8&cad=rja&uact=8&ved=2ahUKEwih7M-MsefdAhXJC8AKHU6wCdsQFjAHegQIAxAC&url=http%3A%2F%2Fpublications.naturalengland.org.uk%2Ffile%2F111042&usg=AOvVaw3MVUAgiMRMAuZMaKA6jWkq

Natural England (2014), Site Improvement Plan, Rochdale Canal SAC. Available from: http://publications.naturalengland.org.uk/publication/6227629417955328

Appendix E. Estimate of motorway closures for each signed/unsigned diversion route that passes through the SPA

Table 3: Gantry Removals/Installations and Closures between J21-J23

Scheme Link	Structure Id	Closures Needing Diversion Routes Through SPA		
		Both Carriageways	Eastbound Carriageway	Westbound Carriageway
J21-J22	G2-01	0	0	0
	G2-02	3	0	0
	G2-03	0	1	0
	G2-04	0	0	1
	G2-05	1	0	1
	G2-06	0	1	0
	G2-07	0	0	1
	G2-08	1	1	1
	G2-09	1	1	0
	G2-10	1	0	1
	G2-11	0	1	0
	G2-12	1	1	1
	G2-13	0	1	0
	G2-14	0	1	0
	G2-15	0	0	1
	G2-16	1	1	0
	G2-17	0	2	0
	G2-18	2	0	0
	G2-19	0	2	0
	G2-20	1	0	0
J22-23	G3-01	0	0	1
	G3-02	0	0	1
	G3-03	0	0	1
	G3-04	0	2	0
	G3-05	0	0	2
	G3-06	0	0	1
	G3-07	0	1	0
	G3-08	0	0	2
	G3-09	0	0	1
	G3-10	0	2	0
	G3-11	0	0	2
	G3-12	0	2	0
	G3-13	0	0	1
	G3-14	0	1	0
	G3-15	0	0	2
	G3-16	1	1	0
	G3-17	0	1	0
	G3-18	0	0	1
	G3-19	0	2	0
	G3-20	0	1	0
	G3-21	0	0	2
	G3-22	0	2	0
	G3-23	0	0	1
	G3-24	0	1	0
	G3-25	0	2	0
	G3-26	0	0	1
	G3-27	0	1	0
	G3-28	0	0	2
	G3-29	0	1	0
	G3-30	2	0	0
Total Affecting SPA		**15**	**33**	**28**