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Habitats Regulations Assessment for the Bradford District Core Strategy (Proposed Modifications)

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Abbreviations

AA	Appropriate Assessment
BBS	Breeding Bird Survey
BoCC	Bird of Conservation Concern
CRoW Act	Countryside and Rights of Way Act 2001
Dph	Dwelling per hectare
DPD	Development Plan Document
FCT	Favourable Condition Tables
HRA	Habitats Regulations Assessment
IPENS	Improvement Programme for England's Natura 2000 Sites
IROPI	Imperative Reasons of Overriding Public Interest
LDF	Local Development Framework
Ml	Megalitres
Ml/d	Megalitres per day
NO_X	Oxides of nitrogen
RSS	Regional Spatial Strategy
SAC	Special Area of Conservation
SAMM	Strategic Access Management and Monitoring
SEGI	Site of Ecological or Geological Importance
SHLAA	Strategic Housing Land Availability Assessment
SIP	Site Improvement Plan
SPA	Special Protection Area
Sqm	Square metres
SSSI	Site of Special Scientific Interest
SPD	Supplementary Planning Document
WRMP	Water Resource Management Plan
WWTW	Waste Water Treatment Works

0 Executive Summary

0.1 Introduction

0.1.1 The City of Bradford Metropolitan District Council is preparing the Core Strategy Development Plan Document as part of the district's Local Plan. As an integral part of this process, the Council is undertaking a Habitats Regulations Assessment to ensure that the Core Strategy does not lead to adverse effects on the ecological integrity of internationally important habitats or species assemblages within or close to the district.

0.1.2 Habitats Regulations Assessment (HRA) is a requirement of the Conservation of Habitats and Species Regulations 2010 (as amended; commonly referred to as 'the Habitats Regulations'), and must be applied to any plan or project in England and Wales with the potential to adversely affect the ecological integrity of any sites designated for their nature conservation importance as part of a system known collectively as the Natura 2000 network of European sites.

0.1.3 The Council previously undertook a joint HRA screening assessment for the Draft Core Strategy and Draft Waste Management DPD (Environ, 2012) which found that the Core Strategy was considered likely to lead to significant effects on European sites in and around the district. Following this, a more detailed Appropriate Assessment (UEEC, 2013) of issues affecting the European sites was prepared, which assessed the impacts of the Further Engagement Draft Core Strategy and included preliminary recommendations for avoidance and mitigation.

0.1.4 A further iteration of the HRA Report (February 2014) provided an assessment of the Publication Draft Core Strategy (February 2014). It included analysis of baseline information gathered during a number of studies undertaken during 2013, including:

- Surveys of visitor activity within the SAC/SPA;
- Breeding bird surveys within 2.5km of the SAC/SPA; and
- Surveys of moorland fringe habitats.

0.1.5 A third iteration of the HRA Report (December 2014) included further analysis of the above data, particularly in relation to visitor surveys, and an element of review in response to the earlier consultation. The current HRA Report assesses the Core Strategy at the Proposed Modifications stage and addresses issues raised during the Examination in Public. Chapters 1, 2 and 5 introduce the Core Strategy, its HRA and the methods used in the assessment.

0.2 Scope of the Assessment

0.2.1 European sites considered within the scope of this assessment include all those identified during the earlier screening assessment as likely to be significantly affected by Core Strategy developments:

- South Pennine Moors SAC;
- South Pennine Moors Phase 2 SPA;
- North Pennine Moors SAC; and
- North Pennine Moors SPA.

0.2.2 These four European sites have been designated to conserve similar groups of upland habitats, wading birds and raptors, although there are some significant differences between them; see Chapters 3 and 4 for a review of qualifying habitats and species, and their conservation objectives.

0.3 Impact Pathways

0.3.1 The HRA screening assessment identified a range of likely significant effects on the North and South Pennine Moorlands that could result from the Core Strategy for Bradford district. This list has been reviewed and rationalised, with new impact categories added as part of the Appropriate Assessment procedure. Impact pathways now considered for likely significantly effects on the European sites are:

- Loss of supporting habitats (directly or indirectly);
- Increased water demand;
- Impacts on water quality;
- Increased emissions to air;
- Collision mortality risk and displacement due to wind turbine developments;
- Recreational impacts, including walkers, dogs, trampling and erosion; and
- A range of urbanisation impacts, including fly-tipping, invasive species, wildfire and increased predation.

0.3.2 Chapter 6 describes the available evidence about these impact pathways in relation to the North and South Pennine Moors.

0.4 Findings

0.4.1 Adverse effects resulting from wind turbine development, increased water demand or impacts on water quality are not considered likely for any of the four European sites.

0.4.2 Loss of supporting habitats and urbanisation impacts are unlikely to affect the North Pennine Moors SAC/SPA.

0.4.3 Loss of supporting habitats and urbanisation impacts are assessed as likely to affect the South Pennine Moors SAC/SPA, however, they are considered to be adequately avoided and mitigated by the policy response in Core Strategy Policy SC8.

0.4.4 Recreational impacts are assessed as potentially affecting any of the four sites, however, they are considered to be adequately avoided and mitigated by the Core Strategy policy response.

The distribution and magnitude of impacts differs between the four designated areas. Evidence is presented to indicate that, if left unmitigated, impacts are likely to be greater in relation to the South Pennine Moors sites due to their relative proximity to locations for future development and high levels of accessibility, a key influence on the numbers of people visiting the sites and associated impacts.

0.4.5 The likelihood of traffic-related atmospheric pollution affecting any of the four sites will be determined through more detailed traffic modelling during the pre-allocations testing stage.

0.4.6 Chapter 7 describes how the range of impacts has been assessed in relation to each site. Chapter 8 determines whether there would be adverse effects on ecological integrity.

0.5 Conclusions

0.5.1 To ensure that delivery and funding mechanisms for avoidance and mitigation measures are taken forward, the Council will produce a Supplementary Planning Document to guide implementation of the South Pennine Moors Zones of Influence Policy set out in Strategic Core Policy 8 in the Core Strategy (Proposed Modifications).

0.5.2 Taking into account the range of avoidance and mitigation measures incorporated into this strategic plan, it can be concluded that the Core Strategy (Proposed Modifications) will not result in adverse effects on the ecological integrity of the North Pennine Moors SAC and SPA, South Pennine Moors SAC and South Pennine Moors Phase 2 SPA. The Core Strategy can be considered compliant with the Habitats Regulations in respect of all four sites.

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1 Introduction

1.1 Background

1.1.1 The City of Bradford Metropolitan District Council is preparing the Core Strategy Development Plan Document (DPD) as part of the district's Local Plan. As an integral part of this process, the Council is undertaking a Habitats Regulations Assessment to ensure that the Core Strategy does not lead to adverse effects on the ecological integrity of internationally important habitats or species assemblages within or close to the district.

1.2 Requirement for Habitats Regulations Assessment

1.2.1 Habitats Regulations Assessment (HRA) is a requirement of the Conservation of Habitats and Species Regulations 2010 (as amended; commonly referred to as 'the Habitats Regulations'), the UK's transposition of European Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora ('the Habitats Directive').

1.2.2 Under Regulation 102, HRA must be applied to any land use plan in England and Wales with the potential to adversely affect the ecological integrity of sites designated for their nature conservation importance as part of a system known collectively as the Natura 2000 network of European sites.

1.2.3 European sites provide ecological infrastructure for the protection of rare, endangered or vulnerable natural habitats and species of exceptional importance within the European Union. These sites consist of Special Areas of Conservation (SAC, designated under the Habitats Directive) and Special Protection Areas (SPA, designated under European Council Directive 2009/147/EC on the conservation of wild birds ('the Birds Directive')). Meanwhile, the National Planning Policy Framework (DCLG, 2012) and Circular 06/05 (ODPM, 2005) require that Ramsar sites (UNESCO, 1971) are treated as if they are fully designated European sites for the purposes of considering development proposals that may affect them.

1.2.4 An HRA must determine whether or not a plan or project will adversely affect the integrity of the European site(s) concerned, in view of the site's conservation objectives.

1.3 Purpose and Structure of this Document

1.3.1 The Council previously undertook a joint HRA screening assessment for the Draft Core Strategy and Draft Waste Management DPD (Environ, 2012) which found that the Core Strategy was considered likely to lead to significant effects on European sites in and around the district. Following this, a more detailed Appropriate Assessment (UEEC, 2013) of issues affecting the European sites was prepared, which assessed the impacts of the Further Engagement Draft Core Strategy and included preliminary recommendations for avoidance and mitigation.

1.3.2 A second iteration of the HRA Report (February 2014) provided an assessment of the Publication Draft Core Strategy (February 2014). It included analysis of baseline information gathered during a number of studies undertaken during 2013, including:

- Surveys of visitor activity within the SAC/SPA;
- Breeding bird surveys within 2.5km of the SAC/SPA; and
- Surveys of moorland fringe habitats (UEEC, 2014).

1.3.3 A third iteration of the HRA Report (December 2014) included further analysis of the above data, particularly in relation to visitor surveys, and an element of review in response to the earlier consultation.

1.3.4 The current HRA Report assesses the Core Strategy at the Proposed Modifications stage and addresses issues raised during the Examination in Public. The findings of the report include information in relation to:

- **Chapter Two:** HRA methodology;
- **Chapter Three:** European site features and conservation objectives;
- **Chapter Four:** Baseline information about the European sites;
- **Chapter Five:** Core Strategy proposals, including incorporated mitigation measures;
- **Chapter Six:** Identifying impact pathways;
- **Chapter Seven:** Impact assessment;
- **Chapter Eight:** Determining whether there will be adverse effects on integrity; and
- **Chapter Nine:** Summary and conclusions.

2 Methodology

2.1 Guidance and Best Practice

2.1.1 Draft guidance on HRA has been defined by DCLG (2006) with more detailed draft guidance from Natural England (Tyldesley, 2009) and a range of other bodies[1]. More recently *The Habitats Regulations Assessment Handbook* (Tyldesley & Chapman, 2013) was developed to improve earlier methodologies on the basis of recent good practice and case law, and in response to Defra's Habitats and Birds Directives Implementation Review. The requirement for HRA stems from Articles 6(3) and 6(4) of the Habitats Directive, which are represented by four stages within the HRA process as listed in Table 2.1 which illustrates their relationship to stages within the DCLG (2006) guidance.

Table 2.1: Stages of HRA in guidance from Tyldesley & Chapman (2013) & DCLG (2006)

HRA Handbook stage	Equivalent DCLG stage
Stage 1: Screening	Task 1: Likely Significant Effects (Screening)
Stage 2: Appropriate Assessment & Integrity Test	Task 2: Ascertaining the effect on site integrity
Stage 3: Alternative Solutions	Task 3: Mitigation measures and alternative solutions
Stage 4: Imperative Reasons of Overriding Public Interest (IROPI) and Compensatory Measures	

2.1.2 In *The Habitats Regulations Assessment Handbook* (Tyldesley & Chapman, 2013) section F.1.1.2 (Introduction and overview to 'Plan' assessment) it is recognised that the assessment of a plan may not be as precise and detailed as that of a project at application stage. Plans, and in particular strategic plans such as a core strategy, also vary in their degree of specificity ranging from very general statements which may cover a wide geographic area to more prescriptive proposals that are scale and location specific.

2.1.3 An HRA must determine whether or not a plan or project will adversely affect the integrity of the European site(s) concerned, in view of the site's conservation objectives. Where adverse effects are anticipated changes must be made to the plan or project. The process is characterised by application of the precautionary principle, defined as (European Commission, 2000a):

> *"If a preliminary scientific evaluation shows that there are reasonable grounds for concern that a particular activity might lead to damaging effects on the environment, or on human, animal or plant health, which would be inconsistent with the protection normally afforded to these within the European Community, the Precautionary Principle is triggered.*

[1] For example European Commission (2001) and RSPB (Dodd *et al*, 2007)

"Decision-makers then have to determine what action to take. They should take account of the potential consequences of taking no action, the uncertainties inherent in the scientific evaluation, and they should consult interested parties on the possible ways of managing the risk. Measures should be proportionate to the level of risk, and to the desired level of protection. They should be provisional in nature pending the availability of more reliable scientific data.

"Action is then undertaken to obtain further information enabling a more objective assessment of the risk. The measures taken to manage the risk should be maintained so long as the scientific information remains inconclusive and the risk unacceptable."

2.2 Counteracting Measures

2.2.1 This section draws on Principle C.5 of the HRA Handbook (Tyldesley & Chapman, 2013) to identify different types of counteracting measure and describe how they should be considered within the HRA. There is a well-established policy and ethical approach to assessment which recognises a hierarchy of counteracting measures, which prefers avoidance of adverse effects in the first instance, then cancellation, then reduction, and finally compensatory measures where these can be adequately justified. This approach is embedded in guidance (e.g. CIEEM, 2006), professional standards (BS42020:2013) and the National Planning Policy Framework (para. 118; DCLG, 2012).

2.2.2 A distinction must be drawn between measures intended to avoid, cancel or reduce adverse effects on European sites (collectively referred to as mitigation measures) and those which are intended to compensate for adverse effects (compensatory measures); the latter must only be considered following application of the Imperative Reasons of Overriding Public Interest test:

- Mitigation: Avoidance measures: intended to stop or prevent effects from occurring, or to eliminate the risk of them occurring. Successful avoidance measures mean there will be no adverse effect, and hence no requirement to assess effects in combination.
- Mitigation: Cancellation measures: intended to completely neutralise adverse effects. In this context a proposal will have a potential effect, but its potentially negative outcomes have been cancelled without residual effect, and there is no requirement to assess effects in combination.
- Mitigation: Reduction measures: intended to diminish an effect either by reducing the scale of the effect, or its likelihood of occurring, or both. Such measures can reduce the severity/likelihood of an effect to the point where it can no longer be regarded as a likely significant effect, but may result in a risk of residual effects. Residual effects need to be considered for their potential to lead to cumulative or in combination effects.
- Compensatory measures: intended to offset the harm to the integrity of a European site that would occur as a result of a plan or project. They are considered only after having established that the harm to the site itself cannot be further reduced by mitigation or alternative solutions, and are the measures required to ensure that the overall coherence of Natura 2000 is protected.

2.2.3 Mitigation measures proposed by the plan maker must be incorporated into the plan so that they are inseparable parts of it and are guaranteed to be delivered. Mitigation measures of this kind are referred to as '*incorporated mitigation measures*'. Where they are effective, reliable, timely, guaranteed and of sufficient duration they should be taken into account throughout the HRA process, including the screening stage. A competent authority can impose '*additional mitigation measures*' over and above incorporated mitigation, if necessary, so as to ensure that a plan or project would not adversely affect the integrity of a European site, either alone or in combination with other plans and projects. Additional mitigation measures must be considered at the integrity test stage (Stage 2) but should not be relied upon during screening.

2.3 Screening

2.3.1 All proposed policies were screened for likely significant effects on European sites. Chapter 3 defines which European sites are considered during the assessment, while Chapter 4 presents baseline information about the sites' qualifying features. The ways in which each site might be significantly affected by proposed Core Strategy policies are described in Chapter 5.

2.3.2 *The Handbook* defines a list of 'screening categories' to provide a rigorous and transparent approach to determining which aspects of the plan could potentially result in significant (adverse) effects. These are listed in Table 2.2, where green indicates that the proposal can be screened-out, orange denotes proposals which may have a significant effect in combination and require further analysis, and red specifies proposals likely to have a significant effect. The colour-coded categories provide the means of recording the results of the assessment in such a way that important issues are identified whilst policies that have no effect are screened out.

Table 2.2: Screening categories (Source: Tyldesley & Chapman, 2013)

Cat.	Description
A	General statement of policy / aspiration
B	Policy listing general criteria for testing the acceptability / sustainability of proposals
C	Proposal referred to but not proposed by the plan
D	Environmental protection / site safeguarding policy
E	Policy/proposal steers change in such a way as to protect European sites from adverse effects
F	Policy that cannot lead to development or other change
G	Policy/proposal that could not have any conceivable effect on a European site
H	Policy/proposal the (actual or theoretical) effects of which cannot undermine the conservation objectives (either alone or in combination with other aspects of this or any other plan/project)
I	Policy/proposal with a likely significant effect on a European site alone
J	Policy/proposal with an effect on a site but not likely to be significant alone; check for likely significant effects in combination
K	Policy/proposal not likely to have a significant effect either alone or in combination (after the in combination test)
L	Policy/proposal likely to have a significant effect in combination (after the in combination test)

2.3.3 Acknowledging that the Core Strategy is not directly connected with or necessary to management of the sites for nature conservation, the initial HRA screening assessment (Environ, 2012) predicted a range of likely significant effects from the Core Strategy for Bradford district. The screening results were re-visited during each subsequent stage of HRA (UEEC, 2013, February 2014 and December 2014). Appendix I presents the findings of the revised screening exercise for the Core Strategy (Proposed Modifications), taking account of incorporated mitigation measures which are described at section 5.3.

2.4 The Appropriate Assessment Stage

2.4.1 The purpose of the Appropriate Assessment is to further analyse likely significant effects identified during the screening stage, as well as any effects which were uncertain or not well understood and taken forward for assessment in accordance with the precautionary principle. The Appropriate Assessment evaluates the implications of the plan, either alone or in combination with other plans or projects, in view of the conservation objectives. The Appropriate Assessment is presented at Chapter 7 and draws on the information presented in earlier chapters.

2.4.2 The Appropriate Assessment stage includes a test of whether the plan proposals will result in significant adverse effects on site integrity (presented at Chapter 8) which can be defined as:

> *"The integrity of a site is the coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified."* (ODPM, 2005)

2.5 In Combination Effects

2.5.1 Other plans and projects being prepared or implemented in the area may have the potential to cause negative effects on the integrity of European sites. These effects may act in combination with the effects of the Core Strategy, possibly leading an insignificant effect to become significant. It is therefore important to consider which other plans and projects could generate similar effects as development within Bradford district, at the same European sites, and which may act in-combination. The following plans or projects could act in combination:

- Bradford Metropolitan District Council Waste Management DPD (Preferred Option stage);
- Burnley Borough Council Emerging Local Plan;
- Craven District Council Draft New Local Plan;
- Calderdale Metropolitan Borough Council Emerging Local Plan;
- Harrogate Borough Council Emerging District Local Plan;
- Leeds City Council Adopted Core Strategy;
- Pendle Borough Council Pre Submission Core Strategy; and
- West Yorkshire Local Transport Plan 2011 – 2026.

2.5.2 In combination effects are considered in Chapters 5 and 7.

3 European Site Features and Conservation Objectives

3.1 Scope of the Assessment

3.1.1 Each European site has its own intrinsic qualities, besides the habitats or species for which it has been designated, that enable the site to support the ecosystems that it does. For example, an intrinsic quality of any European site is its functionality at the landscape ecology scale; in other words, how the site interacts with the zone of influence of its immediate surroundings, as well as the wider area.

3.1.2 Hence the ecological integrity of a site is influenced by natural and human-induced activities in the surrounding environment. This is particularly the case where there is potential for development to take land, generate water- or air-borne pollutants, use water resources or otherwise affect water levels, or involve an extractive or noise emitting use. Adverse effects may also occur via impacts to mobile species occurring outside of a designated site but which are qualifying features of the site. For example, there may be effects on protected birds that use land outside the designated site for foraging or roosting.

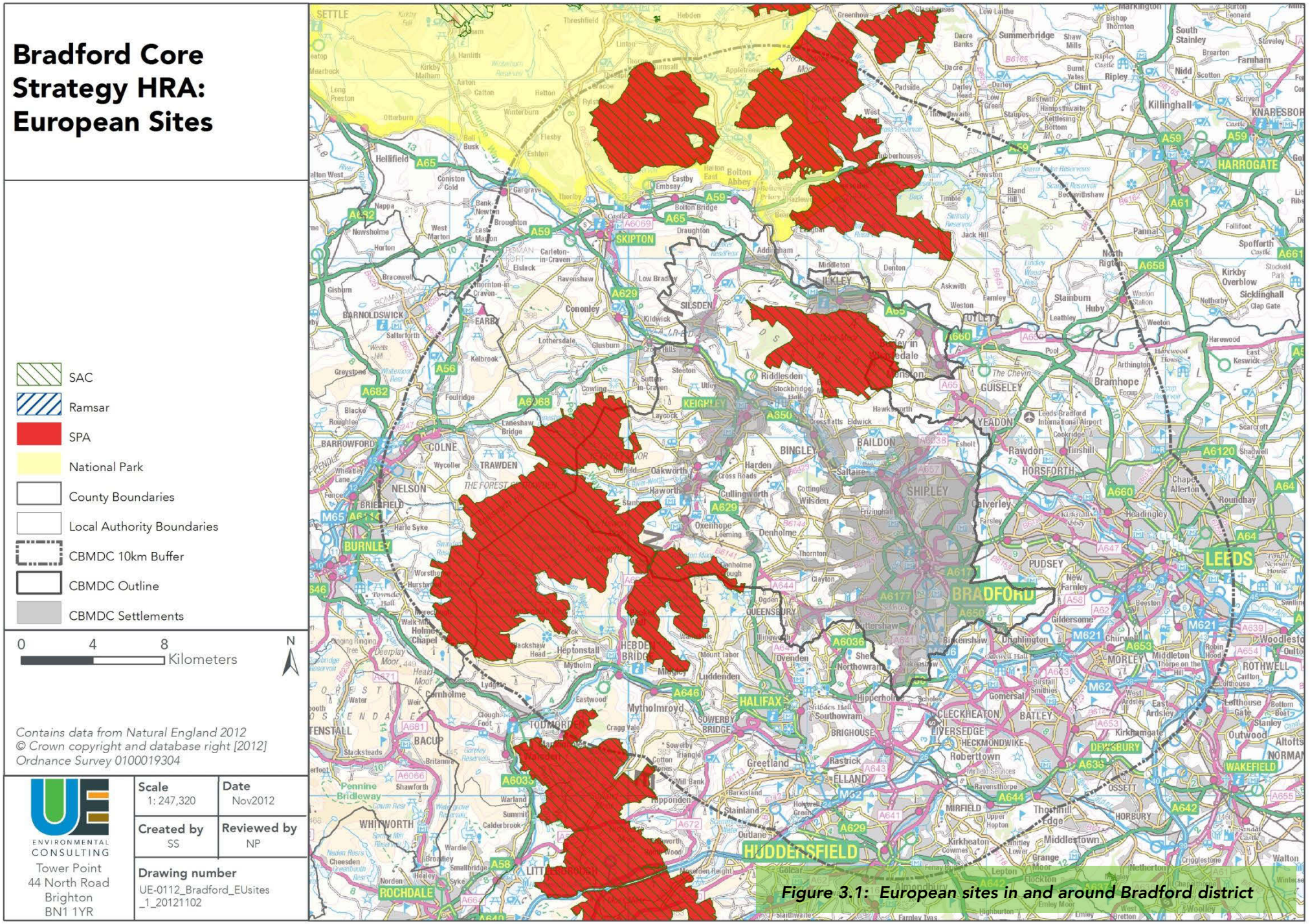
3.1.3 European sites considered within the scope of this assessment include all those identified during the earlier screening assessment (Environ, 2012) as likely to be significantly affected by Core Strategy developments, as shown on Figure 3.1 and listed below:

- South Pennine Moors SAC;
- South Pennine Moors Phase 2 SPA;
- North Pennine Moors SAC; and
- North Pennine Moors SPA.

3.1.4 These four European sites have been designated to conserve similar groups of upland habitats, wading birds and raptors, although there are some significant differences between them. Table 3.1 identifies the qualifying features of each site. The qualifying features are listed on the original citation submitted to the European Commission at the time of designation / classification, and with the conservation objectives published on the Natural England website.

3.1.5 The following sections provide a description of the features for which each European site has been classified or designated. Chapter 4 goes on to provide more detailed information regarding the disposition of these features in the vicinity of Bradford.

Bradford Core Strategy HRA: European Sites



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Scale	Date
1: 247,320	Nov2012
Created by	**Reviewed by**
SS	NP

Drawing number
UE-0112_Bradford_EUsites_1_20121102

Figure 3.1: European sites in and around Bradford district

Table 3.1: European site qualifying features

South Pennine Moors SAC	South Pennine Moors Phase 2 SPA	North Pennine Moors SAC	North Pennine Moors SPA
Annex I Habitats (primary) ▪ 4030 - European dry heaths ▪ 7130 - Blanket bogs * Priority feature ▪ 91A0 - Old sessile oak woods with Ilex and *Blechnum* in the British Isles Annex I Habitats (not primary) ** ▪ 4010 - Northern Atlantic wet heaths with *Erica tetralix* ▪ 7140 - Transition mires and quaking bogs *Source: JNCC website*	Article 4.1: Annex I Birds (breeding) ▪ A098 – Merlin *Falco columbarius* ▪ A140 - Golden Plover *Pluvialis apricaria* Article 4.2: Regularly occurring migratory birds – internationally important assemblage of breeding birds ▪ Common Sandpiper *Actitis hypoleucos* ▪ Short-eared Owl *Asio flammeus* ▪ Dunlin *Calidris alpina schinzii* ▪ Twite *Carduelis flavirostris* ▪ Common Snipe *Gallinago gallinago* ▪ Curlew *Numenius arquata* ▪ Northern Wheatear *Oenanthe oenanthe* ▪ Golden Plover *Pluvialis apricaria* ▪ Whinchat *Saxicola rubetra* ▪ Redshank *Tringa totanus* ▪ Ring Ouzel *Turdus torquatus* ▪ Lapwing *Vanellus vanellus* *Source: SPA citation*	Annex I Habitats (primary) ▪ 4030 - European dry heaths ▪ 5130 - *Juniperus communis* formations on heaths or calcareous grasslands ▪ 7130 - Blanket bogs * Priority feature ▪ 7220 - Petrifying springs with tufa formation (*Cratoneurion*) * Priority feature ▪ 8220 - Siliceous rocky slopes with chasmophytic vegetation ▪ 91A0 - Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles Annex I Habitats (not primary) ** ▪ 4010 - Northern Atlantic wet heaths with *Erica tetralix* ▪ 6130 - Calaminarian grasslands of the *Violetalia calaminariae* ▪ 6150 - Siliceous alpine and boreal grasslands ▪ 6210 - Semi-natural dry grasslands and scrubland facies: on calcareous substrates (*Festuco-Brometalia*) ▪ 7230 - Alkaline fens ▪ 8110 - Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*) ▪ 8210 - Calcareous rocky slopes with chasmophytic vegetation Annex II Species ** ▪ 1528 - Marsh saxifrage *Saxifraga hirculus* *Source: JNCC website*	Article 4.1: Annex I Birds (breeding) ▪ A082 -Hen Harrier *Circus cyaneus* ▪ A098 – Merlin *Falco columbarius* ▪ A103 - Peregrine Falcon *Falco peregrinus* ▪ A140 - Golden Plover *Pluvialis apricaria* ▪ Article 4.2: Regularly occurring migratory birds – internationally important assemblage of breeding birds ▪ No species are listed on the North Pennine Moors SPA citation as qualifying under Article 4.2 *Source: SPA citation*

* Denotes priority feature

** Present as a qualifying feature but not a primary reason for site selection

3.2 South Pennine Moors Phase 2 SPA

3.2.1 The South Pennine Moors were designated as SPA in two phases in 1996 and 1997 and were further extended in 2000. This assessment focuses on the South Pennine Moors Phase 2 SPA only[2]. The site covers an area of some 20,937ha. It incorporates three component Sites of Special Scientific Interest (SSSI), including the South Pennine Moors SSSI, The Dark Peak SSSI and Standedge Road Cutting SSSI. It includes the major moorland areas of the northern South Pennines from Ilkley in the north to Chase Moss and Pule Hill near Marsden in the south. It covers extensive expanses of semi-natural moorland habitat including upland heath and blanket mire.

3.2.2 The SPA is of European importance for several upland breeding bird species, including birds of prey and waders. Both Merlin *Falco columbarius* and Golden Plover *Pluvialis apricaria* feed upon farmland or in-bye land on the edge of the moors that is outside of the SPA boundary; this is considered important to the long term conservation of the SPA population of these birds. 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.

3.2.3 The South Pennine Moors Phase 2 SPA qualifies under Article 4.1[3] of the Birds Directive (2009/147/EC) by supporting breeding populations of European importance of the following species listed on Annex 1 of the Directive. Population numbers and significance are at time of designation unless otherwise stated:

- Merlin: 28 pairs representing at least 4.3% of the breeding population of Great Britain; and
- Golden Plover: 292 pairs representing at least 1.2% of the breeding population of Great Britain.

3.2.4 The subsequent JNCC review, published in 2001, found that Peregrine Falcon *Falco peregrinus*, Short-eared Owl *Asio flammeus* and Dunlin *Calidris alpine schinzii* were also present in qualifying numbers.

3.2.5 The site also qualifies under Article 4.2[4] of the Birds Directive by supporting internationally important breeding populations of the following regularly occurring migratory species:

- Common Sandpiper, Short-eared Owl, Dunlin, Twite, Common Snipe, Curlew, Wheatear, Golden Plover, Whinchat, Redshank, Ring Ouzel and Lapwing.

[2] The Peak District Moors (South Pennine Moors Phase 1) SPA is around 16.5km south of Bradford district at its nearest extent. It is considered to be a separate legal entity with its own citation, qualifying features and conservation objectives (which are not the same as those for South Pennine Moors Phase 2 SPA) and is not considered further in this assessment.

[3] Article 4.1 relates to populations of birds listed on Annex I of the Birds Directive.

[4] Article 4.2 relates to regularly occurring migratory species not listed on Annex I.

3.3 North Pennine Moors SPA

3.3.1 The North Pennine Moors SPA extends north from the Ribble-Aire corridor (Skipton) to the Tyne Gap (Hexham) incorporating the Pennine moorland massif within the local authorities of North Yorkshire, Cumbria, Durham and Northumberland. It extends to a total of 147,246 hectares and encompasses extensive tracts of moorland habitat. It is important for several upland breeding bird species including waders and birds of prey.

3.3.2 The North Pennine Moors SPA qualifies under Article 4.1 of the Birds Directive by supporting breeding populations of the following species listed on Annex I of the Directive:

- Hen Harrier *Circus cyaneus:* 11 pairs representing at least 2.2% of the breeding population of Great Britain (count as at 1993 and 1994);
- Merlin: 136 pairs representing at least 10.5% of the breeding population of Great Britain (count as at 1993 and 1994);
- Peregrine: 15 pairs representing at least 1.3% of the breeding population of Great Britain (count as at 1991); and
- Golden Plover: 1,400 pairs representing at least 6.2% of the breeding population in Great Britain (population minimum based on densities recorded 1960-1993).

3.3.3 The 2001 JNCC review found that Dunlin and Curlew *Numenius arquata* were also present in qualifying numbers. No species were listed in the original SPA citation as qualifying under Article 4.2.

3.4 South Pennine Moors SAC

3.4.1 The South Pennine Moors SAC was selected for its representation of three Annex 1 habitat types (European dry heaths, Blanket bogs, and Old sessile oak woodlands) while a further two were subsequently identified as being present as qualifying features within the SAC (Northern Atlantic wet heaths, and Transition mires and quaking bogs). These vegetation communities are described in detail in Chapter 4.

3.5 North Pennine Moors SAC

3.5.1 The North Pennine Moors SAC was selected for a total of six Annex 1 habitat types. A further seven habitat types were subsequently identified as being present as qualifying features. Four of the Annex 1 habitat types are the same as those within the South Pennine Moors SAC; Blanket bog, Dry heath, Northern Atlantic wet heath and Old sessile oak woodland. In addition to these extensive habitat types, the North Pennine Moors SAC also contains examples of a number of more localised Annex 1 habitat types:

- *Juniperus communis* formations on heaths or calcareous grasslands;
- Petrifying springs with tufa formation (*Cratoneurion*) * Priority feature*;
- Siliceous rocky slopes with chasmophytic vegetation;

- Calaminarian grasslands of the *Violetalia calaminariae;*
- Siliceous alpine and boreal grasslands;
- Semi-natural dry grasslands and scrubland facies: on calcareous substrates (*Festuco-Brometalia*);
- Alkaline fens;
- Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*); and
- Calcareous rocky slopes with chasmophytic vegetation.

3.5.2 Marsh saxifrage (*Saxifraga hirculus*) is also present as a qualifying Annex II species. The distribution of many of these upland habitats is associated with calcareous and other rocky outcrops and heavy metal contaminated soils found further north in the Pennines and are not considered likely to be affected by proposals within the Bradford Core Strategy.

3.6 Conservation Objectives

3.6.1 The Habitats Directive requires that Member States maintain or where appropriate restore habitats and species populations of European importance to favourable conservation status. Guidance from the EC (2000b; p.19) states: *"The conservation status of natural habitat types and species present on a site is assessed according to a number of criteria established by Article 1 of the Directive. This assessment is done both at site and network level".* In the UK, the term favourable condition has been used to differentiate the status of habitats and species populations on a given site, as compared to that of the wider network of European sites.

3.6.2 Regulation 102[5] requires that an Appropriate Assessment is made of the implications for each site in view of the site's conservation objectives. To make such an assessment, it is necessary to understand in more detail the features of the sites that contribute to their favourable condition or conservation status. Natural England has published detailed Favourable Condition Tables (FCT) in which various attributes of the habitat and species populations are defined for assessing site condition. These have been developed from the definition of Favourable Conservation Status provided in Article 1 of the Habitats Directive (**Box 1** overleaf).

3.6.3 The above descriptions of qualifying Annex 1 habitat types within the two SAC identifies a number of habitats, particularly within the North Pennine Moors SAC, that are not likely to be affected by policies within the Bradford Core Strategy. Conservation Objectives for the two SAC are therefore confined within this HRA to the following four habitat types:

- European dry heaths;
- Blanket bogs;
- Northern Atlantic wet heaths with *Erica tetralix*; and
- Transition mires and quaking bogs.

[5] Conservation of Habitats and Species Regulations 2010.

3.6.4 In addition to those habitats that are not likely to be affected by the Bradford Core Strategy, the location of the Annex II species marsh saxifrage is within the Yorkshire Dales National Park and is not likely to be affected.

Box 1: Extract from Managing Natura 2000 Sites (EC, 2000)

Conservation status is defined in Article 1 of the Habitats Directive. For a **natural habitat**, Article 1(e) specifies that it is: '*the sum of the influences acting on a natural habitat and its typical species that may affect its long-term natural distribution, structure and functions as well as the long-term survival of its typical species …*'.

For a species, Article 1(i) specifies that it is: '*the sum of the influences acting on the species concerned that may affect the long-term distribution and abundance of its population …*'

The Member State has therefore to take into account all the influences of the environment (air, water, soil, territory) which act on the habitats and species present on the site.

Favourable conservation status is also defined by Article 1(e) for natural habitats and Article 1(i) for species.

For a **natural habitat**, it occurs when:

- '*its natural range and areas it covers within that range are stable or increasing;*
- *the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future; and*
- *the conservation status of its typical species is favourable*'.

For a **species**, it occurs when:

- '*the population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats;*
- *the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future; and*
- *there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis*'.

The favourable conservation status of a natural habitat or species has to be considered across its natural range, according to Articles 1(e) and 1(i), i.e. at biogeographical and, hence, Natura 2000 network level. Since, however, the ecological coherence of the network will depend on the contribution of each individual site to it and, hence, on the conservation status of the habitat types and species it hosts, the assessment of the favourable conservation status at site level will always be necessary.

The conservation status of natural habitat types and species present on a site is assessed according to a number of criteria established by Article 1 of the Directive. This assessment is done both at site and network level.

Conservation objectives of the South Pennine Moors Phase 2 SPA and North Pennine Moors SPA

3.6.5 With regard to the South Pennine Moors Phase 2 SPA and North Pennine Moors SPA, and the individual species and/or assemblage of species for which the sites were classified (the Qualifying Features as listed at Table 3.1), an over-riding conservation objective has been defined by Natural England as:

> *"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."*

3.6.6 For the populations of birds within the two SPA, favourable conservation status can be defined by reference to article 1(i) (Box 1). Conservation objectives for the South Pennine Moors Phase 2 SPA and North Pennine Moors SPA are therefore, subject to natural change, to maintain or restore the:

- **Objective 1:** Extent and distribution of the habitats of the qualifying features;
- **Objective 2:** Structure and function of the habitats of the qualifying features;
- **Objective 3:** Supporting processes on which the habitats of the qualifying features rely;
- **Objective 4:** Populations of the qualifying features; and
- **Objective 5:** Distribution of the qualifying features within the site.

Conservation objectives of the South Pennine Moors SAC and North Pennine Moors SAC

3.6.7 With regard to the South Pennine Moors SAC and North Pennine Moors SAC, and the natural habitats and/or species for which the sites were designated (the Qualifying Features as listed at Table 3.1), an over-riding conservation objective has been defined by Natural England as:

> *"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."*

3.6.8 For the SAC habitats that might be affected by policies within the Bradford Core Strategy (listed in section 3.6.3), favourable conservation status can be defined by reference to article 1(e) (Box 1). Conservation objectives for the South Pennine Moors SAC and North Pennine Moors SAC are therefore, subject to natural change, to maintain or restore the:

- **Objective 6:** Extent and distribution of the qualifying natural habitats;
- **Objective 7:** Structure and function (including typical species) of the qualifying natural habitats. A list of some of the typical species associated with the habitat types is given in Table 3.2; and
- **Objective 8:** Supporting processes on which the qualifying natural habitats rely.

3.6.9 From consideration of the distribution of qualifying habitats and species within the North Pennine Moors SAC (sections 3.5 and 4.3), it has been concluded that only those habitats that also occur within the South Pennine Moors SAC should be considered within the context of Objectives 6 - 8.

3.6.10 In relation to Conservation Objective 7 above, it is important to emphasise that typical species are used to help in assessing impacts on the structure and function of Annex 1 habitat types in accordance with Conservation Objective 7 and should not be regarded as equivalent to Annex II species for which an SAC can be selected, or confused with species for which the SPA have been classified. Some of the species typical of the Annex 1 habitats for the SAC were designated are listed in Table 3.2.

Table 3.2: Some of the typical species of Annex 1 habitat types present with SAC

Annex I Habitat Type	SAC in which it occurs	Typical species
4030 European dry heaths	South Pennine Moors SAC North Pennine Moors SAC	Birds Red Grouse *Lagopus lagopus scoticus*, Skylark *Alauda arvensis*, Meadow Pipit *Anthus pratensis* Invertebrates Bilberry Bumblebee *Bombus monticol* Plants Bilberry *Vaccinum myrtillus*, Crowberry *Empetrum nigrum ssp. nigrum*, Cowberry *Empetrum vitus-idaea*, Heather *Calluna vulgaris*, Bell Heather *Erica cinerea*
4010 Northern Atlantic wet heath with *Erica tetralix*	South Pennine Moors SAC North Pennine Moors SAC	Birds Curlew *Numenius arquata* Plants Heather, Cross-leaved Heath *Erica tetralix*, Deer Grass *Trichophorum cespitosum*, Bog Asphodel *Narthecium ossifragum*
7130 Blanket bogs *Priority feature*	South Pennine Moors SAC North Pennine Moors SAC	Birds Dunlin *Calidris alpina schinzii*, Golden Plover *Pluvialis apricaria* Plants Common Cotton-grass *Eriophorum angustifolium*, Hare's Tail Cotton-grass *Eriophorum vaginatum*, bog mosses *Sphagnum spp.*
7140 Transition mires and quaking bogs	South Pennine Moors SAC	Plants Bottle Sedge *Carex rostrata*, bog mosses

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4 European Site Characterisation

4.1 SPA Bird Populations and Ecology

4.1.1 The following summaries have been adapted from the UK SPA Review, published by the Joint Nature Conservancy Committee (JNCC; 2001), together with a review of other available literature on the behaviour and ecology of these species.

Golden Plover

4.1.2 Golden Plovers are ground nesting birds, breeding on heather moorland, blanket bog, acidic grasslands and montane summits, where they prefer to nest on high, flat or gently sloping plateaux, away from the moorland edge. Adjacent pastures with abundant earthworms and cranefly larvae are important for feeding adults, and chicks may be moved up to 2 km or more to feed in marshy areas rich in invertebrate food (Byrkjedal & Thompson, 1998)[6]. Breeding densities generally vary from 2–7 pairs/km^2, but exceptionally have been recorded at 16 pairs/km^2 (Ratcliffe, 1976)[7]. Densities in Great Britain are some of the highest within the range (Byrkjedal & Thompson, 1998).

4.1.3 In Europe, breeding occurs through Iceland, Scandinavia, and the Baltic States, northern Russia and in northern/upland parts of Britain and Ireland. 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 (Ratcliffe, 1976; Gibbons *et al.*, 1993[8]). In Ireland, the species breeds mainly in the northern and western uplands. Two-thirds of the British and Irish breeding population occur in Scotland. The English and Welsh populations breed at the southern edge of the species' global range (Gibbons *et al.*, 1993; Byrkjedal & Thompson, 1998).

4.1.4 The South Pennine Moors Phase 2 SPA is one of several in the UK that have been selected for their populations of breeding Golden Plover. Other sites and their populations are shown in Table 4.1.

4.1.5 Breeding Golden Plover populations have been adversely affected by loss of habitat from agricultural improvement and forestry development. A decline in Grouse moor management and associated keepering has also been implicated in declines in some upland areas. Numbers in Britain during the 1980s were estimated at 22,600 pairs, compared with 29,400 during 1968–1972 (Gibbons *et al.*, 1993).

[6] Byrkjedal, I. & Thompson, D.B.A. 1998. *Tundra Plovers. The Eurasian, Pacific and American Golden Plovers and Grey Plover*. London, T. & A.D. Poyser. 422 pp.

[7] Ratcliffe, D.A. 1976. Observations on the breeding of the Golden Plover in Great Britain. *Bird Study* **23**: 63-116.

[8] Gibbons, D.W., Reid, J.B. & Chapman, R.A. 1993 *The New Atlas of Breeding Birds in Britain and Ireland: 1988–1991*. London, T. & A.D. Poyser. 520 pp.

4.1.6 The 2005 South Pennine Moors Phase 2 SPA breeding bird survey identified a total of 132 Golden Plover registrations within 5km of settlement boundaries within Bradford. Fourteen of these registrations were from Rombalds/Ilkley Moor with the majority being located on the moors to the south and west of Haworth and Oxenhope. A repeat survey in 2014 found 121 Golden Plover territories within 5km of settlements, 40 of which were from Rombalds Moor; see Figure 4.1 and Figure 4.2. Data on the proximity of breeding Golden Plover to settlement boundaries within the North Pennine Moors SPA boundary is not available.

Table 4.1: SPA selected for their populations of breeding Golden Plover and proportion of the national and biogeographic population they support

Site name	Site total	% biogeographic pop.[9]	% of national pop.
Caithness and Sutherland Peatlands	1,064	0.2	4.7
Lewis Peatlands	1,978	0.4	8.8
Muirkirk and North Lowther Uplands	175	<0.1	0.8
North Pennine Moors	1,400	0.3	6.2
North York Moors	526	0.1	2.3
Pettigoe Plateau (NI)	12	<0.1	3.0 (Ire)
South Pennine Moors[10]	752	0.2	3.3
TOTAL	**5,907**	**1.2%**	**26.1%** **3.0% (Ire)**

4.1.7 A study undertaken by Whitfield and Thomas for Scottish Natural Heritage in 2006[11] centred on the use of moorland fringe fields by golden plover in east Sutherland around the Caithness and Sutherland Peatlands SPA, Scotland. They found golden plover moving up to 6km from the SPA boundary to feed (range 1–5,994m, mean 1,922 ± 1,387m). In the pre-breeding period and during incubation, adult birds flew an average of 2.7km to feed on fields (range 0.4–10.7km) with strong fidelity within and across years to the same field and parts of a field.

4.1.8 The use of moorland fringe habitats in other locations is also reviewed by Whitfield and Thomas (2006). They refer to two studies in northern England, (Whittingham *et al.*, 2000[12]; Pearce-Higgins & Yalden, 2003[13]).

[9] Numbers breeding in Europe (Iceland, Scandinavia, and the Baltic States, northern Russia and northern/upland parts of Britain and Ireland).

[10] The figures quoted for the South Pennine Moors relate to both Phases 1 and 2 of the classification.

[11] Whitfield, D. P. & Thomas, C. J. (2006). *Analysis of a survey of golden plover around the Caithness and Sutherland Peatlands Special Protection Area*. Scottish Natural Heritage Commissioned Report No. 181 (ROAME No. F01LB205/5.

[12] Whittingham, M.J., Percival, S.M. & Brown, A.F. (2000). Time budgets and foraging of breeding goldenplover *Pluvialis apricaria*. *Journal of Applied Ecology*, **37**, 632–646.

[13] Pearce-Higgins, J.W. & Yalden, D.W. (2003). Variation in the use of pasture by breeding European golden plovers *Pluvialis apricaria* in relation to prey availability. *Ibis*, **145**, 365–381.

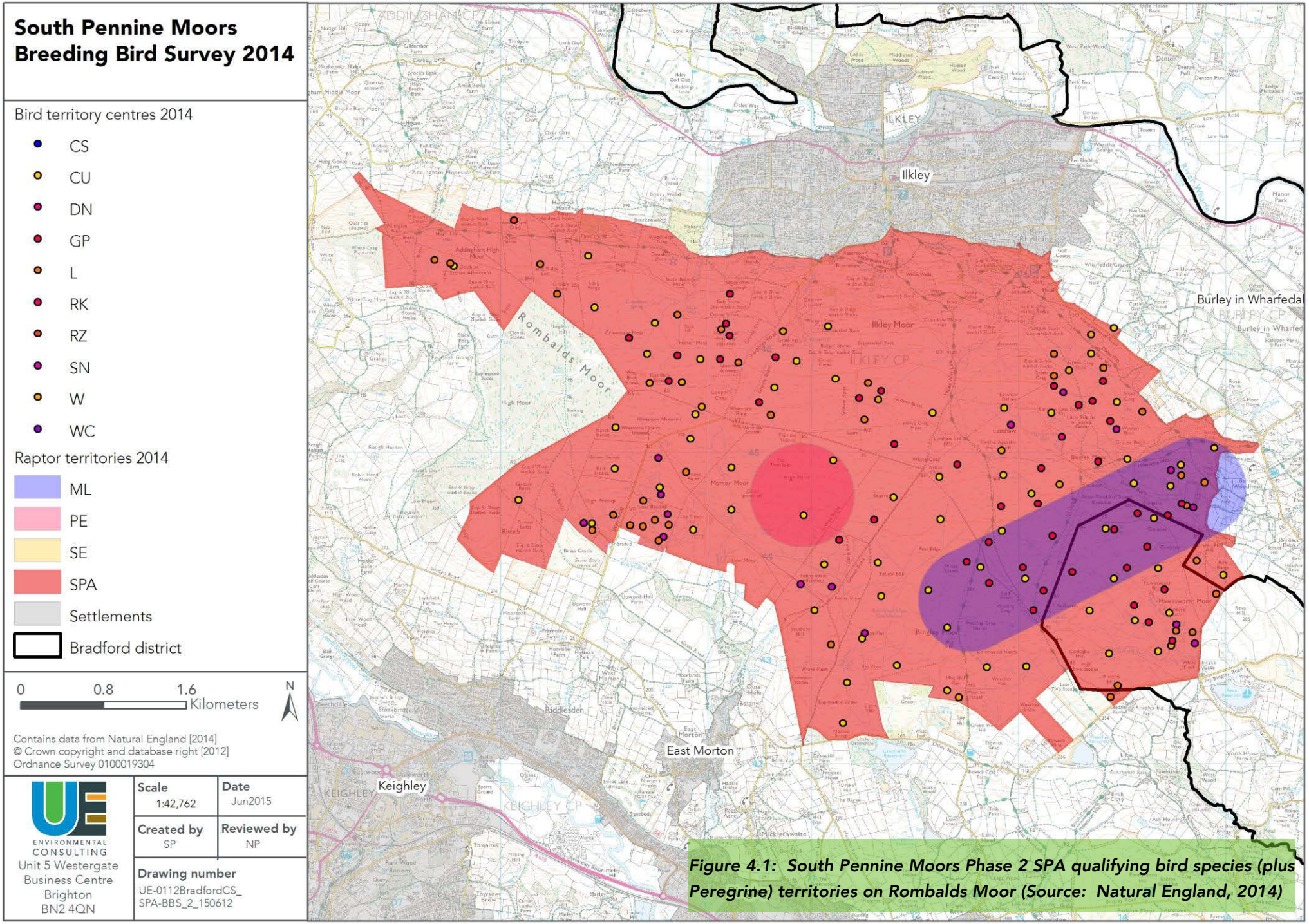

Figure 4.1: South Pennine Moors Phase 2 SPA qualifying bird species (plus Peregrine) territories on Rombalds Moor (Source: Natural England, 2014)

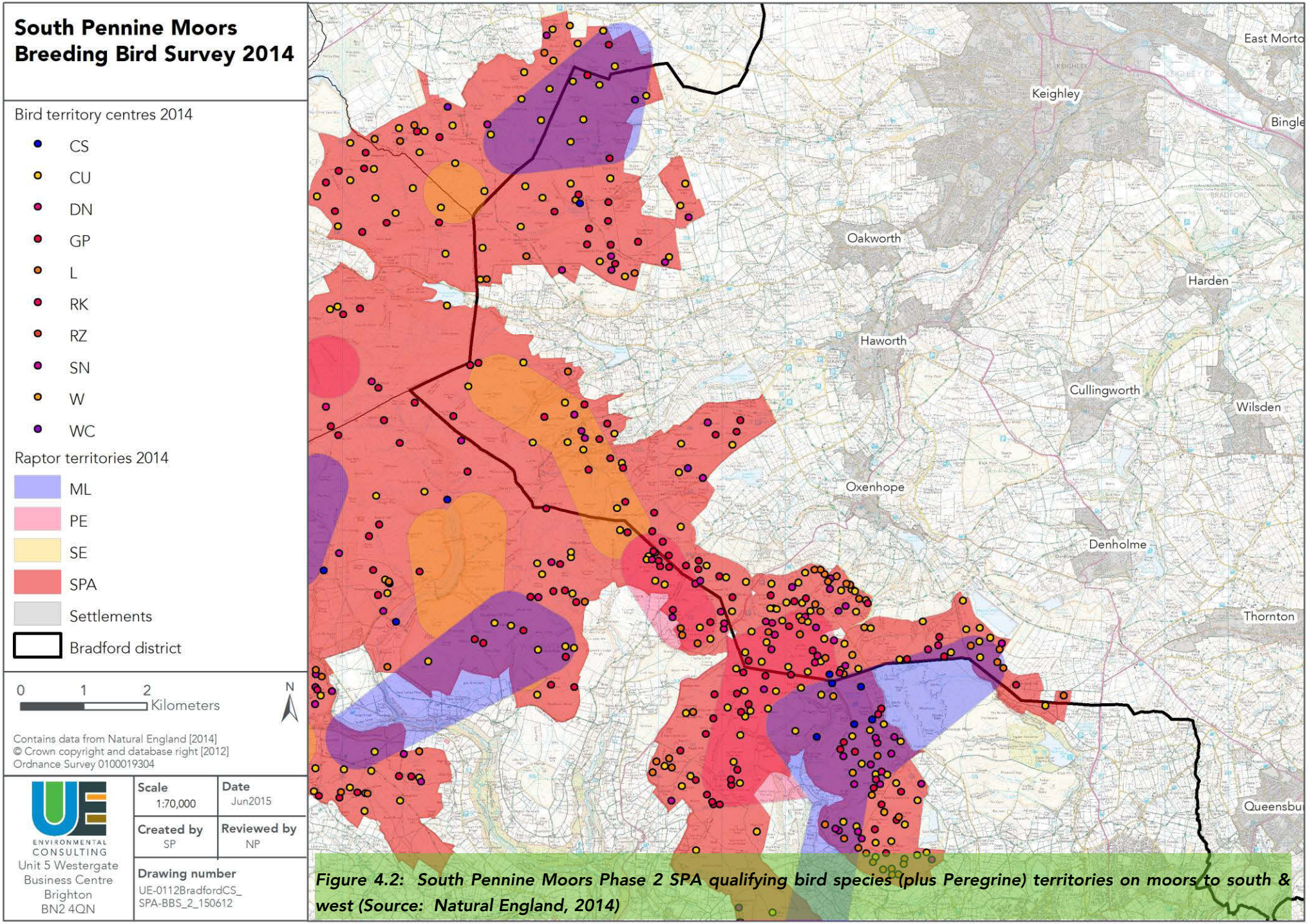

Figure 4.2: South Pennine Moors Phase 2 SPA qualifying bird species (plus Peregrine) territories on moors to south & west (Source: Natural England, 2014)

4.1.9 Both studies found females used fields during the day, and males at night, but it was apparent that field choice could differ between males and females, notably in the South Pennines study when males used fields closer to breeding sites than their mates (Pearce-Higgins & Yalden, 2003). Distances travelled to fields from nests was similar to east Sutherland, with mean distances of 2.1–2.7km in North Pennines (range 1.2–3.7km: Whittingham *et al.*, 2000) and 6.6–7.2km (max. 8.2km: females) or 2.4–2.7km (max. 4.2km: males) in South Pennines (Pearce-Higgins & Yalden, 2003).

4.1.10 Both studies also indicated that use of fields for feeding was greater than in east Sutherland. For example, whereas field use virtually stopped when chicks hatched in Sutherland, parents continued to feed in fields to some degree in northern England during this phase of the breeding cycle, especially in the South Pennines. Field size was an influential factor in north Pennines (larger fields selected) but not in south Pennines, and sward height was important in south Pennines (shorter swards selected) but not in north Pennines. Evidence suggested that earthworms (north Pennines) and tipulid larvae (south Pennines) were influential in determining plovers' choice of fields.

Merlin

4.1.11 The Merlin is a small dashing Falcon that feeds mostly on small birds such as Meadow Pipit *Anthus pratensis* and Skylark *Alauda arvensis*. Merlin breed on heather moorland across the uplands of Britain. They traditionally build their nest on the ground in the cover of heather but are now more frequently using tree nest sites. Ground nesting is a peculiar feature of British nesting Merlin and may only be possible where mammalian predators are controlled on moors managed for Grouse shooting (Gibbons *et al.*, 1993).

4.1.12 In Europe there are an estimated 10,166–16,612 pairs, with the largest numbers occurring in Sweden, Norway and Finland – each of which holds more than 2,000 pairs. The Great Britain population was estimated at 1,128 pairs in 2008[14]. In the breeding season, the UK's SPA suite for Merlin supports, on average, 426 pairs. This amounts to about a third of the British breeding population.

4.1.13 The British breeding population was thought to have declined from the 1950s until the early 1990s, initially as a result of organochlorine and other pesticide contamination, and more recently through habitat loss (Gibbons *et al.*, 1993). The first national Merlin survey in 1983–84 returned a population estimate of 550–650 breeding pairs for Britain (Bibby & Natrass, 1986). A second national Merlin survey in 1993–94 estimated the British population as 1,291 breeding pairs (95% CI: 1108–1500; Rebecca & Bainbridge, 1998), providing evidence that the population had increased since 1983–84. This increase may be partly due to increased tree nesting and use of woodland edge nest sites[15]. As a result the Merlin has moved from being Red listed in 2001 to Amber listed in Birds of Conservation Concern 3 (2009)[16].

[14] Ewing, S.R., Rebecca, G.W., Heavisides, A., Court, I., Lindley, P., Ruddock, M., CoHen, S. & Eaton, M.A. (2011) Breeding status of the Merlin *Falco columbarius* in the UK in 2008. *Bird Study* **58**: 379–389

[15] Little, B., Davison, M. & Jardine, D. (1995) Merlins *Falco columbarius* in Kielder Forest: influences of habitat on breeding performance. *Forest Ecology and Management* **79**: 147–152.

4.1.14 Information on the population of Merlin in England, and the South Pennine Moors in particular, has been extracted from Ewing *et al.* (2008). This suggests significant regional declines in the three main upland areas of England between the 1993-94 survey and 2008, with a 47% decline in the South Pennine Moors and North York Moors and a 67% decline in Northumbria. The figures extracted are reproduced in Table 4.2. These declines may be due to equivalent declines in the main prey species of Merlin in these uplands with declines in the numbers of Meadow Pipit, Skylark and Wheatear *Oenanthe oenanthe* all recorded over this same time period. Ewing *et al.* (2008) suggest that changes in Grouse moor management with increased levels of moor burning may also be significant.

4.1.15 The 2005 South Pennine Moors breeding bird survey recorded 11 registrations for Merlin within 5km of settlement boundaries within the Bradford area. These were concentrated in two areas, one south west Steeton and a second (single registration) south of Oxenhope. The 2014 South Pennine Moors breeding bird survey recorded 4 Merlin territories within 5km of settlements, one on Rombalds Moor and three towards the south-west fringes of the district.

Table 4.2: Changes in Merlin population within northern England from Ewing et al. (2008)

Site name	Breeding pairs 1993-94	Breeding pairs 2008	% change
South Pennine Moors	55	29	-47
North York Moors	36	19	-47
Northumbria	39	12	-67

4.1.16 Information on use of supporting habitat by Merlin is very limited and, while they will hunt several kilometres from the nest, they are generally thought to confine their activity to the moorland within the SPA, or to a tight buffer around its margins, where its primary prey species (meadow pipit) is abundant (Murison, unpubl.). More information is available on effects of recreational disturbance although even this is rather inconclusive. The following extracts from Newton *et al.* (1981)[17] are of interest.

> *"Of the 16 sites which were used after 1970, 14 are remote from footpaths, and therefore relatively undisturbed. This may indicate that, as the Merlin has become scarcer, it has avoided the most disturbed areas. Newton et al (1978) noted that two of their five 'lost' sites had suffered from disturbance.*
>
> *"The negotiation of access agreements between moorland owners and the Peak Park Planning Board has not produced a negative correlation between access areas and Merlins. However, there was a negative correlation between latter-day Merlin sites and nearby footpaths, which might suggest a sensitivity to disturbance. Since the enormous increase in outdoor recreation in the Peak District occurred mainly during the 1970s, it is unlikely to have accounted for the sharp decline in Merlins during the 1950s. It could, perhaps, delay or prevent recolonisation in future, but given the tendencies of walkers to*

Rebecca, G.W. (2011) Spatial and habitat-related influences on the breeding performance of Merlins in Britain. *British Birds* **104**: 202–216.

[16] http://www.rspb.org.uk/Images/BoCC_tcm9-217852.pdf

[17] Dr I. Newton , J. E. Robinson & Dr D. W. Yalden (1981): Decline of the Merlin in the Peak District, *Bird Study*, **28**:3, 225-234.

follow well-known footpaths and to walk (where possible) along ridges rather than in cloughs, there should be sufficient undisturbed sites for numbers of Merlins to breed successfully."

4.1.17 References to feeding stress the importance of small passerines (Meadow Pipit and Skylark) which suggests that they will hunt in any habitat near to the open moorland that supports high densities of these birds. This could include in-bye land within close proximity to the moorland fringe.

4.1.18 During winter, Merlin move to the coast or lower altitude habitat where there are concentrations of wintering passerines. There is no clear geographical relationship with the upland breeding habitats and no obvious link between the Pennine moorland fringe and wintering Merlin habitat.

Short-eared Owl

4.1.19 Although not forming part of the Article 4.1 qualification for the South Pennine Moors Phase 2 SPA on the original citation, Short-eared Owl was found to be present in qualifying numbers during the JNCC SPA Review published in 2001. David Glue describes the habitat requirements for breeding Short-eared Owls in Gibbons (1993) as follows; "*The primary requirements for successful nesting by Short-eared Owls are an extensive tract of open ground, a substantial population of small mammal prey, and freedom from persistent disturbance by ground predators including man.*" Apart from a few isolated populations in the south east, the English distribution of Short-eared Owl is centred on the upland moors, from north Staffordshire northwards to the Scottish border.

4.1.20 The nest is normally concealed in tall heather and coarse grass and, following hatching, is normally only visited by adults after dark. In addition, populations can change dramatically following good field vole years when prey abundance is high. Populations can also be temporarily enhanced following the creation of forestry plantations which provide high numbers of voles in the early stages of tree establishment, but this declines as the canopy closes. These factors make census of numbers particularly difficult and the last national population estimate of 1988-91 gives a wide range of between 1,000-3,500 pairs. There is concern that the population is declining in the UK, and the 2009 report of Rare Breeding Birds in the UK (Holling *et al*., 2010) added this species to its list as it had estimated that numbers had dropped below 1,500 pairs. Despite this, it is still included on the Amber list of the Birds of Conservation Concern (BoCC 3).

4.1.21 During the breeding season, the UK's SPA suite for Short-eared Owl supports, on average about 131 pairs. This amounts to about 13% of the British breeding population and about 1% of the international population; see Table 4.3.

4.1.22 The 2005 South Pennine Moors breeding bird survey recorded 11 registrations for Short-eared Owl within 5km of settlement boundaries within the Bradford area. One registration was from the west of Rombalds Moor with the remaining 10 registrations to the south and west of Oxenhope and Haworth. The 2014 South Pennine Moors breeding bird survey recorded 2 Short-eared Owl territories within 5km of settlements, both towards the south-west fringes of the district.

4.1.23 Relatively few references exist in research to date in relation to the use by Short-eared Owls of supporting habitat associated with upland moorlands. Lawton Roberts & Bowman (1986)[18] provide evidence of prey preferences which in moorland tends to be dominated by pigmy shrews reflecting the relative abundance of these small mammals in this habitat. They also state;

> *"Borrero (1962) stated that Short-eared Owls normally hunt within a few hundred metres of the nest. In contrast, we rarely saw one hunting closer than 500 m to a nest and— though our observations were casual and scattered— we felt that the birds were wandering widely in search of food. None was seen to hunt over the adjacent agricultural land.*
>
> *"In our Calluna dominated study area the Pigmy Shrew, probably the most numerous small mammal, is also the most frequent prey of the breeding Short-eared Owls."*

4.1.24 Murison (unpubl.) discusses an average foraging distance of 1.5-4.5km from the nest. However, this may be restricted to within moorland habitats and the number of observations was too low to draw conclusions regarding foraging habitat preferences.

Table 4.3: Distribution of Short-eared Owls within SPA in Britain (JNCC, 2001)

Site name	Site total	% of biogeographic pop.	% of national pop.
Caithness and Sutherland Peatlands	30	0.2	3.00
Forest of Clunie	20	0.1	2.00
Muirkirk and North Lowther Uplands	30	0.2	3.00
Orkney Mainland Moors	20	0.1	2.00
Skomer and Skokholm	6	<0.1	0.60
South Pennine Moors	25	0.2	2.50
TOTAL	**131**	**1.0%**	**13.1%**

Peregrine Falcon

4.1.25 Peregrine Falcon is a qualifying species for the North Pennine Moors SPA and was found to be present in qualifying numbers within the South Pennine Moors Phase 2 SPA following the JNCC Review published in 2001. Since the well documented declines in Peregrine populations caused by organochlorine pesticide poisoning in the 1950s and 60s, the population has recovered strongly throughout Britain. This has involved both increases in breeding density and occupation of new or long deserted breeding haunts. This increase has resulted in a greater range of nest sites being used; in addition the traditional rocky cliff or crag nest sites, birds have

[18] John Lawton Roberts & Neil Bowman (1986): Diet and ecology of Short-eared Owls *Asio flammeus* breeding on heather moor, *Bird Study*, **33**:1, 12-17.

exploited 'walk–in' nest sites on tiny crags as well as genuine ground nest sites and widespread exploitation of ledges on tall buildings in urban areas.

4.1.26 Peregrines occur widely throughout Europe, although they are generally highly dispersed and nest at low densities. As elsewhere in the species' global range, breeding distribution is determined by the availability of suitable nest sites (usually cliffs, or other habitats to which the Peregrine has adapted locally). The European population is estimated at 5,633–6,075 pairs. This represents approximately one-fifth of the world population (Hagemeijer & Blair, 1997).

4.1.27 The number of UK breeding pairs has been censused every ten years since 1961 by BTO/JNCC/RSPB/Raptor Study Groups, and has been estimated as follows: 1961 - 385 pairs; 1971 - 489 pairs; 1981 - 728 pairs; 1991 - 1,283 pairs (Ratcliffe 1993[19]). The National Peregrine Survey 2002[20] found 1,437 breeding pairs in the UK and Isle of Man, a further 12% increase overall since 1991 but with declines in north and west Scotland, North Wales and Northern Ireland (Banks et al. 2003[21]).

4.1.28 The Rare Breeding Birds Panel[22] report for 2009 recorded 833–1,046 pairs, with 34 occupied territories in Yorkshire, 9 in Greater Manchester and 29 in Lancashire and North Merseyside. This conceals increases in all regions of England (by 11%) and in Wales (19%), which are offset by a decline in the reporting rate in Scotland and Northern Ireland. Low site occupation and productivity was reported from study areas where much of the land is managed as grouse moor.

4.1.29 The 2005 South Pennine Moors breeding bird survey recorded six registrations for Peregrine Falcon within 5km of settlement boundaries within the Bradford area. These were concentrated in two areas, one south-west of Oxenhope and a second south west of Steeton. The 2014 South Pennine Moors breeding bird survey recorded 3 Peregrine territories within 5km of settlements, one on Rombalds Moor and two towards the south-west fringes of the district.

Hen Harrier

4.1.30 Hen Harrier is a qualifying species for the North Pennine Moors SPA. Like other moorland raptors, the Hen Harrier is a ground nesting bird, constructing its nest in areas of mature heather and tall grass. Although a few birds remain in the vicinity of the moors during the winter most birds migrate to the coastal marshes especially within the East Anglia estuaries, the Dee estuary, Greater Thames estuary and Solent area. In these regions, Hen Harriers hunt especially over salt-marshes taking small passerines, small mammals and waders.

4.1.31 The national population of breeding Hen Harriers was estimated by Sim *et al.* in 1998 at 570 pairs (500-640) rising to 806 (732-889) territorial pairs in 2004 (Sim *et al.*, 2007). The Rare Breeding Bird Panel (Holling & RBBP, 2011) recorded 646 territorial pairs in 2010.

[19] Ratcliffe, D.A. (1993) *The Peregrine Falcon*. Second Edition. T. & A.D. Poyser, London

[20] Banks, A.N., Crick, H.Q.P., Coombes, R., Benn, S., Ratcliffe, D.A. & Humphreys, E.M. (2010) The breeding status of Peregrine Falcons *Falco peregrinus* in the UK and Isle of Man in 2002. *Bird Study* **57**: 421–436

[21] Banks, A.N., Coombes, R.H. & Crick, H.Q.P. (2003) *The Peregrine Falcon breeding population of the UK & Isle of Mann in 2002.* Research Report 330. BTO, Thetford.

[22] Holling, M. & the Rare Breeding Birds Panel (2011) Rare breeding birds in the United Kingdom in 2009. *British Birds* **104**: 476–537

4.1.32 Hen Harriers have been included on the Red list of Birds of Conservation Concern 3. This reflects the substantial declines over the last two centuries. The UK population was unchanged between surveys in 1988-89 and 1998, with declines in Orkney and England but increases in Northern Ireland and the Isle of Man. A 41% increase was recorded in the UK and Isle of Man during 1998-2004, possibly due to increased use of non-moorland habitats, but with decreases in the Southern Uplands, east Highlands and England, all being areas with many managed Grouse moors. The latest survey, in 2010, reveals a decline of almost 20% since the 2004 survey in these areas (Holling & RBBP, 2011)[23]. Hen Harriers are now almost extinct as a breeding bird in England with only four pairs successfully raising young within the Forest of Bowland, Lancashire in 2011.

4.1.33 Hen Harrier is a species for which the North Pennine Moors SPA has been classified, however, there are currently no breeding birds in this part of England. Efforts to restore this species to the SPA and potentially the South Pennine Moors SPA should not be compromised by policies in the Bradford Core Strategy.

4.1.34 Hen Harriers, like Merlin, are known to feed extensively on small passerine birds such as Meadow Pipit and Skylark. In winter, they migrate from the uplands to lowland coastal and farmland habitats where these and other prey species congregate. The recently published Conservation Framework (Fielding *et al.* 2011) for Hen Harrier in the UK provides further information on its prey. This re-enforces the conclusions of other studies that there is a need to conserve habitats supporting the moorland nest sites at a landscape scale.

4.1.35 Hen Harrier have not bred within the vicinity of Bradford for many years but are a feature of the North Pennine Moors SPA. In bye land could provide important hunting habitat for Hen Harrier (as well as Merlin) but limited information is available on the distribution of potential prey species within these habitats associated with the Pennine Moors SPAs.

South Pennine Moors Internationally Important Assemblage of Birds

4.1.36 The species listed as components of the Internationally Important Assemblage of Birds within the South Pennine Moors (Phase 2) SPA citation are listed in section 3. They include Short-eared Owl (*Asio flammeus*) and eleven other species which can be sub-divided into the following two groups:

- **Breeding waders:** Common Sandpiper (*Actitis hypoleucos*), Dunlin (*Calidris alpina schinzii),* Common Snipe (*Gallinago gallinago*), Curlew (*Numenius arquata*), Golden Plover (*Pluvialis apricaria*), Lapwing (*Vanellus vanellus*) and Redshank (*Tringa totanus*); and
- **Breeding passerines:** Twite (*Carduelis flavirostris*), Northern Wheatear (*Oenanthe oenanthe*), Whinchat (*Saxicola rubetra*) and Ring Ouzel (*Turdus torquatus*).

Breeding waders

4.1.37 Seven species of breeding wading bird have been identified within the internationally important assemblage of birds for which the South Pennine Moors was classified under Article 4.2 of the Birds Directive. Breeding Dunlin are characteristic of moorland and upland habitats and this is

[23] http://blx1.bto.org/birdtrends/species.jsp?&s=Henha

reflected in the species' breeding distribution in the UK. Concentrations are found in the Flow Country of Caithness and Sutherland, and peat moors in the Orkneys, Shetland, Grampians, Pennines and Outer Hebrides (Gibbons *et al.*, 1993). Dunlin breeding in Britain and Ireland are of the temperate population of *C. a. schinzii* which also occurs in the Baltic region. The UK breeding population of Dunlin is estimated to be 9,150 pairs (Stone *et al.* 1997, based on Reed 1985), which represents 83% of the biogeographic population. No information is available concerning population change at a national level, although there have been documented declines in some regions of Britain where forestry has been implicated in displacing breeding Dunlin from peatlands. The population of Dunlin that breed in Britain *C. a. schinzii* are migratory and winter on the coast of west Africa. In the breeding season, the UK's SPA suite for Dunlin supports, on average, 6,812 pairs. This amounts to about 74% of the British breeding population. The suite contains about 62% of the international population. The latest estimate of the Dunlin population within the South Pennine Moors Phase 2 SPA is 46 pairs (Keystone Environmental, 2014). The 2005 South Pennine Moors breeding bird survey recorded 15 registrations for Dunlin within 5km of settlement boundaries within the Bradford area; in 2014 the number of Dunlin territories was 20. These were concentrated in an area to the west and south-west of Oxenhope. Figures for Dunlin populations currently nesting in the North Pennine Moors SPA are not available.

4.1.38 Breeding Curlew populations within the North Pennine Moors SPA meet selection criteria for this species but numbers in the South Pennine Moors are insufficient to cross the selection threshold of 1% of the international (biogeographic) population. In Europe, Curlew have an essentially northern temperate distribution, occurring in greatest numbers in Scandinavia, the Low Countries (especially The Netherlands) and in Britain and Ireland (Hagemeijer & Blair, 1997). Their distribution becomes thinner and more localised in the south of Europe (France, southern Germany and Hungary). The Curlew is a widespread breeding species throughout much of Britain, but is absent from most parts of south-east England, and is sporadic in south-west England, north-west Scotland and parts of Ireland. It is most common in the North Pennines, the Southern Uplands of Scotland, parts of the east Highlands, Caithness, Orkney and Shetland. Despite its recent expansion into lowland agricultural habitats, the species is still more abundant in uplands and northern regions where there are extensive areas of moorland and rough grazing. Variation in breeding densities show that nesting Curlews prefer low intensity agricultural habitats (Gibbons *et al.*, 1993). In the UK, there has been no further expansion of the breeding range in the last 20 years and the distribution has not altered since 1968-72 (Sharrock, 1976). Population declines have been recorded in Northern Ireland and the North Staffordshire Moors (Grant, 1998) but not in recent extensive re-surveys of farmland habitats in Scotland and northern England (O'Brien, unpubl. data). Declines are likely to be associated with recent agricultural improvements, such as land drainage and re-seeding of moorlands, though increases in nest and chick predation rates are also implicated in causing declines (Grant *et al.*, 1999). The North Pennine Moors SPA is reported to support 3,930 pairs of nesting Curlew or 3.3% of the international (biogeographic) population and 11.9% of the national population[24]. The 2014 South Pennine Moors breeding bird survey recorded 456 Curlew territories, 186 of which were within 5km of settlements, 64 on Rombalds Moor and the remainder towards the south-west fringes of the district.

[24] JNCC SPA Review (2001): http://jncc.defra.gov.uk/default.aspx?page=2000

4.1.39 Common Sandpiper, Snipe, Lapwing and Redshank are all ground nesting waders, each selecting slightly different habitat types in which to construct their nest ranging from wet marshy grassland to blanket bog and mire. The young of these birds are nidifugous, that is they leave the nest shortly after hatching to feed themselves under the protection of their parents. They remain unable to fly for several weeks after hatching and need to be able to walk from the nest site to nearby feeding habitat. This may contrast with the nest habitat type and include pond, lake and river banks, marshy grassland and rush pasture. This supporting habitat may not be within the designated SPA boundary. Conservation of this group of birds is therefore dependent upon the maintenance of both nesting habitat and the correct supporting habitat for feeding.

4.1.40 The breeding strategy of wading birds contrasts with passerine or song birds whose young remain in the nest for several weeks after hatching and are fed by their parents (i.e. are nidicolous).

Breeding passerines

4.1.41 The four species of migratory passerines that contribute to the important breeding bird assemblage include Twite, Northern Wheatear, Whinchat and Ring Ouzel. These four birds have very different breeding requirements associated with the heathland, acid grassland and scrub habitats found within the SPA. As with the breeding waders, supporting habitat outside of the SPA boundary is important for breeding Twite.

4.1.42 A comprehensive study of breeding ecology of Twite was commissioned by English Nature in 1994[25] focusing on twite nesting on the South Pennines in West Yorkshire. Nests were located in areas of bracken and heather moorland but the birds travelled up to c.2.6km from the nest site to feed on fields rich in unripened dandelion seeds and sorrel seeds. The research showed a strong selection for fields with high densities of these plants, and the birds abandoned fields with high dandelion density for fields with high sorrel density after the dandelions lost their seeds. Densities of these preferred food species were found to be highest in unimproved meadows and lowest in improved pastures and reseeded grasslands. Twite populations have declined nationally and within the South Pennines. It is a Red listed species in Birds of Conservation Concern[26]. Thirty-four Twite territories were recorded in the 2014 South Pennine Moors breeding bird survey.

4.1.43 Wheatear nest in areas of short sheep- or rabbit-grazed grassland where there is an abundance of grass root caterpillars. They build their nest under rocks, in mountain screes or holes in stone walls. Numbers of Wheatear have declined in the UK and it is an Amber listed species within Birds of Conservation Concern. Twenty Wheatear territories were recorded in the 2014 South Pennine Moors breeding bird survey.

[25] McGhie, H.A., Brown, A.F., Reed, S. and Bates, S.M. (1994). *Aspects of the Breeding Ecology of Twite in the South Pennines*. English Nature Research Reports No. 118.

[26] Mark A. Eaton, Andy F. Brown, David G. Noble, Andy J. Musgrove, Richard D. Hearn, Nicholas J. Aebischer, David W. Gibbons, Andy Evans and Richard D. Gregory. (2009). *Birds of Conservation Concern 3 The population status of birds in the United Kingdom, Channel Islands and Isle of Man*. British Birds 102. 296–341

4.1.44 By contrast, Whinchat are a species of low scrub, with low gorse scrub being the preferred nesting habitat. Birds feed in areas of short grass and in particular roadside verges. Whinchat numbers have declined in the UK and it is an Amber listed species within Birds of Conservation Concern. Nine Whinchat territories were recorded in the 2014 South Pennine Moors breeding bird survey.

4.1.45 The Ring Ouzel is a species of rock outcrops and steep sided valleys. In the south Pennines, heather and bracken abundance are important for nesting cover whilst presence of nearby pasture for feeding is of overriding importance. Numbers of nesting Ring Ouzel have declined significantly and it is a Red listed species within Birds of Conservation Concern. Two Ring Ouzel territories were recorded in the 2014 South Pennine Moors breeding bird survey.

4.1.46 Wheatear, Whinchat and Ring Ouzel nesting within the SPA are unlikely to be travelling from the SPA to utilise supporting habitat outside of the SPA boundary during the breeding season.

4.2 Habitats of South Pennine Moors SAC

4.2.1 The following paragraphs are adapted from the JNCC site characterisation of the South Pennine Moors SAC[27].

European dry heaths

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

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

Blanket bogs (*priority feature*)

4.2.4 This site 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. The uncommon cloudberry *Rubus chamaemorus* is locally abundant in bog vegetation. Bog pools provide diversity and are often characterised by common cottongrass *E.*

[27] http://jncc.defra.gov.uk/ProtectedSites/SACselection/sac.asp?EUCode=UK0030280

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.

4.2.5 Blanket bog and dry heath often form intimate mosaics of vegetation in the South Pennine Moors and have been mapped as mosaics within the most recently produced vegetation survey of the SAC (West Yorkshire Ecology, 2009). This makes it difficult to calculate the area of each of these two Annex 1 habitats in the vicinity of Bradford, however, an estimation is given in Table 4.4.

4.2.6 An area of 1,783 hectares of blanket bog has been identified from the South Pennines SAC that falls within 5km of the settlements in the Bradford area. A total of 1,361 hectares of H9 dry heath and 149 hectares of H12 dry heath were also mapped within this area; see Figure 4.3 and Figure 4.4.

Table 4.4: Area of Annex I habitats within the South Pennine Moors SAC (West Yorkshire Ecology, 2009)

Habitat	Area (ha)
H9 Dry heath	2,161
H12 Dry heath	418
Undefined Blanket bog	6,855
M19 Blanket bog	299
M20 Blanket bog	4,758

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

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

4.2.8 The extent and location of this woodland habitat type in the vicinity of the Bradford area was not included in the 2009 vegetation survey of the South Pennine Moors. However, reference to the Ancient Woodland Inventory shows that the nearest area of ancient woodland within either of the two SAC is Guisecliff Wood (North Pennine Moors SAC) near Glasshouses, over 15km to the north of the Bradford district boundary, and is not likely to be affected by policies within the Core Strategy.

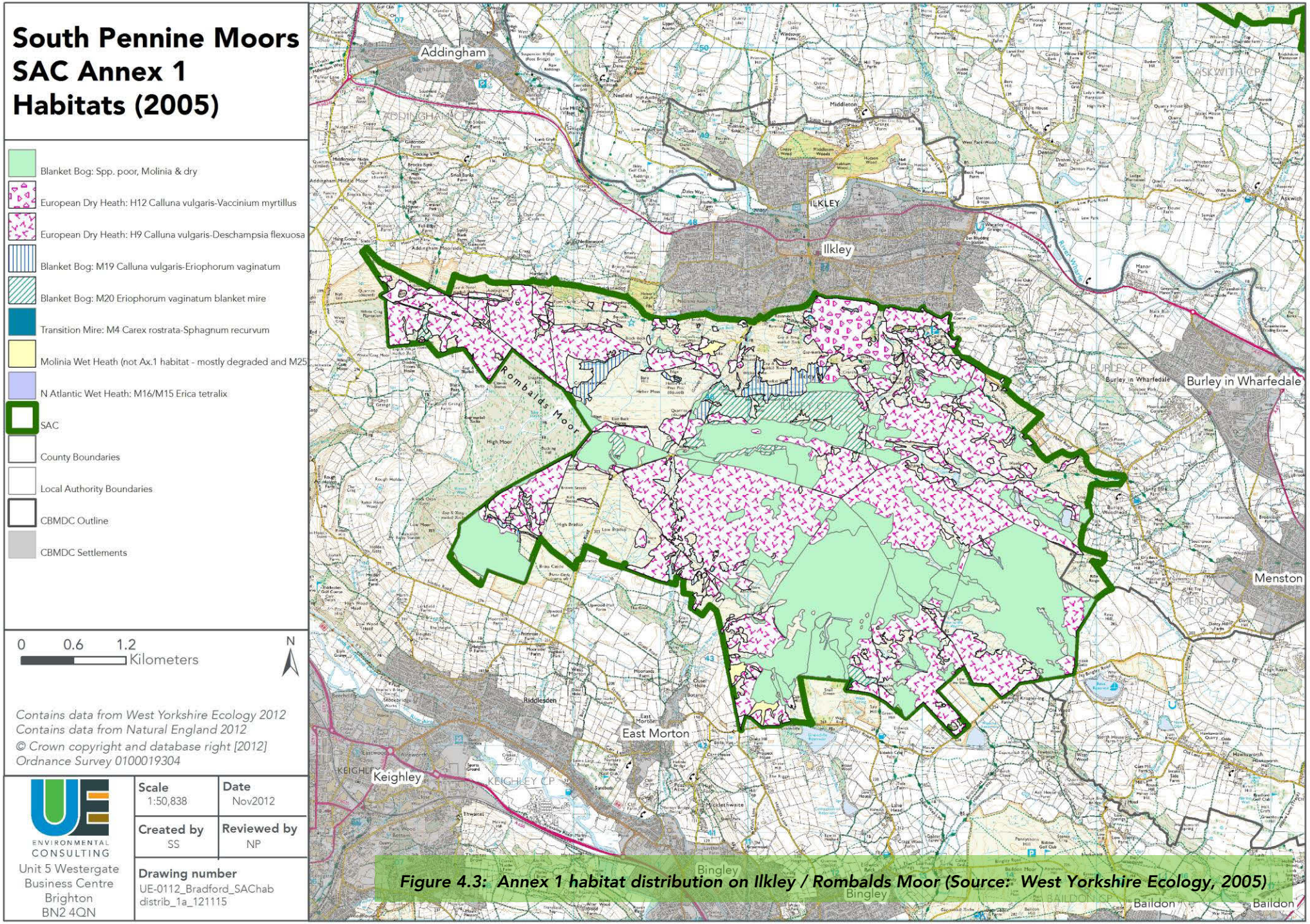

Figure 4.3: Annex 1 habitat distribution on Ilkley / Rombalds Moor (Source: West Yorkshire Ecology, 2005)

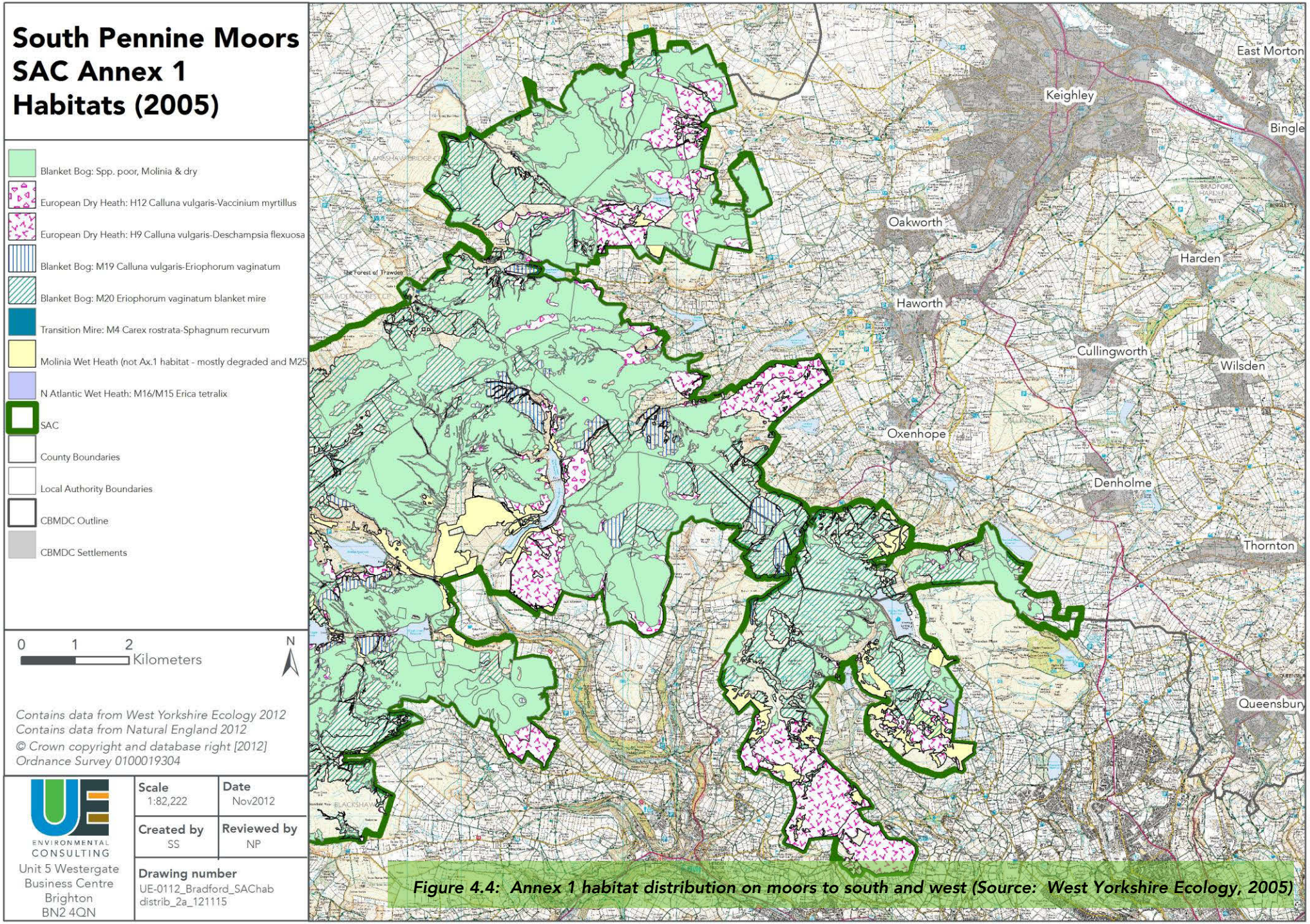

Figure 4.4: Annex 1 habitat distribution on moors to south and west (Source: West Yorkshire Ecology, 2005)

4.2.9 In addition to the Annex 1 habitats for which this SAC was originally selected, it also supports two additional habitats that are present as qualifying features. These are Northern Atlantic wet heath and Transition mires and quaking bogs.

***Northern Atlantic wet heaths with* Erica tetralix**

4.2.10 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.

4.2.11 The Pennine Moors contains small areas of typical M16 *Erica tetralix – Sphagnum compactum* wet heath. This is characteristic of drier climates in the south and east, and is usually dominated by mixtures of *E. tetralix*, *Calluna* and *Molinia*. The bog-moss *Sphagnum compactum* is typically abundant, while on Orkney and at high altitude in the eastern Scottish Highlands, *Cladonia* lichens are abundant. In the south, species with a mainly southern distribution in Britain, such as marsh gentian *Gentiana pneumonanthe*, brown beak-sedge *Rhynchospora fusca* and meadow thistle *Cirsium dissectum*, enrich wet heaths. At high altitude in northern Scotland, forms of the community rich in northern and montane species occur and often also have an abundance of *Cladonia* lichens.

4.2.12 Only 5.04 hectares of true wet heath (M15/M16) were mapped as occurring within the South Pennines SAC during the 2009 South Pennine Moors vegetation survey. However, a much larger area of 2,915 hectares was mapped as purple moor-grass (*Molinia caerulea*) dominated blanket bog and wet heath. This degraded moorland vegetation does not conform to the Habitats Directive Annex I definition of Northern Atlantic Wet Heath. A note relating to these areas of purple moor-grass dominated vegetation states:

> *"Many examples of Molinia blanket bog have probably been placed in the M25 community solely on the basis of dominance by Molinia, and it is possible that a large proportion of these could be better described as wet heath that has been degraded by grazing and / or burning in the past."*

Transition mires and quaking bogs

4.2.13 The term 'transition mire' relates to vegetation that in floristic composition and general ecological characteristics is transitional between acid bog and 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'.

4.2.14 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 Blanket bogs (e.g. ladder fens).

4.2.15 In the South Pennine Moors SAC, Transition mire habitat occurs as examples of M4 *Carex rostrata – Sphagnum recurvum* mire. The SAC was not originally selected for this habitat type but its presence was subsequently identified as a qualifying feature. A total of 5.75 hectares of M4 Transition mire has been recorded from the South Pennines SAC. The nearest examples of this habitat occur some distance from the proposed development within Bradford occurring over 8km to the west of Haworth.

4.3 North Pennine Moors SAC

4.3.1 This SAC was selected for its representation of a total of six Annex 1 habitat types. A further seven habitat types were subsequently identified as being present as qualifying features within the SAC (see Chapter 3), many of which are upland habitats associated with calcareous and other rocky outcrops and heavy metal contaminated soils found further north in the Pennines. These are not considered likely to be affected by proposals within the Bradford Core Strategy.

4.3.2 Four of the Annex 1 habitat types are the same as those within the South Pennine Moors SAC; Blanket bog, Dry heath, Northern Atlantic wet heath and Old sessile oak woodland. It has not been possible to obtain detailed information on the distribution of these Annex 1 habitats within the North Pennine Moors SAC. Their distribution in the vicinity of Bradford district has instead been obtained by reference to the NBN Gateway; see Figure 4.5.

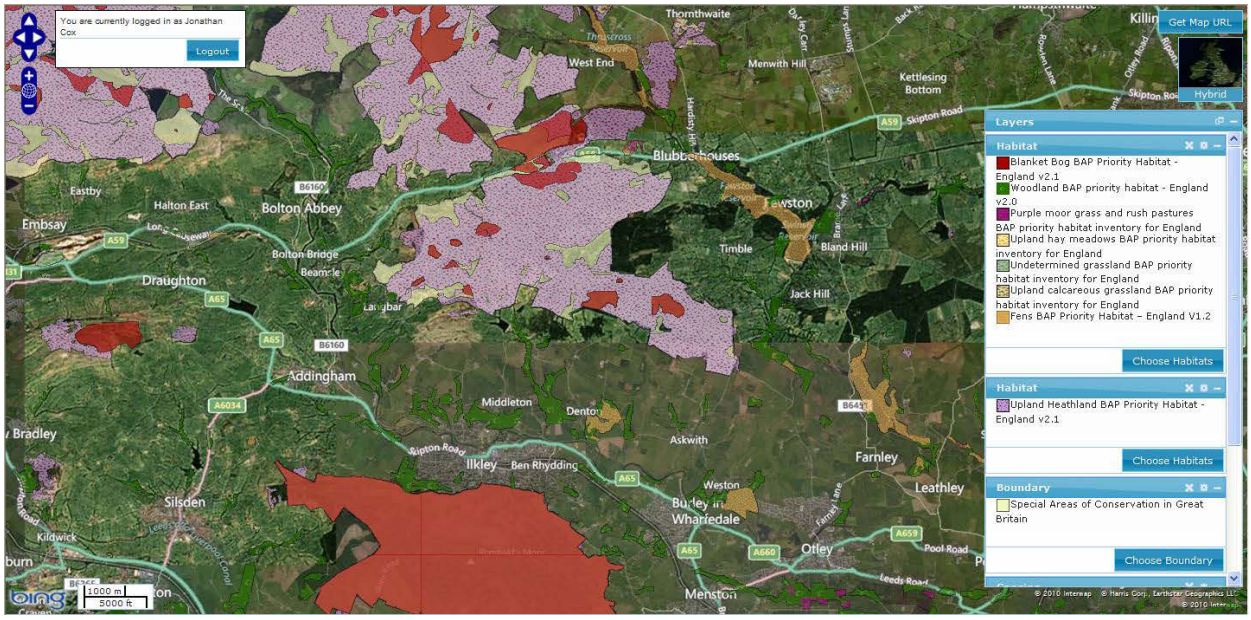

Figure 4.5: Habitat extents in North Pennine Moors SAC (Source: NBN Gateway)

4.3.3 Information on the distribution of Old sessile oak woodland has been inferred the Natural England ancient woodland inventory. The extent and location of this woodland habitat type shows that the nearest area of ancient woodland within either of the two SAC is Guisecliff Wood (North Pennine Moors SAC) near Glasshouses, over 15km to the north of the Bradford district boundary, and is not likely to be affected by policies within the Core Strategy.

4.4 Condition (Conservation) Status

4.4.1 Assessing the impact of a plan or project on a European site requires an understanding of the current condition of that site. Sites that are already under environmental stress are less likely to be able to withstand increased pressure than those that are less stressed. Such stressed sites may therefore be closer to a tipping point where additional pressure changes them from favourable to unfavourable condition and consequent adverse effect on site integrity.

4.4.2 It is very difficult to predict the capacity of sites to absorb additional pressure without pushing them beyond this theoretical tipping point. As a consequence, it is important to take a precautionary approach to such assessment and only countenance a conclusion of no adverse effect where there is strong evidence to show that the condition (conservation status) of a site will not be reduced.

4.4.3 Natural England undertakes periodic condition monitoring of SSSIs. Figure 4.6 shows a summary of the condition of SSSI units in the North and South Pennines close to Bradford district (condition assessment dates range from March 2009 to December 2014)[28]. Within Bradford district, the majority of units are in unfavourable but recovering condition (i.e. under suitable management), with one unit in unfavourable (no change) condition and five units in favourable condition.

[28] Source: Environment Agency Geo-store [accessed 8/6/15]:
http://www.geostore.com/environment-agency/WebStore?xml=environment-agency/xml/ogcDataDownload.xml

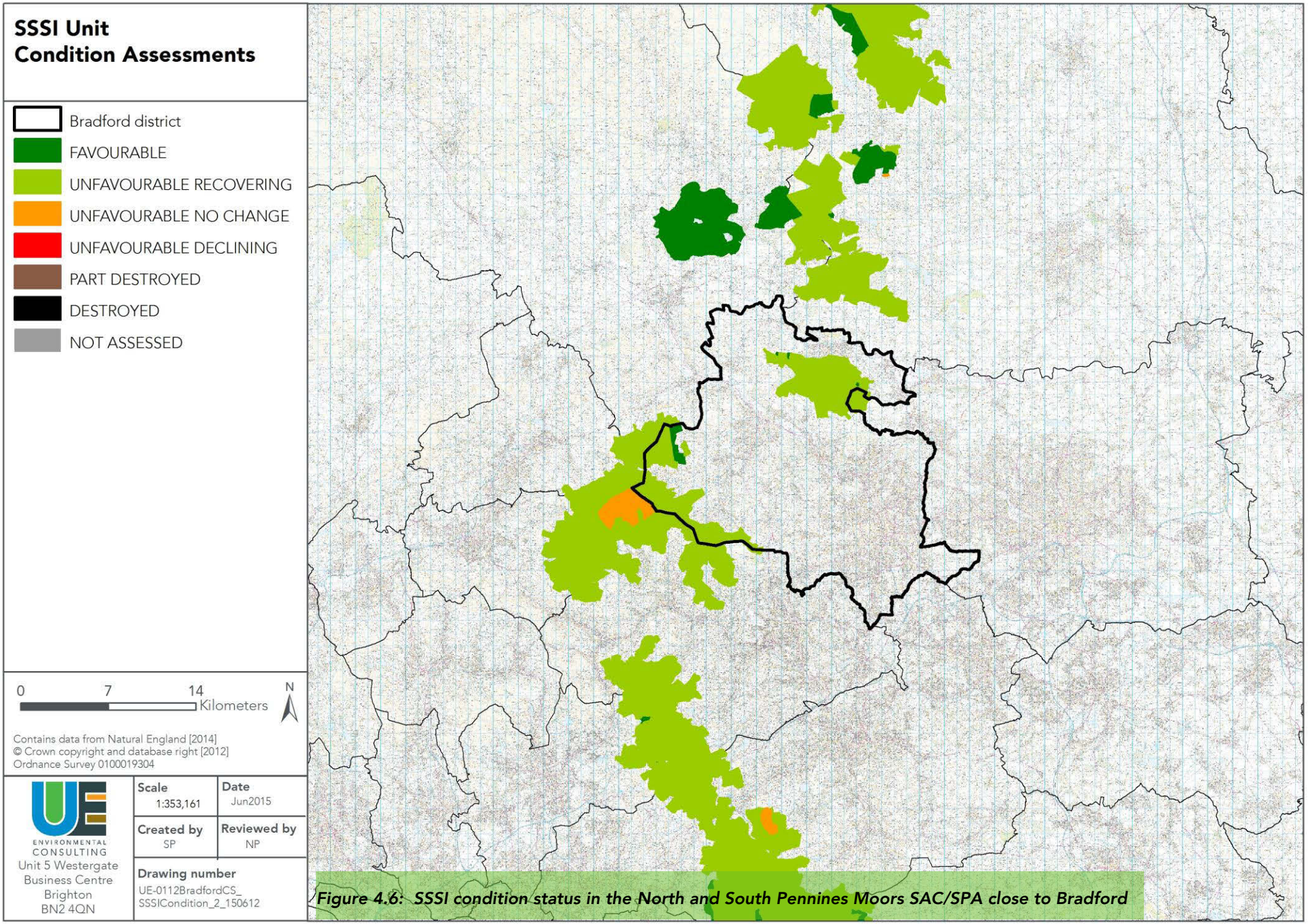

Figure 4.6: SSSI condition status in the North and South Pennines Moors SAC/SPA close to Bradford

5 The Bradford District Core Strategy

5.1 Introduction

5.1.1 The chapter presents a summary of the key policy proposals of the Core Strategy (Proposed Modifications).

5.2 Key Policy Proposals

5.2.1 The Core Strategy (Proposed Modifications) is the culmination of several years' work and forms the central strategic planning document for the district. It will govern the way in which development is planned and managed for the period through to 2030.

5.2.2 The Strategic Core Policies, Sub Area Policies and policies EC3, HO1, HO2 and HO3 identify the following development aims for the district over the plan period and provide for:

- At least 42,100 dwellings and 135ha of employment land between 2013 and 2030;
- The Regional City of Bradford (with Shipley and Lower Baildon) being the prime focus for a wide range of developments, with the principal towns of Ilkley, Keighley and Bingley being the main local focus for housing, shopping, leisure, education, health and cultural activities and facilities. The Local Growth Centres of Burley in Wharfedale, Menston, Queensbury, Silsden, Steeton with Eastburn and Thornton are identified as making a significant contribution to meeting the district's needs for housing, employment and supporting community facilities, with a range of local service centres providing for smaller scale developments;
- Growth areas including Bradford City Centre and the Shipley & Canal Road Corridor, an urban extension (at Holme Wood), local green belt deletions and a focus on previously developed land;
- A wide variety of infrastructure, ancillary and supporting development to achieve regeneration and build sustainable communities; and
- A zoned approach to managing and mitigating the effects of development around the South Pennine Moors Phase 2 SPA and South Pennine Moors SAC.

5.2.3 The distribution of residential development (which is a key element in the plan) at the Proposed Modifications stage, reflecting changes put forward during the examination process, is listed in Table 5.1. The relative scale of residential development across the district is illustrated at Figure 5.1.

Table 5.1: Spatial distribution of residential development

Spatial distribution of residential development			
Regional City of Bradford			
Bradford City Centre	3500	**Shipley & Canal Road**	3100
Shipley	750	**SE Bradford**	6000
NE Bradford	4400	**SW Bradford**	5500
NW Bradford	4500	**-**	-
Principal Towns			
Keighley	4500	**Bingley**	1400
Ilkley	1000	**-**	-
Local Growth Centres			
Burley in Wharfedale	700	**Steeton w/ Eastburn**	700
Menston	600	**Silsden**	1200
Queensbury	1000	**Thornton**	700
Local Service Centres			
Addingham	200	**Baildon**	350
Cottingley	200	**Cullingworth**	350
Denholme	350	**East Morton**	100
Harden	100	**Haworth**	400
Oakworth	200	**Oxenhope**	100
Wilsden	200	**-**	-

5.3 Incorporated Mitigation Measures

5.3.1 Drawing on earlier iterations of the HRA, the plan includes incorporated mitigation measures which need to be considered when assessing the impacts of the Core Strategy at the Proposed Modifications stage. These include a zoned approach to managing and mitigating the effects of development and minor changes to policy wording and/or supporting text.

Zoned approach to mitigating the effects of development

5.3.2 Policy SC8 implements this incorporated mitigation measure and is reproduced below:

Strategic Core Policy (SC8) Protecting the South Pennine Moors SPA and the South Pennine Moors SAC and their zone of influence

In this Policy:

- Zone A is land up to 400m from the South Pennine Moors Special Protection Area ("SPA") and South Pennine Moors Special Area of Conservation ("SAC") boundary;
- Zone B is land up to 2.5km from the SPA and SAC boundary; and.
- Zone C is land up to 7km from the SPA and SAC boundary.

Subject to the derogation tests of Article 6(4) of the Habitats Directive, in all Zones development will not be permitted where it would be likely to lead, directly or indirectly, to an adverse effect (either

alone or in combination with other plans or projects), which cannot be effectively mitigated, upon the integrity of the SPA or the SAC. In conducting the above assessment the following approach will apply:

- In Zone A no development involving a net increase in dwellings would be permitted unless, as an exception, the development and/or its use would not have an adverse effect upon the integrity of the SPA or SAC.
- In Zone B it will be considered, based on such evidence as may be reasonably required, whether land proposed for development affects foraging habitat for qualifying species of the SPA.
- In Zone C, in respect of residential developments that result in a net increase of one or more dwellings, it will be considered how recreational pressure on the SPA or SAC, that such development might cause, will be effectively mitigated. The mitigation may be:

  (i) such that the developer elects to offer, either on-site and / or deliverable outside the boundary of the development site, such as the provision of accessible natural greenspace and/or other appropriate measures; or

  (ii) in the form of a financial contribution from the developer to:

  1. the provision of additional natural greenspace and appropriate measures to deflect pressure from moorland habitats and the long-term maintenance and management of that greenspace;

  2. the implementation of access management measures, which may include further provision of wardens, in order to reduce the impact of visitors;

  3. a programme of habitat management and manipulation and subsequent monitoring and review of measures.

To mitigate impacts on the SPA and SAC due to the increase in population, an SPD will set out a mechanism for the calculation of the financial contributions, by reference to development types, the level of predicted recreational impact on the SPA or SAC, and the measures upon which such contributions will be spent.

5.3.3 The SPD referred to in Policy SC8 is listed in the Local Development Scheme and will include:

- A description of the types of measures proposed, including improvement of existing natural greenspaces, provision of alternative new greenspaces, arrangement for future maintenance in perpetuity, provision of dog-walking areas, access and visitor management projects, and monitoring;
- Information regarding the need for foraging bird surveys for potentially important foraging land within 2.5km of the SPA, and associated mitigation measures (paragraphs 6.2.58 to 6.2.62 discuss this in further detail);
- The commitment to develop a Strategic Access Management and Monitoring (SAMM) Strategy to better manage access arrangements within the SAC/SPA, in conjunction with the provision of alternative recreational spaces, which will allow appropriate, feasible and publicly acceptable means of mitigating residual impacts to be implemented;
- Access and visitor management projects may include:
  - Improvement of existing routes linking into settlements and which could form local circular networks away from SPA/SPA;

- Improvement of strategic access routes which link to and through the SPA/SAC so that they are capable of carrying additional use without compromising the SPA/SAC conservation objectives;
- Provision of additional visitor information to influence behaviour and understanding, additional wardening and management of car parking, etc;

- A delivery mechanism for determining the planning contribution that will be sought from development within the zone of influence, taking account of any on-site mitigation that may be proposed.

Minor changes to policy wording and/or supporting text

5.3.4 The following amendments to proposed policy wordings and/or supporting text have been made to improve the integration of HRA issues within the Core Strategy, and to sign-post to useful information sources and future work priorities relevant to the HRA:

- Adding the following underlined text to the end of paragraph 3.93 (supporting text to Policy SC6 Green Infrastructure): "Providing high quality areas of natural greenspace on a suitable scale will assist in mitigating the adverse effects of increased recreation on the South Pennine Moors SPA/SAC."
- Adding the following underlined text to the end of criterion B of Policy SC6 Green Infrastructure: "Mitigating the adverse effects of increased recreation upon the South Pennine Moors SPA/SAC will be a priority."
- Replace paragraph 3.117 (supporting text to Policy SC8 Protecting the South Pennine Moors SPA and SAC and their Zone of Influence) with the following: "Increased emissions to air were identified as an impact pathway in the HRA Report. However, linking pollution loads to Core Strategy proposals is not straightforward and at present proposals are not sufficiently specific and data is not available to fully assess the nature of impacts. The HRA Report therefore recommended that more detailed testing and traffic modelling should be undertaken to inform work on the Allocations DPD is taken forward."
- Adding the following text to the start of paragraph 3.121 (supporting text to Policy SC8): "The evidence base for the forthcoming SPD will inform the identification and delivery of opportunities for additional greenspaces, improvements to existing areas and visitor access and management measures. These will be set out in a Strategic Access Management and Monitoring (SAMM) Strategy to better manage access arrangements within the SAC/SPA, in conjunction with the provision of alternative recreational spaces, which will allow appropriate feasible and publicly acceptable means of mitigating residual impacts to be identified."
- Adding the following text to criterion D2 of Policy AD1 Airedale: "Protect and enhance the integrity of the South Pennine Moors SPA/SAC and identify measures to support valuable upland fringe habitats, avoid the loss of important foraging land within the SPA's zone of influence, and to mitigate the impact of increasing visitor numbers."

- Add further text to criterion D2 of Policy WD1 Wharfedale: "Avoid the loss of important foraging land within the SPA's zone of influence and mitigate the impacts of increasing visitor numbers."
- Adding the following text to criterion E2 of Policy PN1 South Pennine Towns and Villages: "Protect the ecological integrity, the wilderness appeal and wide open skylines of the South Pennine Moors from adverse impacts, including avoiding the loss of important foraging land within the SPA's zone of influence, enhance the value and connectivity of upland fringe habitats and mitigate the impacts of increasing visitor numbers."
- Adding the following text to the end of paragraph 5.4.17 (supporting text to Policy EN1 Open Space and Recreation Facilities): "An SPD will be produced to identify contributions and secure mitigation measures, in relation to provision of natural greenspace, where this is required to mitigate the effects of increased recreation pressure upon the South Pennine Moors SPA/SAC."
- Adding a cross-reference to the supporting text for Policy EN6 Energy to sign-post readers to West Yorkshire Ecology's (2013) *Guidance for ornithological information required to support Small Wind Turbine Developments in West Yorkshire.*
- Adding a new paragraph to the supporting text for Policy EN8 stating: "The Council will undertake a programme of modelling to assess air quality effects of proposed allocations on areas where air quality is a matter of concern, including European sites designated for nature conservation importance. The programme will assess air quality effects from local roads in the vicinity of proposed allocations on nearby European sites (including those from increased traffic, construction of new roads and upgrading of existing roads), as recommended in work carried out on the Habitats Regulations Assessment. The impacts on vulnerable locations from air quality effects of increased traffic on the wider road network will also be tested using traffic projections and distance criterion. This will be followed by local air quality modelling where required at the pre-allocations testing stage and the development of any mitigation measures required to ensure that there are no adverse effects on the European sites."
- Adding the following text to the end of criteria A3 and B3 of Policy EN9 Minerals Sites: "… or to adverse effects on the South Pennine Moors SAC/SPA or important foraging land within the SPA's zone of influence".
- Adding the following text to proposed new paragraph 5.6.29 (modification 8) of Policy WM2 Waste Management: "… or to adverse effects on the South Pennine Moors SAC/SPA or important foraging land within the SPA's zone of influence".
- Adding a reference to Policy ID3 Developer Contributions and/or its supporting text to highlight the need for development contributions to protect the South Pennine Moors SAC and SPA as proposed by Policy SC8.

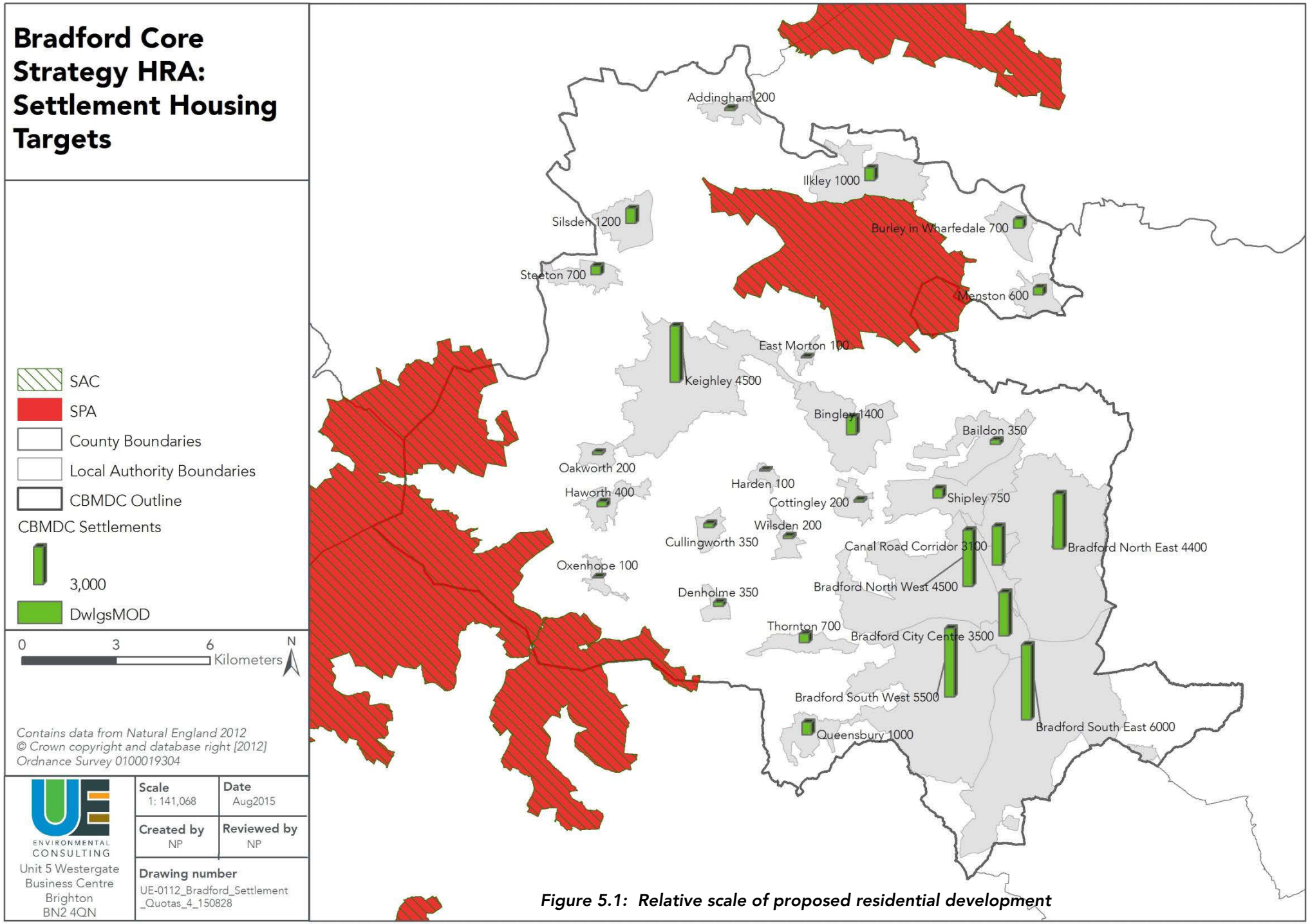

Figure 5.1: Relative scale of proposed residential development

6 Identifying Impact Pathways

6.1 Introduction

6.1.1 Acknowledging that the Core Strategy for Bradford district is not directly connected with or necessary to the management of the sites for nature conservation, the HRA screening assessment (Environ, 2012) identified a range of likely significant effects on the North and South Pennine Moorlands that could result from the plan. This list was reviewed and rationalised in the May 2013 iteration of this report, with new impact categories added as part of the Appropriate Assessment procedure. A revised screening matrix for Core Strategy policies at the Proposed Modifications stage (taking into account incorporated mitigation measures) is presented in Appendix I, while the following sections provide information on how the identified impact pathways could affect the moors and have influenced the development of mitigation measures.

6.2 Loss of Supporting Habitat

6.2.1 The populations of birds for which the two SPA were classified breed within the SPA boundary but often feed on habitats outside of the SPA. These off-site habitats are vital to the conservation of the SPA bird populations and their conservation is of paramount importance to the maintenance of favourable conservation status (condition) of the SPA. Off-site habitats are particularly important for Golden Plover during the breeding season as young birds are often taken from their moorland nest sites to feed on meadows adjacent to the moorland. These meadows, sometimes referred to as in-bye land are rich in invertebrate food, in particular cranefly larvae and earthworms. Chicks may be moved up to 2km or more to feed in such meadows (Byrkjedal & Thompson, 1998).

6.2.2 Curlew and Lapwing also frequently utilise wet meadows to feed both during the breeding season and in periods of migration when flocks of birds congregate in in-bye fields. Curlew and Lapwing form part of the internationally important breeding bird assemblage within the South Pennine Moors Phase 2 SPA. Hence the conservation of these off-site in-bye meadows is important to the maintenance of favourable condition (conservation status) of the South Pennine Moors Phase 2 SPA. Other breeding wading birds in the assemblage such as Redshank and Snipe may also utilise in-bye land for feeding and in some instances for breeding.

6.2.3 The in-bye meadows are also important for nesting Twite. These small finches have undergone significant national declines in recent years and are red list species (Birds of Conservation Concern 3). They are a bird of the moorland-farmland interface, nesting under rocky crags or in patches of bracken, heather or bilberry in areas of mature heathland within the dry heaths habitat. However, the Twite only eats seeds, even when it is feeding its young. Without a good supply of seed sources close to its moorland nest, it will not survive. It searches for seeds on roadside verges, patches of waste ground and particularly hay meadows, within 2.5km of its

nesting site[29]. Twite is also a contributing species to the internationally important assemblage of regularly occurring migrant birds during the breeding season for which the South Pennine Moors Phase 2 SPA has been classified.

6.2.4 Within this section, land outside of the SPA can be generally classified into one of three categories:

(i) land for which there is currently no evidence of use by SPA birds,

(ii) land for which there is some evidence for use by SPA birds, but for which there is currently insufficient data to demonstrate that the land is 'functionally linked' to SPA – this is referred to as 'supporting habitat', and

(iii) land for which there is current evidence of regular use by SPA birds and should be considered as 'functionally linked' land.

6.2.5 Two surveys were carried out during 2013 to provide baseline information in relation to the use made by SPA species of land considered to have potential for future development (i.e. sites included in the Strategic Housing Land Availability Assessment, henceforth referred to as SHLAA sites), and to start to identify important areas of in-bye land that provide off-site habitat for qualifying SPA species:

- Habitat surveys were carried out for meadows within 2.5km of the South Pennine Moors Phase 2 SPA and 1km of settlement boundaries to identify the extent and coverage of potentially good quality supporting habitats for SPA bird species; and
- Breeding bird surveys were undertaken by West Yorkshire Ecology between April and the beginning of July 2013 for target areas within 2.5km of the South Pennine Moors Phase 2 SPA. The target areas focused on sites published in the SHLAA update of May 2013, both within settlements and up to 1km from settlement boundaries, using transect routes and vantage points. The survey was intended to allow a precautionary assessment of the current land supply and to provide baseline information in relation to assessing potential areas for future development.

6.2.6 In addition, Natural England commissioned a new breeding bird survey of the South Pennine Moors Phase 2 SPA in 2014 (Keystone Environmental Ltd, 2014), the results from which are examined in this section.

Habitat survey results

6.2.7 Surveys were targeted within defined zones around the SPA boundary based upon established patterns of use by the target bird species, and areas around settlements with the potential for development. A 2.5km buffer around the SPA has been established as the main area within which supporting habitat is utilised. A 1km buffer around existing settlements was identified as the likely maximum extent of urban expansion. Within and beyond this 1km zone, more specific areas of search were identified from the Council's SHLAA.

[29] http://www.watershedlandscape.co.uk/care/the-pennine-Twite/

6.2.8 The field survey targeted land which is either (a) listed in the SHLAA and lies within 2.5km of the SPA, or (b) is located both within 2.5km of the SPA and within 1km of a settlement. The total area of land falling both within 2.5km of the SPA and within 1km of settlements is 11,411ha. This area was significantly reduced during the desk-study phase which utilised aerial photography analysis to exclude arable, woodland and brownfield sites. The resulting coverage of the habitat survey extends to a total of 1,504 survey polygons covering an area of 2,592.5ha. In many instances, these were individual fields, although in places, groups of fields were combined where they had similar habitat characteristics. A description of each of the recorded habitat types is given in the survey report (UEEC, 2014).

6.2.9 Data were gathered at a field unit scale and included categorical field variables such as management regime, grazer and grazing intensity, and continuous field variables which included percentage cover of the various habitat types within the meadow, or abundance of seed-bearing wildflowers.

6.2.10 Table 6.1 shows the dominant habitat of surveyed meadows (dominant habitat being classified as any one habitat type which has coverage of 75% or more). The majority were dominated by habitats of relatively low ecological value with 65.8% of the area being given over to improved or species poor semi-improved grassland.

Table 6.1: Predominant habitat types within surveyed meadows

Habitat Type	No. of polygons	% of area	Area (Ha)
Amenity Grassland	49	1.0	27.2
Improved Grassland	294	20.0	516.0
Species poor semi-improved grassland	680	45.8	1186.6
Species rich semi-improved grassland	55	7.8	201.4
Unimproved grassland	9	0.7	17.2
Rough grassland	28	1.1	28.9
Enclosed acid grassland	17	1.3	34.0
Dry dwarf shrub heath	2	0.3	8.4
Dry heath/acid grassland mosaic	11	1.6	41.4
Rush pasture	3	0.5	13.7
Other (mixed habitats and woodland)	110	3.4	89.2
Total	**1258**	**83.5**	**2164.0**
Meadows without dominant (>75%) habitat	246	16.5	428.5
Grand Total	**1504**	**100**	**2592.5**

Breeding bird survey results

6.2.11 Bird data has been derived from two sources; the 2013 Moorland Fringe Bird Survey, undertaken by West Yorkshire Ecology under contract to Bradford City Council, and the 2014 South Pennine Moors Phase 2 SPA Breeding Bird Survey, undertaken by Keystone

Environmental Ltd under contract to Natural England. These data are used in conjunction with potential future development sites identified by the Council as 'trajectory sites' in its SHLAA2 (May, 2013) to assess the scope for losses of land which may be regularly used as a foraging resource by SPA qualifying bird species. Data from the 2014 SPA breeding bird survey (see Table 6.2) were used to provide a baseline figure for the current populations of qualifying bird species within the SPA (number of territories). For ease of reference, the qualifying species of the South Pennine Moors Phase 2 SPA are:

- A098 *Falco columbarius*; Merlin (Breeding);
- A140 *Pluvialis apricaria*; European Golden Plover (Breeding);
- Internationally important assemblage of breeding birds:
    - Common Sandpiper, Common Snipe, Curlew, Dunlin, Golden Plover, Lapwing, Redshank, Ring Ouzel, Short-eared Owl, Twite, Wheatear and Whinchat.

6.2.12 The objective of this section is to explore the use of land outside of the SPA by qualifying bird species for which the SPA was classified, as defined in the above bullets. It is acknowledged that some individuals of these species which were recorded outside of the SPA may not breed within the SPA and would not therefore form part of the SPA population. In order to deal with this when analysing data from the 2013 Moorland Fringe Bird Survey, birds showing behaviours which may be indicative of breeding outside the SPA were excluded. Only birds recorded as foraging, standing, preening or roosting are considered within the analysis (henceforth referred to as 'SPA birds'), as birds demonstrating these behaviours may be breeding within the SPA boundary. Their presence within a site is taken as an indicator of the land's suitability for foraging.

Table 6.2: SPA bird population changes 1990 – 2014 (number of pairs/territories) (Source: Natural England SPA Breeding Bird Survey, 2014)

Species	1990	2005	2014	Change (%)	Trend	Regional trend
Article 4.1 birds						
Golden Plover	263	229	259	13%	Stable	Unknown
Merlin	NS	NS	13			Unknown
Breeding bird assemblage						
Common Sandpiper	19	35	28	-20%	Stable	Unknown
Common Snipe	40	89	106	19%	Increase	1%
Curlew	295	461	456	-1%	Stable	24%
Dunlin	52	34	46	35%	Increase	Unknown
Lapwing	41	116	133	15%	Stable	9%
Redshank	36	20	12	-40%	Decrease	Unknown
Ring Ouzel	NS	14	2	-86%	Unknown	Unknown
Short-eared Owl	3	9	10	11%	Stable	Unknown
Twite	219	57	34	-40%	Decrease	Unknown
Wheatear	27	25	20	-20%	Decrease	68%
Whinchat	25	22	9	-59%	Decrease	Unknown

South Pennine Moors Phase 2 SPA Breeding Bird Survey (2014)

6.2.13 This survey was commissioned by Natural England and undertaken in 2014. Table 6.3 summarises the results of this survey. Numbers of breeding territories are provided for the whole SPA, for Rombalds Moor and the portion of the SPA within the south west part of Bradford District. The density of breeding birds is provided for the whole SPA and for each of these sections of the SPA, however it should be noted that not all of the SPA provides habitat which is suitable for each species. Furthermore, the population of birds within the SPA will not be evenly distributed, and certain parts of the SPA are likely to be of varying importance to different species.

Evidence of supporting habitat use by SPA birds

6.2.14 A literature review has been undertaken to identify evidence of use of off-site feeding habitat by upland breeding wading birds. English Nature published key habitat attributes for birds in England (English Nature, 2000[30]). For curlew, this identifies a landscape requirement of open terrain, relatively free of obstructions with unrestricted views of >200m and an effective field size of >10ha. Non intertidal feeding habitat should have short vegetation (<5cm) and an abundance of soil and ground surface invertebrates including earthworms and leatherjackets. Attributes for golden plover are similar with short vegetation (<10cm) being preferred with non-intertidal feeding habitat having an abundance of soil and ground surface invertebrates, in particular earthworms, leatherjackets, beetles and spiders.

6.2.15 Buchanan *et al* (2006) [31] undertook a literature review to determine the importance of invertebrates for moorland breeding birds. They found that relatively few taxa were widely taken, with Diptera and Coleoptera being the most important. Dietary differences were found between wader adults and chicks that reflect the fact that during the pre-laying and incubation periods, at least, adult Curlew and Golden Plover forage off moorland on improved pastures and other grasslands where they exploit soil invertebrates.

6.2.16 Despite being prevalent in the diets of some moorland birds, worms are virtually absent from the peat soils found on moorland. However, they are abundant on mineral soils, especially pastures, near moorland edges, where the adults of some species (Curlew, Golden plover[32] and Ring ouzel[33]) forage regularly (e.g. Whittingham *et al*. 2000[34], Burfield 2002, Pearce-Higgins & Yalden 2003).

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[30] Kirby, J., Drewitt, A, Chivers, L. & Saunders, R. (2000). *Key habitat attributes for birds and bird assemblages in England*. English Nature Research Report No. 359. Peterborough.

[31] Buchanan, G.M., Grant, M.C., Sanderson, R.A., Pearce-Higgins, J.W. (2006) *The contribution of invertebrate taxa to moorland bird diets and the potential implications of land-use management. Ibis* **148**, 615–628

[32] Pearce-Higgins, J.W. & Yalden, D.W. (2003). Variation in the use of pasture by breeding European Golden Plovers *Pluvialis apricaria* in relation to prey availability. *Ibis* **145**: 365–381.

[33] Burfield, I.J. (2002). *The Breeding Ecology and Conservation of the Ring Ouzel* Turdus torquatus *in Britain*. PhD thesis, University of Cambridge.

[34] Whittingham, M.J., Percival, S.M. & Brown, A.F. (2000). Time budgets and foraging of breeding golden plover *Pluvialis apricaria*. *J. Appl. Ecol.* **37**: 632–646.

Table 6.3: Numbers of SPA bird territories (pairs) within Rombalds Moor and SW Bradford Sector of the SPA, with territory densities and % of SPA population

Species	2014 survey SPA (territories)	Density (ha/territory)	2014 survey territories on Rombalds Moor	Density (ha/territory)	% of SPA population on Rombalds Moor	2014 survey territories on SW Bradford SPA	Density (ha/territory)	% of SPA population on SW Bradford SPA
Article 4.1 birds								
Golden Plover	259	80.87	40	63.2	15.44%	43	50.82	16.60%
Merlin	13	1611.12	1	2527.8	7.69%	1	2185.30	7.69%
Breeding bird assemblage								
Common Sandpiper	28	748.02	0	0	0.00%	2	1092.65	7.14%
Curlew	456	45.93	64	39.5	14.04%	69	31.67	15.13%
Dunlin	46	455.32	1	2527.8	2.17%	9	242.81	19.57%
Lapwing	133	157.48	33	76.6	24.81%	25	87.41	18.80%
Redshank	12	1745.38	2	1263.9	16.67%	3	728.43	25.00%
Ring Ouzel	2	10472.25	1	2527.8	50.00%	0	0.00	0.00%
Short-eared owl	10	2094.45	0	0	0.00%	1	2185.30	10.00%
Snipe	106	197.59	15	168.52	14.15%	20	109.27	18.87%
Twite	34	616.01	0	0	0.00%	1	2185.30	2.94%
Wheatear	20	1047.23	11	229.8	55.00%	5	437.06	25.00%
Whinchat	9	2327.17	0	0	0.00%	2	1092.65	22.22%
Area (ha)	*20944.5*		*2527.8*	*12.07% of SPA Area*		*2185.3*	*10.43% of SPA Area*	

6.2.17 Dallimer *et al* (2012)[35] provide further evidence of the importance of offsite habitat in supporting moorland breeding waders. They surveyed 37 paired sites comprising an area of moorland and an area of farmland in the Peak District. The mean distance between moorland and farmland sites within a pair was 2.03k (range 0.65-4.95).

6.2.18 Within the farmland, habitat surveys assessed variables that have been shown to influence avian abundance or breeding success in UK uplands (Robson *et al*. 2002[36], Pearce-Higgins and Yalden, 2003). Fields were characterised according to whether they were agriculturally improved grassland, cut for silage or hay, proportion of field boundary hedges, woods, fences and walls, numbers of trees present, proportion of rush cover and proportion of wet features.

6.2.19 They found that curlew frequently moved between moorland and farmland (a quarter of all movements). Curlew spent more time feeding on farmland than moorland, so much so that over half their time-budget on farmland was used for foraging. As curlews surveyed on farmland were likely to be foraging, the density of birds observed on a farmland site depended in part, on the numbers breeding on nearby moorland. A model was constructed to identify features of farmland and moorland habitats that had the greatest effect on avian density/richness. For Curlew on farmland, wet features followed by intensive grass and vegetated boundaries were the most important predictors of relative importance for moorland nesting birds. On moorland, burning was found to be the most important.

6.2.20 Radio tracking studies (Whittingham *et al*. 2000) have shown that golden plover use multiple habitats. They found that golden plover in an upland landscape of enclosed fields and moorland in county Durham fed principally in enclosed fields, 1.1-3.7 km from their moorland nests, but spent less than 5% of their foraging time on moorland. Only 17 of 85 fields in the study area were used for foraging by breeding golden plover. The number of molehills, a reported indicator of earthworm abundance, was the best single variable explaining field choice. Both field size and distance from road had small but significant effects on field choice.

6.2.21 Pearce-Higgins & Yalden (2003) also recorded use of agricultural fields by radio-tracking golden plover near to moorland nest sites in the Peak District. They found that arable and improved fields received most use by 15 radio-tagged birds, whilst the use of pasture throughout the breeding season was negatively correlated with sward height. Adult diet consisted largely of subsurface prey, particularly larval tipulids, although earthworms were an important component in March/April. The biomass of larval tipulids was strongly correlated with an index of the use of fields. The selection of fields by Golden Plovers is hence dependent upon prey abundance and availability, and, consequently, is likely to be enhanced by summer grazing and poor drainage.

6.2.22 From the published literature on foraging habitat of moorland breeding birds, it can be concluded that bird use is closely related to land-use or agricultural management with some farming activities making fields highly attractive to foraging birds. Fields may only be attractive

35 Dallimer, M., Skinner, A.M.J., Davies, Z.G., Armsworth, P.R. & Gaston, K.J. (2012). Multiple habitat associations: the role of offsite habitat in determining onsite avian density and species richness. Ecography **35**: 134–145.

36 Robson, G. et al. (2002). The use of marginal farmland by curlew *Numenius arquata* breeding on upland moors. – Aspects Appl. Biol. **67**: 75–84.

for a limited period of time – for example heavily grazed and poached fields with exposed bare ground may be attractive in late winter and early spring, recently mown or cut grassland fields may be attractive immediately after cutting and arable fields may attract birds whilst under cultivation. By contrast, taller grassland fields or growing arable crops are less likely to attract foraging SPA wading birds.

Moorland fringe breeding bird survey (2013)

6.2.23 This survey was undertaken by West Yorkshire Ecology on behalf of Bradford City Council. Birds were recorded along sample transects following public rights of way for target areas within 2.5km of the South Pennine Moors Phase 2 SPA boundary. The target areas focused on sites published in the SHLAA update of May 2013, both within settlements and beyond settlement boundaries within the 2.5km zone.

6.2.24 The breeding bird survey outputs relate to a single year's survey work and included daytime surveys only. The survey used a modified version of the BTO/ JNCC/ RSPB Breeding Bird Survey (BBS) and Common Bird Census (CBC) methodologies. Each of the survey transects was visited twice with the first visit taking place between 1 April and 15 May 2013 and the second from 16 May to the end of June. The numbers of each target bird species were recorded at locations along the survey transects. These were mapped using GPS together with information on bird activity and details of habitat characteristics. The survey made 3,036 records in visit 1 and 3,224 records in visit 2. Records of flying, calling, displaying and nesting birds were removed from these totals to focus on those birds that are most likely to be breeding within the SPA and using the survey area for off-site feeding or foraging. This left a total 756 records of birds (of all SPA species) that were foraging, standing, preening or roosting in visit 1 and 516 records in visit 2 (note that some records were of more than one bird).

6.2.25 Table 6.4 summarises the number of foraging birds of each of the SPA species recorded within the entire survey area, and those within the 2.5 km zone around Rombalds Moor and the SW Bradford SPA boundary. The number of birds recorded in visit 1 is expressed as a percentage of the SPA breeding population (which can be calculated as the number of territories x2), or a percentage of the Rombalds Moor and SW Bradford SPA breeding populations. The visit 1 total has been used as this is most likely to avoid birds nesting in the survey area and their young i.e. birds recorded as foraging that may also be nesting or young that have been bred outside of the SPA.

6.2.26 The 2013 moorland fringe bird survey was undertaken using a methodology designed to record breeding birds. During the breeding season birds tend to be faithful to a limited area of habitat and hence can be recorded with some accuracy with only a few survey visits at the appropriate time of year. The two visits used in this survey are however a minimum. For breeding waders, including curlew, redshank, snipe and lapwing, the standard method is to use three survey visits (Bibby et al, 1992[37]). Due to the objective and methods, the survey, it did not record early spring congregations of SPA birds or night-time feeding birds. This may be particularly important for golden plover which are known to have both a diurnal and nocturnal feeding pattern.

[37] Bibby, C., Burgess, N.D., Hill, D.A. & Mustoe, S. (1992) *Bird Census Techniques. Second Edition*. Academic Press.

Table 6.4: Foraging birds recorded during the 2013 moorland fringe bird survey compared with SPA populations for Rombals Moor and SW Bradford SPA. Note: Numbers of birds are calculated as a percentage of the total number of individual breeding birds in the SPA, i.e. twice the number of breeding pairs

Species	Visit 1	Visit 2	Visit 1	Visit 2	Visit 1	Visit 2
	2013 moorland fringe survey		*2013 survey Rombalds*		*2013 survey SW Bradford*	
Article 4.1 birds						
Golden Plover	236	4	143	1	93	3
Merlin	3	0	0	3	0	0
Breeding bird assemblage						
Common Sandpiper	9	0	1	0	2	9
Curlew	495	372	339	261	159	101
Dunlin	1	0	0	0	1	1
Lapwing	327	539	186	312	147	201
Redshank	6	2	3	0	3	2
Ring Ouzel	0	0	0	0	0	0
Short-eared owl	3	0	0	0	0	0
Snipe	4	0	0	1	0	2
Twite	0	0	0	0	0	0
Wheatear	73	3	54	0	19	3
Whinchat	1	0	1	0	0	0

6.2.27 As the moorland fringe survey was limited in both number of visits and extent, and also confined to daytime survey, it could only identify a limited number of fields used by foraging birds from the SPA, being those that were attractive to feeding birds at the time of survey. It was not be able to identify fields used at night by feeding golden plover, nor fields used at other times of year. The numbers of birds recorded feeding within a particular field may only represent a small proportion of the total number of birds that may use that field over a period of time. Unlike fields used by breeding waders, birds feeding in fields are not territorial so that the same field may be used by several pairs of breeding birds over a period of time due to this process of turn-over. The limited survey time and number of survey visits means that the results of this survey represent only a partial record of foraging bird use both in terms of distribution and numbers of birds.

6.2.28 Box 2 provides a case study of the approach used in the Solent area to protect land outside of an SPA but which is nevertheless regularly used by roosting waders and feeding Brent geese *Branta bernicla bernicla*. Whilst there are clear differences in habitat and topography between land used by feeding Brent geese and roosting waders around the Solent, and the land used by off-site foraging waders from the Pennine Moors, the Solent Waders and Brent Goose Strategy[38] provides a model of how the extent and use of such off-site habitat by SPA birds can be identified.

Box 2: Case Study – The Solent Waders and Brent Goose Strategy

The Solent Waders and Brent Goose Strategy was developed as a strategic response to the need to conserve off-site feeding and roosting habitat for birds from the three SPA within the Solent. The three SPA have large over-wintering assemblages of wading birds and waterfowl, and are also used by breeding Annex 1 birds (e.g. terns) and on-passage birds. The Strategy has been considered in the context of the South Pennine Moors SPA to identify parallels that might be applicable to the South Pennine Moors. It identifies areas of land around the Solent edge that are used by feeding Brent geese and roosting wading birds from the SPA and provides important evidence used in development plans across the region.

The Wader and Brent Goose Strategy identified survey sites that contained potential Brent goose feeding and wader roosting habitat. A team of volunteer surveyors were asked to count sites regularly, ideally every two weeks. Counts took place over the winter period from October to March (six months) for three seasons: 2006-2007, 2007-2008 and 2008-2009 giving a maximum of 36 counts per site.

All sites that were being used by waders and/or Brent geese were considered to be "important" as they form part of the ecological network of sites used by the birds. In some cases birds may use sites occasionally in high numbers, or regularly in low numbers, sometimes sites are favoured later in the year and some only under extreme weather conditions. Land used by birds from the South Pennine Moors SPA is also likely to have such a varied pattern of use as part of an ecological network with changes due to land-use and seasonal variations.

Although all sites being used by Brent geese and waders were considered important, each site was assessed in terms of frequency and scale of use and the diversity of waders using a site. A confidence assessment was also made to reflect the fact that some sites were not counted as frequently as others. The results from sites that fell below a threshold of count frequency were classified as being "uncertain". Only sites that had been regularly recorded with no birds being seen were classified as "no recorded use".

[38] King, D. (2010) *Solent Waders and Brent Goose Strategy 2010*. Hampshire and Isle of Wight Wildlife Trust.

6.2.29 If one were to apply the confidence assessment used in the Solent Strategy, all the sites identified by the 2013 Moorland Fringe Bird Survey, with just two visits in one year, would be classified as having 'uncertain' use as they would fail to meet the survey frequency threshold. Equally, with the limited number of survey visits it is not possible to determine with any confidence that a field has 'no recorded use'.

6.2.30 Due to the limited survey time and methodology, an assessment of SHLAA sites using the 2013 Moorland Fringe Bird Survey needs to be undertaken with caution. Further survey will be required to extend the coverage and hence confidence with which the survey data can be used and to help develop a model upon which predictions of future use and land management guidance can be based.

6.2.31 The following sections provide an indication of SHLAA sites that might conflict with the conservation of land used by foraging SPA birds. The percentage of the SPA population associated with each SHLAA site has been calculated in accordance with advice from Natural England, however, it is our view that these percentages cannot be considered to determine significance levels at this stage due to the issues of turn-over, the limited survey coverage and number of survey visits.

Use of land by foraging SPA birds

6.2.32 The conservation of several of the SPA bird populations is dependent upon the maintenance of sufficient off site feeding habitat within the moorland fringe. To provide an indication of the extent of this resource the location of foraging birds has been related to the fields in which they were recorded. This was estimated by relating the location of foraging SPA birds to OS MasterMap polygons. This identified a total area of 2,037ha of land in the moorland fringe outside of the SPA boundary from which SPA birds have been recorded as foraging.

SHLAA sites used by foraging SPA birds

6.2.33 SHLAA sites that are being used by SPA birds were identified by relating records of foraging, standing, roosting and preening birds to SHLAA sites. Numbers of birds recorded within each SHLAA site were calculated and this was related to the total numbers of birds present within both the entire SPA, the Rombalds Moor part of the SPA and the SPA adjacent to the south western settlements (within Bradford District).

6.2.34 A total of ten SHLAA trajectory sites were recorded by the 2013 survey as being used by foraging SPA birds. Table 6.5 lists these sites and summarises the bird use.

Proportion of SPA bird population using SHLAA sites

6.2.35 Table 6.6 analyses the proportion of the South Pennine Moors SPA, Rombalds Moor section of the SPA and SW Bradford section of the SPA population of breeding birds recorded foraging within SHLAA trajectory sites during the 2013 moorland fringe bird survey. Site IL/014 has two records of lapwing giving a total of 3 birds for this site.

Table 6.5: SHLAA trajectory sites used by foraging SPA birds

SHLAA ref	Settlement	Species	Abundance	Activity
BI/008	Bingley	Lapwing	1	forage
BU/002	Burley	Curlew	1	forage
ME/007	Menston	Curlew	1	forage
SI/003	Silsden	Curlew	1	forage
SI/006	Silsden	Curlew	1	forage
AD/004	Addingham	Curlew	1	stand
AD/005	Addingham	Curlew	1	stand
EM/010	East Morton	Curlew	1	forage
IL/014	Ilkley	Lapwing	1	forage
IL/014	Ilkley	Lapwing	2	forage
OA/014	Oakworth	Lapwing	1	forage

Note: Site IL/014 had lapwing recorded on two occasions giving a total of 3 birds for this site.

SHLAA sites on or adjacent to land used by foraging SPA birds

6.2.36 There is limited evidence of the effect of housing development on the use of land adjacent to the development by foraging wading birds. It is evident that feeding wading birds are susceptible to disturbance, either from recreational use or from predators such as domestic cats and dogs. Disturbance will reduce feeding time and increase energy requirements and hence reduce the efficiency with which they are able to feed. Regularly disturbed birds will ultimately move away from a feeding site to find a less disturbed location and thus there would be an effective reduction in the extent of available foraging land.

6.2.37 Studies have been undertaken of the effects of recreational disturbance on feeding intertidal birds in the Solent (Liley *et al*, 2010). This showed effective disturbance distances for curlew varied between both the source and type of disturbance with general activity on sea walls having an effective disturbance distance of 43.2m and disturbance from dogs off leads on sea walls of 54.6m. These distances increased with disturbance from activity on the intertidal to 68.0m and with dogs off leads to 82.2m. The maximum observed bird-visitor distance at which a response in curlew was observed was 200m.

6.2.38 The Solent Waders and Brent Goose Strategy aims to protect inland feeding sites (fields) for waders that use the mudflats at low tide. Whilst not directly comparable with an moorland fringe, it provides some evidence of neighbouring land use features that influence foraging site selection by wading birds on inland sites without open public access. Analysis of the survey results used to develop the Solent Strategy found that;

> *"Statistical correlations show that factors that describe how urban the area surrounding a site is, e.g. distance to road, area of buildings, relative distance of buildings and number of homes at different travel times, all significantly correlate with Brent Goose and wader site usage."* King (2010), p.16.

Table 6.6: Proportion of SPA birds present within trajectory SHLAA sites

SHLAA ref	Settlement	Species	Abundance	Activity	% SPM SPA	% Rombalds	% SW Bradford
BI/008	Bingley	Lapwing	1	forage	0.38%	1.52%	N/A
BU/002	Burley	Curlew	1	forage	0.11%	0.78%	N/A
ME/007	Menston	Curlew	1	forage	0.11%	0.78%	N/A
SI/003	Silsden	Curlew	1	forage	0.11%	0.78%	N/A
SI/006	Silsden	Curlew	1	forage	0.11%	0.78%	N/A
AD/004	Addingham	Curlew	1	stand	0.11%	0.78%	N/A
AD/005	Addingham	Curlew	1	stand	0.11%	0.78%	N/A
EM/010	East Morton	Curlew	1	forage	0.11%	0.78%	N/A
IL/014	Ilkley	Lapwing	1	forage	0.38%	1.52%	N/A
IL/014	Ilkley	Lapwing	2	forage	0.75%	3.03%	N/A
OA/014	Oakworth	Lapwing	1	forage	0.38%	N/A	2.00%

6.2.39 The Solent Strategy found a significant correlation between use of a site for feeding Brent geese and roosting waders and the area of built development within two zones; 0-50m and 50-500m for both Brent goose feeding and wader roosting sites.

6.2.40 Land use is also important in maintaining the quality of off-site feeding habitat, most importantly, in maintaining short swards rich in soil invertebrates. This depends on continued mixed farming practices involving livestock grazing and hay/silage cutting. Development that reduces the viability of the agricultural economy of an area and a change in land-use is liable to reduce the value of land for feeding waders from the South Pennine Moorlands SPA.

6.2.41 Some further guidance on disturbance distances was provided by English Nature in *Key habitat attributes for birds and bird assemblages in England*[39] (Kirby *et al.*, 2000) which provides suggested sight line distances for foraging curlew and other upland breeding waders (golden plover, snipe, common sandpiper, dunlin and redshank). It suggests landscape attributes should comprise open areas including large fields (anti-predator, feeding, roosting display). They set a monitoring target of unrestricted views of >200m.

6.2.42 To test the effect of development on adjacent habitat used by feeding waders from the SPA, a 200m buffer has been used because this is the maximum distance at which waders were recorded to be disturbed by visitors to the Solent and because it is the effective sight line distance needed for feeding curlew identified by English Nature in Kirby *et al.* (2000).

SHLAA sites within 200m of SPA bird foraging habitat and foraging birds

6.2.43 Two approaches have been taken to identifying SHLAA sites that are close to foraging SPA birds and their habitat. A simple approach is to identify all records of foraging SPA birds that are within 200m of a SHLAA trajectory site. However, the location from which such records are made relate to a field or area of habitat that is important to conserve as a unit. To take a habitat based approach, records of foraging or potentially foraging birds were related to OS polygons from which these birds were recorded. Table 6.7 and Table 6.8 relate SHLAA trajectory sites to foraging SPA birds and OS polygons used by foraging SPA birds. It should be noted that all records of foraging SPA birds were used in this analysis (from survey visits 1 and 2).

6.2.44 A total of 36 SHLAA trajectory sites have been identified that are within 200m of foraging SPA birds (Table 6.7). The proportion of the total SPA populations of the three most abundant species (golden plover, curlew and lapwing) is shown in Table 6.9.

6.2.45 Table 6.8 identifies a total of 56 SHLAA sites that are within 200m of foraging habitat for SPA birds. Table 6.10 shows the proportion of the SPA populations of the three most abundant species associated with each SHLAA site.

[39] Kirby, J., Drewitt, A, Chivers, L. & Saunders, R. (2000). *Key habitat attributes for birds and bird assemblages in England*. English Nature Research Report No. 359. Peterborough.

Table 6.7: SHLAA trajectory sites within 200m of SPA foraging birds

SHLAA ref	Golden Plover	Curlew	Lapwing	Com. Sandpiper
Addingham				
AD/002		2		
AD/004		3		
AD/005		3		
AD/007		1		
AD/009		3		
AD/012		3		
Bingley				
BI/007		2	1	
BI/008		2	1	
BI/009		2		
BI/011			2	
BI/032			1	
Burley				
BU/002		2		
BU/004		1		
Denholme				
DH/005		1		
DH/010		2		
DH/011		5		
DH/015	4			
East Morton				
EM/004		1		
EM/006		1		
EM/007		1		
EM/010		1		
Ilkley				
IL/010			2	
IL/011B		1		
IL/013			3	
IL/014			5	
IL/019		4		
Menston				
ME/006		1		
ME/007		2		
ME/012		1		
Oakworth				
OA/005			3	
OA/012			1	
OA/014			1	
Oxenhope				
OX/001				1
Silsden				
SI/003		7		
SI/006		8		
Thornton				
TH/005			4	

Table 6.8: SHLAA trajectory sites within 200m of SPA foraging habitats (defined by OS MasterMap polygons used by foraging SPA birds)

SHLAA ref	Gldn Plover	Curlew	Lapwing	Cm Sandpiper	Redshank	Wheatear
Addingham						
AD/001		4				3
AD/002		3				3
AD/003		1				
AD/004		8				
AD/005		9				
AD/007		4				
AD/009		4				
AD/012		3				1
Bingley						
BI/007		2	1			
BI/008		2	1			
BI/009		2				
BI/011			7			
BI/032			1			
Burley						
BU/002		4	1			
BU/004		1				
BU/005		3	2			
BU/008		2	12			
Denholme						
DH/002		1				
DH/005		1		2		
DH/006		1				
DH/010		3				
DH/011	4	6	1			
DH/015	4	1	1			
DH/016				2		
East Morton						
EM/003		1				
EM/004		2				
EM/006		2				
EM/007		2				
EM/010		1				
Haworth						
HA/011		4				
Ilkley						
IL/009			2			
IL/010			5			
IL/011B		1				

SHLAA ref	Gldn Plover	Curlew	Lapwing	Cm Sandpiper	Redshank	Wheatear
IL/012		3				
IL/013			3			
IL/014		3	7			
IL/019		6				
Keighley						
KY/046		1				
KY/047						2
KY/088				1		
KY/093				1		
Menston						
ME/001		1				
ME/002		1				
ME/005		1				
ME/006		1				
ME/007		3	1			
ME/012		2	1			
Oakworth						
OA/005			5			
OA/012			1			
OA/014			1			
Oxenhope						
OX/001			1	1	1	
Silsden						
SI/002		4				
SI/003		8				
SI/004		1				
SI/006		9				
Thornton						
TH/005			4			

Table 6.9: Proportion of SPA population present within 200m of SHLAA sites

SHLAA ref	Abundance	% SPA population	% Rombalds or SW Bradford pop	Abundance	% SPA population	% Rombalds or SW Bradford pop	Abundance	% SPA population	% Rombalds or SW Bradford pop
	Golden Plover			Curlew			Lapwing		
Addingham									
AD/002				2	0.22%	1.56%			
AD/004				3	0.33%	2.34%			
AD/005				3	0.33%	2.34%			
AD/007				1	0.11%	0.78%			
AD/009				3	0.33%	2.34%			
AD/012				3	0.33%	2.34%			
Bingley									
BI/007				2	0.22%	1.56%	1	0.38%	1.52%
BI/008				2	0.22%	1.56%	1	0.38%	1.52%
BI/009				2	0.22%	1.56%			
BI/011							2	0.75%	3.03%
BI/032							1	0.38%	1.52%
Burley									
BU/002				2	0.22%	1.56%			
BU/004				1	0.11%	0.78%			
Denholme									
DH/005				1	0.11%	0.72%			
DH/010				2	0.22%	1.45%			
DH/011				5	0.55%	3.62%			
DH/015	4	0.77%	4.65%						
East Morton									
EM/004				1	0.11%	0.78%			
EM/006				1	0.11%	0.78%			
EM/007				1	0.11%	0.78%			
EM/010				1	0.11%	0.78%			
Ilkley									
IL/010							2	0.75%	3.03%
IL/011B				1	0.11%	0.78%			

IL/013				3	1.13%	4.55%
IL/014				5	1.88%	7.58%
IL/019	4	0.44%	3.13%			
Menston						
ME/006	1	0.11%	0.78%			
ME/007	2	0.22%	1.56%			
ME/012	1	0.11%	0.78%			
Oakworth						
OA/005				3	1.13%	6.00%
OA/012				1	0.38%	2.00%
OA/014				1	0.38%	2.00%
Silsden						
SI/003	7	0.77%	5.47%			
SI/006	8	0.88%	6.25%			
Thornton						
TH/005				4	1.50%	8.00%

Table 6.10: Proportion of SPA population present within OS MasterMap polygons within 200m of SHLAA sites

SHLAA ref	Abundance	% SPA population	% Rombalds or SW Bradford pop	Abundance	% SPA population	% Rombalds or SW Bradford pop	Abundance	% SPA population	% Rombalds or SW Bradford pop
	Golden Plover			Curlew			Lapwing		
Addingham									
AD/001				4	0.44%	3.13%			
AD/002				3	0.33%	2.34%			
AD/003				1	0.11%	0.78%			
AD/004				8	0.88%	6.25%			
AD/005				9	0.99%	7.03%			
AD/007				4	0.44%	3.13%			
AD/009				4	0.44%	3.13%			
AD/012				3	0.33%	2.34%			

Bingley									
BI/007				2	0.22%	1.56%	1	0.38%	1.52%
BI/008				2	0.22%	1.56%	1	0.38%	1.52%
BI/009				2	0.22%	1.56%			
BI/011							7	2.63%	10.61%
BI/032							1	0.38%	1.52%
Burley									
BU/002				4	0.44%	3.13%	1	0.38%	1.52%
BU/004				1	0.11%	0.78%			
BU/005				3	0.33%	2.34%	2	0.75%	3.03%
BU/008				2	0.22%	1.56%	12	4.51%	18.18%
Denholme									
DH/002				1	0.11%	0.72%			
DH/005				1	0.11%	0.72%			
DH/006				1	0.11%	0.72%			
DH/010				3	0.33%	2.17%			
DH/011	4	0.77%	5.00%	6	0.66%	4.35%	1	0.38%	2.00%
DH/015	4	0.77%	5.00%	1	0.11%	0.72%	1	0.38%	2.00%
East Morton									
EM/003				1	0.11%	0.78%			
EM/004				2	0.22%	1.56%			
EM/006				2	0.22%	1.56%			
EM/007				2	0.22%	1.56%			
EM/010				1	0.11%	0.78%			
Haworth									
HA/011				4	0.44%	2.90%			
Ilkley									
IL/009							2	0.75%	3.03%

IL/010				5	1.88%	7.58%
IL/011B	1	0.11%	0.78%			
IL/012	3	0.33%	2.34%			
IL/013				3	1.13%	4.55%
IL/014	3	0.33%	2.34%	7	2.63%	10.61%
IL/019	6	0.66%	4.69%			
Keighley						
KY/046	1	0.11%	0.78%			
Menston						
ME/001	1	0.11%	0.78%			
ME/002	1	0.11%	0.78%			
ME/005	1	0.11%	0.78%			
ME/006	1	0.11%	0.78%			
ME/007	3	0.33%	2.34%	1	0.38%	1.52%
ME/012	2	0.22%	1.56%	1	0.38%	1.52%
Oakworth						
OA/005				5	1.88%	7.58%
OA/012				1	0.38%	1.52%
OA/014				1	0.38%	1.52%
OX/001				1	0.38%	1.52%
Silsden						
SI/002	4	0.44%	3.13%			
SI/003	8	0.88%	6.25%			
SI/004	1	0.11%	0.78%			
SI/006	9	0.99%	7.03%			
Thornton						
TH/005				4	1.50%	8.00%

Foraging SPA bird habitat preferences

6.2.46 The records of foraging curlew from 2013 Moorland Fringe Bird Survey have been analysed to identify the habitat characteristics of the fields used by these birds. The habitat characteristics for the fields from which birds were recorded were noted by the bird surveyors. Curlew were recorded from 477 OS MasterMap land parcels outside of the SPA boundary covering an area of 582.06 ha.

6.2.47 Habitat features of fields used by foraging curlew are summarised in Table 6.11. The results show that short grass fields grazed by sheep were the most frequently used by foraging curlew.

Table 6.11: Habitat characteristics of fields used by foraging curlew from the 2013 Moorland Fringe Bird Survey. Records may be of more than one bird

Characteristic	%
Records of curlew from fields with short grass <30cm	77.36%
Records of curlew from fields with no rush cover	51.77%
Records of curlew from fields with rush cover 1-5%	28.32%
Records of curlew from fields grazed by livestock	72.38%
Proportion of grazed fields with sheep	90.12%
Records of curlew from fields cut/mown for hay or silage	12.69%
Sites with unknown management	10.47%

6.2.48 A Moorland Fringe Habitat Survey was also undertaken in 2013 (UEEC, January 2014). A total of 73 OS field parcels included in this survey, covering an area of 304 ha, were used by foraging curlew. Table 6.12 compares the numbers of fields recorded in different habitat categories in the survey compared with those used by foraging curlew.

Table 6.12: Habitat types recorded during the 2013 Moorland Fringe Habitat Survey, and the proportion of each used by foraging curlew

Habitat/variable	All fields surveyed	Fields surveyed with foraging curlew
Improved grass	19.63%	30.93%
Species poor semi-improved grass	43.91%	43.30%
Species rich semi-improved grass	3.8%	6.19%
Rush pasture cover 26-50%	2.26%	3.16%
Fields with molehills	21.28%	27.37%
Total number of fields	1421	96
Total area of fields	2405 ha	595 ha
Average field size	1.69 ha	6.14 ha

6.2.49 The results of this comparison show that the number of records of curlew from improved grass fields and species rich semi-improved grass fields was greater than the number of these fields in the survey area as a whole suggesting a preference for these field types. Most records of foraging curlew were from species poor semi-improved grassland although the proportion of fields with this grass type was similar to that found in the survey area as a whole, suggesting no particular preference for this grassland type, and the same is true for fields with rush pasture. However, the average size of fields in which curlew were recorded foraging was much greater than the average field size across the survey area, which suggests that curlew are selecting larger fields with greater effective sight lines.

Categorisation of SHLAA sites

6.2.50 Natural England advised that, when appraising potential development locations, the Council should consider whether it is possible to identify sites/locations that are:

a) Unlikely to be deliverable (where significant numbers (of SPA birds) are recorded on-site or likely to be disturbed off-site) and therefore should be avoided,

b) Deliverable with mitigation (either site specific or strategic mitigation), or

c) Deliverable without mitigation (unconstrained).

6.2.51 In this analysis SHLAA2 trajectory sites have been used as a proxy to test future land supply in relation to proposals for development in the Core Strategy.

6.2.52 The three categories may be considered in short hand as Red, Amber and Green sites. Insufficient data regarding foraging SPA bird abundance and frequency of use of SHLAA sites presently exists to conclusively categorise each site in accordance with these groups. As a consequence, there are currently no sites which fall into category a) – Red sites.

6.2.53 All sites identified as being used by foraging SPA birds are classified as category b) – Amber sites which provide supporting habitat. We would also provisionally place the majority[40] of SHLAA sites within 200m of foraging SPA birds, or within 200m of OS MasterMap polygons containing records of foraging SPA birds, within the Amber list (category b). However, further survey and assessment of Amber category sites may result in a conclusion that one or more are regularly used for foraging by SPA birds, or are adjacent to land which is regularly used, and such sites may need to be added to the Red category in future (i.e. sites which are functionally linked to the SPA).

6.2.54 All the remaining SHLAA sites not identified as Amber within the 2.5km buffer are categorised as group c) – Green sites. All SHLAA sites that are outside of the 2.5km buffer around the SPA would also fall within category c) – Green sites.

[40] Sites KY/088 and KY/093 are included within the list of sites within 200m of foraging polygons given in Table 6.8 but have subsequently been placed in the Green category. This is due to an anomaly arising from the use of MasterMap polygons related to bird records. Common sandpiper was recorded foraging from the edge of the River Aire to the west of these two SHLAA sites that resulted in a section of 2.5km the river being selected as a MasterMap polygon with foraging birds. Due to the elongated shape of this polygon it resulted in these two sites being selected as being within 200m but in reality they are over 1km from the foraging common sandpiper record. For this reason these two sites were not included in the Amber category.

6.2.55 The results of this method of categorisation are shown in Appendix II, while maps showing the extent of SHLAA2 trajectory sites in relation to foraging SPA birds recorded during the 2013 survey are shown in Appendix III.

6.2.56 Some caution needs to be applied to the above assessment which, whilst adequate at a strategic level, was based on just two visits per site during the 2013 breeding season. Further survey work will give a better indication of frequency of use and may show that foraging SPA birds are present in greater abundance, or that some sites are used more frequently at certain stages of the season, or that some sites are only irregularly used by small numbers of birds.

Responding to the risk of loss of supporting habitat

6.2.57 The data presented in Appendix II allows a reasonable assessment of risk to be made at the Core Strategy level and a response to be identified. The hierarchy of Habitats Regulations Assessment of plans means that proposals can be subject to further and more detailed assessment when more information is available, in relation to choice of sites, in-combination effects and the scope and need for appropriate mitigation measures, in a lower tier plan. HRA of the Allocations DPD will need to be able to demonstrate that, in relation to the impact pathways identified, the level of development proposed in a particular area, including in-combination effects, will not have an adverse effect on the integrity of the SPA/SAC.

Future survey, assessment and mitigation

6.2.58 Additional survey and assessment will be required when testing sites for inclusion within the Allocations DPD, for residential or employment development or other land uses within the 2.5km zone. Outputs from further surveys and assessments are to be incorporated into the wider Sustainability Appraisal and Strategic Environmental Assessment testing process.

6.2.59 Sufficient survey effort needs to be undertaken to be certain that an area of land is not being used to support SPA bird populations. The survey standards, objectives and methods for assessing site importance will be agreed with Natural England and set out for consultation in the SPD identified in Policy SC8.

6.2.60 The hierarchy of HRA of plans means that proposals can be subject to further and more detailed assessment when more information is available in a lower tier plan. Appropriate assessment of the Allocations DPD will need to be able to demonstrate that, in relation to the impact pathways identified, the location, scale and nature of development proposed will not have an adverse effect on the integrity of the SPA.

6.2.61 The approach to mitigation will need to take account of the assessed importance of each site and also the scale of impact. The principle will be to avoid direct or indirect negative effects on functionally linked sites or supporting habitats which are regularly used by foraging SPA birds. Avoidance/mitigation would include the choice of sites being identified for development, providing equivalent replacement habitat so that the overall resource available to the birds is not diminished, improved management of a site to increase bird use, or timing of works outside of the period in which sites are frequently used. Where identifying mitigation measures would

allow development to take place, measures should be in place prior to development commencing.

6.2.62 Where replacement sites are required the objective would be to maintain the area of suitable foraging habitat in approximately the same distribution i.e. replacement habitat would not only need to be within 2.5km of the SPA but also within foraging range of the birds that are displaced. The following principles should be taken into account during selection and design of replacement sites:

- Replacement with equivalent area (ha) of foraging land;
- Replacement site to be comparable distance from SPA, and certainly within 2.5km zone;
- Replacement site to be of comparable quality regarding (i) food abundance, (ii) habitat type/quality, (iii) topography, (iv) sight lines, (v) absence of current or foreseeable access/disturbance.

Potential for In Combination effects

6.2.63 Developments within surrounding districts (e.g. Craven, Harrogate, Leeds, Calderdale, Burnley and Pendle) are at this stage considered unlikely to adversely affect birds using supporting habitats within Bradford district. However, developments within these districts could result in direct or indirect effects on birds using supporting habitats within those districts.

6.2.64 Where bird records and/or areas of supporting habitat are identified close to adjoining authority boundaries, this issue may need to be kept under review, as plan-making work progresses, and be the subject of future liaison with the authority concerned.

6.3 Increased Water Demand

6.3.1 In relation to water demand, the earlier screening assessment stated the following (Environ, 2012):

> *"Changes in groundwater levels and water quality from new housing and economic development: The risk of a likely significant effect (LSE) is uncertain. On the basis of the precautionary principle, an LSE is identified because the Core Strategy directs development close to the boundaries of the SPA, particularly at Rombalds Moor, and it is not known whether there are any issues relating to water supply and the delivery of the Core Strategy. Measures to manage flood risk associated with development in the District and whether they could affect the hydrology of the site are also unknown."*

6.3.2 Yorkshire Water has published its Final Water Resources Management Plan (WRMP) (August 2014) for the period 2015/16 to 2039/40. Bradford district falls entirely within the company's 'Grid Surface Water Zone'. The Final WRMP concludes that the baseline supply-demand balance for the Grid SWZ dry year annual average scenario shows a substantial deficit which increases over the planning period as the forecast supply cannot meet the forecast demand. The deficit is the result of a continuing decline in water available for supply, due to the impacts of climate change and Sustainability Reductions (which are implemented to protect the integrity

of European sites). Climate change is forecast to create a year on year incremental reduction in supply. A 2.0Ml/d Sustainability Reduction is applied in 2013/14 and a 0.7Ml/d sustainable reduction applied in 2017/18. The Grid SWZ supply-demand deficit starts in 2018/19, when demand, including target headroom, is 2.67Ml/d greater than supply. By 2027/28 supply is below demand and no headroom is available. The deficit continues increasing to 108.65Ml/d by 2039/40.

6.3.3 The preferred solution to the Grid SWZ dry year annual average deficit over the 25 year period provides a balance of demand reduction options (including reduction of leakage and processing losses, and increased customer water efficiency) and options to increase supply (including use of an existing river abstraction licence, and three groundwater scheme). A total of 47.96Ml/d demand reduction will be achieved by delivering 14 demand side schemes over the 25 years. Four supply side options will be delivered providing 61.95Ml/d additional resource. The first will be in year 11 when Yorkshire Water will implement its largest resource solution, the "D20 Ouse Raw Water Transfer", to provide 40Ml/d. In year 17 it will abstract an additional 2Ml/d from an existing borehole in North Yorkshire. In year 18 the company will implement the "East Yorkshire Groundwater Option 1" scheme to provide 6.55Ml/d. The final resource solution will provide a yield of 5.36Ml/d in year 21 that will increase to 13.4Ml/d by year 23.

6.3.4 Based on the preferred solution, the final planning scenario supply-demand balance results in a surplus in Grid SWZ throughout the plan period; see Figure 6.1.

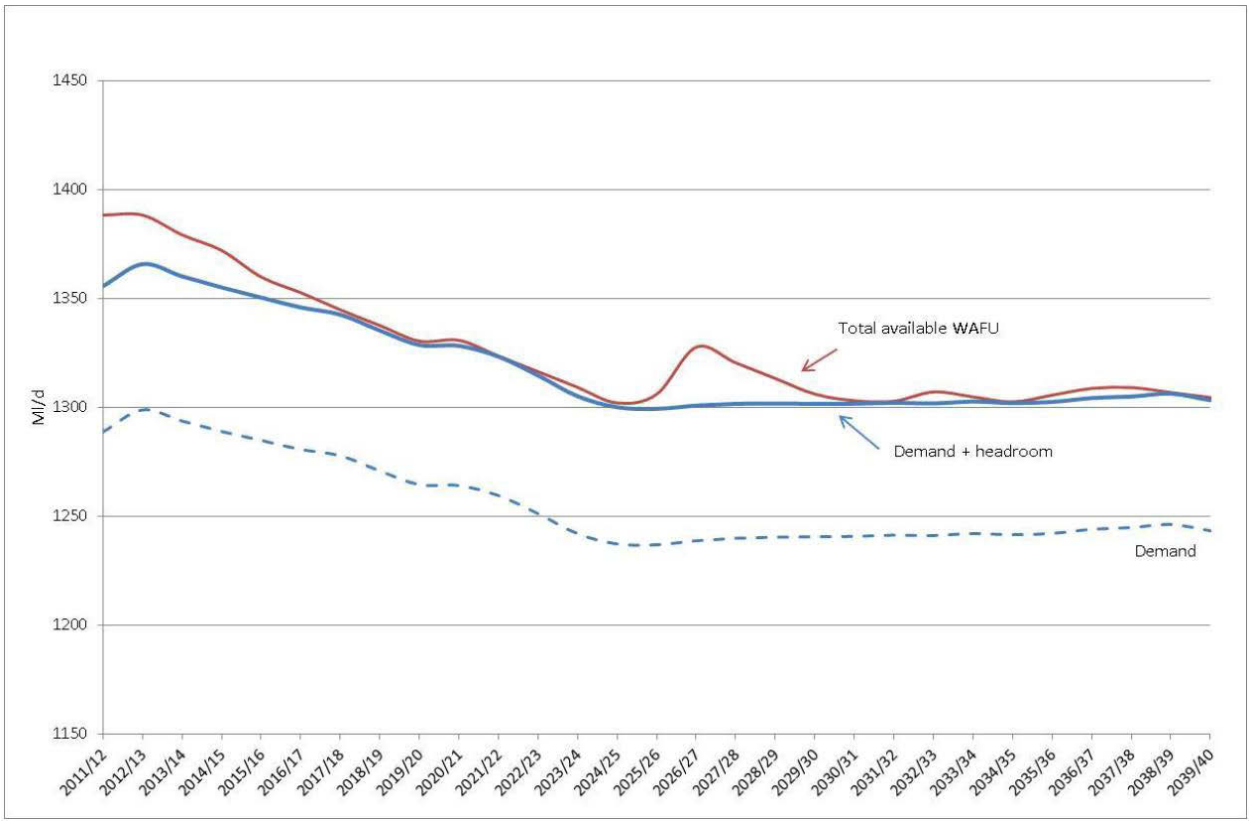


Figure 6.1: Grid SWZ preferred solution supply demand balance (Source: Yorkshire Water (August 2014) p.161)

6.3.5 An HRA was also prepared to assess the potential for likely significant effects of the WRMP options on sites designated under the Habitats Directive, Birds Directive and the international Ramsar Convention. The findings were discussed with Natural England and the Environment Agency. The HRA screening assessment of the preferred solution concluded that, with mitigation taken into account, the preferred plan is not likely to have significant effects on the integrity of any of these designated sites based on current information and designations.

6.3.6 Concerns were raised during consultation on the Draft WRMP as to the potential impact of additional abstraction pressure on the dissolved oxygen concentrations in the Lower Ouse during low flow conditions in the summer months which may lead to adverse effects on designated migratory fish species and on the Humber Estuary European Marine Site (EMS). One scheme (Ouse raw water transfer) has the potential to impact on flows in the Lower Ouse and this was assessed as part of the HRA process.

6.3.7 The Ouse raw water transfer scheme involves additional abstraction of 40 Ml/d, but this remains within the existing maximum abstraction licence conditions. The Environment Agency has previously reviewed the impact of the abstraction at maximum licence volumes and concluded that this would not have a likely significant effect on the Humber Estuary EMS and migratory fish species. The HRA also concluded that the additional abstraction of 40 Ml/d would not lead to likely significant effects on fish migration or on the Humber Estuary. This conclusion is based on previous investigations which showed that the dissolved oxygen risks occur in the summer months (June to September) which do not overlap with the key fish migration periods (October to May). Extensive water quality modelling work carried out during recent years also demonstrates that the scale of flow change arising from the additional 40Ml/d abstraction would have a negligible effect on dissolved oxygen concentrations. Environment Agency modelling has shown that dissolved oxygen concentrations are not sensitive to changes in abstraction rates of this magnitude.

Potential for In Combination effects

6.3.8 Cumulative assessment of the WRMP with other water company WRMPs, drought plans and other relevant programmes and plans has also concluded that there would be no likely significant effect on any designated sites.

6.3.9 It can be concluded that the residential development target of the Bradford district Core Strategy (Proposed Modifications) is not likely to affect the North or South Pennine Moors SAC/SPA through increased water demand.

6.4 Impacts on Water Quality

6.4.1 In relation to water demand, the earlier screening assessment stated the following (Environ, 2012):

> *"Changes in groundwater levels and water quality from new housing and economic development: The risk of a likely significant effect (LSE) is uncertain. On the basis of the precautionary principle, an LSE is identified because the Core Strategy directs development close to the boundaries of the SPA, particularly at Rombalds Moor, and it is*

not known whether there are any issues relating to water supply and the delivery of the Core Strategy. Measures to manage flood risk associated with development in the District and whether they could affect the hydrology of the site are also unknown"

6.4.2 There is no further elaboration on how water quality on the moorlands could be significantly affected as a result of new housing and economic development in Bradford district. However, waste water from new developments must be collected, conveyed and treated prior to discharge to the environment, and can result in impacts to water quality and ecological receptors. The following information regarding waste water treatment infrastructure and discharge flows relevant to Bradford district was gathered from conversations with Environment Agency (pers. comm., 2012b). The main waste water treatment works (WWTW) serving settlements in the district are listed in Table 6.13.

6.4.3 All of these WWTWs discharge to the Rivers Aire, Wharfe or Calder, either directly or via tributaries. The River Clader joins the Aire at Castleford, with the Aire flowing on to meet the Riiver Ouse at Goole, while the Wharfe joins the Ouse at Cawood; the Ouse eventually joins the Humber Estuary.

Table 6.13: Main waste water treatment works serving settlements in Bradford district

WWTW	Settlement	Discharges to
Esholt	Bradford City Centre	R. Aire
Dowley Gap	Bingley	R. Aire
Marley	Keighley	R. Aire
Oxenhope	Oxenhope	Bridgehouse Beck > R. Worth > R. Aire
Ben Rhydding	Ilkley	R. Wharfe
Ash Holme	Burley in Wharefdale	R. Wharfe
Denholme	Denholme	Denholme Beck > Harden Beck > R. Aire
Mitchell Laithes (Dewsbury)	South east Bradford	R. Calder

Potential for In Combination effects

6.4.4 The Humber Estuary, which drains over a fifth of the area of England, is an SAC, SPA and Ramsar site and all discharges to it were assessed as part of the Environment Agency's Review of Consents under the Habitats Directive. It was assumed for the purposes of the RoC that all discharges were operating to their licensed limit. The assessment could not conclude with certainty that there would be no adverse effect on the integrity of the site's features as a result of dissolved oxygen sag due to organic loading (from sewage discharges as well as other sources)[41]. Low dissolved oxygen can impact on a number of estuary features; effects can include changes to the types and numbers of plant, animal and fish species present. The

[41] Other types of impact were considered, including entrainment and impingement of Lamprey, toxic contamination from current and past industry, and freshwater flows over mud flats, but none of these in linked to Core Strategy development in Bradford.

Environment Agency modelled all regulated consents that affect oxygen sag and concluded that they are responsible for approximately 40% of the total impact. In response it made changes to two discharge permits, including significant improvements in the Selby area to reduce major surcharges to the River Ouse.

6.4.5 It is concluded that development under the Bradford district Core Strategy (Proposed Modifications) is unlikely to affect any European site as a result of impacts on water quality.

6.5 Increased Emissions to Air

6.5.1 Atmospheric pollution is a widespread issue, with background air quality heavily influenced by large point-source emitters including transboundary sources. During the 1800s the industrial revolution led to extensive use of steam-powered machines, and an increase in the number of factories in northern Britain including around Manchester, the Peak District and South Pennines. Nitrous and sulphurous oxides released from chimney stacks in South and West Yorkshire and Greater Manchester were deposited on the moors. Deposition of sulphurous oxides degraded or destroyed large areas of peat-forming *Sphagnum* moss, while nitrous oxide emissions (which remain high today) result in nutrient enrichment, benefitting, nitrophilous grasses so that they out-compete the mosses and other moorland vegetation.

6.5.2 Local pollutant sources can affect designated sites, particularly in relation to protected habitats within the SAC, from industrial emissions, from waste processing facilities which involve thermal treatment, and from road traffic emissions. The Core Strategy identifies broad criteria for identifying and selecting sites for the management of waste processing (Waste Management Policy WM2), and policies in the Economy Section (Policy EC3) also set parameters for identifying employment allocations, but the Core Strategy does not specifically allocate sites for waste processing or other large point-source emitters. However, through its spatial distribution of development and sustainable transport measures, the Core Strategy will affect the way in which locally emitted pollutants reach each site. The main pollutant effects of interest are acid deposition and eutrophication by nitrogen deposition. The following brief descriptions draw on information presented through the Air Pollution Information System[42] (APIS).

6.5.3 Acid deposition: caused by oxides of nitrogen (NO_X) (or sulphur dioxide) reacting with rain/ cloudwater to form nitric (or sulphuric) acid, and is caused primarily by energy generation, as well as road traffic and industrial combustion. Both wet and dry acid deposition have been implicated in the damage and destruction of vegetation (heather, mosses, liverworts and lichens are particularly susceptible to cell membrane damage due to excessive pollutant levels) and in the degradation of soils and watercourses (including acidification & reduced microbial activity).

6.5.4 Eutrophication by nitrogen deposition: consists of the input of nitrogen from NO_X (and sometimes ammonia) emissions by deposition, and is caused primarily by road traffic, as well as energy generation, industrial combustion and agricultural practices. Nitrogen deposition can cause direct damage to heather, mosses, liverworts and lichens, as well as other plant species, because of their sensitivity to additional atmospheric nitrogen inputs, whilst deposition can also lead to long term compositional changes in vegetation and reduced diversity. For example a

[42] Online at: http://www.apis.ac.uk/index.html [Accessed 17/10/12]

marked decline in heather and an increased dominance of grasses have been observed throughout the Netherlands and also in the East Anglian Brecklands (see for example Bobbink et al (1993) and Pitcairn et al (1991)). Furthermore, while plants are able to detoxify and assimilate low exposure to atmospheric concentrations of NO_X, high levels of uptake can lead to detrimental impacts including:

- Inhibition of pigment biosynthesis, leading to reduced rates of photosynthesis;
- Water soaking as NO_2 molecules attach to lipids in membranes, causing plasmolysis (removal of water) and eventually necrosis;
- Inhibition of lipid biosynthesis, leading to reduced rates of regeneration and growth;
- Injury to mitochondria and plastids, essential to internal processing of energy & proteins;
- Decrease in stomatal conductance of air and water vapour; and
- Inhibition of carbon fixation (at least under low light levels).

6.5.5 Critical loads and levels can be used both as a benchmark for air quality management, and assessing the impacts of actions that lead to new pollutant emissions. Nilsson and Grennfelt (1988) define the concept of critical loads and levels as "*a quantitative estimate of exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge*". Critical loads concern the quantity of pollutants deposited from the air to the ground (for example nitrogen deposition and acid deposition), whilst critical levels concern the gaseous concentration of a pollutant in the air (for example nitrogen oxides).

6.5.6 Appendix IV presents data available through APIS on background critical load/level exceedances for these key pollutants types. A selection of grid references within European sites on or close to the road network connecting to Bradford district were chosen to interrogate APIS (Figure 6.2) because beyond 200m effects from road sources diminish to the equivalent of background levels (Laxen & Wilson (2002), DfT (2005)). For each grid reference, the actual and critical load/level was obtained for acid deposition, nutrient deposition and NOx in relation to a representative qualifying habitat type, or closest available match thereto, within European sites of interest (North and South Pennine Moors SAC). Cells shaded in red indicate an exceedance, whereas those shaded in amber indicate that the background load/level is more than 70% the critical load/level i.e. it is approaching exceedance.

6.5.7 As can be seen, for every location queried, the nitrogen deposition load is already exceeded, often by a high margin; Wadsworth Moor (GR3) and Thornton Moor (GR4), which are dissected by the A6033 Hebden Bridge Road currently have a modelled nitrogen loading of 549% of the critical load for bog habitats. All locations except Round Hill (Grid Reference 1 and Embsay Moor (GR2) are also currently exceeded for acid deposition (from a combination of sulphur and nitrogen inputs). None of the locations are exceeded for atmospheric concentrations of nitrogen, although Rishworth/Moss Moor (GR6) is approaching exceedance; this site is sandwiched between the A672 Oldham Road and M62 (J23-J22).

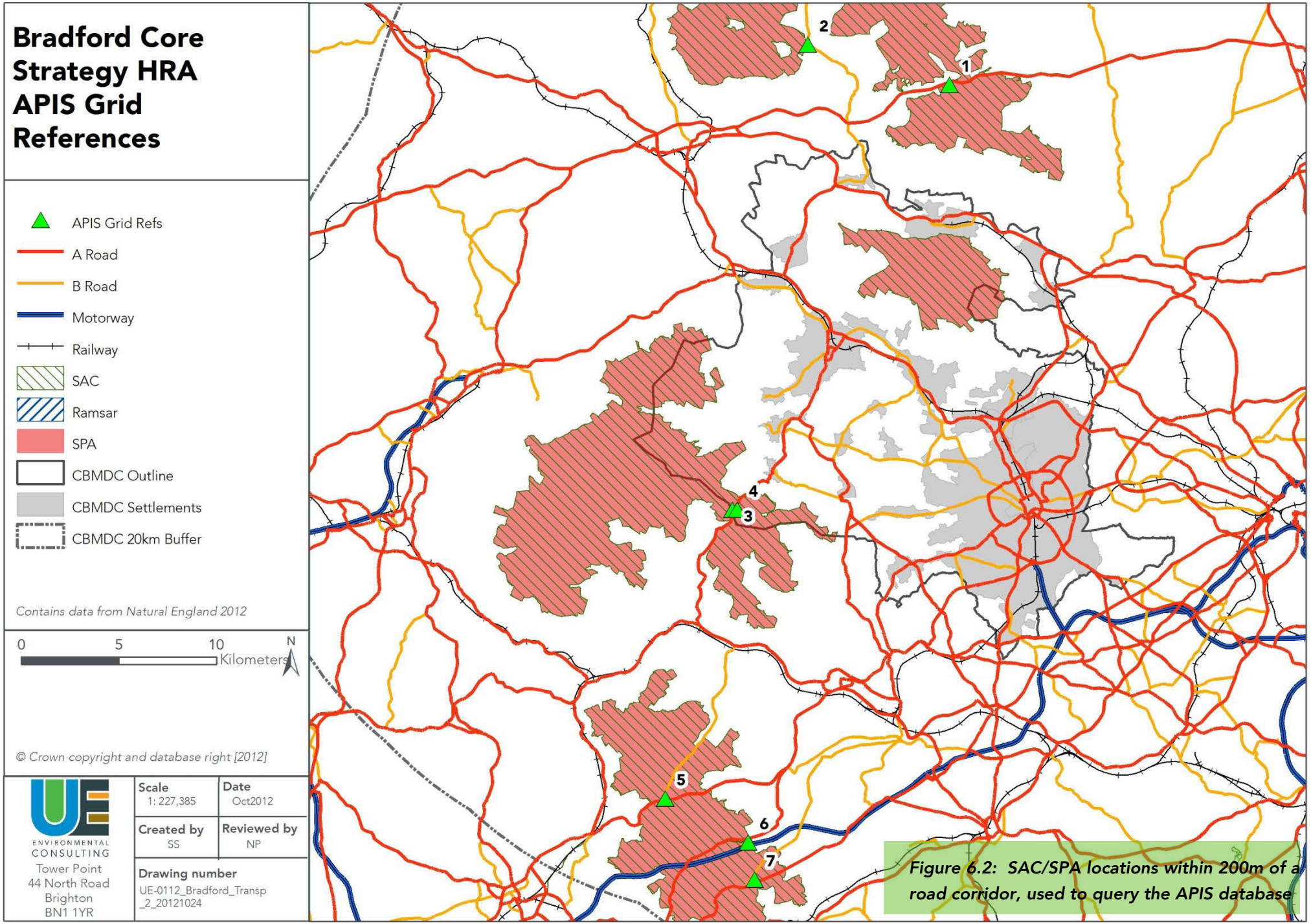


Figure 6.2: SAC/SPA locations within 200m of a road corridor, used to query the APIS database

6.5.8 The Design Manual for Roads and Bridges (DMRB; Highways Agency, 2007) provides guidance on assessing the impact that road projects may have on local air quality. Specific provision is made in relation to sites designated under the Habitats Directive. In this instance the assessment is in relation to existing, as opposed to new roads, however the guidance clarifies that '*where appropriate, the advice may be applied to existing roads*'. DMRB provides a scoping assessment for local air quality and initially requires the identification of roads which are likely to be affected by the proposals. The criteria for defining an affected road are:

- Road alignment will change by 5 metres or more; or
- Daily traffic flows will change by 1,000 annual average daily traffic (AADT) or more; or
- Heavy Duty Vehicle (HDV) flows will change by 200 AADT or more; or
- Daily average speed will change by 10km/hr or more; or
- Peak hour speed will change by 20km/hr or more.

6.5.9 The scoping assessment then requires that nature conservation sites (e.g. SAC/SPA/Ramsar) within 200m of the road and their characteristics be identified. The guidance states that if none of the roads in the network meet the traffic/alignment criteria (that is, they are not affected roads) or there are no relevant designated sites near the affected roads, then the impact of the scheme can be considered neutral in terms of local air quality and no further work is needed.

6.5.10 In selecting its preferred spatial development option for the Core Strategy, the Council commissioned an extensive transport study to examine impacts to all modes of travel (Steer Davies Gleave, 2010), based on a multi-modal model of the district's transport network. For all options considered the model produces trip rate forecasts by origin and destination, across all modes, according to 15 sectors of the district. However, the model did not produce traffic flow outputs in AADT format suitable for use with DMRB guidance. The study identifies ten key transport corridors in the district that can be expected to carry increased transport demand, as listed below and shown in Figure 6.3:

- 1: M606/M62;
- 2: A629/A644 (Keighley to Queensbury);
- 3: A6036/Little Horton Lane (route between Calderdale and Bradford – through Northowram/Shelf);
- 4: B6145 (Thornton Road);
- 5: A650 (Airedale corridor between Keighley and Bradford);
- 6: A629 (route between Craven and Bradford – through Silsden/Steeton area);
- 7: A65/A6038 (Wharfedale corridor between Addingham and Bradford);
- 8: A647 (route between Leeds and Bradford ring-roads);
- 9: A641 (route between Calderdale (Brighouse) and Bradford); and
- 10: A650 (Tong Street).

6.5.11 Comparing Figure 6.3 with Figure 6.2, it can be seen that none of the study's "key transport corridors" coincides with any of the locations on the road network falling within 200m of the North or South Pennine Moors SAC/SPA, although several of them are heading in the direction of trans-Pennine routes in the Rishworth and Moss Moor areas. This makes it difficult to draw any firm conclusions regarding the potential impact of development-related traffic growth on the SAC/SPA.

6.5.12 It is recommended that more detailed traffic modelling is undertaken during the pre-allocations testing stage which will precede development of the Allocations DPD.

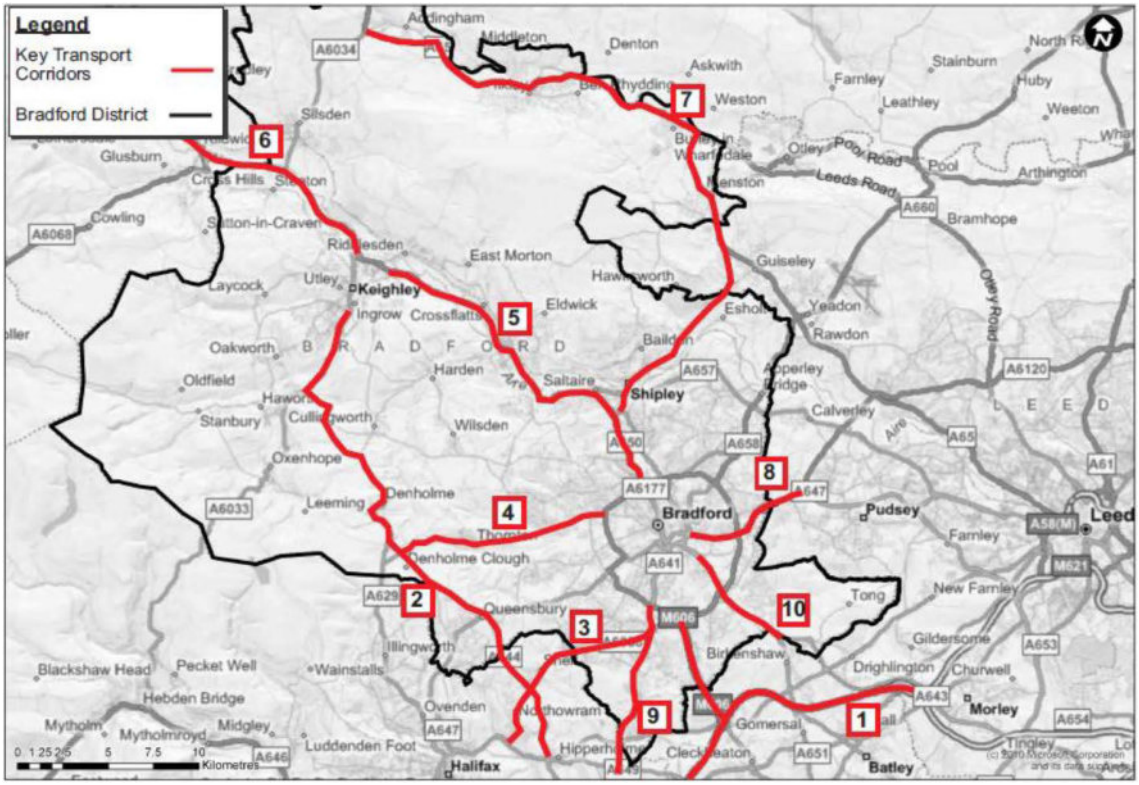


Figure 6.3: Transport corridors with increased demand in the preferred option (Source: Steer Davies Gleave, 2010)

Potential for In Combination effects

6.5.13 Traffic growth resulting from Bradford Core Strategy developments could act in combination with both background traffic growth, and traffic increases resulting specifically from planned developments in neighbouring authority areas (e.g. Calderdale and Craven).

6.5.14 However, insufficient data currently exists to fully assess the likelihood of a significant atmospheric pollution effect on the North or South Pennine Moors SAC/SPA, either alone or in combination, resulting from traffic growth associated with new development proposed by the Core Strategy.

6.6 Wind Turbines (Collision Mortality Risk and Displacement)

6.6.1 Proposed policy EN6 encourages the development of energy efficiency, and low carbon and renewable sources of energy, which is to be welcomed in the context of climate change. The supporting text to EN6 acknowledges that the presence of the South Pennine Moors Phase 2 SPA places a 'strategic constraint' on potential new wind generation capacity.

6.6.2 The risk of impacts to bird populations from wind turbine development is well-documented in scientific literature. For example, wind turbines can negatively affect birds through the risk of collision mortality, habitat loss, displacement from otherwise supporting habitats, and disorientation from flight paths (see for example Langston and Pullan, 2003). Displacement leads to the reduction in birds' use of an area for feeding or roosting, or absence in entirety, effectively rendering the loss of habitats to birds. Research shows that such negative effects, as associated with wind turbines, have been observed at a distance of up to 800m (including zero); 600m is the maximum reliably recorded distance at which such effects would take place (Drewitt and Langston, 2006) However, there is inconclusive evidence in relation to the precise mechanisms of impacts, the general applicability of findings between species or sites, and the relative importance of disturbance, displacement and collision mortality risk in effects on bird populations and distribution.

6.6.3 Pearce-Higgins *et al.* (2009) compared twelve operational wind farms in unenclosed upland locations (moorland, rough grassland or blanket bog) to investigate whether there is reduced occurrence of breeding birds close to wind farm infrastructure including turbines, access tracks and overhead transmission cables. Seven of the twelve species (Buzzard *Buteo buteo*, Hen Harrier, Golden Plover, Snipe, Curlew, Wheatear and Meadow Pipit) studied had significantly lower occurrence close to the turbines, after accounting for habitat variation. They also found sound evidence of reduced flight activity in raptors close to turbines. They concluded that there could be a reduction in breeding bird densities of up to c.50% within up to 500m of wind farms. But in a later study, Douglas, Bellamy & Pearce-Higgins (2011) found that Golden Plover showed an increase in numbers from 0.8 pairs per km^2 to 1.4 pairs per km^2 over two years close to an operational 17-turbine wind farm site. Of note was an increase from 4 to 9 plover territories within 500m of turbines, with even greater increases in numbers noted on the control site. These findings potentially underline the importance of prey abundance and habitat suitability in population numbers.

6.6.4 Furthermore, recent studies have suggested that impacts during construction may have greater detrimental impacts than those during wind farm operation (Pearce-Higgins *et al.*, 2012). Another multi-site, multi-species investigation, this study found that Red Grouse, Snipe and Curlew densities all declined on wind farms during construction, whereas Skylark and Stonechat population densities increased. Red Grouse populations recovered post-construction but, although Snipe and Curlew densities did not, there was little evidence for consistent post-construction decline in any of the species studied. They considered that high levels of activity and disturbance are likely to cause birds to vacate territories close to turbines during construction and that, depending on their subsequent breeding success, they may not return to breed in subsequent years.

6.6.5 Data were supplied by the Council and West Yorkshire Ecology on the distribution of wind turbine proposals within the district up to 31 March 2012; see Figure 6.4. This shows that a reasonably high proportion of proposals in close proximity to the SPA are unsuccessful in gaining planning consent. Guidelines have been prepared by West Yorkshire Ecology (2013) applicable to all wind turbine proposals which do not require Environmental Impact Assessment (EIA) and where ornithological interest has not been identified within the scope set by the Local Planning Authority of the EIA.

6.6.6 The guidelines focus on sites within 1km of the South Pennine Moors Special Protection Area, Sites of Special Scientific Interest notified for ornithological interest and any other sites with records of notable bird species. The paper provides provisional guidance for defining a proportionate level of ornithological survey and assessment information required for small wind development applications. Developers and wind power companies are encouraged to use the guidance to steer development away from locations which may have an adverse impact on the SPAs/SSSIs and where the cost of bird survey work may seem to be prohibitively expensive, with a higher risk of failure to gain planning approval.

6.6.7 A Zone of Adverse Impact for the purposes of this broad assessment is defined by the guidelines (WYE, 2013) as 100m for small turbines up to 20m hub height, or 600m for turbines with a hub height of 20m and over, unless data searches indicate that other larger zones are necessary. The Zone of Adverse Impact resulting from the proposed development may be reduced where evidence from surveys demonstrates that there are already high background levels of disturbance which reduces the value of habitat for notable species. These assumptions are based on discussions with Natural England over previous planning applications.

6.6.8 Whilst it is not clear how uniformly the guidelines are being applied (they apply to the whole of West Yorkshire) they are considered to provide a sufficiently robust means of avoiding the risks of impacts from wind energy proposals if applied properly in Bradford district. It is recommended that the guidelines are cross-referenced within the Core Strategy under policy EN6, and consideration is given to adopting the Zone of Adverse Impact within the Allocations DPD and its Proposals Map.

6.6.9 The Core Strategy does not allocate land for wind generation, but it does identify the SAC/SPA as a strategic constraint on potential new wind generation capacity. In this context it is concluded that development under the Bradford district Core Strategy (Proposed Modifications) is unlikely to affect any European site as a result of collision mortality risk or displacement, particularly where the West Yorkshire Ecology (2013) guidelines are being applied.

Potential for In Combination effects

6.6.10 Given the absence of impacts from the Bradford Core Strategy in relation to wind turbine developments, there are unlikely to be adverse effects in combination with other plans and projects.

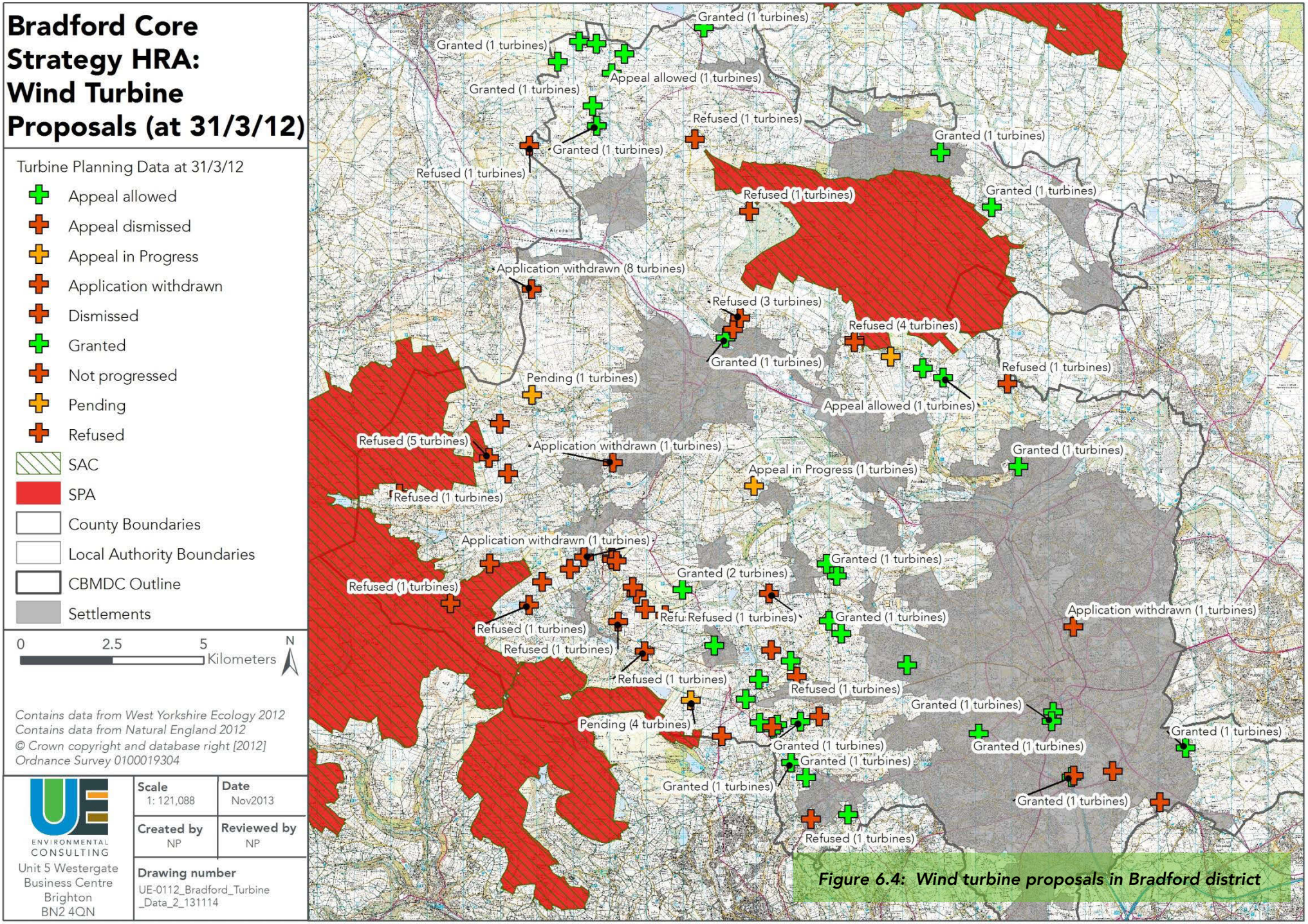


Figure 6.4: Wind turbine proposals in Bradford district

6.7 Recreational Impacts

Visitor activity

6.7.1 Research into the effects of urban development on southern lowland heathlands has identified a number of pressures that threaten their habitat condition, arising from a range of factors that have been reviewed by a number of studies. Visitors surveys have revealed how much the open, remote and natural features of these lowland heathland are appreciated by the local population and make them attractive for a range of recreational uses, particularly walking and dog walking although horse riding, cycling, jogging, picnicking and bird watching are also identified as regular activities (see for example Clarke *et al.*, 2006, Liley *et al.*, 2006, Pincombe & Smallbone, 2009a&b). These trends are reflected in surveys of visitors to the South Pennine Moors SPA/SAC undertaken in Bradford district and outlined later in this report.

6.7.2 The range of recreational activities undertaken places the habitats and the breeding birds they support under pressure. This can arise from: disturbance to nesting birds leading to chilling or predation of eggs or young; displacement of birds from areas with high levels of disturbance; trampling and erosion of moorland vegetation and soils; increased risk of accidental or intentional fire; and nutrient enrichment and eutrophication of heathland soils from dog fouling (see for example Langston *et al.*, 2007, Liley & Clarke, 2003, Murison, 2002, Murison *et al.*, 2007, and Underhill-Day, 2005). Rombalds and Ilkley Moors, an isolated patch of SAC/SPA in the north of district, appears particularly vulnerable to this range of impacts, given its size[43] and relative proximity to urban areas on all sides.

6.7.3 The Pennine Moors are subject to a wide range of recreational effects. These are reviewed in the 1998 *South Pennine Moors Integrated Management Strategy and Conservation Action Programme* and include; walking (with & without dogs), horse-riding, cycling/mountain biking, hang gliding(particularly at breeding sites or seasons), rock climbing, model aircraft flying, orienteering, large walking events, fell running, off-road driving (including 4x4 & scrambling), Grouse shooting and angling. The Strategy considered that "*these activities may have significant localised impacts, and have the potential to have wider conservation implications. Plans to extend or develop recreational activities in the area must be accompanied by appropriate assessment and monitoring.*"

6.7.4 In 2014 Natural England published a report entitled *Monitor of Engagement with the Natural Environment* [MENE] *Survey (2009-12): Visit taking in the South Pennines* (Burt *et al.*, 2014) which was commissioned on behalf of the South Pennines Local Nature Partnership. It analysed data from the 2009-12 period with particular reference to the South Pennines and the surrounding South Pennines Catchment Area.

6.7.5 The survey revealed that 82% of visitors to the South Pennines lived within a distance of 10 miles and that a significantly higher proportion of visits (4x) to the South Pennines were to mountain or moorland, when compared with all England outdoor visits. Overall, 50% of visits included walking with a dog, but when limited to people who live within the South Pennines (as opposed

[43] The Rombalds and Ilkley Moors part of the SAC/SPA is 2,528ha in size.

to the Catchment Area and beyond), this figure rose to 68%. More than half (59%) of the same population of South Pennine residents visited the area at least weekly, with 25% visiting several times a week – 3% higher than the all England figure.

Review of visitor survey data (2000)

6.7.6 In relation to the Bradford district, data was provided by the Countryside and Rights and Way division of Bradford Council from a survey of four sites carried out in late spring / early summer 2000. Two of the sites give access onto moorland which is part of the South Pennines Phase 2 SPA: Cow and Calf (Ilkley Moor) and Penistone Hill (Haworth Moor). Just over half (51%) of visitors to the two sites travelled less than 10 miles (c.16km), with 31% travelling less than 5 miles (c.8km), and an overwhelming majority of visits were made by car (75%). The proportion walking to their chosen site was 13%, with 5% arriving by bus and 4% travelling by train.

6.7.7 Over three-quarters of visitors (82%) had been to their site previously, with 20% making frequent visits, 12.5% visiting regularly, 48% occasionally, and 19% not having visited in the previous twelve months. The sites are popular with adults of all ages, with those over 50yrs making up 34.5% of respondents; people aged 31-50yrs formed 40% of respondents, 19-30yr olds made up 23.5% of the sample, with children (<18yrs) representing 1.5%.

General patterns of visitor activity (survey data 2013)

6.7.8 Further surveys of visitor activity were undertaken by the Council during July/August 2013 in response to the recommendations of an earlier version of this report. A total of 807 interviews were conducted with 1,636 people (1,378 adults and 258 children), focused on a range of access points to the South Pennine Moors SAC/SPA (both Rombalds Moor to the north of the district, and Haworth Moor to the south-west) as well as Harden Moor to provide comparator data (see Figure 6.7). This section reports the findings of initial analyses of this data.

6.7.9 Overall, 58% of visitors said they visit the site on at least a weekly basis, with nearly a third (29%) visiting daily. This reflects the finding reported on a South Pennine-wide basis in the MENE analysis outlined in 6.7.4 above. Access points to Haworth Moor had the lowest percentage of weekly visits (45%), while at Rombalds Moor 58% of visitors were weekly. Whilst nearly 20% of people stated a preference for visiting their site during the summer, over three-quarter of respondents stated no preference indicating that they would visit with the same frequency throughout the year.

6.7.10 The majority of visitors (73%) travelled to site by car, a trend which was particularly strong at Harden Moor, but a much higher proportion of visitors at Rombalds Moor arrived by foot reflecting its easy accessibility from Ilkley and other settlements; see Table 6.14.

6.7.11 Approximately half (49%) of all groups interviewed had taken at least one dog with them; 28% had more than one dog. Of those who took dogs, 77% let all of their dogs of the lead, 9% let some of their dogs off, and 14% kept all dogs on the lead during their visit. At Harden Moor just 10% of groups were not accompanied by a dog, a figure which increased substantially at Haworth Moor (60%) and Rombalds Moor (58%).

Table 6.14: Mode of travel to site (%)

Mode	All sites	Harden Moor	Rombalds Moor		Haworth Moor
			Airedale	*Wharfedale*	
Car	73	97	44	69	79
Bus	1	-	-	2	1.5
Cycle	4	-	7	2	2.5
Horse	-	-	-	-	0.5
Walk	21	3	46	26	15
Train	1	-	3	1	1.5

Impacts on raptors

6.7.12 The impacts of recreational access on birds of prey are difficult to assess. These birds exist at low densities and will select nest sites in secluded locations away from human disturbance. There is likely to be a critical threshold level of disturbance above which they will be unable to utilise an area of moorland for nesting. Ground nesting birds of prey such as Merlin and Short-eared Owl are likely to be particularly vulnerable to such disturbance.

Impacts on wading birds

6.7.13 Research into the effects of walkers on nesting Golden Plover is of particular interest (e.g. Finney *et al*, 2005). They investigated effects of recreational disturbance on Golden Plovers in the Peak District National Park. A population of birds was studied at Snake Summit on the route of the Pennine Way. Surveys of breeding Golden Plovers were carried out during the years 1986–1988 and 1996–1998. The Pennine Way was resurfaced with flagstones between these two survey periods. The study found that recreational disturbance along the Pennine Way, equating to approximately 60 visitors per weekend day, resulted in Golden Plovers avoiding a zone 200m wide either side of the unsurfaced path, and that this was likely to result in a reduction in breeding density within the study site as a whole. They concluded that:

> *"The results from this study suggest that an increase in recreational activity could have an adverse impact on breeding Golden Plovers, and potentially other upland waders, by reducing the availability of suitable chick-rearing habitat, but that this is most likely to occur in extreme situations, where there is very high visitor pressure."*

6.7.14 Whilst this study was carried out in a different context to the South Pennine Moors in Bradford district, its findings indicate that on well-used unsurfaced access routes across the Pennine Moors there is likely to be an avoidance by breeding Golden Plover and potentially other waders. The width of this disturbance zone can be as much as 400m (200m either side of the path). This effect was studied in relation to Golden Plover, the most numerous species for which the South Pennine Moors Phase 2 SPA has been selected. However, it is also likely to affect other ground nesting birds, such as Dunlin and Curlew, in similar ways.

Interpreting the available evidence in relation to the South Pennine Moors

6.7.15 An approach to assessing potential impact of recreational access is to consider the distance that walkers and dog walkers penetrate into a site from an access point i.e. the average straight line distance between the point of access and the furthest part of the SPA visited during their walk. Access points are often car parks but in sub-urban locations may be the start of a footpath or bridleway. Visitor surveys were undertaken within Bradford's South Pennine sites to establish how far visitors penetrate into the site, broadly in line with the methods of similar surveys undertaken at a number of lowland heathland sites in Dorset, the Thames Basin, Wealden Heaths and Ashdown Forest. Combining the data for Dorset and Thames Basin Heaths, approximately half of visitors penetrate into a site by up to around 700m (Liley *et al.*, 2006). Other surveys show penetration distances for walkers and dog-walkers on Ashdown Forest of 867m and 872m respectively, and Wealden Heaths of 920m and 784m respectively (mean of the latter four distances = 860m).

6.7.16 Similar analysis was undertaken using walked route data collected during the Bradford South Pennines visitor survey of summer 2013. This shows that the average penetration distance recorded by visitors to the moorlands to the south and west of Haworth was 1,856m, while the average penetration distance at Rombalds and Ilkley Moors was recorded as 1,951m. Figure 6.5 and Figure 6.6 illustrate the extent of these penetration distances as buffers around each of the access points included in the survey, and demonstrate that a significant area of the SPA may be subject to the effects of recreation by the average visitor, especially within Rombalds and Ilkley Moors. These buffer zones cover an area of 2,336ha on Rombalds/Ilkley Moor and 2,035ha within the moorlands south and west of Haworth. It is interesting to note that the possible 'gap' in disturbance suggested by Figure 6.5 actually includes one of the more heavily walked routes from access point R10 towards Ilkley along which upwards of 40 people were recorded during the course of the survey.

Effects of dogs

6.7.17 An important impact of urban development is that arising from the increased use of accessible land by walkers with dogs. These are generally included within the wider mix of recreational and urban pressures considered above, but a more detailed understanding of the mechanisms by which they impact on lowland heathland wildlife is helpful in predicting potential impacts on the moorland habitats and bird populations in the vicinity of Bradford.

6.7.18 Dogs have been recorded preying on ground nesting birds and studies have shown a variety of bird species being flushed from their nest by dogs. Studies have also shown birds to be warier of dogs and people with dogs than people alone, with birds flushing (flying away) more readily, more frequently and at greater distances, and staying longer off the nest when disturbed (Murison, 2002). Other studies have shown dog fouling to cause changes in heathland vegetation with a reduction in heather and increase in grass abundance due to the effects of nutrient enrichment (eutrophication). Dogs also chase and worry livestock. As a consequence, conservation grazing schemes can be affected due to graziers not being prepared to graze sites with open access to dog walkers (Underhill-Day, 2005).

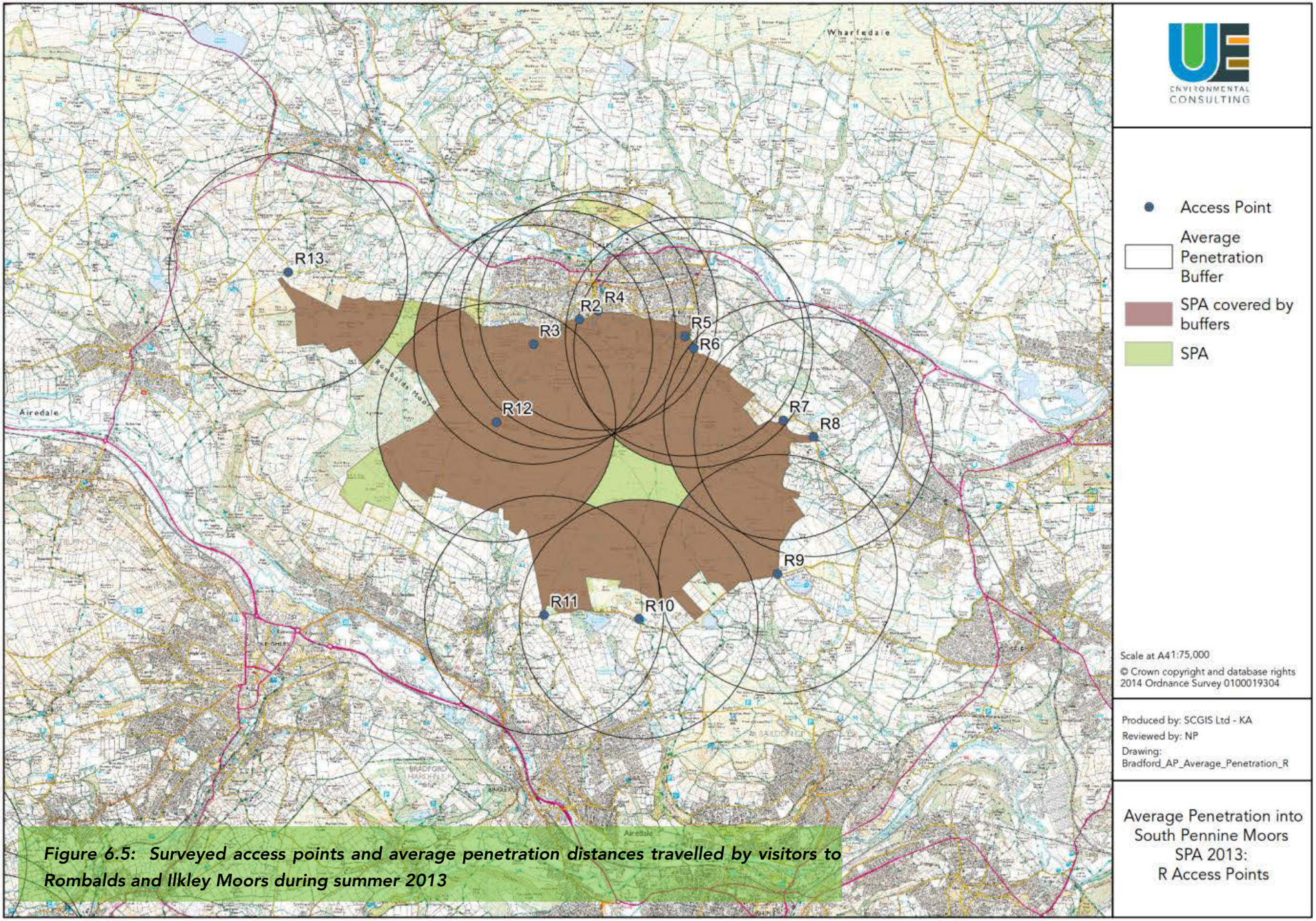


Figure 6.5: Surveyed access points and average penetration distances travelled by visitors to Rombalds and Ilkley Moors during summer 2013

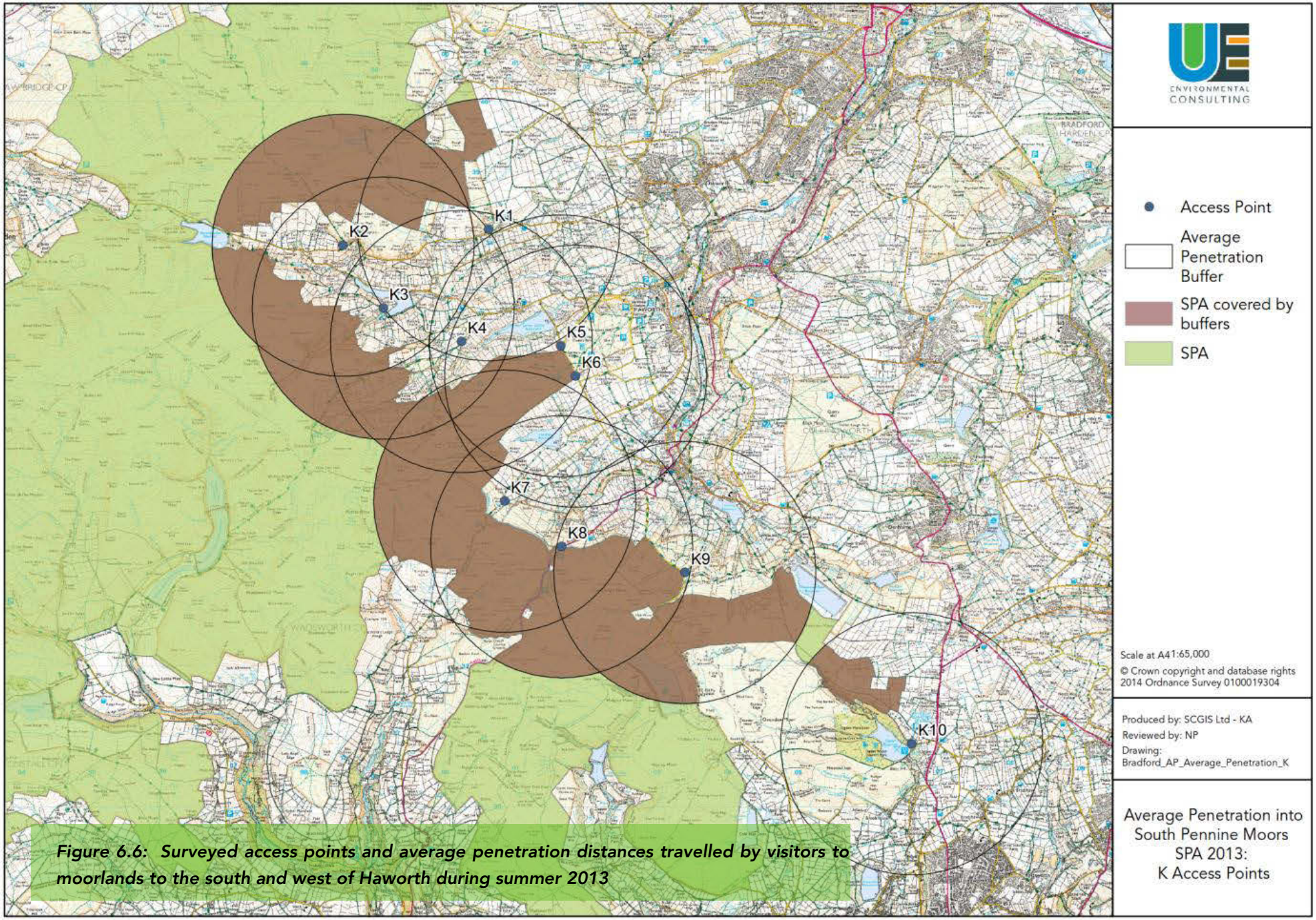


Figure 6.6: Surveyed access points and average penetration distances travelled by visitors to moorlands to the south and west of Haworth during summer 2013

6.7.19 Data from 2013 visitor surveys at Bradford district SPA/SAC sites shows that 49% of respondents had at least one dog with them, 77% of whom let them off the lead when on the site. The high proportion of visitors accompanied by dogs, a high proportion of whom were let off the lead, combined with the information presented in Figure 6.5 and Figure 6.6, indicates potential for significant zones of disturbance around access points.

Trampling and erosion

6.7.20 A comprehensive review of the effects of trampling and erosion on moorland heath and blanket bog was undertaken as part of the implementation of the CRoW Act (Anderson ed., 2001). The following review has been extracted from this report, the main findings of which were:

- Off-path use can be as high as 30% where adjacent vegetation is amenable to walking;
- Paths can have very substantial trampling widths in popular areas;
- Path networks and density can increase significantly with increasing use;
- People walk extensively in the uplands;
- Lichen-rich and *Sphagna*-rich communities are destroyed after c.50-80 passages;
- Wet vegetation on peat is very sensitive;
- Acid grassland and young heather less vulnerable;
- Heather in montane situations more sensitive than at lower altitudes;
- Crowberry and *Vaccinium* species are sensitive to trampling; and
- Vegetation recovery may not be to pre-existing communities.

6.7.21 The work by Anderson (1990), which involved counting visitors on and off paths in large areas of open access (or *de facto* access) moorland in the Peak District, showed that across all the vegetation types, on average, 23.4% of people were off the path. This was accentuated beside small rivers and on blanket bog. In the Peak District this habitat is mostly M19 *Eriophorum vaginatum* mire with minimal *Sphagnum* cover, or eroding, dissected blanket mire with cottongrass, crowberry and bilberry, and in this respect it is similar to much of the vegetation within the two SAC adjacent to the Bradford area.

6.7.22 There is a long tradition of fell or hill walking involving direction finding and off-path use, especially in the South Pennines. Even where there are primary footpath routes like the Pennine Way, the intensity of use has resulted in eroding, boggy ground which pedestrians avoid as far as possible, resulting in an extension of the path widths. Research has shown that similar effects arise from use of such areas by mountain bikers. South Pennine Moors sites within Bradford, notably Rombalds Moor, have seen a significant increase in mountain biking in recent years.

6.7.23 In addition to extensive off-path use, path networks have increased in extent and density, and have deteriorated in condition, with a proliferation of routes developing (Bayfield & Aitken, 1992). Research has also shown how, if the path surface becomes difficult to walk on due to erosion, a new path forms alongside, thus increasing the impact width. Bayfield (1985) notes

that path width can continue increasing for some time: at least 12 years on Stac Polly, 14 years on the Cairngorms, and longer on the Pennine Way in the Peak District.

6.7.24 In many upland areas, unlike some lowland sites, a significant proportion of visitors typically walk more than two miles probably in areas where repeat visits and a general familiarity is greater, as in the South Pennines near the large conurbations where weekend rather than holiday visitors predominate. For example, the Peak Park Joint Planning Board Recreation Survey (1988) found that on average 22% of 18.5 million visitors walked more than two miles (more in winter, and fewer in summer).

6.7.25 A review of the relative sensitivity of plant species to trampling was undertaken by Anderson (1990) in the Peak District moorlands. The relative sensitivity of species and their associated Annex 1 habitat types within the South and North Pennines SAC are shown in Table 6.15. The Review concludes with a summary table of impacts of public access to moorland habitats, including direct as well as indirect impacts; see Table 6.16 (from Anderson, 2001).

South Pennine Moors zone of visitor influence

6.7.26 Visitor surveys were undertaken by the Council during July and August 2013 at 23 access points to the South Pennine Moors SAC/SPA within its administrative area (plus three points on Harden Moor to provide comparator data); see Figure 6.7. Post code data collected during the surveys were analysed to explore whether an approximate visitor catchment area could be established for this part of the moors.

6.7.27 A Microsoft Access database was provided by the Council which contained the postcode data collected from each questionnaire respondent, together with location (access point) at which they were interviewed and responses to each of the questions included in the survey. The first step in the analysis was to clean the postcode dataset, i.e. to insert a space to six digit postcodes and convert to upper case to enable the data to be imported to ArcGIS 9.3, and remove invalid or incomplete postcode records[44]. The next step was to attempt to geo-reference the postcodes using Ordnance Survey CodePoint data.

6.7.28 After removing all records with invalid or incomplete postcodes, 427 were successfully matched to OS CodePoint data (version 2014.2.0 (April 2014)) supplied by the Council. Three of these did not provide an access point location, and 54 were interviewed at access points on Harden Moor which is outside of the SAC/SPA and included in the survey to provide comparator data. The remaining 370 records originated from a very broad geographic area, with the furthest record travelling from a postcode 411km from the point of access to the moors. In order to avoid unnecessarily distorting the analysis it was decided to exclude all outliers beyond 50km, which resulted in a total visitor survey dataset of 343 records (out of 807 interview respondents in total, or 42.5%).

[44] Of the 807 records, 342 contained invalid or incomplete postcodes. In these cases the postcode was: missing (35); or comprised just the first two characters of the postcode e.g. BD (4); or contained the district postcode e.g. BD1 (299); or contained reference to the visitor's home country (4).

Table 6.15: Relative sensitivity of moorland plants to trampling pressure (Anderson, 1990)

Less sensitive	Species name	Notes	SAC/SPA Presence
	Common bent/crested dog's-tail grasses	As in some in-bye land	Not major component of SAC Annex 1 habitats
	Wavy hair-grass/sheep's fescue	On mineral soils	Often minor component of SAC dry heath habitat
	Heather	Young	Major component of Annex 1 dry heath and blanket bog habitats
	Mat-grass	Usually on drier, thin peats or peaty mineral soils	Often component of heavily grazed dry heath habitat
	Purple moor-grass	Usually on wetter flushed peaty soils.	Major component of wetter heath and blanket bog habitats
	Bracken	Young plants	Can be invasive on drier heath and acid grassland habitats
	Heather	Old – old plants are brittle and easily broken.	Major component of Annex 1 dry heath and blanket bog habitats. Important for nesting SPA birds
	Crowberry/bilberry	On peat	Major component of Annex 1 dry heath and blanket bog habitats
	Cotton-grass spp.	Cotton-grass mire on peat	Major component of Annex 1 blanket bog habitats
More sensitive	***Sphagna***	Flushes, mire on peat.	Major component of blanket bogs and transition mire habitats

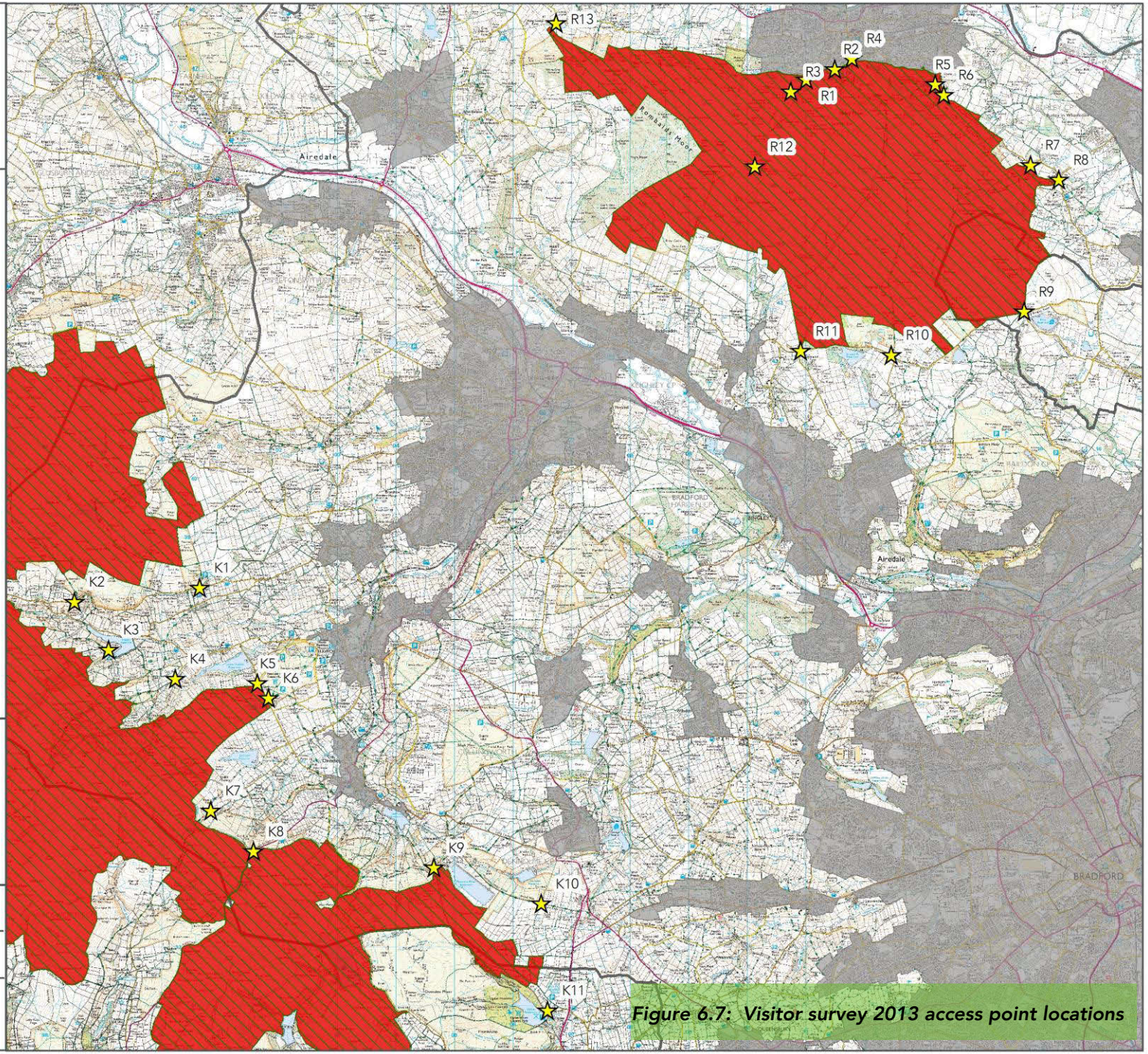
Table 6.16: Summary of potential significance of access impacts on mountain and moor

Habitats	Direct Impacts		Indirect Impacts	
	Trampling	Disturbance	Fire	Management
Dry dwarf-shrub heath	XX		XXX	
Wet dwarf-shrub heath	XXX		XX	
Blanket mire	XXX		XXX	
Mountain	XXX		X	
Acid grassland	XX		XX	
Calcareous grassland	XX			XX
Flushes/springs	XXX			
Rock ledges	XX			
Screes	XX			
Breeding birds		XXX	XXX	XX
Wintering birds (Raptor roosts)		X		
Invertebrates	XX		XX	X
Deer		XX		
Earth heritage	X?			

Key (degree of negative effects): Least X XX XXX Most

The assessment assumes a moderate to high level of use to have the above impacts.

Bradford Core Strategy HRA: Visitor Survey Access Points



Surveyed Access Points
SAC
SPA
County Boundaries
Local Authority Boundaries
CBMDC Outline
Settlements

0 0.9 1.8 Kilometers

N

Contains data from West Yorkshire Ecology 2012
Contains data from Natural England 2012
© Crown copyright and database right [2014]
Ordnance Survey 0100019304

ENVIRONMENTAL CONSULTING
Unit 5 Westergate Business Centre
Brighton
BN2 4QN

Scale	Date
1: 86,303	Oct2014
Created by	**Reviewed by**
NP	NP

Drawing number
UE-0112_VS_Access_Points_2_141002

Figure 6.7: Visitor survey 2013 access point locations

6.7.30 The distance between postcode of origin and point of access to the SAC/SPA was then calculated within GIS for each record. Finally, these 343 records of distance travelled to the SAC/SPA were used to generate a cumulative distribution curve; see Figure 6.8. Natural England advises that the 75th percentile should be used as the upper threshold for determining a zone of influence for assessing recreational impacts on European sites, as this figure has been successfully defended at Examination in Public in relation to other sites. Using this threshold for the subset of 343 records travelling from within 50km results in a zone of influence extending to approximately 10.5km from the SAC/SPA boundary.

6.7.31 The analysis was repeated to examine how far residents within Bradford district travel to reach the SAC/SPA. In this case 219 interview respondents gave a full valid postcode from within the district (not including those who were interviewed on Harden Moor). The resulting cumulative distribution curve is shown at Figure 6.9 which shows that 75% of Bradford residents travelled from within approximately 5km to reach the South Pennine Moors SAC/SPA in summer 2013. The curve continues to climb to the 85th percentile where it levels off. This coincides with the 7km mark. Taking an approximately average figure in relation to the 75th percentile for all visitors (10km) and Bradford residents (5km) also results in a figure of around 7km. The distance of 7km has therefore been used to define the outer limit of the zone of influence proposed in the Core Strategy Strategic Core Policy 8 (SC8).

Figure 6.8: Cumulative distribution of distances travelled (all visitors) to South Pennine Moors SAC/SPA in summer 2013, excluding outliers >50km

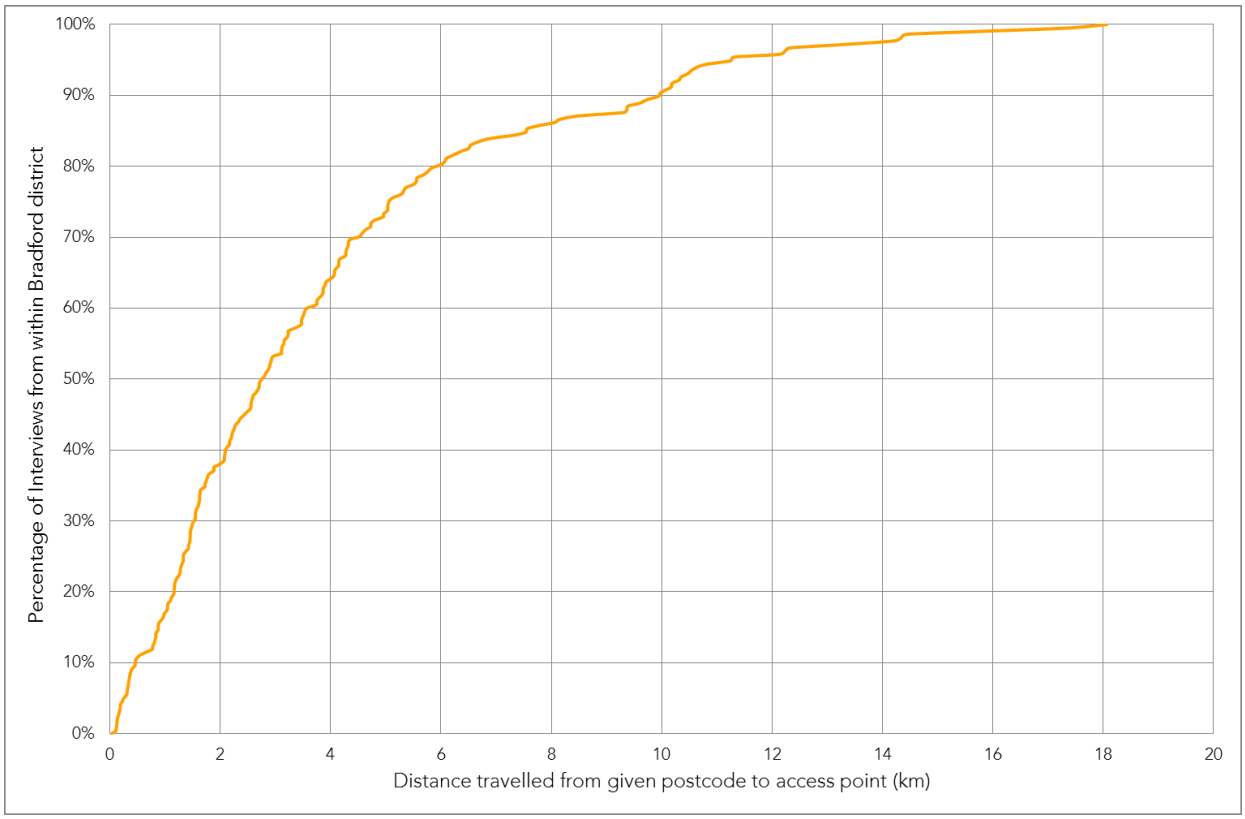


Figure 6.9: Cumulative distribution of distances travelled (by Bradford residents) to South Pennine Moors SAC/SPA in summer 2013

Analysing visitor numbers

6.7.32 This section considers the proportion of people living within Bradford settlements who were recorded visiting the SAC/SPA during summer 2013, to derive estimates of total current visitor numbers. Figures quoted therefore only include visits from Bradford residents and not from those living outside the district. Overall visitor numbers are likely to be considerably higher than the figures discussed below.

6.7.33 Visitor survey records were linked to the settlement from which they originated. These were subsequently sorted into those records which were interviewed at the northern[45] part of the SAC/SPA, and those interviewed at the southern[46] part of the SAC/SPA in Bradford district, to establish whether visiting rates differed in relation to each of the main moorland blocks.

6.7.34 The proportion of the population[47] in each settlement which visits each moorland block was calculated as a daily rate by dividing the number of visitors recorded during the survey by the number of hours of survey, then multiplying by 12 daylight hours. The proportion of people visiting each access point was established by dividing the number of visitors by the number of access points surveyed, then multiplying by the number of available accesses to each moorland

[45] Northern SPA: Rombalds and Ilkley Moors.

[46] Southern SPA: moorlands to the south and west of Haworth.

[47] Current settlement populations were estimated using the ONS 2013 release of Census 2011 population data at postcode level, aggregated to settlement level.

block (data supplied by the Council). Having estimated the proportion of daily visitors to each access point from each settlement, the data were then summed to estimate overall visitor numbers to each of the main moorland blocks.

6.7.35 A summary of estimated annual visit rates to each moorland block is presented in Table 6.17, broken down by settlement, together with the proportions which were recorded as arriving by car or visiting for the primary purpose of walking the dog. The results suggest that the northern part of the SAC/SPA at Rombalds and Ilkley Moors is much more frequently visited than the moors to the south and west of Haworth. This is perhaps not surprising given the extent of urban area in relative close proximity to Rombalds/Ilkley Moors.

6.7.36 The annual number of Bradford district residents visiting the northern SAC/SPA is estimated to be in the region of 131,954. At the southern part of the SAC/SPA, the number of Bradford district residents estimated to visit is in the region of 69,480. The estimated annual visit rates presented in Table 6.17 clearly indicate the significantly higher number of visits made by those living in settlements closest to the SAC/SPA, particularly in Wharfedale.

6.7.37 Summing these figures for north and south to give overall Bradford district visits to the SAC/SPA, the current annual estimated figure is in the region of 201,434. This can be expected to increase in the context of the Core Strategy housing distribution.

Summary of key findings from Bradford South Pennines visitor survey 2013

6.7.38 A number of key factors in relation to recreational impacts are summarised below:

- It is estimated that 201,434 annual visits to the SAC/SPA are made by Bradford residents, and this can be expected to increase in future in the context of the Core Strategy housing distribution.
- The higher number of visits made to the northern part of the SAC/SPA and the higher number of visits made by those living close to the site, particularly in Wharfedale.
- The high proportion of visits made accompanied by dogs and the high proportion of dogs that are let off the lead.
- The relatively extensive network of tracks, paths, access points, car parks and local roads providing ease of access to areas of the South Pennine Moors within Bradford District.
- The potential for high levels of disturbance to bird species and vegetation within corridors around paths, tracks and zones in the vicinity of access points and car parks, particularly in relation to Rombalds Moor.

Potential for In Combination effects

6.7.39 Other plans and projects which may act in combination with the Core Strategy to exacerbate recreational impacts to the SAC/SPA include proposed residential developments in neighbouring authority areas (e.g. Craven, Harrogate, Leeds, Calderdale, Burnley and Pendle) resulting in a net gain in dwellings within a zone of influence around the SAC/SPA. The zone of influence may differ in other authority areas in relation to residential population density and accessibility to/within the SAC/SPA.

Table 6.17: Estimated annual visit rates to each moorland block

Number of visitors to northern SPA (Rombalds and Ilkley Moors)			
Settlement	**Current visitors**	**% car**	**% dog**
Oxenhope	0.00	-	-
Haworth	0.00	-	-
Harden	0.00	-	-
Cullingworth	1306.47	100.00	0.00
Denholme	0.00	-	-
Wilsden	0.00	-	-
Thornton	0.00	-	-
Cottingley	0.00	-	-
Bingley	5879.12	80.00	60.00
East Morton	653.24	100.00	100.00
Silsden	1306.47	50.00	0.00
Steeton	653.24	100.00	0.00
Addingham	4572.65	100.00	75.00
Burley in Wharfedale	20250.30	76.47	52.94
Baildon	2612.94	50.00	50.00
Ilkley	66630.03	69.35	66.13
Menston	5225.88	100.00	50.00
Bradford South East	1306.47	100.00	0.00
Oakworth	0.00	-	-
Canal Road Corridor	0.00	-	-
Bradford North West	1306.47	100.00	0.00
Shipley	1306.47	100.00	100.00
Bradford City Centre	0.00	-	-
Bradford North East	13717.95	75.00	25.00
Keighley	3919.41	75.00	25.00
Queensbury	0.00	-	-
Bradford South West	1306.47	100.00	0.00
Sub-totals	***131,954***	**-**	**-**

Number of visitors to southern SPA (south and west of Haworth)			
Settlement	**Current visitors**	**% car**	**% dog**
Oxenhope	1793.05	50.00	50.00
Haworth	15689.15	94.12	52.94
Harden	0.00	-	-
Cullingworth	0.00	-	-
Denholme	448.26	100.00	100.00
Wilsden	896.52	100.00	0.00
Thornton	5379.14	100.00	50.00
Cottingley	2241.31	100.00	50.00
Bingley	1793.05	100.00	0.00
East Morton	1793.05	100.00	50.00
Silsden	0.00	-	-
Steeton	0.00	-	-
Addingham	0.00	-	-
Burley in Wharfedale	896.52	100.00	0.00
Baildon	896.52	0.00	0.00
Ilkley	0.00	-	-
Menston	0.00	-	-
Bradford South East	0.00	-	-
Oakworth	7172.18	87.50	37.50
Canal Road Corridor	0.00	-	-
Bradford North West	0.00	-	-
Shipley	1793.05	100.00	0.00
Bradford City Centre	0.00	-	-
Bradford North East	0.00	-	-
Keighley	8068.70	80.00	30.00
Queensbury	8068.70	100.00	75.00
Bradford South West	12551.32	100.00	46.15
Sub-totals	***69,480***	**-**	**-**

6.7.40 In particular, the Screening Assessment of Leeds Core Strategy identified potential for in-combination effects in relation to increases or changes in recreational pressure due to the location of dwellings in relation to the South Pennine Moors. Bradford's Core Strategy and future Allocations DPD were identified as having the greatest potential for in-combination impacts in relation to this factor. The Leeds District housing requirement is to deliver 70,000 new dwellings between 2012 and 2028, and distributes the housing requirement between housing market areas rather than individual settlements.

Responding to the risk of recreational effects

6.7.41 As described at paragraph 6.7.31 above, the results of visitor survey analysis show that 75% of all visitors come from within approximately 10.5km of the SAC/SPA, while 75% of Bradford residents travelled around 5km to reach the site. The distance of 7km has therefore been used to define the outer limit of a zone of influence around the SAC/SPA in Bradford district. Natural England and the RSPB are supportive of Policy SC8's Zone C and the basis for setting this zone in relation to disturbance from visitors, and dog walkers in particular. Within this zone contributions will be collected from residential development to mitigate effects through the provision of new recreational nature greenspace, contributions to off-site natural greenspaces, improvements to existing open spaces or adjusting the management of visitors within the SAC/SPA.

6.7.42 The provision of alternative sites for informal recreation close to new or existing residential areas are intended the satisfy the majority of the daily recreational needs of those residents, and so deflect pressure away from the SPA/SAC. Provision of areas for dog-walking will need to be considered. By providing attractive, accessible greenspace close to home, alternative sites reduce the likelihood of residents travelling to the SAC/SPA to satisfy this need. Alternative sites will be funded via development contributions. Further analysis of existing natural greenspace, visitor survey data and consideration of Natural England standards in relation to accessible natural greenspace will inform the approach.

6.7.43 The commitment to develop a Strategic Access Management and Monitoring (SAMM) Strategy to better manage access arrangements within the SAC/SPA, in conjunction with the provision of alternative recreational spaces, will allow appropriate, feasible and publicly acceptable means of mitigating residual impacts to be identified. The SAMM Strategy and actions to implement it will be funded via development contributions. Mitigation measures developed to address key impact pathways should be considered to be critical infrastructure and accorded a high priority in relation to development contributions.

6.7.44 The scope and range of measures will draw on evidence presented in the HRA, further analysis of visitor survey data and documents such as Natural England's Site Improvement Plans (SIP) as part of their Improvement Programme for England's Natura 2000 Sites (IPENS; Natural England, 2015). The SIP relating to the South Pennine Moors (Natural England, 2014) identifies public access and disturbance, for example, as key pressures and threats to the condition of the South Pennine Moors SPA/SAC. Access and visitor management arrangements may include:

- Improvements to existing routes linking into settlements and which could form local circular networks;

- Improvements of strategic routes which link through the SPA/SAC so that they can carry additional use without compromising the SPA/SAC conservation objectives;
- Provision of visitor information to influence behaviour and understanding;
- Management of other on-site access arrangements (e.g. car parking);
- Provision of additional on-site wardening (particularly seasonal);
- Promotion of Fire Operations Group activity to reduce potential for wildfire and monitoring of damage and recovery, where incidents occur; and
- Monitoring of measures identified.

6.8 Urban Edge Effects

Introducing urban edge effects

6.8.1 In addition to recreational pressure, urban edge moorlands are also subject to a number of additional pressures from people's use and abuse of these areas of land. This includes: fly tipping; dumping of garden waste and resultant introduction of invasive/alien plants; traffic causing air pollution and rat running along minor roads and tracks; off-road vehicles leading to track erosion; disturbance to (conservation) grazing livestock; increased incidence of wildfire; and predation from domestic pets and urban scavengers.

Evidence of edge effects in general

6.8.2 A review of the existing pressures on the lowland heathlands around Whitehill and Bordon in East Hampshire was undertaken using data gathered from a focus group workshop and from meetings with the major landowners (Cox & Pincombe, 2011). The results of this review are summarised in Table 6.18. Note that the data, although collected in 2011, do not relate to a defined period.

6.8.3 The results of the focus group workshop fit closely with the findings of other studies undertaken by Liley et al., (2006) and Underhill-Day (2005). The range of effects that people and the proximity of urban development have on the conservation of lowland heathland sites have become known as 'urban pressures' and present the greatest single impact of development on the conservation of these often fragmented and vulnerable areas of habitat.

6.8.4 It can be predicted that a similar range of impacts is likely to arise from urban development near to the upland moorland habitats found in the vicinity of the Bradford, particularly those moorland blocks that are isolated and fragmented (E.G. Rombalds/Ilkley Moors). Indeed, analysis of 2012 incident reports collected by the South Pennines Moorwatch website[48] (run by Pennine Prospects) reveals a range of reported activities, which aligns well with those reported elsewhere; see Table 6.18.

[48] http://www.moorwatch.com/view-reports&report_start=0

Table 6.18: Urban and recreational pressures on lowland heathlands near Whitehill and Bordon, Hampshire (2011), and South Pennine Moors (2012)

Impact type	Incidence	
	Whitehill-Bordon	South Pennines
Camping	9	-
Disturbance of wildlife	28	1
Disturbance to livestock	5	-
Dog fouling	21	-
Impact caused by animal (e.g. horse, dog)	10	-
Fly-tipping	72	3
Garden waste / invasive species	10	2
Litter	5	-
Mixed impacts	11	-
Off-road vehicles	32	21
Pollution	10	-
Rat-running / illegal parking	4	3
Theft or poaching	11	2
Unlawful digging / building	2	-
Vandalism (e.g. of visitor mgt infrastructure)	1	-
Wildfire or arson	83	2
TOTAL	314	35

Fire

6.8.5 The effects of fire on lowland heathland have been reviewed by Underhill-Day (2005), who highlights a study for the UK Government by Kirby & Tantrum (1999) following an adverse report on the condition of the Dorset Heaths by The Council of Europe's Bern Secretariat. Kirby & Tantram concluded that fires occurred at higher densities on the fringes of larger conurbations and in sites within developed urban areas, where fire events present a serious risk to ecological integrity. They considered that the statistical data, in combination with visual assessment and their fire event density map, suggested that the incidence of fires on heaths in urbanised areas was higher than those in more rural locations, and that this was likely to be due to easier access to these heaths, as the data suggested that most fires were deliberately set. The evidence suggested that fire setting by children of school age may be a significant factor in the pattern.

6.8.6 Heather burning is a traditional management tool on Grouse moors. But uncontrolled wildfire, particularly during spring and summer, destroys moorland vegetation which can then take many years to re-establish, depending on substrates and the characteristics of the fire. In various studies it took between 4 and 20 years for heathland vegetation to recover, and in some cases the fire triggered a change from heathland to woodland on the better soils. In most studies, burnt areas go through a successional phase of grassland before dwarf ericaceous shrubs re-establish.

6.8.7 Fire has a number of effects on the ecology of moorland habitats and bird populations. The most obvious effect is where spring and summer fires result in destruction of birds' nests. Fire

also has a significant effect on the habitat structure and typical species even if there is no long term effect on species composition. This can have a major effect on the use of upland heathland by ground nesting birds such as Merlin, Short-eared Owl and Twite that select areas of taller heather in which to nest. More severe fire or repeated fires can have fundamental effects of the moorland soils and vegetation especially in areas of dry and drying heathland and blanket bog (a priority habitat feature) where fire can burn into the peat substrate. In these instances habitats can take many years to recover.

6.8.8 Although it is not possible to equate numbers of residents to numbers of fires it is clear that there is a relationship between urban development and fire incidents on moorlands. This was investigated by the Moors for the Future Partnership which commissioned research into moorland fire risk mapping on the South Pennine Moors (Walker *et al.*, 2009). This study identified c.400 fires occurring on the moorlands of the South Pennines in the nine year period between 2000 and 2008 (excluding North Yorkshire). Based on a 2x2km grid of wildfire occurrence, they identified three areas of high wildfire density and four areas of medium wildfire density as listed in Table 6.19 and shown in Figure 6.10. Overall, the study found that wildfire incidents were more likely to occur in areas close to centres of population, or where access to the moor was readily available.

Table 6.19: High and medium fire density areas in West Yorkshire, Lancashire and Greater Manchester

Moorland block(s)	County
High fire density	
Rishworth, Soyland & Blackstone Edge Moors	Greater Manchester, West Yorkshire
Crompton Moor	Greater Manchester
Illingworth *	West Yorkshire
Medium fire density	
Ilkley Moor	West Yorkshire
Baildon Moor *	West Yorkshire
Anglezarke and Rivington Moor	Greater Manchester, Lancashire
Ashworth Moor (Knowl Moor)	Greater Manchester

* Illingworth, although within the Natural England 'moorland line' is actually two narrow wedges of scrub between two densely populated urban areas on the outskirts of Halifax, while Baildon Moor suffers high levels of recreational pressure from a number of sources, including a golf course (which extends across c.50% of its area) and caravan park.

6.8.9 Of the four Medium fire density areas it is interesting to note that they include Ilkley Moor and Baildon Moor. Both of these sites are located in the Bradford area. Ilkley Moor is within the SPA and SAC whereas Baildon Moor is not. Examining the extent of wildfires on Ilkley Moor Walker *et al*. (2009) determine that, although it is a good example of 'true' moorland habitat, it is strongly influenced by the town of Ilkley some of whose houses back directly onto the moor. Their analysis shows that 20 out of 26 of the recorded wildfires between 2000 and 2008 occurred within 1km of the urban boundary.

6.8.10 In summary, the information presented on fire identifies a number of key issues including:

- That fires are likely to occur in areas close to centres of population and where access to the moor is readily available;
- That heathland vegetation takes between 4 and 20 years to recover;
- The fire incidents can resulting in both the destruction of ground nesting bird's nests and nesting habitat; and
- That wildfires present a serious risk to ecological integrity, especially where priority blanket bog habitats are present.

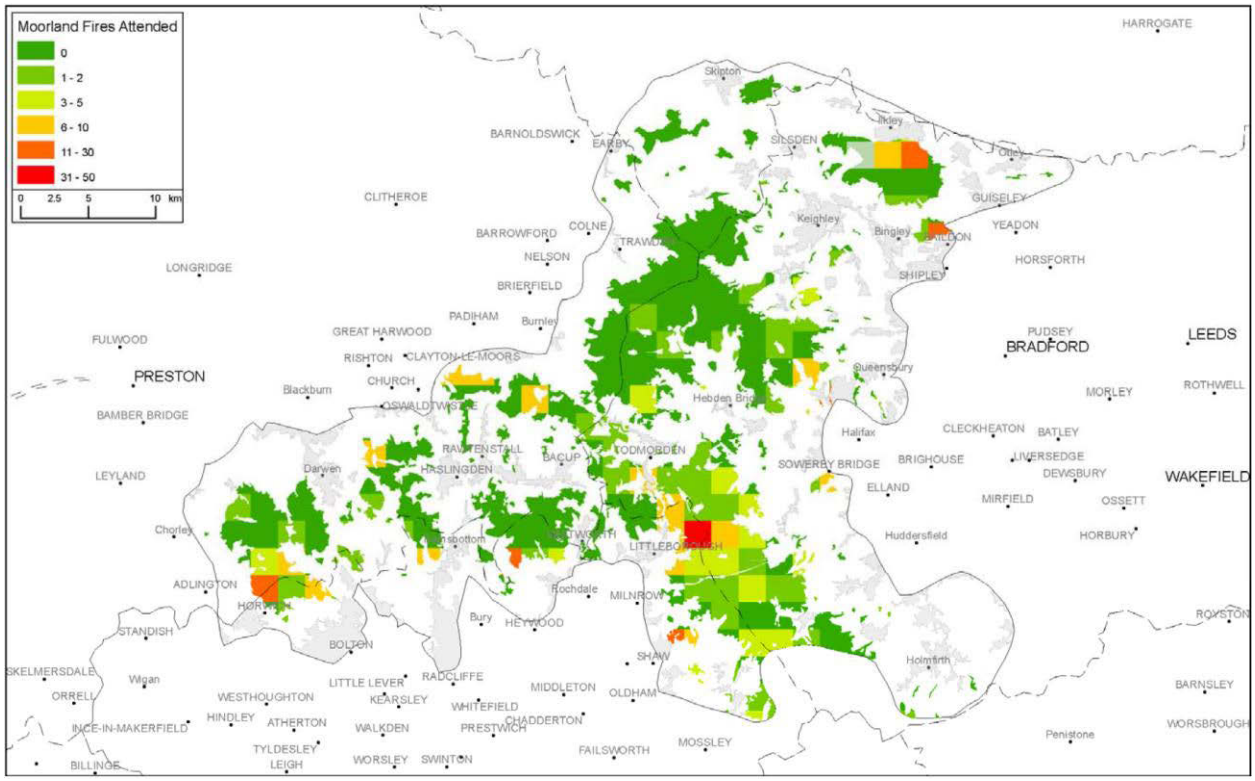


Figure 6.10: Moorland fire density map of incidents attended between 2000-2008 at 2x2km cell resolution. Green indicates few to no fire occurrences, whilst red indicates fire hot spots (Source: Walker et al., 2009)

Pet predation (cats)

6.8.11 Studies of the impacts of urban development on lowland heaths within southern England have identified the potential impact of predation by domestic cats on birds, reptiles and mammals. These can be European protected species, birds for which the SPA have been classified or typical species of qualifying habitats within SAC. A significant amount of research has been undertaken to understand the relationship between domestic cats and their effects on European wildlife sites.

6.8.12 The effects of cat predation on lowland heathlands are reviewed in detail by Underhill-Day (2005). Prey items taken by hunting cats have been collated from a number of studies and show that small mammals make up the greatest proportion of prey items (49-91%). Birds are the next

most commonly predated group making up between 5% and 30% of prey items. Amphibians, reptiles and fish make up the next most frequently preyed upon group with between 0.4% and 9.4% of prey items. Using this data, Underhill-Day (2005) estimates total numbers of prey caught by cats per 1000 households per annum as reproduced in Table 6.20.

6.8.13 The impact of cat predation on species populations is more difficult to assess. Mead (1982) could find no evidence of cats affecting the population of the eighteen bird species most commonly reported as having been taken by cats. However, cat predation was a significant cause of death for most of the species examined and accounted for 25% of all recoveries (ringed birds found dead) in six species. However, such levels of predation may be sustainable for common and widespread species but may not apply to small populations found on localised or specialist habitat.

Table 6.20: Total prey caught by cats per 1000 households per annum (Source: Underhill-Day (2005) estimated from Woods et al, 2003, and Howes, 2002)

Species group	Estimated numbers	Estimated percentage
Mammals	6,735	72.7
Birds	2,075	22.4
Herpetofauna and fish	251	2.7
Invertebrates	140	1.5
Unidentified	6	0.7
TOTAL	9,261	100.0

6.8.14 Cats can range widely from their home. Again, a number of studies have assessed this ranging distance. In all studies, male cats range more widely than females. The distances they range vary considerably, from 80-400m for Cornish farm cats to 1107m (± 589m) for male feral cats in Avonmouth Docks. Radio tracking studies have also looked at the size of cat home ranges and again show larger home ranges for male cats ranging in size from 615ha for cats in Australia to 134ha for cats in New Zealand. Using an average home range size for male cats from all studies of 365ha, and assuming a circular home range, gives a mean ranging radius of 1,078 m or just over 1km.

6.8.15 The potential impact of cat predation on the moorland habitats and birds has not previously been estimated. There are no quantifiable records of moorland birds being taken by cats; although cats have been recorded taking some species including Linnet *Carduelis cannabina* and Yellow Hammer *Emberiza citrinella* it is not recorded if these were killed on moorland or other habitats. Despite the inconclusive data of the potential impact of cats on moorland wildlife the evidence shows that cats kill a large number of animals including birds and mammals, and that cats range widely from their homes with male cats ranging up to 1,107 m.

6.8.16 Although the data remains inconclusive, as with lowland heaths, the potential risks are high from cat predation to birds and small mammals, and this effect can occur within 1km of urban areas.

Urbanised avifauna

6.8.17 Several species of birds are associated with urban and sub-urban areas including Crows *Corvus corone* and Magpies *Pica pica* (collectively known by their generic name of Corvids). The following review of the impact of these birds, and other urban predators, has been taken from Underhill-Day's literature review of urban effects on lowland heaths and their wildlife (2005). It has been found that corvid numbers are higher on sites visited by more people (Taylor, 2002), and other predators have been recorded at higher densities in urban than rural environments including Magpies and Foxes *Vulpes vulpes*.

6.8.18 Taylor (2002) investigated the predation risk to woodlarks on lowland heathland and analysed the degree of disturbance and the presence of predators, and found that as human activity increases, the presence and activity of corvids also increases. Hence the risk of predation is higher on sites with higher corvid activity. The link between corvids and disturbance is much stronger early in the season; in late season it is no longer significant. Taylor considered that the link between human presence and greater number of corvids was not solely due to increased scavenging opportunities as litter was not common on the study sites and most disturbance was due to dog walkers. She suggested that corvids have greater opportunities to find food when sites are more heavily disturbed because the disturbance is associated with greater urban development around sites, which probably offers better scavenging opportunities.

6.8.19 The 2005 SPA breeding bird survey shows that the nearest breeding Golden Plover are 1km from settlement boundary of Ilkley. It is unlikely that predation by corvids will impact on these nesting birds. However, it may be that such effects are already operating and causing a displacement of birds away from the urban edge.

Potential for In Combination effects

6.8.20 The effects of increasing urbanisation are generally considered to operate over relatively short distances where new or existing developments are in close proximity to designated areas. Developments within surrounding districts (e.g. Craven, Harrogate, Leeds, Calderdale, Burnley and Pendle) within such a distance of the SAC/SPA could contribute to urban edge effects in that location. While these are unlikely to specifically act in combination with such impacts insofar as they may occur within Bradford district, when taken together, adverse effects on the overall integrity of the SAC/SPA are possible.

Responding to the risk of urban edge effects

6.8.21 The Core Strategy (Proposed Modifications) has responded to the risk of urban edge effects by restricting residential development within 400m of the SAC/SPA boundary, in order to avoid fly-tipping, introduction of invasive species, cat/scavenger predation and increasing fire risk. To illustrate the importance of this zone, 922 breeding bird observations were made during the 2013 surveys of moorland fringe within 400m of the SPA, including 534 Curlew, 1 Dunlin, 32 Golden Plover, 346 Lapwing, 3 Merlin, 11 Redshank, and 62 Snipe. Protection for the 400m zone has now been incorporated within policy SC8 (Protecting the South Pennine Moors and their Zone of Influence. The RSPB has supported this approach, expressing concern about the potential for displacement from the nest associated with domestic pets.

7 Impact Assessment

7.1 Introduction

7.1.1 The following assessment uses the conservation objectives and ecological data for each European site defined in Chapters 3 and 4, and considers these against the range of impact pathways described in Chapter 5.

7.2 South Pennine Moors Phase 2 SPA

Conservation Objectives – subject to natural change, to maintain or restore the:

- Objective 1: Extent and distribution of the habitats of the qualifying features;
- Objective 2: Structure and function of the habitats of the qualifying features;
- Objective 3: Supporting processes on which the habitats of the qualifying features rely;
- Objective 4: Populations of the qualifying features; and
- Objective 5: Distribution of the qualifying features within the site.

Supporting habitat

7.2.1 Recent surveys undertaken by West Yorkshire Ecology during 2013 have shown a number of locations used by Annex 1 and migratory birds (section 6.2) including Golden Plover, Curlew and Lapwing. These are concentrated along the moorland fringe to the west of Keighley, Oakworth, Oxenhope and Denholme; an area to the north west of Ilkley Moor south of Addingham towards Keighley and East Morton; and another important area to the south and east of Rombalds / Ilkley Moor, between Burley in Wharfedale and Menston and north of the settlements of Bingley and Baildon.

7.2.2 Further analysis of this survey data in relation to SHLAA2 sites which could potentially come forward for development during the plan period has shown that, on the basis of currently available data, it is not possible to demonstrate that any of the SHLAA sites are functionally linked to the SPA due to their importance for foraging SPA birds (i.e. none of them are Red category sites which are unlikely to be deliverable). Taking account of the level of risk associated with Amber sites and the availability of Green sites, in relation to a strategic plan and the assessment made of supporting habitat, it is concluded that there is sufficient flexibility to have confidence in Core Strategy housing targets being met without adverse effects on the population or distribution of qualifying bird species within the SPA.

7.2.3 However, this is assessment is based on a limited dataset comprised of two visits from one breeding season (2013). Despite the data limitations the analysis has also shown that 54 sites associated with the settlements of Addingham, Bingley, Burley, Denholme, East Morton, Haworth, Ilkley, Keighley, Menston, Oakworth, Oxenhope, Silsden and Thornton supported foraging SPA bird species, or were within 200m of land which supported foraging birds. These are considered to be Amber category sites (that may be deliverable with mitigation) and it is

likely that further survey and assessment of these sites would result in a conclusion that some are regularly used for foraging by SPA birds (i.e. they are functionally linked to the SPA), or are adjacent to land which is regularly used, and such sites may need to be added to the Red category in future. Development that impinges upon functionally linked land or supporting habitats, either directly or indirectly, may result in an actual or effective loss of habitat and consequent decline in the population and range of these species within the SPA.

7.2.4 The Core Strategy has responded to this risk within Policy SC8 which states that, within Zone B (up to 2.5km from the SPA boundary), future land allocations and development proposals will be assessed for negative effects on foraging habitat for qualifying species of the SPA, based on such evidence as may be reasonably required by the Council. Further details on how the Council intends to implement this approach will be set out in a Supplementary Planning Document, and provisional guidance on a suitable level of survey effort is given at section 6.2 of this report.

7.2.5 Furthermore, the Council intends to undertake additional survey and assessment when testing sites for inclusion within the Allocations DPD, for residential or employment development or other land uses within the 2.5km zone. Outputs from further surveys and assessments are to be incorporated into the wider Sustainability Appraisal and Strategic Environmental Assessment testing process.

Increased emissions to air

7.2.6 There is evidence of degradation to the bog habitats of the qualifying bird species of the SPA (particularly Golden Plover and Dunlin) as a result of atmospheric pollution, both from industrial sources (past and present) and road traffic emissions. The nitrogen and acid deposition loading at all locations investigated was found to significantly exceed the critical load and as such may be interfering with the supporting processes on which the habitats of the qualifying species rely. Under extreme or prolonged exposure this could result in changes to the extent and distribution of the habitats of qualifying bird species.

7.2.7 However, linking pollution loads to development proposed through the Core Strategy is not straight forward and at present there is insufficient data to enable the nature of impacts, where and when they might manifest themselves, to be properly explored. Haworth and Oxenhope Moors could be affected, particularly in the vicinity of A6033 Hebden Bridge Road. The most substantial impacts are likely to continue to occur around Rishworth and Moss Moors where a number of road corridors cross the Pennines towards Greater Manchester, although impacts here are likely to be from a combination of sources.

7.2.8 It is recommended that more detailed traffic modelling is undertaken during the pre-allocations testing stage which will precede development of the Allocations DPD.

Wind turbines – collision mortality risk and displacement

7.2.9 Although recent scientific studies have led to mixed conclusions, there is some evidence to suggest that negative impacts from wind turbine development can occur, including through suppressed breeding densities and displacement, and locally reduced population size. Such

impacts have been demonstrated (though not consistently) in relation to upland raptors and wading birds, including Golden Plover, a qualifying feature of the SPA. Adverse effects on birds using supporting habitats off the SPA are also possible. However, the Core Strategy does not allocate land for wind generation, but it does identify the SAC/SPA as a strategic constraint on potential new wind generation capacity.

Recreation (including dog walkers)

7.2.10 There is significant potential for additional recreational pressure having adverse effects on the populations of Annex 1 (Golden Plover and Merlin) and regularly occurring migratory birds (assemblage of breeding birds) within the South Pennine Moors Phase 2 SPA. Populations on Rombalds / Ilkley Moor at particular risk are the Golden Plover and the single Merlin and Peregrine Falcon territories recorded in 2014. Merlin, Peregrine Falcon, Short-eared Owl, Golden Plover and Dunlin breeding on the moors to the south and west of the Haworth are also at risk. Declines in breeding numbers of SPA birds are likely to result in a reduction in the range of these birds within the SPA, particularly if birds are displaced from isolated moorland blocks such as Rombalds and Ilkley Moors.

7.2.11 Data from the visitor survey carried out by the Council during July and August 2013 was analysed to derive estimates of current visiting rates. The results suggest that the northern part of the SPA at Rombalds and Ilkley Moors is much more frequently visited (c.131,954 annual visits) than the moors to the south and west of Haworth (c. 69,480). Summing these figures for north and south to give overall Bradford district origin visits to the SPA, the current annual estimated figure is in the region of 201,434. This can be expected to increase in the context of Core Strategy housing targets. These figures indicate visits from Bradford residents only and not from those living outside the district.

7.2.12 The visitor survey data were further analysed to estimate the penetration distance of the average visitor to the SPA (i.e. the average straight line distance between the point of access and the furthest part of the SPA visited during their visit). This showed that average penetration distance on the moors to the south and west of Haworth was 1,856m, encompassing 2,035ha of potentially disturbed nesting habitat. On Rombalds and Ilkley Moors the penetration distance was 1,951m, resulting in 2,336ha of potentially disturbed habitat.

7.2.13 The summary of key findings from the analysis of visitor survey data and research relating to disturbance to breeding birds, presented in 6.7.38, indicates causes for concern in relation to cumulative impacts resulting in adverse effects on ecological integrity. Locating development further away from the SPA allows a greater measure of confidence that residual impacts can be successfully managed and mitigated.

7.2.14 The distances travelled to reach the SPA were also analysed to explore whether an approximate visitor catchment area could be established. The resulting cumulative distribution curve is shown at Figure 6.9 and shows that 85% of Bradford district residents travelled from within approximately 7km to reach the South Pennine Moors SAC/SPA in summer 2013. This is the zone within which provision of alternative recreational sites is likely to be most effective in deflecting regular visitors (especially dog walkers) away from the SPA.

7.2.15 The Core Strategy has responded to these risks within Policy SC8 which prevents a net increase in dwellings within 400m of the SPA, and requires residential developments within up to 7km of the SPA to provide or contribute to additional natural greenspace for recreation, and implementation of access management and monitoring measures within the SPA to reduce the impacts of recreational pressure.

Trampling and erosion (including pedestrian and off-road vehicles)

7.2.16 Urban development and consequent increases in recreational visits to the SPA threatens increased erosion of paths causing damage to habitats used by SPA bird populations, particularly on Rombalds / Ilkley Moor and the moors to the south and west of the South Pennine Town and Villages.

7.2.17 The Core Strategy has responded to this risk within policy SC8 which prevents a net increase in dwellings within 400m of the SPA, and requires residential developments within up to 7km of the SPA to provide or contribute to additional natural greenspace for recreation, implementation of access and habitat management measures within the SPA to reduce the impacts of recreational pressure.

Urban edge effects

Fire

7.2.18 Rombalds / Ilkley Moor has been identified as one of seven high and medium fire density areas within the South Pennine Moors (section 6.8.8). Additional housing development in the vicinity of this urban edge moorland is liable to further exacerbate the risk of fire on the moor, leading to potential loss of nest sites and habitats used by SPA birds, particularly Golden Plover and potentially Short-eared Owl. The moors to the south and west of the South Pennine Towns and Villages have been identified as currently having lower levels of fire density although it is evident from Figure 6.10 that moors closest to Queensbury have a raised incidence of fire.

7.2.19 It has been shown from studies on both lowland heathlands and the Pennine moors that fire risk is significantly increased where these sites are close to urban areas, where young people are concentrated and at times of day and periods of the year when young people are likely to have access to the heaths and moors.

7.2.20 It is considered likely that increased urban development near to the SPA is liable to result in an increase in threat from fire to SPA bird populations, their range and the habitats they use.

Fly-tipping and garden waste / invasive species

7.2.21 It is unlikely that these impacts will have an adverse effect on the SPA bird population, their range or the habitats they use.

Dog fouling

7.2.22 It is unlikely that dog fouling will have an adverse effect on the SPA bird population, their range or the habitats they use.

Urbanised avifauna

7.2.23 The effects of increased crow and magpie predation on SPA bird species is likely to operate where housing development is in close proximity to SPA birds' nest sites.

Cat predation

7.2.24 The South Pennine Towns and Villages are located slightly further from the SPA boundary than those within Wharfedale and Airedale and development here is unlikely to result in threats of cat predation to the SPA bird species. However, there is a risk of wide ranging cats reaching Rombalds / Ilkley Moor if green field development within Wharfedale or Airedale is permitted within close proximity to the SPA boundary. This could have localised impacts on the population and range of SPA birds.

Responding to the risk of urban edge effects

7.2.25 The Core Strategy has responded to the risk of urban edge effects through Policy SC8 which seeks to protect the South Pennine Moors and their zone of influence. This prevents a net increase in residential units within 400m of the edge of the SPA/SAC. Evidence has been presented of the risk of urban edge impacts occurring where there are urban communities within and beyond the 400m zone. Locating housing away from the zone where urban edge impacts are most likely to occur reduces the risk of adverse effects and allows a greater measure of confidence that residual impacts can be successfully managed and mitigated.

Overall Assessment against the Conservation Objective of South Pennine Moors Phase 2 SPA

7.2.26 Recreational impacts and urban edge effects from housing proposed in the Bradford Core Strategy risks reducing Annex 1 and migratory bird populations, habitat viability and range within the South Pennine Moors Phase 2 SPA. The release of greenfield sites for development (of any type) could result in a loss of supporting habitat for SPA birds, particularly within around 2.5km of the SPA boundary. Increased risks of fire could reduce the extent and viability of Annex 1 and migratory bird habitat. There is a risk of cat predation affecting bird populations and range within Rombalds / Ilkley Moor.

7.2.27 However, the Core Strategy establishes a reasonable and pragmatic strategic approach to reducing the risk of adverse effects in Policy SC8, which enables the HRA to demonstrate that adverse effects are capable of being avoided and/or mitigated. Work to continue towards implementing these measures will be undertaken during preparation of the Allocations DPD to ensure that:

(a) Delivery and funding mechanisms are established through a Supplementary Planning Document to ensure that additional recreational sites are brought forward to divert recreational pressures away from the European sites, coupled with strategic access management and monitoring measures; and

(b) Greenfield sites to be released for development (of any type) do not include areas of important supporting habitat regularly used by foraging SPA birds, and that a sufficiently robust network of offsite foraging habitats continues to exist.

7.2.28 Taking into account the strategic approach to reducing and managing the identified risks, and the potential for more detailed assessment in a lower tier plan (the Allocations DPD), it can be concluded that the Core Strategy (Proposed Modifications) will not result in adverse effects on the ecological integrity of the South Pennine Moors Phase 2 SPA as a result of these impacts.

7.2.29 Traffic-related atmospheric pollution could affect the extent, structure and composition of the habitats of Annex 1 and migratory bird species. There is currently insufficient data to make a fuller assessment. It is envisaged that more detailed traffic modelling will be undertaken during the pre-allocations testing stage which will precede development of the Allocations DPD, to ensure that traffic growth resulting from new development does not add significantly to levels of traffic and atmospheric pollution on roads within 200m of the European sites.

7.3 South Pennine Moors SAC

Conservation Objectives – subject to natural change, to maintain or restore the:

- Objective 6: Extent and distribution of the qualifying natural habitats;
- Objective 7: Structure and function (including typical species) of the qualifying natural habitats; and
- Objective 8: Supporting processes on which the qualifying natural habitats rely.

Increased emissions to air

7.3.1 There is evidence of changes to the structure and composition of Blanket bog (*priority feature*) and Transition mire habitats of the SAC as a result of atmospheric pollution, and this may also be affecting the habitats' typical bird species including Golden Plover, Dunlin and Meadow Pipit.. Dry and wet heathland habitats are also vulnerable to inputs of nitrogen, with typical plant species being out-competed by nitrophilous species. The nitrogen and acid deposition loading at all locations investigated was found to significantly exceed the critical load. Under extreme or prolonged exposure this could result in changes to the extent and distribution of the qualifying habitats.

7.3.2 However, linking pollution loads to development proposed through the Core Strategy is not straight forward and at present there is insufficient data to fully assess the nature of impacts. Haworth and Oxenhope Moors could be affected, particularly in the vicinity of A6033 Hebden Bridge Road. Impacts are most likely to occur around Rishworth and Moss Moors where a number of road corridors cross the Pennines towards Greater Manchester, although impacts here are likely to be from a combination of sources. Further pressure points could arise as a result of locations identified for development or through increases in visitor numbers.

7.3.3 It is recommended that more detailed traffic modelling is undertaken during the pre-allocations testing stage which will precede development of the Allocations DPD, to ensure that sites being considered for allocation can be implemented in compliance with the Habitat Regulations and Core Strategy Policy SC8.

Wind turbines – collision mortality risk and displacement

7.3.4 There is some evidence to suggest that negative impacts from wind turbine development can occur to typical bird species of the SAC habitats, including Golden Plover and Curlew, through suppressed breeding densities, displacement, and locally reduced population size. However, such impacts are unlikely to adversely affect the qualifying habitats of the SAC, and in any event the Core Strategy does not allocate land for wind generation.

Trampling and erosion (including pedestrian and off-road vehicles)

7.3.5 Erosion from increased recreational use of tracks and paths in the SAC has significant potential to cause damage to both heathland and blanket bog habitats. The Core Strategy has responded to this risk within Policy SC8 which prevents a net increase in dwellings within 400m of the SAC, and requires residential developments within up to 7km of the SAC to provide or contribute to additional natural greenspace for recreation, implementation of access and habitat management measures within the SAC to reduce the impacts of recreational pressure.

Urban edge effects

Fire

7.3.6 The increased risk of fire to the SAC from greater urbanisation of the moorland edge poses a potentially significant impact upon heathland and blanket bog (*priority feature*) habitats. Fire mapping data has shown the current relatively high levels of fire associated with the most urban moors such as Ilkley Moor. Research indicates that heathland vegetation takes between 4 and 20 years to recover and that fire events present a serious risk to ecological integrity.

7.3.7 Since 2008, a South Pennines Fire Operations Group, chaired by Bradford Council, has operated across the area. This is a partnership of Fire and Rescue Services, local authorities, water companies and major landowners, whose joint aim is to raise awareness of the impacts of wildfire on the South Pennine Moors, and to improve training and equipment for fighting wildfire. This provides a means of monitoring the incidence of fire which, if supplemented with monitoring in relation to impacts on vegetation and species, would allow the issue to be kept under review.

Fly-tipping and garden waste / invasive species

7.3.8 Urban development near to the SAC or with easy access to car parks on the moorland fringe has the potential to result in damage to SAC habitats from introduced invasive species and from fly-tipping.

Dog fouling

7.3.9 Linked to the impacts of trampling and increases in the number of visitors accompanied by dogs is the potential for dog fouling to change soil nutrient levels and have an adverse effect on heathland and blanket bog habitats. This is likely to occur along paths and tracks leading from heavily used car parks. The effect tends to be localised and may not have an adverse effect on the SAC integrity, but the intensity of use will be a contributory factor.

Responding to the risk of urban edge effects

7.3.10 The Core Strategy has responded to the risk of urban edge effects through Policy SC8 which seeks to protect the South Pennine Moors and their zone of influence. This prevents a net increase in residential units within 400m of the edge of the SPA/SAC. Evidence has been presented of the risk of a number of urban edge impacts occurring where there are urban communities beyond the 400m zone. Locating housing away from the zone where urban edge impacts are most likely to occur reduces the risk of adverse effects and allows a greater measure of confidence that residual impacts can be successfully managed and mitigated.

Overall Assessment against the Conservation Objective of South Pennine Moors SAC

7.3.11 There is a risk of loss of Annex 1 habitat extent, structure and function due to increased recreational use and consequent erosion and trampling, an increased threat of fire and risks from the consequences of fly-tipping and invasion of alien species, as well as changes induced by deposition of atmospheric pollutants.

7.3.12 However, the Core Strategy establishes a reasonable and pragmatic strategic approach to reducing the risk of adverse effects in Policy SC8, which enables the HRA to demonstrate that adverse effects are capable of being avoided and/or mitigated. Taking into account the strategic approach to reducing and managing the identified risks, and the potential for more detailed assessment in a lower tier plan (the Allocations DPD), it can be concluded that the Core Strategy (Proposed Modifications) will not result in adverse effects on the ecological integrity of the South Pennine Moors SAC as a result of these impacts.

7.3.13 It is envisaged that more detailed traffic modelling will be undertaken during the pre-allocations testing stage which will precede development of the Allocations DPD, to ensure that traffic growth resulting from new development does not add significantly to levels of traffic and atmospheric pollution on roads within 200m of the European sites.

7.4 North Pennine Moors SPA

Conservation Objectives – subject to natural change, to maintain or restore the:

- Objective 1: Extent and distribution of the habitats of the qualifying features;
- Objective 2: Structure and function of the habitats of the qualifying features;
- Objective 3: Supporting processes on which the habitats of the qualifying features rely;
- Objective 4: Populations of the qualifying features; and
- Objective 5: Distribution of the qualifying features within the site.

Supporting habitat

7.4.1 The North Pennine Moors SPA boundary is approximately 2.5km north of Ilkley. Most of the land between the north and south SPAs lies outside of the Bradford district, but approximately 282ha of land within 2.5km of the North Pennine Moors SPA falls within the district, including small areas north of Ilkley and to the north and east of Addingham. The scope for impacts to off-site foraging habitats within these areas has been explored through analysis of Bradford's SHLAA sites. There are seven SHLAA2 trajectory sites which fall within 2.5km of the North

Pennine Moors SPA[49], which include two Amber category sites (AD/005 and IL/019). The importance of these sites to foraging SPA birds will be further assessed under the provisions of Policy SC8 prior to selecting sites for inclusion within the Allocations DPD. Developments brought forward through the Bradford Core Strategy are therefore unlikely to have direct effects on SPA supporting habitats within this area. However, it is important that consideration is given to planning policies within the neighbouring planning authority to ensure that sufficient off-site foraging habitats between the SPA and the settlements within Wharfedale are conserved.

Increased emissions to air

7.4.2 There is evidence of degradation to the bog habitats of the qualifying bird species of the SPA (particularly Golden Plover, Dunlin and Curlew) as a result of atmospheric pollution, both from industrial sources (past and present) and road traffic emissions. The nitrogen (but not acid) deposition loading at both locations investigated was found to significantly exceed the critical load. Under extreme or prolonged exposure this could result in changes to the extent and distribution of the habitats of qualifying bird species.

7.4.3 However, linking pollution loads to development proposed through the Core Strategy is not straight forward and at present there is insufficient data to enable the nature of impacts to be properly explored. Examining the layout of the road network emanating northwards from Bradford district, impacts could be expected at Round Hill close to the A59 Kex Gill Road, and at Embsay Moor on the B6160 (nr Barden Tower). It is recommended that more detailed traffic modelling is undertaken during the pre-allocations testing stage which will precede development of the Allocations DPD.

Wind turbines – collision mortality risk and displacement

7.4.4 The Bradford Core Strategy does not allocate land for wind turbine development and is not likely to adversely affect the SPA which lies just over 2km to the north of the district boundary.

Recreation (including dog walkers)

7.4.5 Addingham (with 200 dwellings proposed) is approximately 2km from the North Pennine Moors SPA, and Ilkley (with 1,000 dwellings proposed) is around 2.5km from the SPA. Visitor survey data collected on the South Pennine Moors indicates that 85% Bradford residents travel up to 7km to reach the site, but equivalent data is not available for the North Pennine Moors. There is potential for additional recreational pressure to have adverse effects on the populations of Annex 1 (Golden Plover, Merlin and Peregrine Falcon) within the North Pennine Moors SPA. However, this is likely to be of a much lesser scale than increased recreation on the South Pennine Moors Phase 2 SPA, due to the limited number of car parks and access points onto the North Pennine Moors SPA in the vicinity of settlements within the Bradford area.

7.4.6 The Core Strategy has responded to this risk within Policy SC8 which requires residential developments within up to 7km of the South Pennine Moors Phase 2 SPA to provide or contribute to additional natural greenspace for recreation. This zone would also include all

[49] SHLAA2 trajectory sites within 2.5km of North Pennine Moors SPA: AD/005, AD/006, AD/013, AD/014, AD/015, AD/016, IL/019.

residential development within Bradford district which could contribute towards increasing recreational pressure within the North Pennine Moors SPA. It is concluded that there will not be an adverse effect on this SPA as a consequence of the proposed development in the Core Strategy.

Trampling and erosion (including pedestrian and off-road vehicles)

7.4.7 It seems improbable that there would be a significant increase in path erosion and loss of habitat from proposed development in the Core Strategy on the North Pennine Moors SPA. This is due to the limited availability of access to the SPA from settlements within the Bradford area, the distance between the SPA and the Bradford settlements and the presence of alternative more accessible moorlands within the South Pennines SPA/SAC. It is concluded that there will not be an adverse effect on this SPA as a consequence of the proposed development in the Core Strategy.

Fire

7.4.8 It has been shown from studies on both lowland heathlands and the Pennine moors that fire risk is significantly increased where these sites are close to urban areas, where young people are concentrated and at times of day and periods of the year when young people are likely to have access to these heaths and moors. In all these respects the North Pennine Moors are unlikely to be used by new residents within the Bradford district and it is concluded that there is no significant risk of fire to the North Pennine Moors SPA as a consequence of the proposed development in the Core Strategy.

Fly-tipping and garden waste / invasive species

7.4.9 It is unlikely that these impacts will have an adverse effect on the SPA bird populations, their range or the habitats they use.

Dog fouling

7.4.10 It is unlikely that dog fouling will have an adverse effect on the SPA bird populations, their range or the habitats they use.

Urbanised avifauna

7.4.11 It is unlikely that there will be an adverse effect on bird populations from an urbanisation of the bird fauna associated with the proposed new development as this will all be at least 2km from the SPA boundary.

Cat predation

7.4.12 It is unlikely that cat predation will have an adverse effect on the SPA bird populations, their range or the habitats they use.

Overall Assessment against the Conservation Objective of North Pennine Moors SPA

7.4.13 It is concluded that development proposed by the Bradford Core Strategy will not have adverse effects on the ecological integrity of the North Pennine Moors SPA, or its supporting habitats, due to recreation, trampling, erosion, fire, fly-tipping, dog fouling, urbanised avifauna, cat predation or wind generation.

7.4.14 Traffic-related atmospheric pollution could affect the extent, structure and composition of the habitats of Annex 1 and migratory bird species, especially around Round Hill and Embsay Moor. There is currently insufficient data to make a fuller assessment. It is envisaged that more detailed traffic modelling will be undertaken during the pre-allocations testing stage which will precede development of the Allocations DPD, to ensure that traffic growth resulting from new development does not add significantly to levels of traffic and atmospheric pollution on roads within 200m of the European sites.

7.5 North Pennine Moors SAC

Conservation Objectives – subject to natural change, to maintain or restore the:

- Objective 6: Extent and distribution of the qualifying natural habitats;
- Objective 7: Structure and function (including typical species) of the qualifying natural habitats; and
- Objective 8: Supporting processes on which the qualifying natural habitats rely.

Increased emissions to air

7.5.1 There is evidence of changes to the structure and composition of Blanket bog (*priority feature*) and Transition mire habitats of the SAC as a result of atmospheric pollution, and this may also be affecting the habitats' typical bird species including Golden Plover, Dunlin, Curlew and Meadow Pipit.. Dry and wet heathland habitats are also vulnerable to inputs of nitrogen, with typical plant species being out-competed by nitrophilous species. The nitrogen (but not acid) deposition loading at both locations investigated was found to significantly exceed the critical load. Under extreme or prolonged exposure this could result in changes to the extent and distribution of the qualifying habitats.

7.5.2 However, linking pollution loads to development proposed through the Core Strategy is not straight forward and at present there is insufficient data to fully assess the nature of impacts. Impacts could be expected at Round Hill close to the A59 Kex Gill Road, and at Embsay Moor on the B6160 (nr Barden Tower). It is recommended that more detailed traffic modelling is undertaken during the pre-allocations testing stage which will precede development of the Allocations DPD.

Wind turbines – collision mortality risk and displacement

7.5.3 The Bradford Core Strategy does not allocate land for wind turbine development and is not likely to adversely affect the SAC which lies just over 2km to the north of the district boundary.

Trampling and erosion (including pedestrian and off-road vehicles)

7.5.4 It seems unlikely that there would be a significant increase in path erosion and loss of habitat from the proposed development in the Core Strategy on the North Pennine Moors SAC. This is due to the limited availability of access to the SAC from settlements within the Bradford District area, the distance between the SAC and the Bradford settlements and the presence of alternative more accessible moorlands within the South Pennines SPA/SAC. It is concluded that there will not be an adverse effect on this SPA as a consequence of the proposed development in the Core Strategy.

Fire

7.5.5 It has been shown from studies on both lowland heathlands and the Pennines moors that fire risk is significantly increased where these sites are close to urban areas, where young people are concentrated and at times of day and periods of the year when young people are likely to have access to heaths and moors. In all these respects the North Pennine Moors are unlikely to be used by new residents within the Bradford District and it is concluded that there is no significant risk of fire to the North Pennine Moors SAC as a consequence of the proposed development in the Core Strategy.

Fly-tipping and garden waste / invasive species

7.5.6 It is unlikely that these impacts will have an adverse effect on the extent, structure and function or typical species of the Annex 1 habitats of the North Pennine Moors SAC.

Dog fouling

7.5.7 It is unlikely that dog fouling will have an adverse effect on the extent, structure and function or typical species of the Annex 1 habitats of the North Pennine Moors SAC.

Urbanised avifauna

7.5.8 It is unlikely that changes to the local bird fauna from urban development with Bradford district will have an adverse effect on the extent, structure and function or typical species of the Annex 1 habitats of the North Pennine Moors SAC.

Cat predation

7.5.9 It is unlikely that cat predation will have an adverse effect on the extent, structure and function or typical species of the Annex 1 habitats of the North Pennine Moors SAC.

Overall Assessment against the Conservation Objective of North Pennine Moors SAC

7.5.10 It is concluded that development proposed by the Bradford Core Strategy will not have adverse effects on the ecological integrity of the North Pennine Moors SAC due to recreation, trampling, erosion, fire, fly-tipping, dog fouling, urbanised avifauna, cat predation or wind generation. .

7.5.11 Traffic-related atmospheric pollution could affect the extent, structure and composition of the Annex 1 habitats of the SAC, especially around Round Hill and Embsay Moor. There is currently insufficient data to make a fuller assessment. It is envisaged that more detailed traffic modelling will be undertaken during the pre-allocations testing stage which will precede development of the Allocations DPD, to ensure that traffic growth resulting from new development does not add significantly to levels of traffic and atmospheric pollution on roads within 200m of the European sites.

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8 Determining Adverse Effects on Integrity

8.1 Introduction

8.1.1 Using the information presented in Chapters 5 and 7, the following sections consider whether there will be adverse effects on the integrity of the North or South Pennine Moors SAC or SPA.

8.1.2 English Nature (2004; now Natural England) has produced guidance on determining site integrity which includes a 'simple, pragmatic checklist' for assessing likely effects on integrity. This requires the assessor to pose a series of five questions to consider whether the Appropriate Assessment has shown:

- That the area of Annex 1 habitats (or composite features) will not be reduced?
- That there will be no direct effect on the population of the species for which the site was designated or classified?
- That there will be no indirect effects on the populations of species for which the site was designated due to loss or degradation of their habitat (quantity/quality)?
- That there will be no changes to the composition of the habitats for which the site was designated (e.g. reduction in species structure, abundance or diversity that comprises the habitat over time)?
- That there will be no interruption or degradation of the physical, chemical or biological processes that support habitats and species for which the site was designated or classified?

8.1.3 The guidance suggests that if the answer to all of these questions is 'Yes' then it is reasonable to conclude that there is not an adverse effect on integrity. If the answer is 'No' to one or more of the questions then further site-specific factors need to be considered in order to reach a decision. Such factors include:

- Scale of impact;
- Long term effects and sustainability;
- Duration of impact and recovery/reversibility;
- Dynamic systems;
- Conflicting feature requirements;
- Off-site impacts; and
- Uncertainty in cause and effect relationships and a precautionary approach.

8.1.4 This two-step process is applied to determine whether there will be adverse effects on the North or South Pennine Moors SAC or SPA as a result of the Bradford district Core Strategy (Proposed Modifications).

8.2 South Pennine Moors (Phase 2) SPA

Step-one tests

Has the Appropriate Assessment shown:	Y/N
That the area of annex I habitats (or habitats of qualifying features) will not be reduced?	**Yes**
That there will be no direct effect on the population of the species for which the site was designated or classified?	**Yes**
That there will be no indirect effects on the populations of species for which the site was designated or classified due to loss or degradation of their habitat (quantity/quality)?	**Yes**
That there will be no changes to the composition of the habitats for which the site was designated (eg reduction in species structure, abundance or diversity that comprises the habitat over time)?	**Yes**
That there will be no interruption or degradation of the physical, chemical or biological processes that support habitats and species for which the site was designated or classified?	**Yes**

8.2.1.1 It can be concluded that there will be no adverse effects on the ecological integrity of the South Pennine Moors (Phase 2) SPA. The Core Strategy can be considered compliant with the Habitats Regulations in this respect.

8.3 South Pennine Moors SAC

Step-one tests

Has the Appropriate Assessment shown:	Y/N
That the area of annex I habitats (or habitats of qualifying features) will not be reduced?	**Yes**
That there will be no direct effect on the population of the species for which the site was designated or classified?	**N/A***
That there will be no indirect effects on the populations of species for which the site was designated or classified due to loss or degradation of their habitat (quantity/quality)?	**Yes ****
That there will be no changes to the composition of the habitats for which the site was designated (eg reduction in species structure, abundance or diversity that comprises the habitat over time)?	**Yes**
That there will be no interruption or degradation of the physical, chemical or biological processes that support habitats and species for which the site was designated or classified?	**Yes**

* SAC not designated for any Annex 2 species.
** Considered as typical species for the purposes of the assessment.

8.3.1.1 It can be concluded that there will be no adverse effects on the ecological integrity of the South Pennine Moors SAC. The Core Strategy can be considered compliant with the Habitats Regulations in this respect.

8.4 North Pennine Moors SPA

Step-one tests

Has the Appropriate Assessment shown:	Y/N
That the area of annex I habitats (or habitats of qualifying features) will not be reduced?	**Yes**
That there will be no direct effect on the population of the species for which the site was designated or classified?	**Yes**
That there will be no indirect effects on the populations of species for which the site was designated or classified due to loss or degradation of their habitat (quantity/quality)?	**Yes**
That there will be no changes to the composition of the habitats for which the site was designated (eg reduction in species structure, abundance or diversity that comprises the habitat over time)?	**Yes**
That there will be no interruption or degradation of the physical, chemical or biological processes that support habitats and species for which the site was designated or classified?	**Yes**

8.4.1.1 It can be concluded that there will be no adverse effects on the ecological integrity of the North Pennine Moors SPA. The Core Strategy can be considered compliant with the Habitats Regulations in this respect.

8.5 North Pennine Moors SAC

Step-one tests

Has the Appropriate Assessment shown:	Y/N
That the area of annex I habitats (or habitats of qualifying features) will not be reduced?	**Yes**
That there will be no direct effect on the population of the species for which the site was designated or classified?	**N/A***
That there will be no indirect effects on the populations of species for which the site was designated or classified due to loss or degradation of their habitat (quantity/quality)?	**Yes ****
That there will be no changes to the composition of the habitats for which the site was designated (eg reduction in species structure, abundance or diversity that comprises the habitat over time)?	**Yes**
That there will be no interruption or degradation of the physical, chemical or biological processes that support habitats and species for which the site was designated or classified?	**Yes**

* SAC not designated for Annex 2 species. Marsh Saxifrage is present but not as a primary reason for site selection, and is not present close to Bradford district boundary.
** Considered as typical species for the purposes of the assessment.

8.5.1.1 It can be concluded that there will be no adverse effects on the ecological integrity of the North Pennine Moors SAC. The Core Strategy can be considered compliant with the Habitats Regulations in this respect.

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9 Conclusions

9.1 Summary

9.1.1 This report presents an Appropriate Assessment under the Habitats Regulations for the Bradford District Core Strategy (Proposed Modifications).

9.1.2 The Council previously undertook a joint HRA screening assessment for the Draft Core Strategy and Draft Waste Management DPD (Environ, 2012) which found that the Core Strategy was considered likely to lead to significant effects on European sites in and around the district. Following this, a more detailed Appropriate Assessment (UEEC, 2013) of issues affecting the European sites was prepared, which assessed the impacts of the Further Engagement Draft Core Strategy and included preliminary recommendations for avoidance and mitigation.

9.1.3 A second iteration of the HRA Report (February 2014) provided an assessment of the Publication Draft Core Strategy based on analysis of baseline information gathered during a number of studies undertaken during 2013. A third iteration of the HRA Report included further analysis of this data, particularly in relation to visitor surveys, and an element of review in response to the earlier consultation. The current HRA Report assesses the Core Strategy at the Proposed Modifications stage and addresses issues raised during the Examination in Public.

9.2 Scope of the Assessment

9.2.1 Four nature conservation sites of European importance are addressed by the assessment, the North Pennine Moors SAC and SPA, South Pennine Moors SAC and South Pennine Moors Phase 2 SPA. The following impact pathways were considered during the assessment:

- Loss of supporting habitats;
- Increased water demand;
- Impacts on water quality;
- Increased emissions to air;
- Wind turbines (collision mortality risk and displacement);
- Recreational impacts; and
- Effects from increasing urbanisation.

9.3 Findings

9.3.1 Adverse effects resulting from wind turbine development, increased water demand or impacts on water quality are not considered likely for any of the four European sites.

9.3.2 Loss of supporting habitats and urbanisation impacts are unlikely to affect the North Pennine Moors SAC/SPA.

9.3.3 Loss of supporting habitats and urbanisation impacts are assessed as likely to affect the South Pennine Moors SAC/SPA, however, they are considered to be adequately avoided and mitigated by the policy response and approach in Core Strategy Policy SC8.

9.3.4 Recreational impacts are assessed as potentially affecting any of the four sites, however, they are considered to be adequately avoided and mitigated by the Core Strategy policy response. The distribution and magnitude of impacts differs between the four designated areas. Evidence is presented to indicate that, if left unmitigated, impacts are likely to be greater in relation to the South Pennine Moors sites due to their relative proximity to locations for future development and high levels of accessibility, a key influence on the numbers of people visiting the sites and associated impacts.

9.3.5 The likelihood of traffic-related atmospheric pollution affecting any of the four sites will be determined through more detailed traffic modelling during the pre-allocations testing stage.

9.4 Conclusions

9.4.1 To ensure that delivery and funding mechanisms for avoidance and mitigation measures are taken forward, the Council will produce a Supplementary Planning Document to guide implementation of the South Pennine Moors Zones of Influence Policy set out in Strategic Core Policy 8 in the Core Strategy (Proposed Modifications).

9.4.2 Taking into account the range of avoidance and mitigation measures incorporated into this strategic plan, it can be concluded that the Core Strategy (Proposed Modifications) will not result in adverse effects on the ecological integrity of the North Pennine Moors SAC and SPA, South Pennine Moors SAC and South Pennine Moors Phase 2 SPA. The Core Strategy can be considered compliant with the Habitats Regulations in respect of all four sites.

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Appendix I: Screening Matrix

Please see insert.

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HRA Screening of the City of Bradford District Core Strategy at Proposed Modifications Stage (taking account of Incorporated Mitigation Measures)

			SAC		SPA	
			South Pennine Moors	North Pennine Moors	South Pennine Moors	North Pennine Moors
ID	Sustainable Development	Likely Significant Effect(s)				
P1	Presumption in Favour of Sustainable Development	-	A	A	A	A
ID	Strategic Core Policies	Likely Significant Effect(s)				
SC1	Overall Approach and Key Spatial Priorities	-	A	A	A	A
SC2	Climate Change and Resource Use	-	D	D	D	D
SC3	Working Together	-	A	A	A	A
SC4	Hierarchy of Settlements	-	E	E	E	E
SC5	Location of Development	-	E	E	E	E
SC6	Green Infrastructure	-	D	D	D	D
SC7	Green Belt	-	C	C	C	C
SC8	Protecting the South Pennine Moors SPA and the South Pennine Moors SAC and their zone of influence	-	D	D	D	D
SC9	Making Great Places	-	A	A	A	A
ID	Sub Area Policies	Likely Significant Effect(s)				
BD1	City of Bradford including Shipley and Lower Baildon Sub Area	-	E	E	E	E
BD2	Investment Priorities for the Regional City of Bradford including Shipley and Lower Baildon	-	A	A	A	A
AD1	Airedale Sub Area	-	E	E	E	E
AD2	Investment Priorities for the Airedale Sub Area	-	A	A	A	A
WD1	Wharfedale Sub Area	-	E	E	E	E
WD2	Investment Priorities for the Wharfedale Sub Area	-	A	A	A	A
PN1	South Pennine Towns and Villages Sub Area	-	E	E	E	E
PN2	Investment Priorities for the South Pennine Towns and Villages Sub Area	-	A	A	A	A

HRA Screening of the City of Bradford District Core Strategy at Proposed Modifications Stage (taking account of Incorporated Mitigation Measures)

			SAC		SPA	
			South Pennine Moors	North Pennine Moors	South Pennine Moors	North Pennine Moors
ID	Economy	Likely Significant Effect(s)				
EC1	Creating a successful and competitive Bradford District economy within the Leeds City Region	-	A	A	A	A
EC2	Supporting Business and Job Creation	-	A	A	A	A
EC3	Employment Land Requirement	-	E	E	E	E
EC4	Sustainable Economic Growth	-	A	A	A	A
EC5	City, Town, District and Local Centres	-	A	A	A	A
ID	Transport	Likely Significant Effect(s)				
TR1	Travel Reduction and Modal Shift	-	A	A	A	A
TR2	Parking Policy	-	A	A	A	A
TR3	Public Transport, Cycling and Walking	-	A	A	A	A
TR4	Transport and Tourism	-	A	A	A	A
TR5	Improving Connectivity and Accessibility	-	A	A	A	A
TR6	Freight	-	A	A	A	A
TR7	Transport Investment and Management Priorities	-	A	A	A	A
TR8	Aircraft Safety	-	A	A	A	A
ID	Housing	Likely Significant Effect(s)				
HO1	The District's Housing Requirement	-	A	A	A	A
HO2	Strategic Sources of Supply	-	A	A	A	A
HO3	Distribution of Housing Development	-	E	E	E	E
HO4	Phasing the Release of Housing Sites	-	A	A	A	A
HO5	Density of Housing Schemes	-	A	A	A	A

			SAC		SPA	
			South Pennine Moors	North Pennine Moors	South Pennine Moors	North Pennine Moors
HO6	Maximising use of Previously Developed Land	-	A	A	A	A
HO7	Housing Site Allocation Principles	-	A	A	A	A
HO8	Housing Mix	-	A	A	A	A
HO9	Housing Quality	-	A	A	A	A
HO10	Overcrowding and Vacant Homes	-	A	A	A	A
HO11	Affordable Housing	-	A	A	A	A
HO12	Sites for Gypsies, Travellers and Travelling Showpeople	-	A	A	A	A
ID	Environment	Likely Significant Effect(s)				
EN1	Protection and Improvements in the provision of Open Space and Recreation Facilities	-	A	A	A	A
EN2	Biodiversity and Geodiversity	-	D	D	D	D
EN3	Historic Environment	-	D	D	D	D
EN4	Landscape	-	D	D	D	D
EN5	Trees and Woodland	-	D	D	D	D
EN6	Energy	-	A	A	A	A
EN7	Flood Risk	-	A	A	A	A
EN8	Environmental Protection	-	D	D	D	D
ID	Minerals	Likely Significant Effect(s)				
EN9	New and Extended Minerals Extraction Sites	-	A	A	A	A
EN10	Sandstone Supply	-	A	A	A	A
EN11	Sand, Gravel, Fireclay, Coal and Hydrocarbons (oil & gas)	-	A	A	A	A
EN12	Minerals Safeguarding	-	A	A	A	A

HRA Screening of the City of Bradford District Core Strategy at Proposed Modifications Stage (taking account of Incorporated Mitigation Measures)			SAC		SPA	
			South Pennine Moors	North Pennine Moors	South Pennine Moors	North Pennine Moors
ID	Waste Management	Likely Significant Effect(s)				
WM1	Waste Management	-	A	A	A	A
WM2	Identifying Waste Management Sites	-	A	A	A	A
ID	Design	Likely Significant Effect(s)				
DS1	Achieving Good Design	-	A	A	A	A
DS2	Working with the Landscape	-	A	A	A	A
Ds3	Urban Character	-	A	A	A	A
Ds4	Streets and Movement	-	A	A	A	A
DS5	Safe and Inclusive Places	-	A	A	A	A
ID	Implementation and Delivery	Likely Significant Effect(s)				
ID1	Development Plan Documents and Annual Monitoring Report	-	A	A	A	A
ID2	Viability	-	A	A	A	A
ID3	Developer Contributions	-	A	A	A	A
ID4	Working with Partners	-	A	A	A	A
ID5	Facilitating Delivery	-	A	A	A	A
ID6	Simplification of Planning Guidance to Encourage Sustainable Development	-	A	A	A	A
ID7	Community Involvement	-	A	A	A	A
ID8	Regeneration Funding and Delivery	-	A	A	A	A

HRA Screening of the City of Bradford District Core Strategy at Proposed Modifications Stage (taking account of Incorporated Mitigation Measures)		SAC		SPA	
		South Pennine Moors	North Pennine Moors	South Pennine Moors	North Pennine Moors
Assessment Key					
A	General statement of policy / aspiration				
B	Policy listing general criteria for testing the acceptability / sustainability of proposals				
C	Proposal referred to but not proposed by the plan				
D	Environmental protection / site safeguarding policy				
E	Policy/proposal steers change in such a way as to protect European sites from adverse effects				
F	Policy that cannot lead to development or other change				
G	Policy/proposal that could not have any conceivable effect on a European site				
H	Policy/proposal the (actual or theoretical) effects of which cannot undermine the conservation objectives (either alone or in combination with other aspects of this or any other plan/project)				
I	Policy/proposal with a likely significant effect on a European site alone				
J	Policy/proposal with an effect on a site but not likely to be significant alone; check for likely significant effects in combination				
K	Policy/proposal not likely to have a significant effect either alone or in combination (after the in combination test)				
L	Policy/proposal likely to have a significant effect in combination (after the in combination test)				

	SAC		SPA	
	South Pennine Moors	North Pennine Moors	South Pennine Moors	North Pennine Moors

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Appendix II: Categorisation of SHLAA Sites

Red SHLAA trajectory sites (sites within 400m of the SPA boundary)

There are currently no sites which fall into the Red category (i.e. sites that are unlikely to be deliverable). However, further survey and assessment of Amber category sites may result in a conclusion that one or more are regularly used for foraging by SPA birds, or are adjacent to land which is regularly used, and such sites may need to be added to the Red category in future.

Table A2.1: Amber SHLAA trajectory sites (sites used by foraging SPA birds and within 200m of OS MasterMap polygons from which SPA foraging birds have been recorded)

SHLAA ref	Settlement	Address
AD/001	Addingham	Turner Lane
AD/002	Addingham	Moor Lane
AD/003	Addingham	Main Street / Southfield Terrace
AD/004	Addingham	Main Street / Addingham Bypass (Southfield Farm)
AD/005	Addingham	Main Street
AD/007	Addingham	Stockinger Lane, Addingham
AD/009	Addingham	Main Street,Addingham
AD/012	Addingham	Moor Lane, Addingham
BI/007	Bingley	Micklethwaite Lane (Airedale Mills), Crossflatts
BI/008	Bingley	Sty Lane
BI/009	Bingley	Greenhill Drive, Micklethwaite
BI/011	Bingley	Greenhill Barn, Lady Lane
BI/032	Bingley	Micklethwaite Lane, Crossflatts
BU/002	Burley	Menston Old Lane, Burley in Wharfedale
BU/004	Burley	Hag Farm Road, Burley in Wharfedale
BU/005	Burley	Banner Grange, Bradford Road
BU/008	Burley	Main Street / A65
DH/002	Denholme	Main Road / New Road
DH/005	Denholme	Old Road / Station Road
DH/006	Denholme	Long Causeway
DH/010	Denholme	Halifax Road, Denholme Gate
DH/011	Denholme	Halifax Road, Denholme Gate
DH/015	Denholme	Halifax Road, Denholme Gate
DH/016	Denholme	Station Road
EM/003	East Morton	Highfield Close, East Morton
EM/004	East Morton	Street Lane
EM/006	East Morton	The Cloisters, Street Lane
EM/007	East Morton	High Stead, Street Lane

SHLAA ref	Settlement	Address
EM/010	East Morton	Morton Lane / Hawthorn Way
HA/011	Haworth	Sun Street, Haworth
IL/009	Ilkley	Ben Rhydding Drive, Wheatley Grove
IL/010	Ilkley	Cheltenham Ave
IL/011B	Ilkley	Skipton Road east
IL/012	Ilkley	Skipton Road
IL/013	Ilkley	Wheatley Lane, Ben Rhydding
IL/014	Ilkley	Coutances Way
IL/019	Ilkley	Hardings Lane
KY/046	Keighley	Carr Bank, Riddlesden
KY/047	Keighley	Carr Bank, Riddlesden
ME/001	Menston	Bingley Road, Menston
ME/002	Menston	Bingley Road, Menston
ME/005	Menston	Beach Close, Menston
ME/006	Menston	The Croft, Burley Road
ME/007	Menston	Burley Road, Menston
ME/012	Menston	Reevadale, Clarence Drive
OA/005	Oakworth	Denby Hill Road, Oakworth
OA/012	Oakworth	Griffe Gardens, Low Bank Lane
OA/014	Oakworth	Boston Hill, Low Bank Lane, Oakworth
OX/001	Oxenhope	Denholme Road
SI/002	Silsden	Breakmoor Avenue, Silsden
SI/003	Silsden	Brownbank Lane, Silsden
SI/004	Silsden	Bolton Road, Brownbank Lane
SI/006	Silsden	Hainsworth Road
TH/005	Thornton	Cragg Lane, Thornton Road

Table A2.2: Green SHLAA trajectory sites within 2.5 km of the South Pennine Moors SPA

Reference	Settlement	Address
AD/006	Addingham	Wharfe Park, Addingham
AD/011	Addingham	Chapel Street
AD/013	Addingham	Bolton Road, Addingham
AD/014	Addingham	Back Beck Lane, Addingham
AD/015	Addingham	Sugar Hill
AD/016	Addingham	Manor Garth, Addingham
BI/005	Bingley	Coolgardie, Keighley Road
BI/006	Bingley	Keighley Road
BI/012	Bingley	Lady Lane, Bingley
BI/013	Bingley	Heights Lane (west side) Eldwick
BI/016	Bingley	Spring Lane, Saltaire Road Eldwick
BI/017	Bingley	Spring Lane,Eldwick

Reference	Settlement	Address
BI/018	Bingley	Sherrif Lane, Eldwick
BI/028	Bingley	The Green, off College Road
BI/029	Bingley	Keighley Road, Crossflatts
BI/034	Bingley	Park Road
BI/035	Bingley	Lady Lane
BI/038	Bingley	Marley Court
BI/039	Bingley	Former Bingley Auction Mart, Keighley Road
BU/001	Burley	Ilkley Road, Burley
BU/003	Burley	Moor Lane resource centre, Moor Lane
BU/009	Burley	The Lawn, Back Lane
BU/010	Burley	East End Allotments, Oak Avenue, Burley
BU/011	Burley	Greenholme Mills, Great Pasture Lane
BU/012	Burley	The Malt Shovel Inn, Main Street
BU/013	Burley	Scalebor House Moor Lane
DH/001	Denholme	Seven Acres
DH/003	Denholme	New Road/Long Causeway
DH/007	Denholme	Hill Top Farm
DH/013	Denholme	Stradmore Road
EM/002	East Morton	Morton Lane
EM/009	East Morton	Morton Lane
HA/002	Haworth	Jacobs Lane
HA/003	Haworth	Lees Lane, Crossroads
HA/004	Haworth	Lees Lane, Crossroads
HA/005	Haworth	Ebor Mills, Ebor Lane
HA/006	Haworth	Mytholmes Lane, Haworth
HA/007	Haworth	Portland Street
HA/008	Haworth	Ashlar Close
HA/009	Haworth	Bridgehouse Mill
HA/010	Haworth	Ivy Bank Lane, Haworth
HA/014	Haworth	Weavers Hill, Haworth
HA/015	Haworth	Brow Top Road, Haworth
HA/017	Haworth	Chapel Works, Station Road
HA/018	Haworth	Cliffe Street
IL/001	Ilkley	Leeds Road
IL/002	Ilkley	Valley Drive
IL/004	Ilkley	Bolling Road
IL/007	Ilkley	Springs Lane
IL/008	Ilkley	Clifton Road / Ben Rhydding Road
IL/022	Ilkley	Fieldway
IL/025	Ilkley	Queens Road
IL/026	Ilkley	Clifton Road

Reference	Settlement	Address
IL/028	Ilkley	Clifton Road
IL/029	Ilkley	Owler Park Road
IL/030	Ilkley	Ben Rhydding Road
IL/031	Ilkley	Ilkley Water Treatment works, Ashlands Road
IL/033	Ilkley	Stockheld Road
IL/034	Ilkley	Beanlands Parade
KY/031	Keighley	Mitchell Street/Chatsworth Street/Beeches Road
KY/038	Keighley	Western Avenue, Riddlesden
KY/042	Keighley	Barley Cote Road, Riddlesden
KY/043	Keighley	Bradford Road, Riddlesden
KY/049	Keighley	Bradford Road Riddlesden
KY/050	Keighley	Bradford Road, Riddlesden
KY/088 *	Keighley	Florist Street, Stockbridge
KY/089	Keighley	Canal Road, Stockbridge Wharf
KY/092	Keighley	Cark Road
KY/093 *	Keighley	70 Bradford Road, Riddlesden
ME/003	Menston	Derry Hill, Menston
ME/009	Menston	Leathley Close
ME/010	Menston	Farnley Road
ME/011	Menston	Burley Road
ME/013	Menston	Otley Road
ME/014	Menston	Whiddon Croft
ME/015	Menston	Farnley Road
OA/001	Oakworth	Providence Lane, Providence Farm
OA/004	Oakworth	Hill Top Road,
OA/010	Oakworth	15 Church Street Colne Road
OX/002	Oxenhope	Denholme Road
OX/005	Oxenhope	Crossfield Road
SI/001	Silsden	North Dene Road
SI/005	Silsden	Daisy Hill
TH/001	Thornton	Thornton Road
TH/002	Thornton	Close Head Lane,
TH/021	Thornton	Former Imperial restaurant, Thornton Road

* N.B. Sites KY/088 and KY/093 are included within the list of sites within 200m of foraging polygons given in Table 6.8 but have subsequently been placed in the Green category. This is due to an anomaly arising from the use of MasterMap polygons related to bird records. Common sandpiper was recorded foraging from the edge of the River Aire to the west of these two SHLAA sites that resulted in a section of 2.5km the river being selected as a MasterMap polygon with foraging birds. Due to the elongated shape of this polygon it resulted in these two sites being selected as being within 200m but in reality they are over 1km from the foraging common sandpiper record. For this reason these two sites were not included in the Amber category.

Appendix III: SHLAA2 Trajectory Sites and Foraging SPA Birds (2013)

Please see following pages.

SHLAA2 Trajectory Sites and Foraging SPA Birds (2013)

- Common Sandpiper
- Curlew
- Dunlin
- Golden Plover
- Lapwing
- Merlin
- Redshank
- Ring Ouzel
- Snipe
- Wheatear
- SHLAA2 Trajectory
- SAC
- South Pennine Moors Phase 2 SPA
- SPM SPA 2.5km buffer
- Settlements
- Bradford District

0 0.4 0.8 Kilometers

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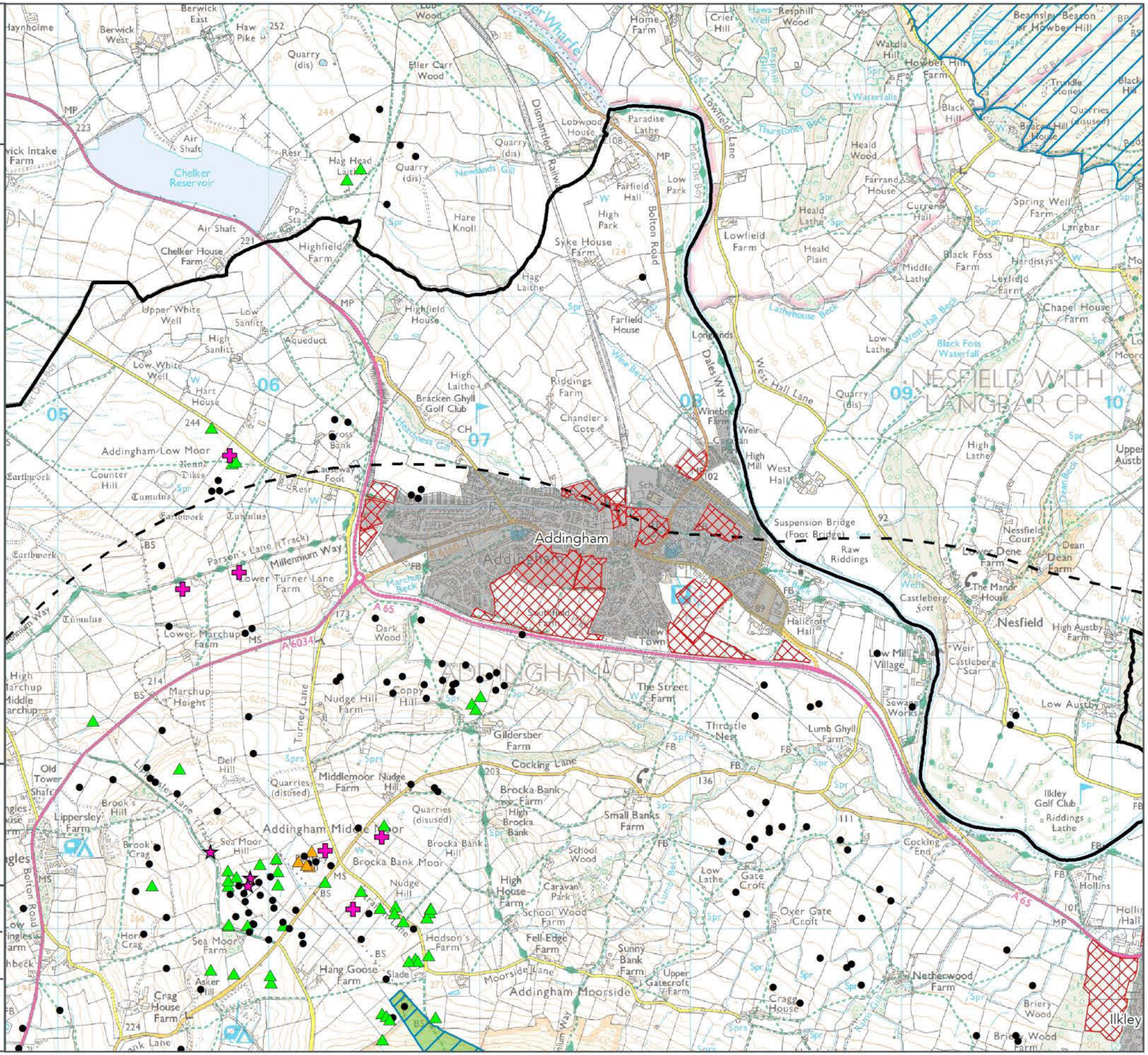

SHLAA2 Trajectory Sites and Foraging SPA Birds (2013)

- Common Sandpiper
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- Ring Ouzel
- Snipe
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- SHLAA2 Trajectory
- SAC
- South Pennine Moors Phase 2 SPA
- SPM SPA 2.5km buffer
- Settlements
- Bradford District

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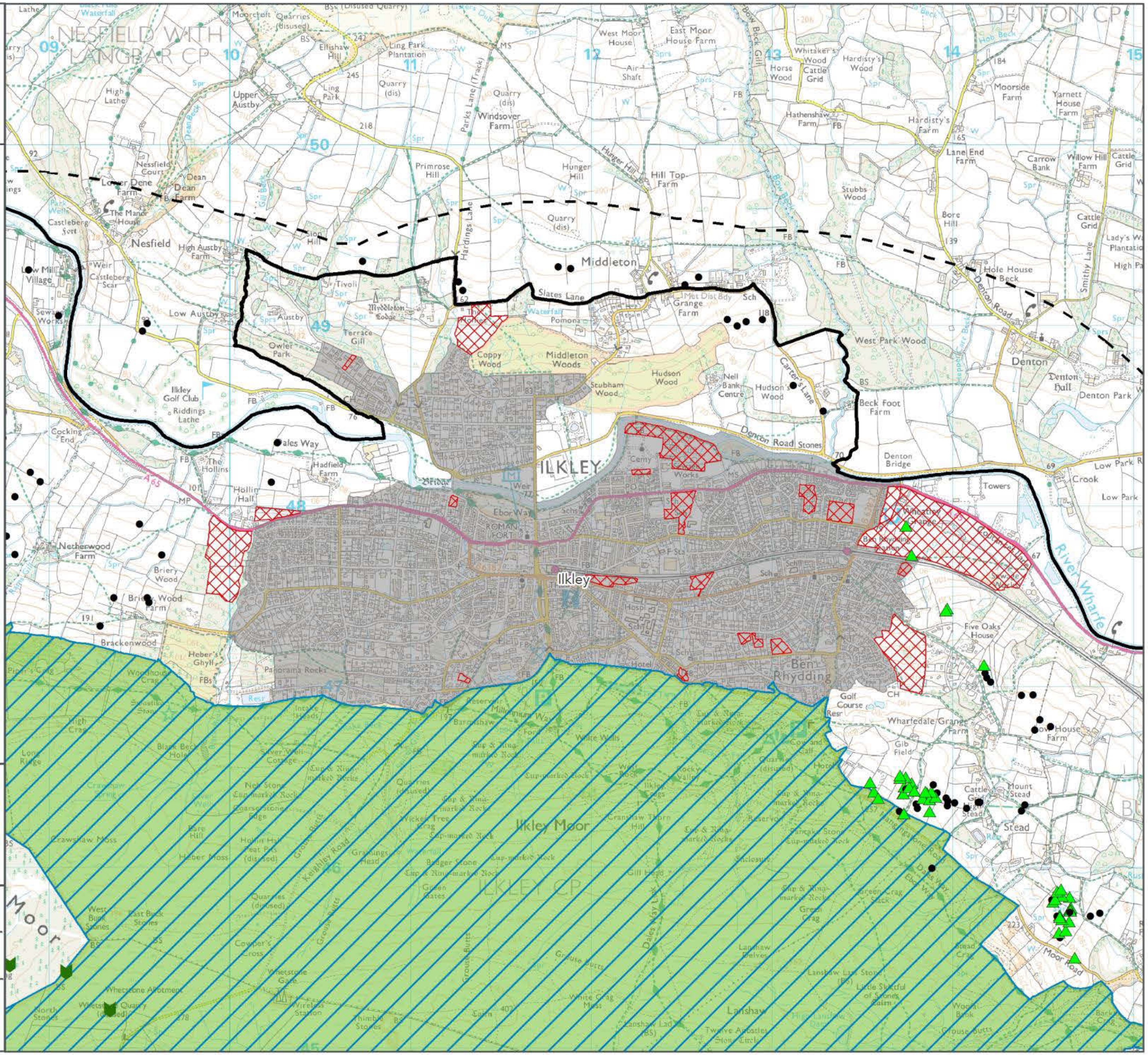

SHLAA2 Trajectory Sites and Foraging SPA Birds (2013)

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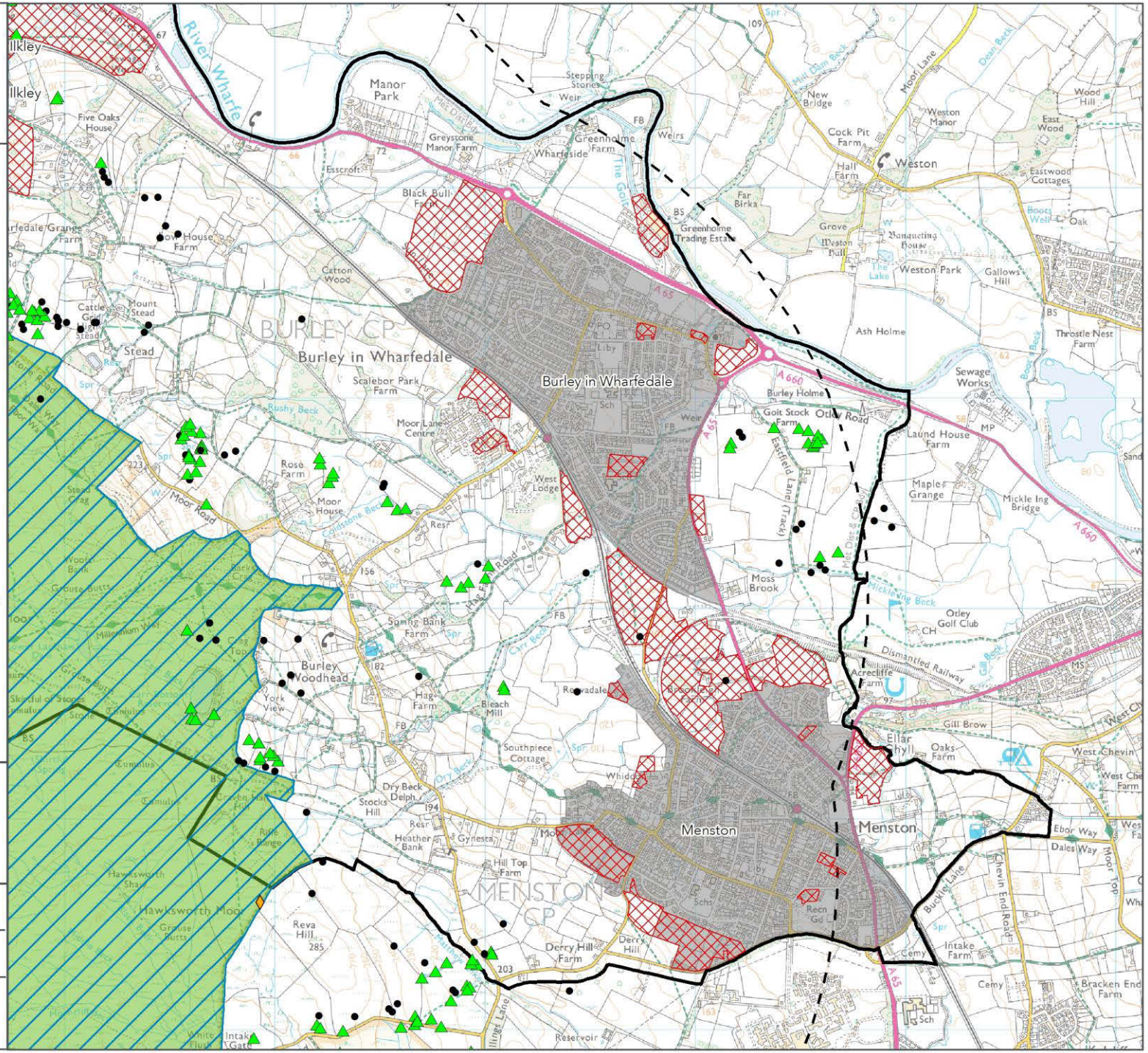

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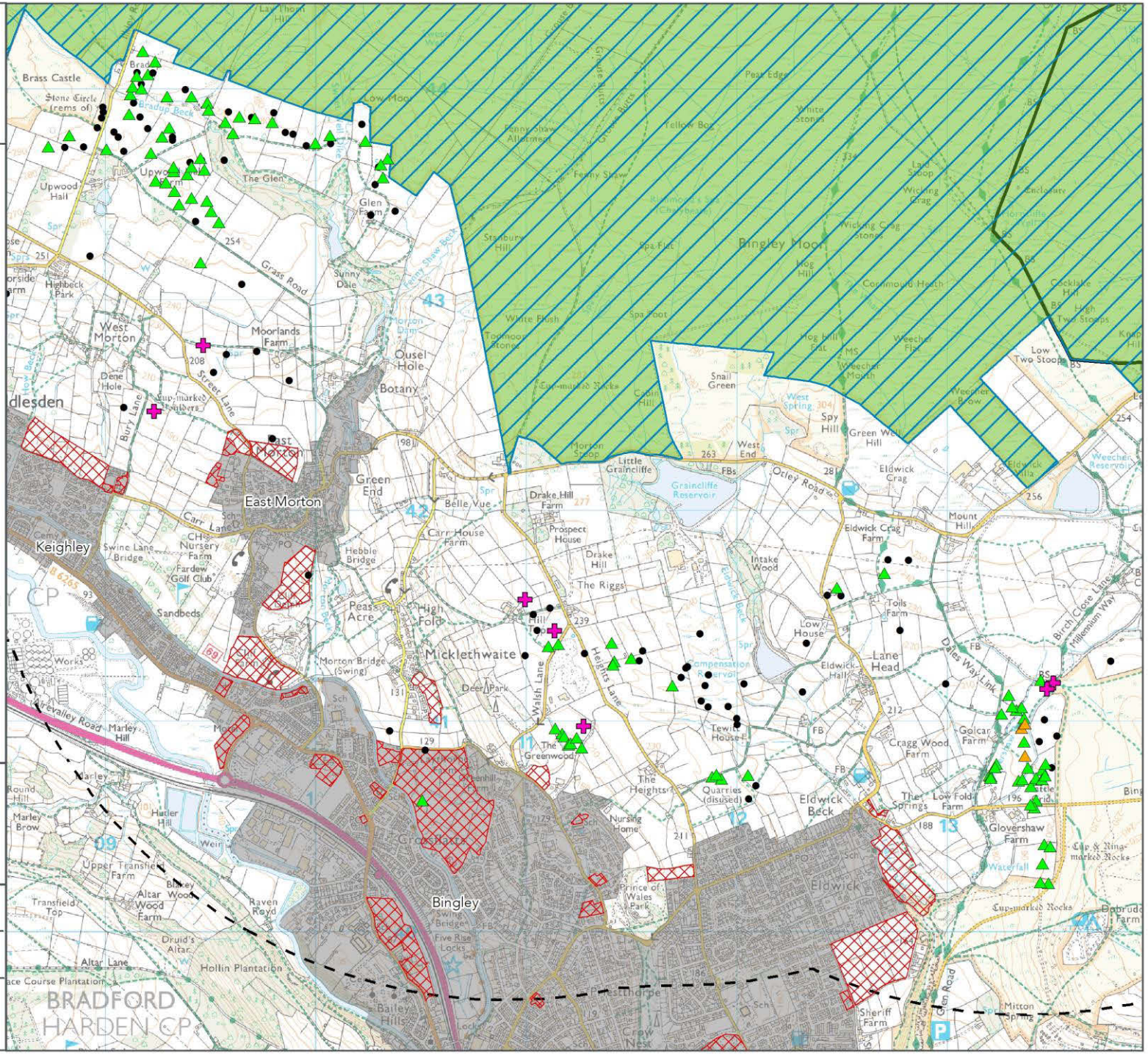

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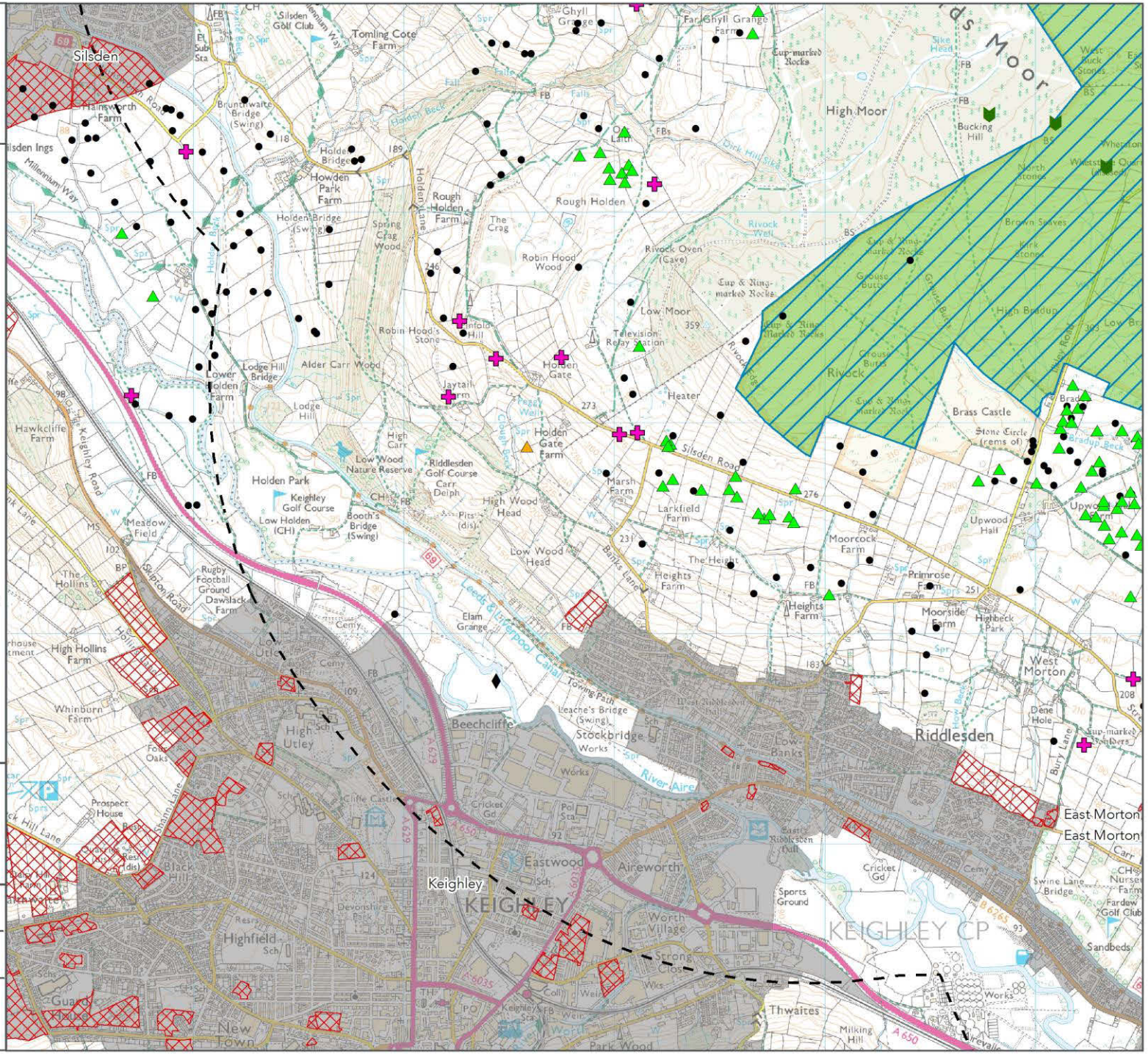

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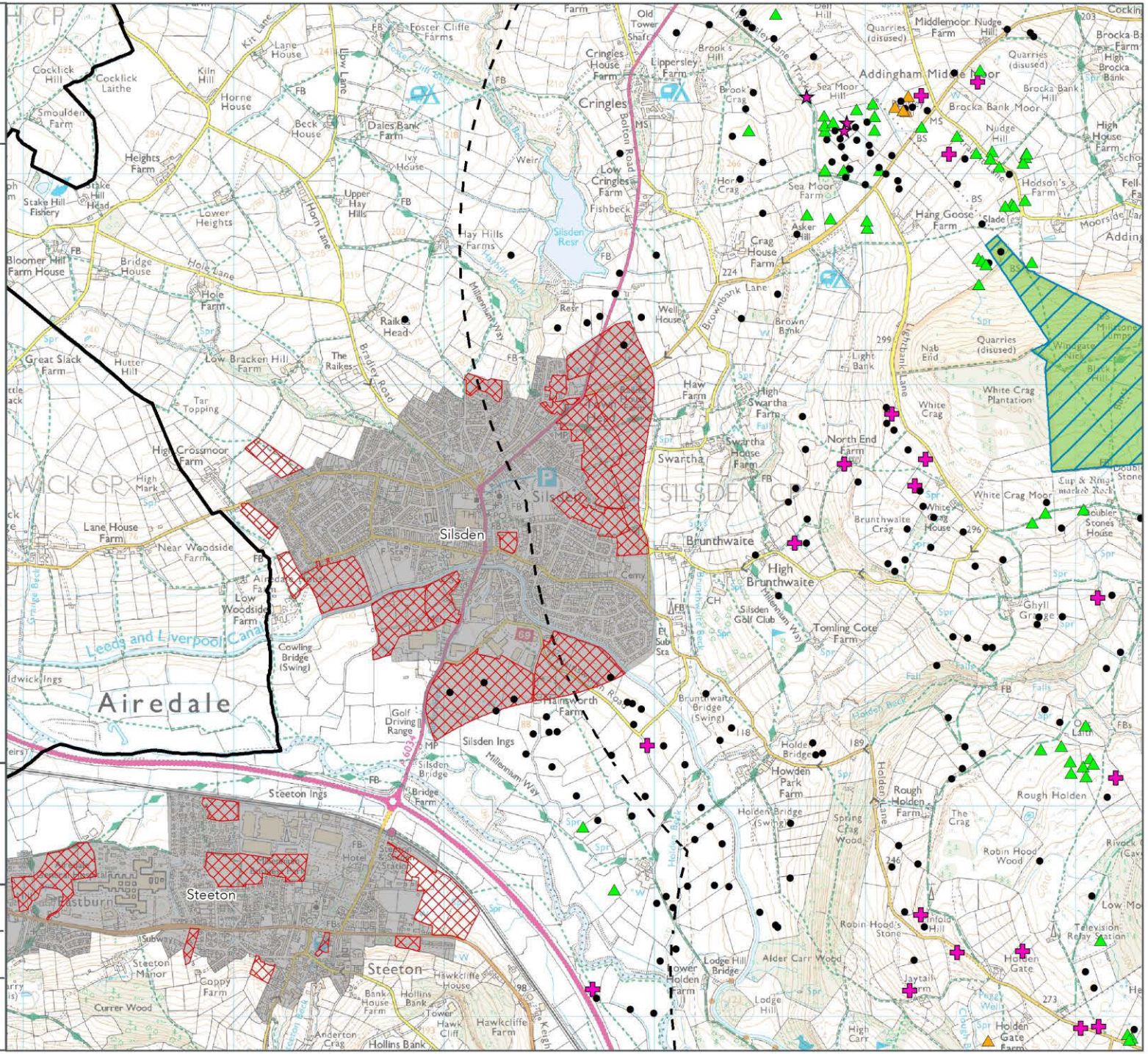

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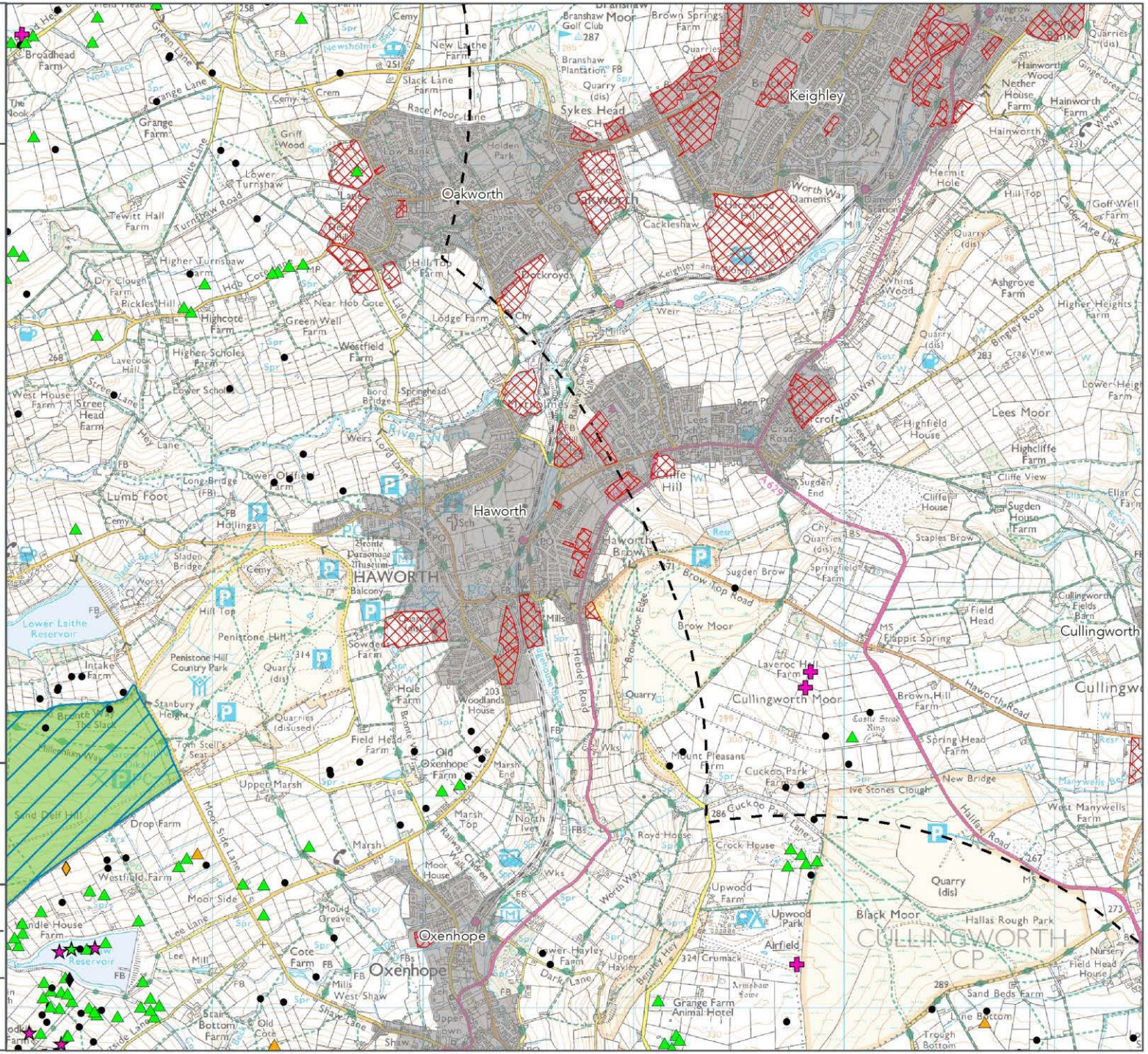

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Scale	Date
1:24,000	Oct2015
Created by	**Reviewed by**
JC/NP	NP

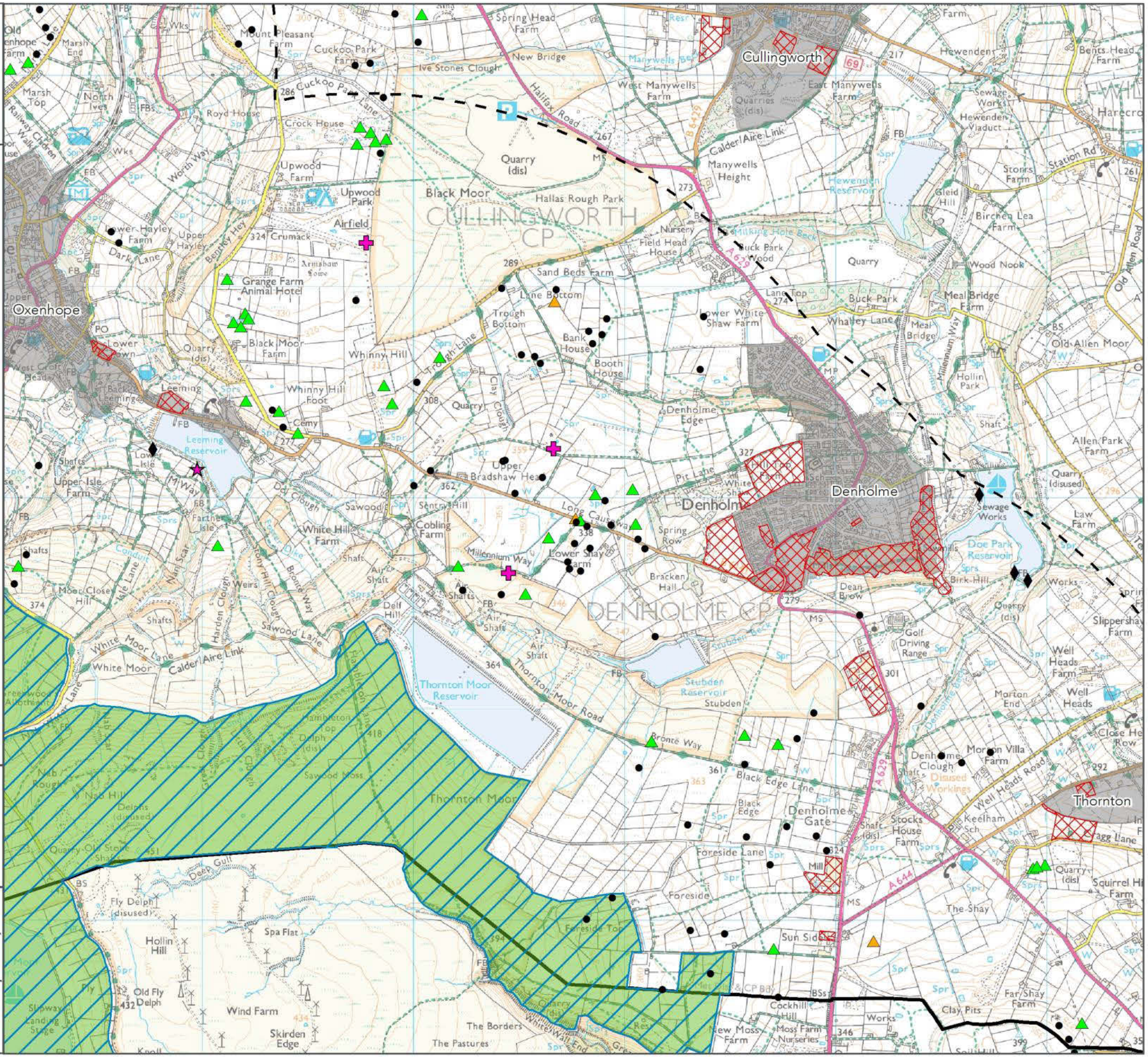
Drawing number
UE-0112 Bradford SHLAA Sites Foraging Birds_3_151007

SHLAA2 Trajectory Sites and Foraging SPA Birds (2013)

- Common Sandpiper
- Curlew
- Dunlin
- Golden Plover
- Lapwing
- Merlin
- Redshank
- Ring Ouzel
- Snipe
- Wheatear
- SHLAA2 Trajectory
- SAC
- South Pennine Moors Phase 2 SPA
- SPM SPA 2.5km buffer
- Settlements
- Bradford District

0 0.4 0.8 Kilometers

N



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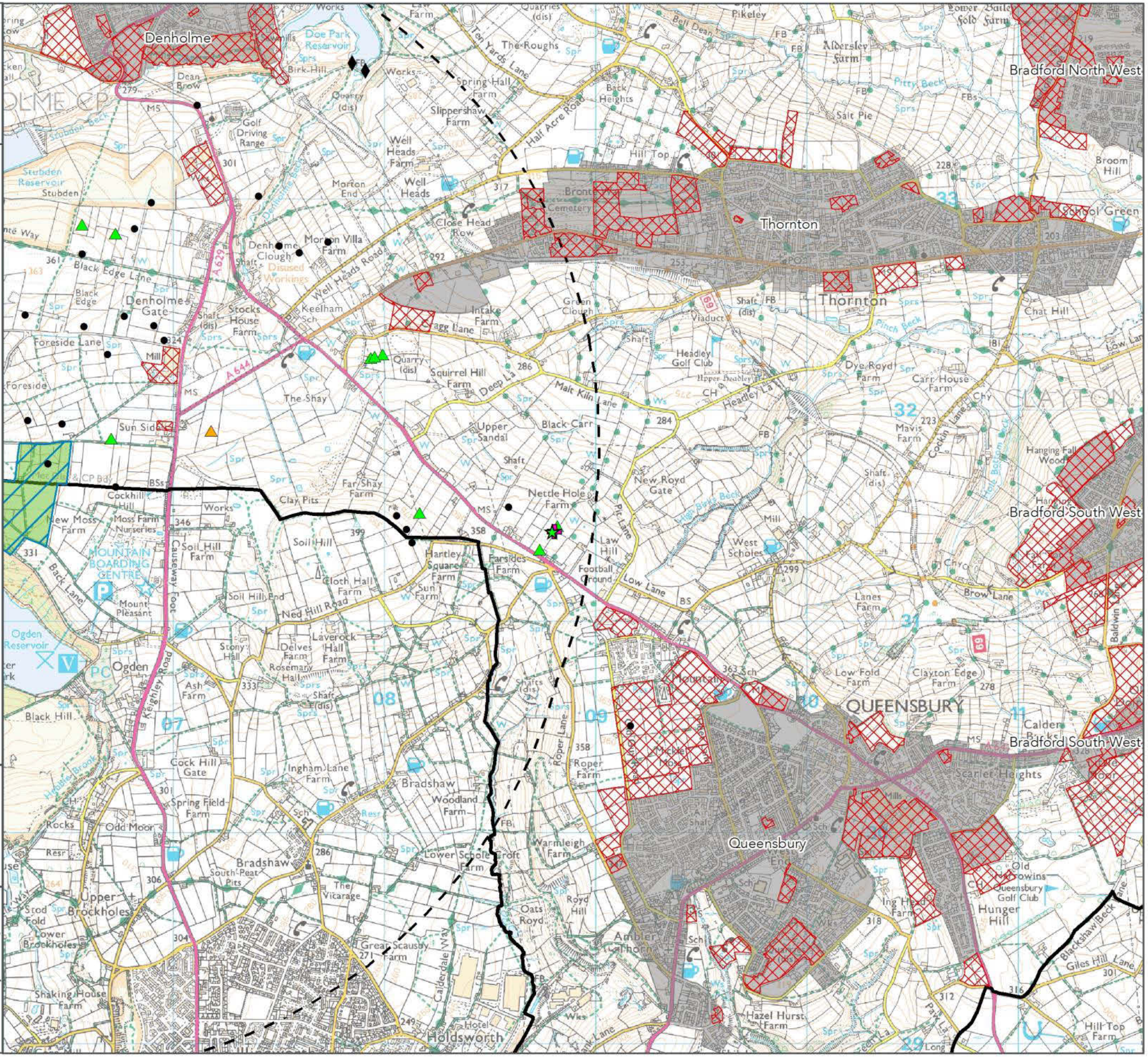
SHLAA2 Trajectory Sites and Foraging SPA Birds (2013)



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Appendix IV: APIS Grid Reference Data

The following tables show data held by APIS (at 30/11/14) for exceedances of critical loads/levels for atmospheric pollutant types relevant to the HRA, at a range of grid references on the strategic road network connecting to Bradford district. All locations are both within a European site, and within 200m of a road corridor. Cells highlighted in red are already exceed; those highlighted in yellow have a background load/level >70% of the critical load/level. The following abbreviations apply:

CL = Critical load or level for target habitat at this location

Dep. / conc. = Current rates of deposition or concentration

Exceed. = The amount by which CL is exceeded (against the lowest CL value where a range is given)

EU site name: North Pennine Moors SAC/SPA (Round Hill)

Queried habitat(s): Fen, Marsh and Swamp

Grid ref(s): 412280,454781

Map ref: 1

Road corridor(s): A59 Kex Gill Road

	412280,454781		
Pollutant:	**CL**	**Dep. / conc.**	**Exceed.**
Acid dep. (keq/ha/yr)	This habitat is not sensitive to acidity	1.93 (N: 1.66 | S: 0.4) (2010-12)	n/a
N dep. (kgN/ha/yr)	Valley mires, poor fens and transition mires: 10 – 15 Rich fens: 15 - 30	23.24 (2010-12)	Valley mires, poor fens and transition mires: 13.24 Rich fens: 8.24
NOx (µgm^{-3})	30	8.15 (2010-12)	-21.85

EU site name: North Pennine Moors SAC/SPA (Embsay Moor)

Queried habitat(s): Fen, Marsh and Swamp

Grid ref(s): 405015,456825

Map ref: 2

Road corridor(s): B6160 (nr Barden Tower)

	405015,456825		
Pollutant:	**CL**	**Dep. / conc.**	**Exceed.**
	This habitat is not sensitive to acidity	1.73 (N: 1.48 I S: 0.36) (2010-12)	n/a
	Valley mires, poor fens and transition mires: 10 – 15 Rich fens: 15 - 30	20.72 (2010-12)	Valley mires, poor fens and transition mires: 10.72 Rich fens: 5.72
	30	6.94 (2010-12)	-23.06

EU site name: South Pennine Moors SAC/SPA (Wadsworth Moor)

Queried habitat(s): Bogs

Grid ref(s): 401140,433000

Map ref: 3

Road corridor(s): A6033 Hebden Bridge Road

	401140,433000		
Pollutant:	**CL**	**Dep. / conc.**	**Exceed.**
Acid dep. (keq/ha/yr)	CLmaxS: 0.47 CLminN: 0.32 CLmaxN: 0.8	2.32 (N: 1.96 I S: 0.53) (2010-12)	Yes
N dep. (kgN/ha/yr)	Valley mires, poor fens and transition mires: 10 – 15 Raised and blanket bogs: 5 - 10	27.44 (2010-12)	Valley mires, poor fens and transition mires: 17.44 Raised and blanket bogs: 22.44
NOx (μgm^{-3})	30	9.6 (2010-12)	-20.4

EU site name: South Pennine Moors SAC/SPA (Thornton Moor)

Queried habitat(s): Bogs

Grid ref(s): 401400,432985

Map ref: 4

Road corridor(s): A6033 Hebden Bridge Road

	401400,432985		
Pollutant:	**CL**	**Dep. / conc.**	**Exceed.**
Acid dep. (keq/ha/yr)	CLmaxS: 0.47 CLminN: 0.32 CLmaxN: 0.79	2.32 (N: 1.96 | S: 0.53) (2010-12)	Yes
N dep. (kgN/ha/yr)	Valley mires, poor fens and transition mires: 10 – 15 Raised and blanket bogs: 5 - 10	27.44 (2010-12)	Valley mires, poor fens and transition mires: 17.44 Raised and blanket bogs: 22.44
NOx (µgm^{-3})	30	9.6 (2010-12)	-20.4

EU site name: South Pennine Moors SAC/SPA (Soyland Moor)

Queried habitat(s): Bogs

Grid ref(s): 397697,418193

Map ref: 5

Road corridor(s): B6138 Turvin Road & A58 Rochdale Road

	397697,418193		
Pollutant:	**CL**	**Dep. / conc.**	**Exceed.**
Acid dep. (keq/ha/yr)	CLmaxS: 0.44 CLminN: 0.32 CLmaxN: 0.76	1.87 (N: 1.59 | S: 0.41) (2010-12)	Yes
N dep. (kgN/ha/yr)	Valley mires, poor fens and transition mires: 10 – 15 Raised and blanket bogs: 5 - 10	22.26 (2010-12)	Valley mires, poor fens and transition mires: 12.26 Raised and blanket bogs: 17.26
NOx (µgm^{-3})	30	13.06 (2010-12)	-16.94

EU site name: South Pennine Moors SAC/SPA (Rishworth/Moss Moor)

Queried habitat(s): Dwarf Shrub Heath

Grid ref(s): 401955,415950

Map ref: 6

Road corridor(s): A672 Oldham Road & M62(J23-J22)

	401955,415950		
Pollutant:	**CL**	**Dep. / conc.**	**Exceed.**
Acid dep. (keq/ha/yr)	CLmaxS: 0.57 CLminN: 0.64 CLmaxN: 1.21	2.21 (N: 1.91 | S: 0.45) (2010-12)	Yes
N dep. (kgN/ha/yr)	10-20	26.74 (2010-12)	16.74
NOx (µgm^{-3})	30	15.36 (2010-12)	-14.64

EU site name: South Pennine Moors SAC/SPA (Moss Moor)

Queried habitat(s): Bogs

Grid ref(s): 402280,414043

Map ref: 7

Road corridor(s): B6114 & A640 New Hey Road

	402280,414043		
Pollutant:	**CL**	**Dep. / conc.**	**Exceed.**
Acid dep. (keq/ha/yr)	CLmaxS: 0.52 CLminN: 0.32 CLmaxN: 0.84	2.2 (N: 1.88 | S: 0.48) (2010-12)	Yes
N dep. (kgN/ha/yr)	Valley mires, poor fens and transition mires: 10 – 15 Raised and blanket bogs: 5 - 10	26.32 (2010-12)	Valley mires, poor fens and transition mires: 16.32 Raised and blanket bogs: 21.32
NOx (µgm^{-3})	30	13.13 (2010-12)	-16.87

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