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Habitat Regulations Assessment: Forest Heath District Council Core Strategy Development Plan Document (March 2009)

Forest Heath
District Council

Summary

This document records the results of a Habitats Regulations Assessment (HRA) of Forest Heath District Council's Core Strategy. The Forest Heath District lies in an area of considerable importance for nature conservation with a number of European sites located within and just outside of the District. The range of sites, habitats and designations is complex. Taking an area of search of 20km around the District boundary as an initial screening for relevant protected sites the assessment identified two different SPAs, seven different SACs and three different Ramsar sites.

Following on from this initial screening the assessment identifies the following potential adverse effects which are addressed within the appropriate assessment:

- Reduction in the density of Breckland SPA Annex I bird species (stone curlew, woodlark and nightjar) near to new development;
- Increased levels of recreational activity resulting in increased disturbance to Breckland SPA Annex I bird species (stone curlew, woodlark and nightjar);
- Increased levels of people on around the heaths, resulting in an increase in urban effects such as increased fire risk, fly-tipping and trampling;
- Increased water discharges to meet the additional waste water treatment needs;
- Increased levels of traffic generated air pollution affecting sensitive features of SAC habitats;
- Potential reduction in the density of Habitats Directive Annex I bird species associated with the SPA (especially stone curlew), due to avoidance of areas close to new roads.

As a result of the assessment a detailed package of mitigation measures has been identified, amendments to the Core Strategy are recommended and additional action is highlighted where further clarification is needed. The direct effect of built development and road improvements and the indirect effect of disturbance to Annex I bird can be mitigated for with the application of the avoidance/mitigation measures proposed. If the mitigation measures proposed both here and within the FHDC/SEBC SFRA/WCS are translated into Core Strategy policy they will prevent any negative effects to European sites arising from the impacts of water demand and water treatment and discharge requirements.

Contents

Summary
1. Introduction – pg 5
2. European sites potentially affected by the Core Strategy – pg 8
3. Baseline conditions affecting the European sites – pg 10
4. Consideration of the East of England Regional Spatial Strategy – pg 17
5. Review of background documents – pg 18
6. Review of previous Forest Heath Appropriate Assessment work – pg 20
7. Review of related research – pg 20
8. Scope of Appropriate Assessment – pg 20
9. Appropriate Assessment of policies – pg 21
10. Appropriate Assessment of potential effects on water cycles – pg 38
11. Appropriate Assessment of new or improved infrastructure and road improvement requirements – pg 49
12. Mitigation – pg 54
Appendix 1 – Re-screening of Proposed Submission Document – pg 65
Appendix 2 – Final Buffers Map – pg 66
Appendix 3 – Deliverability of Core Strategy Housing Numbers in relation to the Core Strategy Habitats Regulations Assessment Buffers – pg 67
Bibliography – pg 81

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1. Introduction

Overview of process to date:

In 2006 Forest Heath District Council published its Core Strategy Preferred Options for public consultation. The Core Strategy Preferred Options was produced in accordance with the East of England Regional Spatial Strategy (RSS), which at the publication of the Preferred Options had not been finalised and adopted. The RSS has since been published in its final form (May 2008), incorporating the Secretary of State's proposed changes.

In order to ensure that the Core Strategy is compliant with the requirements of the Conservation (Natural Habitats &c.) Regulations (1994) and the 2007 amendments to these regulations, Forest Heath District Council has embarked upon an assessment of the strategy's implications for European wildlife sites, i.e. a Habitats Regulations Assessment of the plan. This report sets out the HRA process for the Forest Heath District Council Core Strategy DPD.

Background to the Habitats Regulations Assessment:

The Conservation (Natural Habitats &c.) Regulations (1994), normally referred to as the 'Habitats Regulations', transpose the requirements of the European Habitats Directive (1992) into UK law. The EC Habitats Directive and UK Habitats Regulations afford protection to plants, animals and habitats that are rare or vulnerable in a European context. The 1994 'Habitats Regulations' have been amended by the Conservation (Natural Habitats, &c.) (Amendment) Regulations (2007).

Earlier European legislation, known as the Birds Directive (1979), protects rare and vulnerable birds and their habitats and includes the requirement for all Member States to classify 'Special Protection Areas' (SPA) for birds. This involves each State identifying the most suitable areas of land, water and sea for the protection of rare and vulnerable species listed in the Directive, and areas which are important for migratory species, such as large assemblages of waterfowl.

The Habitats Directive increased the protection afforded to plants, habitats and animals other than birds, through stricter protection of species and by the creation of 'Special Areas of Conservation' (SAC). This required each State, working in bio-geographical regions, to designate the best areas for habitats and species listed in annexes to the Directive. Article 6(1) and (2) of the Habitats Directive impose duties on Member States to establish ecological conservation management measures for these areas, to avoid deterioration of their natural habitats and the habitats of species, and to avoid significant disturbance of the species in the areas.

Importantly, by virtue of Article 7 of the Habitats Directive, the procedures relating to the protection of SAC equally apply to SPA. Article 7 of the Habitats Directive supersedes the previous requirements of the first sentence of Article 4(4) of the Birds Directive.

It should be noted that SPAs and SACs include European Marine Sites which are designated sites below Highest Astronomical Tide. In addition, European Offshore Marine Sites (EOMS) are also part of the suite of internationally protected sites. Although outside the direct jurisdiction of local planning authorities, there is the potential for indirect effects upon European Offshore Marine Sites as a result of plans or projects under local planning authority control.

The UK is also a contracting party to the Ramsar Convention. This is a global convention to protect wetlands of international importance, especially those wetlands utilised as waterfowl habitat. In order to ensure compliance with the requirements of the Convention, the UK Government expects all competent authorities to treat listed Ramsar sites as if they are part of the suite of designated European sites, as a matter of policy. Most Ramsar sites are also a SPA or SAC, but the Ramsar features and boundary lines may vary from those which the site is designated as a SPA or SAC. Collectively proposed and classified SPA, SAC and EOMS are referred to in this assessment as European sites. Article 6(3) and (4) of the Habitats Directive, and

Regulations 48 and 85A-85E of the Habitats Regulations, impose duties on all public bodies to follow strict regulatory procedures in order to protect the European sites from the effects of plans or projects.

Until recently, the assessment of the potential effects of a spatial or land use plan upon European sites was not considered a requirement of the Habitats Directive. A judgement of the European Court of Justice required the UK to extend the requirements of Article 6(3) and (4) of the Directive to include the assessment of the potential effects of spatial and land use plans on European sites. The Habitats Regulations have been amended accordingly (the addition of Part IVA (Regulations 85A-E) to the Habitats Regulations in 2007, under the title "Appropriate Assessments for Land Use Plans in England and Wales").

Outline of the Habitats Regulations Assessment process:

The Habitats Regulations Assessment procedure is outlined in Figure 1 below, which illustrates the method of assessment in accordance with Regulation 85B. The site(s) affected could be in or outside the relevant plan area. Depending on the outcome of the Habitats Regulations Assessment, the LPA may need to amend the plan to eliminate or reduce potentially damaging effects on the European site. If adverse effects on the integrity of sites cannot be ruled out, the plan can only be adopted in accordance with Regulations 85C to 85E, where there are no alternative solutions that would have a lesser effect and there are imperative reasons of overriding public interest sufficient to justify adopting the plan despite its effects on the European site(s).

The Government is likely to expect that a plan will only need to proceed by way of these later tests in the most exceptional circumstances because a Local Planning Authority (LPA) should, where necessary, adopt the plan as a result of the Habitats Regulations Assessment, to ensure that it will not adversely affect the integrity of any European site. The considerations of Regulations 85C to 85E are not applicable in this case.

It will be seen that the key stages are screening, scoping, the 'Appropriate Assessment', introducing mitigation measures, consultation and recording the assessment.

This Habitats Regulations Assessment has taken account of published guidance and good practice including: Department for Communities and Local Government, 2006, *Planning for the Protection of European Sites: Appropriate Assessment under The Conservation (Natural Habitats &c.) (Amendment) (England and Wales) Regulations 2006: Guidance for Regional Spatial Strategies and Local Development Documents*; Office of the Deputy Prime Minister (ODPM), Circular 06/2005, Department for Environment Food and Rural Affairs Circular 01/2005, *Biodiversity and Geological Conservation: Statutory obligations and their impact within the planning system*; and Royal Society for the Protection of Birds, 2007, *The Appropriate Assessment of Spatial Plans in England: A guide o why, when and how to do it*.

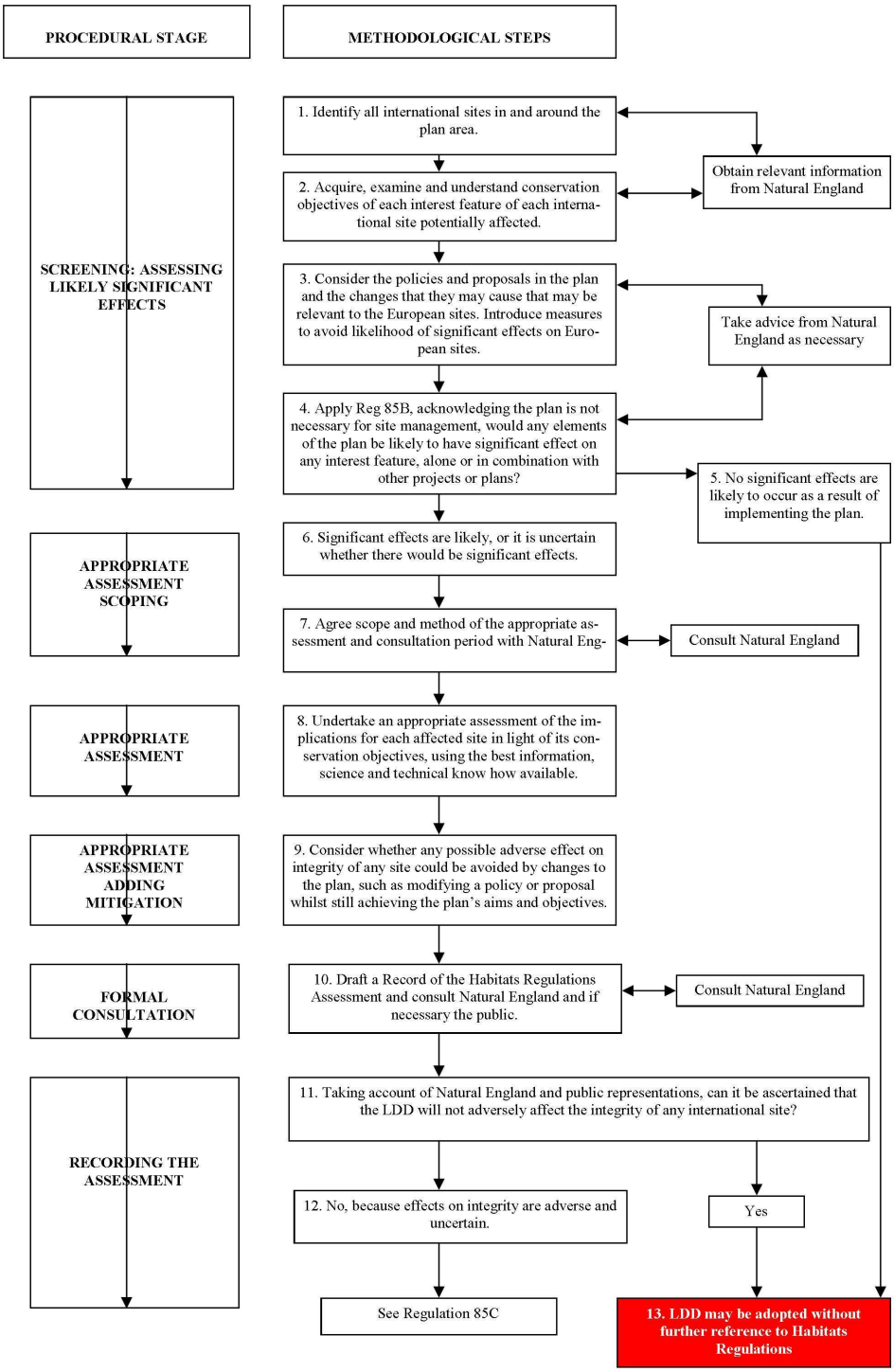


Figure 1- Outline of the procedure for Habitats Regulations Assessment

2. European sites potentially affected by the Core Strategy

Forest Heath District lies in an area of considerable importance for nature conservation with a number of European sites located within and just outside the District. The range of sites, habitats and designations is complex. Some of the European sites include a large number of component SSSIs scattered over a broad area (such as the Breckland SAC), others such as the Breckland SPA cover a large area and are virtually contiguous. In some areas both SPA and SAC designations apply, while other parts of sites or areas are only covered by one designation.

As part of the Habitats Regulations Assessment it is necessary perform a site screening exercise to consider which sites may or may not be affected by the Core Strategy. This exercise is carried out to ensure that all sites and all site interest features that are likely to be significantly affected by the Core Strategy have suitable avoidance measures applied, or are taken forward to the more detailed Appropriate Assessment.

For the screening we looked at European sites both inside and outside of the District, because impacts such as water abstraction, waste water discharge and increased recreation could have effects well beyond the District boundary. Work in other parts of the country (Liley *et al*., 2008, Sharp *et al*., 2008b) has shown that coastal sites or large tracts of semi-natural habitat will attract a relatively high proportion of residents from up to 20km away from the site, therefore a 20km buffer has been used for the initial search area. This buffer is shown in Figure 2 and all the European sites which fall entirely or partly within it are summarised in Table 1.

Table 1: European Sites in and around Forest Heath District, entirely or partly within 20km of the District boundary (sites in *italics* are outside of FHDC boundary but within 20km).

SPA	SAC	Ramsar
Breckland *Ouse Washes*	Breckland Rex Graham Reserve Devils Dyke *Fenland* *Waveney and Little Ouse Valley Fens* *Norfolk Valley Fens* *Ouse Washes*	*Chippenham Fen* *Wicken Fen* *Ouse Washes* *Redgrave and Lopham Fen*

From the list in table 1 we have screened out the following sites due to their character, habitat type, size or location. It is considered unlikely that any significant effects will occur on:

- Waveney and Little Ouse Valley Fens SAC: The three sites which make up this SAC lie right on the eastern edge of the 20km buffer. Overall the sites are unlikely to attract significantly increased numbers of visitors due to their location. They are upstream of any development which will occur in Forest Heath and it is not believed that water abstraction for developments in Forest Heath will affect this sites.
- Redgrave and Lopham Fen Ramsar: This site is also part of the Waveney and Little Ouse Valley Fens SAC, it lies right on the eastern edge of the 20km buffer. Although the site has a visitor centre and is relatively well known, it seems that it is unlikely that development in Forest Heath will result in significantly increased visitor numbers due to the site's distance from the District. It is upstream of Forest Heath and it is not believed that water abstraction or discharges in Forest Heath will affect the site.

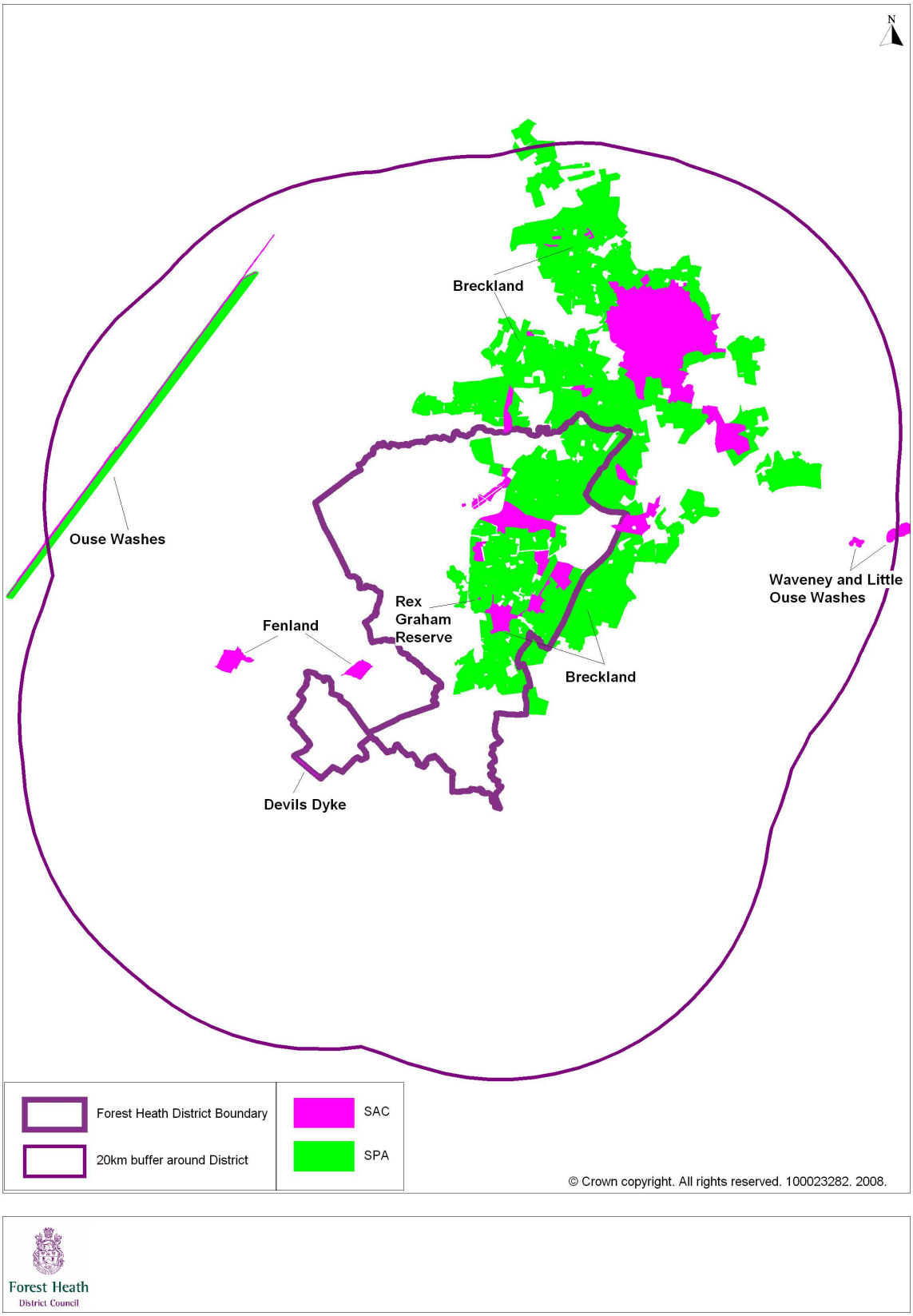


Figure 2. European sites within 20km of Forest Heath (not to scale)

3. Baseline conditions affecting the European sites

Once sites have been screened into the HRA, it is necessary to gather further information on each site to understand its interest features and site sensitivities in order to ascertain whether effects are likely, and then whether those effects are likely to have adverse effects upon the integrity of the European site. Table 2 lists all sites and relevant component SSSIs, providing context and highlighting issues that might be relevant in the next stage of the assessment process.

Table 2. European sites relevant to this assessment. For each site the relevant threats, vulnerabilities and key issues are highlighted, along with a summary of the reasons for the site designation. Data is drawn from Natural England SSSI condition assessments, the UK SPA site accounts, SAC summary details and Ramsar site accounts. The table includes component SSSIs for each European site.

Site	Reason for designation	Condition	Threats and reasons for adverse conditions	Notes
Breckland SPA Component SSSIs within Forest Heath (listed below)	Breeding populations of Stone Curlew (60% GB breeding population), Nightjar (12% GB breeding population) and Woodlark (28% GB breeding population). Increasing stone curlew populations (on arable but not heathland), recent declines in nightjars and woodlarks.		Agricultural operations: disturbance to Annex 1 birds; high nitrogen loads causing undesirable habitat change; development pressures and infrastructure; egg collecting.	
Breckland Forest SSSI	Breeding woodlark and nightjar (recent declines), rare plants and invertebrates, geology. Also red squirrel.	100% Favourable		
Breckland Farmland SSSI	Stone curlew population (increasing)	100% Favourable		
How Hill Track	Rare plants.	100% Unfavourable declining	Water pollution- discharge.	
West Stow Heath	Rare plants (grassland and heath)	77% Favourable, 23% Unfavourable no change	Inappropriate scrub control and inappropriate cutting/ mowing in some areas.	
Eriswell Low Warren	Rare plants	100% Favourable		
Individual SSSIs which are components of both Breckland SPA and Breckland SAC are listed below:	Stone curlew (population declining on heathland sites), nightjar and woodlark. Grassland and heathland habitats (see details in Breckland SAC).	Various (see SSSIs listed under Breckland SAC)	Nutrient deposition, run-off, scrub invasion and inappropriate recreation.	
Breckland SAC	Annex I habitats: inland dunes, natural eutrophic lakes, European dry heaths, semi-natural dry grasslands and scrubland facies, alluvial forests. Annex II species: Great		Nutrient deposition and agricultural run-off. Woodland and scrub invasion of open grassland and heaths and uncontrolled and inappropriate recreational activities.	Inland dunes with open Corynephorus and Agrostis grasslands for which this is the only known outstanding locality in the UK and is considered to be rare as its total extent is estimate to be less than 1,000 hectares.

Component SSSIs within Forest Heath (listed below)	Crested Newts, Barbastelle Bat.			
Berner's Heath, Icklingham	Largest remaining area of heather-dominated heath in Breckland, also rare plants.	97% Favourable, 3% Destroyed	3% destroyed by conversion to agriculture in early 1980's	
Thetford Heath	Rare plants (grassland, heather heath and lichen/moss heath)	36% Favourable, 64% Unfavourable recovering		
Foxhole Heath, Eriswell	Rare plants (lichen/moss heath, heather heath and grassland), stone curlew.	100% Favourable		
Cavenham-Icklingham Heath	Rare plants (grassland, heather heath, lichen/moss) and birds inc. breeding stone curlew, nightjar and woodlark. also rare invertebrates.	29% Favourable, 33% Unfavourable recovering, 17% Unfavourable no change, 18% Unfavourable declining, 3% destroyed	Various reasons including air pollution, drainage, inappropriate water levels and water abstraction.	3% destroyed by mineral extraction.
Weather and Horn Heaths	Good example of Breckland heath and grassland communities, rare plants.	98% Favourable, 2% Unfavourable declining	Vehicles and litter from A11 causing negative effect in one unit.	
Deadman's Grave, Icklingham	Species rich calcareous grassland, rare plants and breeding stone curlews.	73% Favourable, 26.5% Unfavourable recovering, 0.5% Unfavourable no change	Agriculture- small part of site used as a manure heap, water pollution- discharge.	
Wangford Warren and Carr	Best preserved active sand dune system in Breckland interspersed with fen and grass heath areas, rare plants.	6% Favourable, 73% Unfavourable recovering, 21% Unfavourable no change	Drainage, inappropriate water levels, water abstraction and under-grazing in some areas.	
Lakenheath Warren	Largest heathland site remaining in Suffolk Breckland, contains full range of Breck grass-heath types, rare plants. Rare birds inc. nightjar.	9% Favourable, 91% Unfavourable recovering		Recovering following management activities.
RAF Lakenheath (NB. this site is only part of the Breckland SAC not the SPA as well)	Species-rich Breckland grassland, rare plants. Rare invertebrates.	96% Favourable, 4% Unfavourable recovering		
Weeting Heath (NB. this	Rabbit grazed Breckland grass heath. Up to nine pairs	79% Favourable, 21% Unfavourable no change	Inappropriate weed control (ragwort)	Mostly National Nature Reserve, owned by Norfolk

site is adjacent to but not within Forest Heath)	of stone curlew			Wildlife Trust.
Rex Graham SAC	Rare plants inc. largest wild population of Military Orchids in UK.	100% Favourable		Managed by Suffolk Wildlife Trust
Devils Dyke SAC (on FH boundary, part in FH and part in East Cambridgeshire DC)	Species-rich chalk grassland, rare invertebrates.	50% Favourable, 36% Unfavourable recovering, 14% Unfavourable no change	Under-grazing in one component unit.	
Fenland SAC (Outside FH) Components: Chippenham Fen (Ramsar, SSSI) and Wicken Fen (Ramsar, SSSI). Details below.	Annex I habitats: Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) Annex II species: Spined Loach (*Cobitis taenia*), Great Crested Newt (*Triturus cristatus*)		Some problems with inappropriate scrub control, inappropriate cutting/ mowing and inappropriate water levels in some SSSI units.	National Trust undertaking remedial land management work.
Chippenham Fen SSSI (outside FH)	Wetland habitats and associated birds and insects. Areas of tall and often rich fen, fen grassland and basic flush. Site also contains calcareous grassland, neutral grassland, woodland, mix scrub and open water. Rare plants, birds and invertebrates.	65% Favourable, 20% Unfavourable recovering, 15% Unfavourable no change	Inappropriate scrub control and inappropriate cutting/ mowing in some areas. Chippenham Fen has suffered from a changed hydrological regime due to abstraction from the underlying chalk aquifer, however there is a supplementary water supply in place to rectify this.	
Wicken Fen SSSI (outside FH)	One of the best surviving examples of East Anglian peat fen. Rare plants and invertebrates.	36% Favourable, 11% Unfavourable no change, 53% Unfavourable declining	Inappropriate water levels (possibly caused by work carried out on the nearby river system in the 1960's to prevent flooding) and inappropriate scrub control in some units.	
Ouse Washes SPA/SAC/Ramsar (Outside FH)	Declines in most species of breeding waders (except redshank) and wildfowl. Increasing wintering wildfowl	SSSI conditions: 13% Favourable, 87% Unfavourable no change	Neutral grassland- inappropriate summer water levels and water pollution. Watercourses- fail to meet	Long term tidal strategy- regular problems summer flooding- severe siltation of Great Ouse River. Discharge

	and wader numbers to 2005/6. Spined loach populations.		total 0.1mg/l phosphorus target. Vegetation change from changing hydrological regime and high nutrient status of receiving water causing eutrophication. Increases in spring and summer flooding and depth of water flooding. Saline intrusions, turbidity and sediment levels. Increased phosphates from new discharges.	into River Lark, River Little Ouse (and various other smaller watercourses in Forest Heath) could drain into Great Ouse River and to Ouse Washes SPA/SAC. Large land holdings by RSPB, Cambridgeshire Wildlife Trust and Wetlands and Wildfowl Trust.
The Wash SPA/Ramsar (Outside FH)	The whole area is of exceptional biological interest. The intertidal mudflats and saltmarshes represent one of Britain's most important winter feeding areas for waders and wildfowl outside of the breeding season. Enormous numbers of migrant birds, of international significance, are dependent on the rich supply of invertebrate food. The saltmarsh and shingle communities are of considerable botanical interest and the mature saltmarsh is a valuable bird breeding zone. In addition the Wash is also very important as a breeding ground for Common seals.	SSSI conditions: 62.24% Favourable, 37.25% Unfavourable recovering, 0.51% Unfavourable declining	Small area of saltmarsh is unfavourable declining due to being heavily overgrazed by horses. Area unfavourable declining due to existing historic consent allowing unsustainable fishing practices. Area unfavourable declining due to nutrient enrichment from an unknown source and incremental development from adjacent residential properties is having an adverse affect on the site. Shellfish Management Policies have been developed to ensure sustainable management of Wash shellfish stocks and met site conservation objectives.	
The Wash and North Norfolk Coast SAC	Annex I habitats: Sandbanks slightly covered by sea water all the time; mudflats and	SSSI conditions: North Norfolk Coast: 96.62% Favourable, 2.80%	Unfavourable recovering area: Water level lowered to improve area, however	Unfavourable no change due to inappropriate coastal management.

(Outside FH)	sandflats not covered by sea water at low tide; large shallow inlets and bays; reefs; *Salicornia* and other annuals colonising mud and sand; Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*); Mediterranean and thermo-Atlantic halophilous scrubs (*Sarcocornetea fruticosi*); coastal lagoons. Annex II species: Common seal (*Phoca vitulina*); otter (*Lutra lutra*)	Unfavourable recovering, 0.58% Unfavourable no change. The Wash: 62.24% Favourable, 37.25% Unfavourable recovering, 0.51% Unfavourable declining	salinity levels remain very low (however this may be an expression of its normal state). Unfavourable recovering area: revetments removed as part of managed retreat west of Golf Club House, dunes are now beginning to re-profile to a more mature form and retreat to a position which is more in alignment with unprotected dunes. Unfavourable recovering area was arable but is now naturally regenerating. Area of unfavourable no change (shingle ridge) remains in unfavourable condition due to flood defence management.	
Chippenham Fen Ramsar (Outside FH)	Criterion 1: Spring-fed calcareous basin mire with a long history of management, which is partly reflected in the diversity of present-day vegetation. Criterion 2: The invertebrate fauna is very rich, partly due to its transitional position between Fenland and Breckland. The species list is very long, including many rare and scarce invertebrates characteristic of ancient fenland sites in Britain. Criterion 3: The site supports diverse vegetation types, rare and scarce plants. The site is	SSSI conditions: 65.36% Favourable, 20.05% Unfavourable recovering, 14.59% Unfavourable no change	Unfavourable no change: unit 3- much scrub remains to be removed, unit 4- most of unit is unmanaged fen with scrub (management dangerous due to deep hidden pits), unit 13- tree removal needed to restore fen.	Inappropriate scrub control, cutting and mowing in several units contributing to unfavourable no change status.

	the stronghold of Cambridge milk parsley (*Selinum carvifolia*).			
Wicken Fen Ramsar (Outside FH)	Criterion 1: One of the most outstanding remnants of the East Anglian peat fens. The area is one of the few which has not been drained. Traditional management has created a mosaic of habitats from open water to sedge and litter fields. Criterion 2: The site supports one species of British Red Data Book plant, fen violet (*Viola persicifolia*), which survives at only two other sites in Britain. It also contains eight nationally scarce plants and 121 British Red Data Book invertebrates.	SSSI conditions: 36.10% Favourable, 10.98% Unfavourable no change, 52.92% Unfavourable declining	Unfavourable declining: Units 1 and 2: Inappropriate supply and levels of water, National Trust have been undertaking good remedial land management works but this alone may not be enough to maintain notified interest features. Unfavourable no change: Unit 3: Fen invaded by sallow, birch, aspen and rose (area dangerous to enter).	Issues caused by inappropriate water levels and scrub control in some areas.

Data from Natural England website (www.naturalengland.gov.uk) and JNCC website (www.jncc.gov.uk) (15/12/2008 and 16/01/2009)

4. Consideration of the East of England Regional Spatial Strategy

With a full appreciation of relevant European site issues now in place, the evidence gathering for the Forest Heath Core Strategy HRA now turns to the relevant higher tier planning document which guides the content of the Forest Heath Core Strategy. As a local level plan, the Forest Heath Core Strategy should be developed in accordance with the higher tier regional plan. In undertaking a HRA, a local level plan will therefore need to consider the findings of the higher tier plan's HRA when taking forward relevant elements of the regional plan at the local level.

The East of England Regional Spatial Strategy (RSS) was adopted in May 2008. This plan provides the Regional Spatial Strategy for the East of England, and the framework to inform the preparation of Local Development Documents (LDDs). The East of England RSS was assessed under the provisions of the Habitats Regulations, and a HRA record was produced. The RSS was the first regional plan to be subjected to an HRA, and was therefore very much a forerunner in the HRA process. The consultants undertaking the HRA, the Regional Assembly, Government Office, and also to some extent Natural England as statutory consultee, were all very new to the process of assessing regional plans under the requirements of the Habitats Regulations.

The progression of the HRA was particularly difficult because the RSS was well advanced at the time of the amendments to the Habitats Regulations, which made HRA of plans a legal requirement in domestic legislation.

Natural England formally objected to the HRA, and a number of concerns in relation to the robustness of measures proposed to protect the European sites from harm, and in relation to some elements of the plan, a lack of measures actually put forward. The HRA process was reviewed by a separate consultancy as a consequence of Natural England's concerns. This report concluded that there were considerable shortfalls in relation to the process, the absence of a precautionary approach, over reliance upon RSS policy ENV3 as a means of protecting the European sites from adverse effects, and consequently the potential for challenge as a result of the inadequacy of assessment and therefore failure to fully meet the requirements of the Habitats Regulations.

In November 2007 a further consultancy firm was commissioned to deal with a number of specific aspects relating to outstanding HRA concerns with regard to the emerging East of England RSS. This work went some way to rectifying outstanding issues prior to the East of England RSS being published.

Since the HRA was undertaken for the East of England RSS, a greater understanding of HRA requirements, and some examples of good practice have now been developed. However, there is still uncertainty ahead in terms of the HRA process.

Because of the strategic nature of a regional plan, it is accepted that a more detailed HRA at the lower level will be required to clarify details such as location and exact nature of development and any necessary mitigation, but with the certainty from the higher tier assessment that it is possible for the development projects to be implemented.

Where elements of the higher tier plan are taken forward without certainty, a number of measures can be applied to ensure that the plan is published in accordance with the Habitats Regulations. The higher tier plan may specifically state and make clear that those elements are only to be taken forward where lower tier assessment can demonstrate with certainty that adverse effects will be prevented. If the implementation of such elements was critical to the plan, it would be expected that the RSS would present alternative viable options, to be taken forward if lower tier assessment shows that the plan may adversely affect European sites. Alternatively, if such elements were not critical to the plan, it can indicate that the uncertainty elements would only be taken forward subject to them meeting the tests of the Habitat Regulations.

If elements of the RSS are included that do not meet these criteria and it has not been demonstrated that they meet the requirements of the Habitat Regulations, the RSS would need to either remove such elements, or set out a timetable for their review, following more detailed HRA. If subsequent assessment renders elements of the RSS unable to be implemented, those elements should be reviewed and alternative options sought in a revised and republished RSS. Whilst meeting the requirements of the Habitats Regulations, this option is not ideal, as it leaves uncertainty about delivering some aspects of the RSS.

The range of possibilities set out above were not fully pursued in relation to a number of elements of the published East of England RSS. As a result, each planning authority within the region needs to give added consideration to their HRA work.

5. Review of background documents

The HRA process requires the assessors to draw upon a range of background material in order to fully understand the potential effects of the plan. The HRA of Forest Heath's Core Strategy benefits from a range of background material. It is important to list the material used within the assessment in order to provide an accurate record, and to clearly indicate what material has and has not been included, should any further sources of information come to light at a later date.

The background documents used for the HRA are summarised in Table 3. As the appropriate assessment progresses, any additional material, as relevant, will be sourced and listed within the HRA record.

Table 3. Background documents to HRA.

Document	Description	Date
FHDC Preferred Options: Appropriate Assessment Report	Preliminary AA carried out as part of the Core Strategy Preferred Options Sustainability Appraisal. Produced by Suffolk County Council.	October 2006
Strategic Flood Risk Assessment/ Water Cycle Study (SFRA/WCS)	Combined Strategic Flood Risk Assessment and Water Cycle Study carried out in partnership with St Edmundsbury Borough Council. Produced by Hyder Consulting.	Level 1: January 2009
Site Specific Policies and Proposals: Issues and Options DPD	Consultation document seeking public and stakeholder views on possible sites for development.	October 2006
FHDC Landscape Character Assessment (LCA) (Draft)	Work in association with Suffolk County Council considering the rural landscapes within the District.	December 2008
Retail and Town Centre Study	Assessment of three market towns and one of the key service centres within the District. Produced by GVA Grimley.	June 2006
Annual Monitoring Report (AMR) 2008	Summarises 07/08 monitoring year. Produced by FHDC.	2008
Sustainability Appraisal (SA) incorporating Strategic Environmental Assessment (SEA)	Context for final policy option policies and proposals and considers the potential effects on the economic, social and environmental conditions of Forest Heath. Produced by FHDC.	August 2008
Urban Capacity Study (UCS) (and Update)	Estimates housing capacity that can be accommodated within the District's settlements. Produced by Landmark Associates (2005 update by FHDC).	2003 (updated 2005)
Strategic Housing Land Availability Assessment (SHLAA)	Identifies deliverability issues surrounding sites within the District. Study in combination with SEBC, MSDC and BDC. Updated annually.	March 2009
Infrastructure and Environmental Capacity Assessment (IECA)	Assess the infrastructure and environmental capacity of the District. Study in combination with SEBC. Produced by Nathanial Lichfield & Partners.	Awaiting Agreement (Mid 2009)
Employment Land Review (ELR) (2006)	Audit of employment sites and strategic assessment of employment distribution. Joint ELR for Suffolk West Employment Land Review Group.	October 2006
Employment Land Review (ELR) (2009)	Audit of employment sites and strategic assessment of employment distribution. Study in combination with SEBC, BDC, MSDC and SCC. Produced by GVA Grimley.	March 2009 (Draft)
Greenspace Study	Assessment of greenspace provision and requirements within the District. Produced by JPC Strategic Planning and Leisure Ltd.	May 2009 (Draft available)
PPG17 and Built Facilities Study	Assessment of PPG17 and built facilities provision and requirements within the District. Produced by JPC Strategic Planning and Leisure Ltd.	May 2009 (Draft available)
Strategic Housing Market Assessment (SHMA)	Assessment of housing market, addressing migration, incomes etc. Part of the Cambridge Sub Region partnership study.	June 2008
Economic and Tourism Development Strategy (ETDS)	Identifies economic and tourism demands and suggests possible schemes to bring these demands forward. Produced by Bluesail Consultants (Tourism section) and RUK Research Partnership Ltd (Economy Section).	Mid 2009
Parish Profile (Draft)	Sets out parish facilities and supports settlement hierarchy. Produced by FHDC.	May 2008

6. Review of previous Forest Heath Appropriate Assessment work

An initial Appropriate Assessment (AA) screening was carried out alongside the Sustainability Appraisal of the Core Strategy Preferred Options in 2006. This work set out the background for the Forest Heath Core Strategy AA and screened possible implications of the Core Strategy and Development Control Policies. Core Strategy and Development Control Preferred Options policies were assessed for potential impact on the Breckland SPA, 24 policies were judged to have a potential negative effect on the SPA and limited mitigation measures were suggested. The majority of this mitigation involved prevention of negative effects through a nature conservation policy or specific reference to the SPA being included in the relevant policy. National policy and case law indicate that this approach is no longer sufficient for protecting European sites and that a more detailed Habitats Regulations Assessment (HRA) is required to provide the appropriate legal protection these sites require under the Habitat Regulations (1994). The 2006 part of the Appropriate Assessment also only considered the Breckland SPA within Forest Heath, consideration also has to be had for SACs and Ramsar sites within a satisfactory HRA.

The Development Control policies no longer accompany the Core Strategy policies, these will undergo an HRA at the appropriate time.

7. Review of related research

Other than the documents listed in section 6 this appropriate assessment draws on work carried out in neighbouring Breckland District. This work is reported in Liley *et al* (2008) and includes new research on recreational access to parts of the Breckland SPA (Dolman *et al*., 2008), research on potential impacts on nesting stone curlews using "SCARE" methodology (Taylor *et al*., 2007) and the impact of housing and roads on the spatial distribution of stone curlews (Sharp *et al*., 2008a). The work by Sharp *et al* (2008a) found significant avoidance of both housing and roads, highlighting a clear effect of development on the species. The avoidance of housing was detectable at distances over 2km and similar distances were detected for main (trunk) roads.

Factors driving the declines in woodlark and nightjar are still not fully understood, and may not be primarily driven by recreational disturbance. There is also on-going work on nightjars and woodlarks being undertaken. Some of this work has been commissioned by Breckland District Council (BDC) and some will be commissioned in partnership between BDC and FHDC.

8. Scope of the Appropriate Assessment

Regulation 85B of the Habitats Regulations requires plan making authorities to determine whether a land use plan is likely to have a significant effect upon any European site. In considering the implications of the Forest Heath Core Strategy on European sites, this initial stage of the Habitats Regulations Assessment has been undertaken. For a number of policies within the Core Strategy, it was considered either that significant effects would be likely, or that a precautionary approach would need to be taken as it could not be determined that those particular plan policies would not be likely to have a significant effect upon any European site.

Where it is not possible to apply avoidance measures to completely remove the likelihood of significant effects, including where the effects are not fully understood, the relevant aspects of the plan must be subject to an 'Appropriate Assessment' in accordance with Regulation 85B. Application of the Habitats Regulations incorporates the precautionary principle at every stage. The European Court of Justice has set clear parameters in determining the question of adverse

effects on the integrity of a European site and established that there should be no reasonable scientific doubt as to the absence of such effects[1].

The Core Strategy for Forest Heath should therefore be subject to Appropriate Assessment at this stage, in relation to the following policies:

- CS2- Town Centre and Key Service Centre Strategies
- CS6- Economy and Tourism
- CS7- Overall Housing Provision
- CS10- Strategic Transport Improvements
- CS12- Infrastructure and Sustainable Communities

Whilst the Habitats Directive and Regulations do not provide detailed guidance on the scope of an Appropriate Assessment, its requirements are clear from the title, in that it should be an assessment that is 'appropriate'. It should be detailed enough to meet the requirements of the Habitats Regulations in that plans or projects should only proceed where it can be ascertained that there will not be an adverse effect on the integrity of any European site (unless the further specific tests in relation to Regulation 85C are met, which are not considered at this current stage in the stepwise process of the Habitats Regulations Assessment).

Each policy considered likely to have a significant effect upon one or more European sites is considered in turn within the following appropriate assessment, where the implications for the European sites lying within, surrounding or in the vicinity of Forest Heath is considered in detail.

The specific locations of the housing and employment development areas are being progressed within an emerging Site Specific Allocations Document. This DPD will undergo an HRA at the appropriate time.

9. Appropriate Assessment of Policies

Housing, employment, tourism, direct impacts of built development on SPA (Annex I species), indirect effects of residents from additional housing on SPA (Annex I species), other urban effects and other identified effects.

Appropriate Assessment of Residential, Employment and Tourism Related Development (Policies CS2, CS6, CS7, CS10 and CS12)

Work carried out for Breckland District Council for their Core Strategy HRA (Liley *et al*., 2008) also covered the elements of the Breckland SPA within Forest Heath. Therefore the effects and conclusions described within their work can also be applied to the Forest Heath Core Strategy HRA in terms of impacts and effects on Annex I bird species. Liley *et al* combined reviews of existing studies with new survey and modelling work to produce the most accurate and up to date information available on the effects of development on the integrity of SPA and SAC sites. Set out below are the elements of the appropriate assessment related to Forest Heath Core Strategy policies which address the likely significant effects on the integrity of European sites identified in the work by Liley *et al* (2008). As much of the work by Liley *et al* for Breckland DC is directly relevant to Forest Heath as well, some of it has been reproduced here and related, where necessary, to policies in the emerging Forest Heath Core Strategy.

[1] *European Court of Justice Ruling Case C-127/02, 2004, Landelijke Vereniging tot Behoud van de Waddenzee, Netherlandse Verenigilg tot Bescherming van Vogels vs. Staatssecretaris van Landbouw, Natuurbeheer en Visserij. (Waddenzee Ruling).*

Economy and Tourism (CS6)

Employment provision:

Core Strategy policy CS6 advises that the Western Suffolk Employment Land Review (timetabled for completion in March 2009) will determine the total number of jobs to be created in the District between 2006 and 2021, the total hectarage of additional employment land required in the period 2006 to 2021 and the target levels of employment development in hectares per settlement. Whilst the draft policy does not give a figure for the number of jobs to be created during the plan period the policy E1 of the RSS (adopted May 2008) sets as target of 18,000 jobs to be created by Forest Heath in combination with Mid-Suffolk and St Edmundsbury Councils. Forest Heath are currently undertaking an Employment Land Review (ELR) to ascertain what proportion of the 18,000 jobs will be provided within the District.

The policy proposes that new employment development will be located using a combination of the sequential test, the need to create sustainable communities providing a balanced mix of housing and employment growth, and to promote economic regeneration. In reality this will probably mean that the majority of new employment development will be directed to the Market Towns and Key Service Centres. The submission version of the Core Strategy will set out the results of the Employment Land Review in terms of the number of hectares of employment land required.

Whilst research has linked the impact of housing to significant effects upon Annex I bird species, current research has not specifically considered the impact of other types of built development (Liley *et al*., 2008). However, taking a logical, and most importantly a precautionary approach, in the absence of evidence to the contrary it is assumed that similar effects are likely as a result of other types of built development. This appropriate assessment therefore considered the effects of the new employment provision in policy CS6 alongside the effects of the new housing development set out in policy CS7 in terms of the likely significant effects and the potential for adverse effects upon the integrity of European sites.

Tourism:

Policy CS6 also relates to tourism provision within the District. It does not promote any specific schemes or sites and will rely on the results of the FHDC Economic and Tourism Development Strategy which is due for completion in mid-2009, although it is possible that new tourism will be located around Newmarket to take advantage of the town's links to the horseracing industry. Research on the effects of tourism development on European sites is limited, therefore these effects will be considered alongside those of residential and employment development. Any specific sites proposed for tourism development will form part of the Site Specific Allocations DPD and so will be assessed as part of the HRA of that document.

It is considered that there are likely to be the following significant effects as a result of policy CS6:

- A potential reduction in the density of Habitats Directive Annex I bird species, taking a precautionary approach following the negative relationship which has been shown to exist with housing density (stone curlews, nightjars and woodlarks);
- Potential reduction in the density of stone curlews due to their avoidance of roads and the impact of increased road traffic;
- Increased levels of recreational activity resulting in increased disturbance to Annex I ground nesting bird species sensitive to disturbance (stone curlew, nightjar and woodlark) in the Breckland SPA;
- Increased water abstraction requirements to meet the additional water supply needs; and
- Increased water discharges to meet the additional waste water treatment needs.

Housing Provision (CS7)

Core Strategy policy CS7 sets out plans for 3,000 new dwellings within the District in the period 2010 to 2020 and a further 2,740 between 2021 and 2031 (subject to a review of the East of England Regional Spatial Strategy). The policy proposes strategic growth to the north-east of Newmarket, as well as Greenfield urban extensions in Mildenhall and Brandon in the period 2010-2031 and in Lakenheath and Red Lodge in the period 2020-2031, although no locations are proposed for these extensions.

The majority of housing growth will be directed to the Market Towns and Key Service Centres with the rest (700 dwellings in the period 2010-2031) being accommodated in Primary Villages. This will result in an increase in local residents in these areas and possibly a change in the types of people living in different areas.

It is considered that there are likely to be the following significant effects as a result of policy CS7:

- Potential reduction in the density of Habitats Directive I bird species for which a negative relationship has been shown to exist with housing density (stone curlews, nightjars and woodlarks);
- Potential reduction in the density of stone curlews due to their avoidance of roads;
- Increased levels of recreational activity resulting in increased disturbance to Annex I ground nesting bird species sensitive to disturbance (stone curlew, nightjar and woodlark) in the Breckland SPA;
- Increased levels of people, resulting in an increase in urban effects, such as fire risk, fly tipping, trampling etc., on heathland sites;
- Increased water abstraction requirements to meet the additional water supply needs; and
- Increased water discharges to meet the additional waste water treatment needs.

Settlement Strategies (CS2)

Policy CS2 sets out strategies for the three market towns and two key service centres in Forest Heath. It draws on information contained in policies CS1, CS6, CS7, CS9, CS10 and CS12 and has been screened in to the appropriate assessment as it is possible that some of the proposals it contains could have an impact on the integrity of a European site. However as the policy mainly draws its proposals from other policies included within the appropriate assessment, each relevant point from policy CS2 will be considered with the policy it comes from in the appropriate section, e.g. policy CS2 includes the housing figures set out in policy CS7 so both these polices will be assessed together with reference to housing development.

Strategic Transport Improvements and Sustainable Transport (CS10)

Policy CS10 identifies the strategic transport proposals which will be support by the LDF. These include schemes to relieve the adverse impacts of traffic in Brandon, Mildenhall and Newmarket, dualling of the A11 and improvements to the A14/A142 junction at Newmarket. It is possible that some of the schemes proposed could have a negative effect on European sites and if this is the case they will either have to be removed from the Core Strategy or appropriate and acceptable mitigation measures will have to be proposed. Although the policy expresses support for the dualling of the A11 the Highways Authority are the competent authority at it is their responsibility to carry out a Habitats Regulations Assessment of the project, therefore the proposed dualling is not included within this HRA.

The likely significant effects that may result from policy CS10 include:

- Potential reduction in the density of stone curlews from their avoidance of roads;
- Pollution of SAC habitats which are vulnerable to air-borne pollution (i.e. heaths which are vulnerable to nitrogen deposition).

Infrastructure and Sustainable Communities (CS12)

Policy CS12 identifies infrastructure projects which will help achieve sustainable communities in Forest Heath. These include improved services in Lakenheath, Mildenhall, Newmarket, Brandon and Red Lodge and schemes proposed in the Suffolk Local Transport Plan 2006-2011. This policy features a variety of different infrastructure types, including built facilities and road development, therefore all the projects mentioned will be assessed alongside the other appropriate policies, for example built facilities schemes are considered alongside residential, employment and tourism development and road schemes are considered alongside strategic transport improvements.

The likely significant effects that may result from policy CS12 include:

- Potential reduction in the density of Habitats Directive I bird species for which a negative relationship has been shown to exist with housing density (stone curlews, nightjars and woodlarks);
- Potential reduction in the density of stone curlews from their avoidance of roads;
- Increased levels of recreational activity resulting in increased disturbance to Annex I ground nesting bird species sensitive to disturbance (stone curlew, nightjar and woodlark) in the Breckland SPA;
- Increased levels of people, resulting in an increase in urban effects, such as fire risk, fly tipping, trampling etc., on heathland sites;
- Increased water abstraction requirements to meet the additional water supply needs; and
- Increased water discharges to meet the additional waste water treatment needs.
- Pollution of SAC habitats which are vulnerable to air-borne pollution (i.e. heaths which are vulnerable to nitrogen deposition).

Direct impacts of built development on Breckland SPA Annex I bird species

Correlative studies of stone curlews (Sharp *et al*., 2008a), nightjars (Clarke *et al*., 2008, Liley and Clarke, 2003, Liley and Clarke, 2002 and Liley *et al*., 2006a) and woodlarks (Mallord, 2005) have found lower densities of these Annex I species in areas close to housing or surrounded by high densities of housing. The reasons for this avoidance are difficult to pin-point and could be due to a range of factors. Urban sites have higher levels of recreational access (e.g. Liley *at al*., 2006b) and therefore visitor pressure and disturbance may be an underlying cause. Nightjars and woodlarks have both been shown to avoid areas of high human disturbance (Liley *et al*., 2006a, Mallord *et al*., 2006, Mallord *et al*., 2007b), for nightjars there is evidence that disturbance may impact on breeding success (Langston *et al*., 2007b, Murison, 2002) and for stone curlews disturbance has been shown to have an effect on incubation behaviour (Taylor *et al*., 2007). Urban heaths are subject to a range of other urban pressures (Haskins, 2000, Liley *et al*., 2006b, Underhill-Day, 2005), that include increased fire occurrence (Kirby and Tantrum, 1999) and high densities of predators such as cats (e.g. Sims *et al*., 2008) and foxes (Harris and Rayner, 1986).

These factors, such as increased access levels and fire incidence are all indirect effects that occur as a result of the housing, rather than being a direct effect of the presence of the houses. Such urban effects are difficult to tease apart, and are discussed in more detail in later sections. It is however also possible that the reduced densities are directly related to the built environment. The avoidance of housing by stone curlews has been demonstrated using data related to arable land (Sharp *et al*., 2008a), where there is limited public access. The large distances over which the housing has been shown to have an effect (for both stone curlew and nightjar) are such that

access, increased predator density and fire occurrence would seem implausible as explanations in their own right. It may therefore be that these species simply show a behavioural response to avoiding the built environment. It may be that housing and other built development has some negative effect we do not understand, perhaps relating to fragmentation, loss of off-site foraging habitats or similar. It is possible that birds may simply perceive areas close to housing and other built development as poorer quality.

A potential problem with relating the avoidance of housing to an adverse effect on the integrity of the site is that the avoidance of housing is simply a behavioural mechanism, and does not relate to a population effect. With respect to stone curlews, the population size is relatively low (246 nests were found in Breckland in 2006), the species is rare and occurs over a large area at a low density. There is a reasonable amount of habitat choice when populations are at low numbers, and there is likely to be little competition for territories. At present it cannot be predicted whether the avoidance would still be present when the population increases and there becomes competition for territories. If there is in fact no cost (such as increased disturbance or predation) from nesting close to housing, then the avoidance pattern may disappear. Given that it is impossible to predict the pattern of settlement at higher population sizes, we have to assume that there is an adverse effect from development, and that those adverse effects apply for all three Annex I species.

It is difficult to place an exact boundary on the scale at which, or distance at which, housing has an effect on the bird species. For all three species the density of birds is much lower close to housing, but some individuals will still settle in areas close to housing. The pattern of avoidance may also change over time. In fact the proportion of stone curlew nests (within a given year) which are close to settlements has steadily increased over the past two decades, indicating that the avoidance of housing, while always remaining highly significant, has decreased in more recent years (Sharp *et al*., 2008a). Similarly with nightjars, the reduced density on more urban heaths in Dorset, found using the data from the 1992 national survey (Liley and Clarke, 2003) was still present in 2004, when the population had markedly increased, however the avoidance did appear to be weaker (Liley *et al*., 2006a).

The pattern of avoidance (from Sharp *et al*., 2008a), for stone curlews on arable land, across all years combined, is reproduced in Figure 3. It shows that, up to 2.5km away from settlements, the average density of stone curlew nests per year on arable land of a suitable soil type increases with distance from any settlements. This would therefore suggest that stone curlew show avoidance of towns and villages, up to 2.5km away. The area of suitable habitat type in each distance class decreases with distance, such that there is only about 10km^2 which is 2.5 to 4.0km away from any settlement (Figure 3). Within every single year from 1988 to 2006, the stone curlew nest density (per ha of suitable land) was significantly lower on land within 0-500m of the nearest settlement than in successive distance bands. Annual nest densities on arable land 500-1,000m from settlements were also lower than densities at subsequent distance bands in 14 of the 18 years over the period 1988-2006. In the predictive models developed as part of the same piece of work, housing values were weighted (using a half-normal curve) such that nearby housing were assumed to have a greater impact than houses further away. Different weightings were tested and the best fit was found using a curve based on a standard deviation of 1,000m (See Figure 3 in Sharp *et al*., 2008a). This weighting gives housing at 1,000m half as much 'weight' as housing at zero metres, and the impact declines such that at 2,500m the effect is negligible.

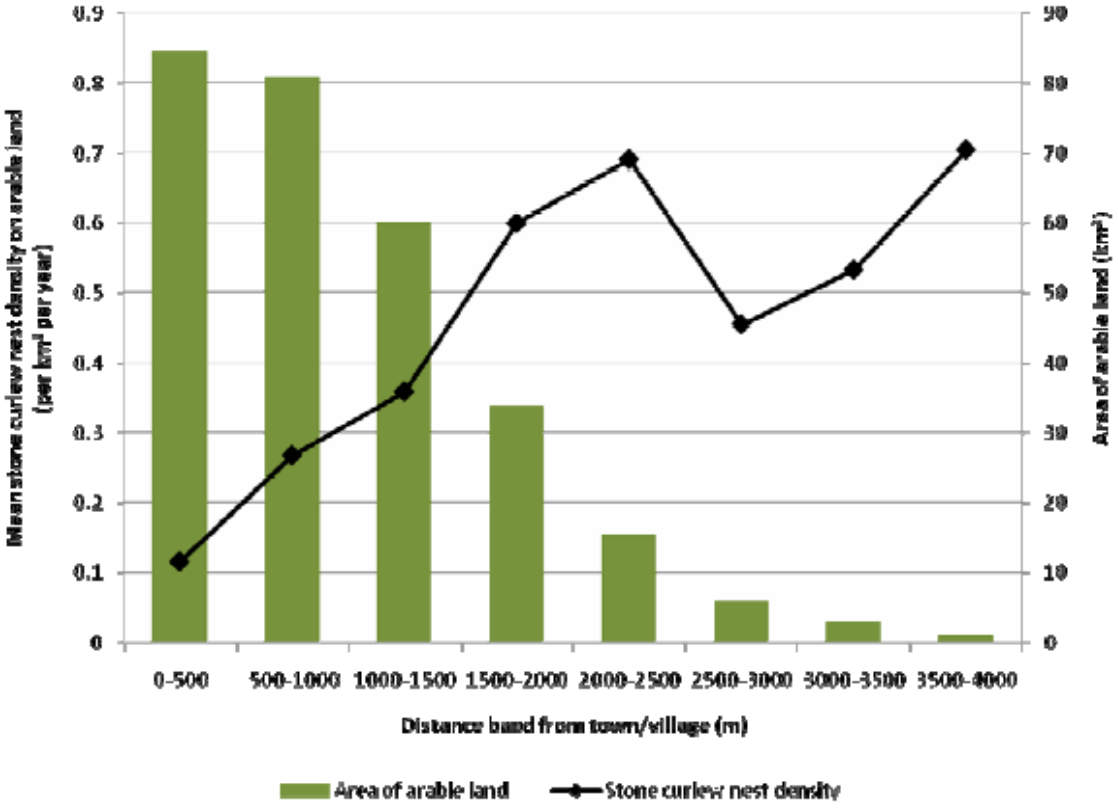


Figure 3. Average density of stone curlew nests on arable land (1988 to 2006) and the area of arable land available at different distance bands away from towns and villages (from Sharp *et al*., 2008a).

For nightjars, significant effects of housing surrounding sites have been detected where that housing occurs within 5km of sites (Liley *et al*., 2006a). The problem is that sites that have lots of housing close by also tend to have lots of houses further away, and it is therefore virtually impossible to state the distance to which housing has an effect. In the Liley *et al* study, it was calculated that the correlation between nightjar density on a heathland patch (based on the 2003 nightjar survey) and the housing density within a range of distances from the edge of each patch, separately for the Dorset and Thames Basin Heaths (TBH) patches and then for the two SPA datasets combined. The correlations were calculated for nightjar density based on the whole patch area and also based on the 'heathland' area only. These simple negative correlations of whole patch nightjar density with housing density for Dorset were similar (-0.373 to -0.417) and statistically significant (all $p<0.01$) for each distance range up to the assessed maximum of 5km, although correlations marginally peaked at distance limits of between 800m and 2,000m. For the Thames Basin Heaths, the negative correlations for whole patch nightjar density with housing density were slightly stronger (-0.425 to -0.481) than those for Dorset for housing distance limits up to 800m. However, because there are fewer sites in the Thames Basin Heaths, the statistical degrees of freedom were much less and the correlations were therefore statistically significant only for distances up to 800m, correlations thereafter decreased in strength with distance. Using nightjar data extracted only for heathland habitats (i.e. calculating density per ha of heathland rather than per ha of the total site) patterns were similar.

For both stone curlew and nightjar there is therefore evidence of an avoidance of housing. This effect trails off with distance away from housing, but this trailing off is gradual and it is therefore difficult to draw a definitive distance, beyond which no effect occurs. There is clearly evidence for taking at least a 1,000m distance for stone curlews, and potentially further to somewhere between 1,000m and 2,500m. Based on the evidence from the Thames Basin Heaths and Dorset, similar distances would potentially be applicable for nightjar too.

The distance at which it is determined that any built development would no longer have an adverse effect upon stone curlews will be based upon the best available information and scientific opinion, whilst also applying the required precautionary approach. Evidence presented here indicates that at a distance of 1,000m there is likely to still be an adverse effect, given that the weighting at this distance is still half that at zero metres, but that the effect becomes negligible once the built development is 2,500m away. At some distance between those points therefore, the effects of the development will no longer be such that an adverse effect upon the ecological integrity of the SPA occurs. At any distance from that point up to 2,500m, effect upon the interest features of the European site are at a scale that those effects are no longer considered to be an adverse effect upon the ecological integrity of the site. Those remaining effects however, would need to be considered in combination with any other effects arising as a result of the Core Strategy, where it has similarly been determined that adverse effects upon site integrity alone have been ruled out, but those effects have not been completely avoided. Two or more of these lower level effects combined could lead to an adverse effect upon site integrity when considered in-combination.

The distribution of key areas for Annex I birds have been identified. The Breckland SPA boundary has been plotted and forestry blocks have also been mapped. The respective habitats were then combined and a range of buffers up to 2.5km were plotted (following the methodology in Liley *et al*., 2008). As can be seen in Figure 4 Brandon and part of the edge of Mildenhall and Red Lodge are within the 1.5km buffer.

Liley *et al* (2008) conclude that the appropriate assessment of the impact of built development upon the Annex I species for Breckland SPA concludes that adverse effects upon the ecological integrity of the site, in relation to the three Annex I bird species cannot be ruled out. Greater evidence exists in relation to the impacts of housing, but a precautionary approach is taken with regard to the impacts of employment and tourism development. The point at which the effects are no longer adverse (i.e. at a distance somewhere between 1,000m and 2,500m) now requires further consideration. It is concluded that as it is the development itself that causes the effect, it is difficult to determine what possible mitigation measures could be implemented, therefore it will probably be necessary to assess each project or proposal within any suggested buffer on a case by case basis.

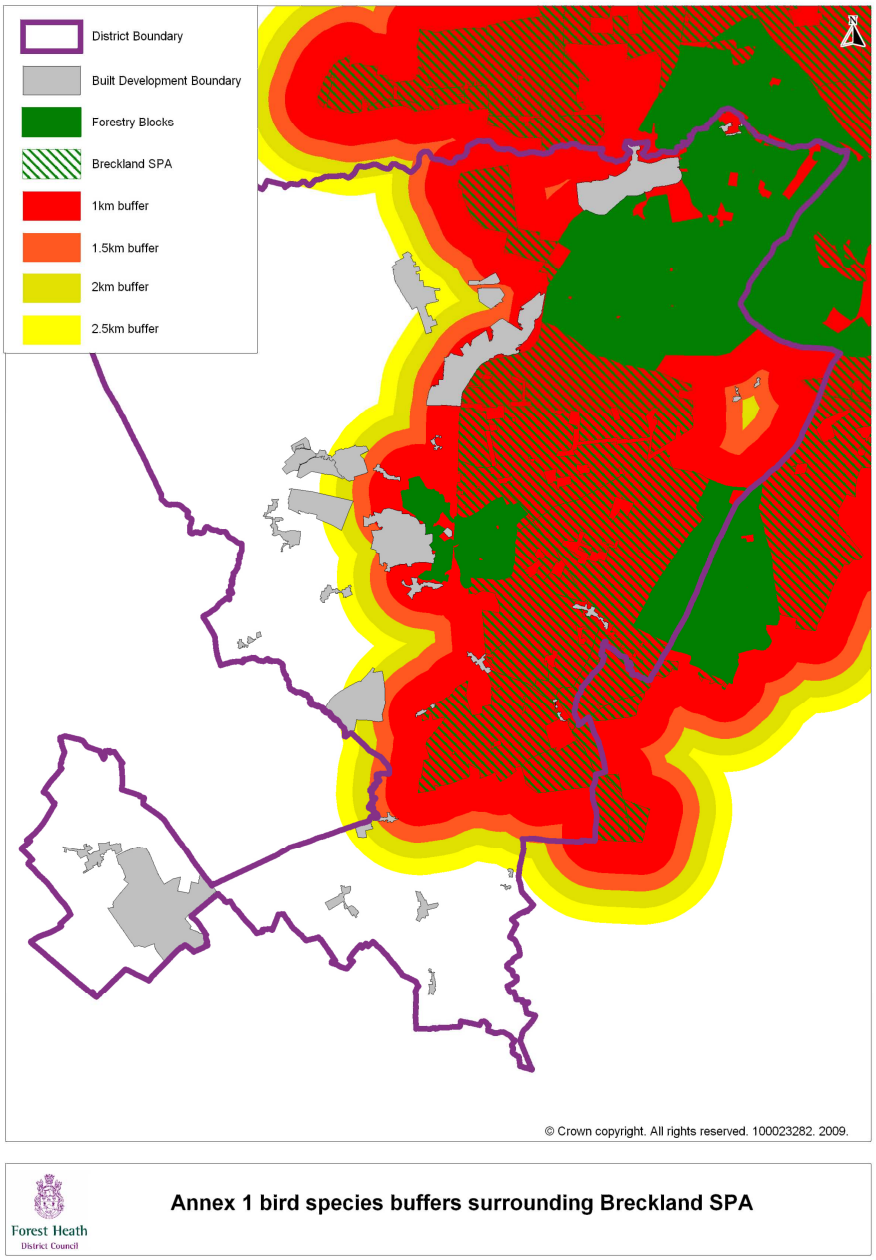


Figure 4 Annex 1 bird species buffers surrounding Breckland SPA.

Indirect effects of residents from additional housing, and incoming tourists, in terms of disturbance of Breckland Annex I bird species (CS6 and CS7)

There is a strong evidence base on the impacts of recreational disturbance on stone curlews, nightjars and woodlarks. Although national populations of all three species have generally increased in recent years, prospects for further recovery, for nightjar and woodlark at least, may be limited by factors including the effects of recreational disturbance (Langston *et al*., 2007c).

In work on Salisbury Plain, Taylor (2007) looked at the behavioural response of incubating stone curlews to potential disturbance events in the vicinity of the nest. Stone curlews responded to disturbance by becoming alert and then temporarily leaving the nest, and Taylor recorded the distance between the source of the disturbance and the nest at which these responses occurred.

Her results showed that stone curlews leave the nest in response to disturbance at considerable distances and that the closer a potential source of disturbance, the greater likelihood that the birds would respond by leaving the nest. Even at long distances (>300m) the probability of the stone curlew running or flying was elevated, relative to that when the disturbance was further away or absent. The probability of response per unit distance also varied with the type of disturbance. For example, after allowing for the effect of distance, birds were more likely to respond by running or flying from a walker with a dog than a walker without a dog, or than a motor vehicle. While these results do not show any population impact of disturbance, the behavioural response shows that the species is particularly sensitive to the presence of people. Repeated flushing has the potential for consequences on the health of the adult in terms of energy use and leaves the nest vulnerable to predation.

Studies of nightjars have shown that breeding success is lower on sites with higher levels of access, and for nests close to footpaths (Murison, 2002). Predation of eggs seems to be a principal cause of nightjar nest failure. Using nest cameras dogs have been filmed flushing incubating nightjars from the nest. Recreational disturbance, particularly from dogs, causes adults to be flushed from the nest, potentially betraying the presence of the nest to predators such as crows (Langston *et al*., 2007a, Langston *et al*., 2007b, Murison, 2002, Woodfield and Langston, 2004). In both conifer plantations and heathland sites nightjar territories tend to occur where levels of human disturbance are lowest (Liley *et al*., 2006a), suggesting that the birds are able to select areas where access levels are lower, and sites with high levels of recreational access tend to hold fewer nightjars (Clarke *et al*., 2008).

Woodlarks have been intensively studied in conifer plantations and heathland habitats in the Dorset Heaths (Mallord, 2005). Mallord's work has shown that otherwise suitable habitat with high levels of recreational access holds lower densities of woodlarks, but that breeding success in such areas is actually better, due to reduced competition between woodlarks (Mallord *et al*., 2007a, Mallord *et al*., 2006). The increase in breeding success is, however, not sufficient to compensate for the impact of disturbance and the net effect is a negative population impact (Mallord *et al*., 2006).

Patterns of recreational use of Thetford Forest and surrounding countryside are described by Dolman *et al* (2008). In their visitor survey, based on a sample of path sections, a total of 379 groups (1,507 people) were recorded during 3551 hours of visitor surveys. This gives an approximate hourly visitor rate of 0.4 people per hour.

The visitor survey documents a pattern of diffuse access across a large area. Most people arrived by car (68% interviewees), particularly in Thetford Forest (when compared to surrounding countryside). Half (50%) of drivers used car-parks, with the remainder using lay-bys (17%), gateways (22%), verges or nearby housing (<10%). The proportion using gateways was higher in the Forest, with nearly one-third (29%) of visitors using these to park. Country Parks had highest visitor rates (0.89 groups per hour). Tarmac roads and National Trails were also busy, followed by byways and designated routes. Fire routes within the forest and gateways were also used but there was little evidence of use on private tracks.

Of the 739 groups, 340 (46% of groups) were dog walkers. Walking and cycling were also frequently recorded activities. Weekends were busiest, but week-day use was still relatively high; virtually three-quarters (74%) of interviewees visited at least once a week. Over half (56%) of dog walkers visited daily. More than half (54%) respondents walked the same footpath at least once per week.

The distance between people's home postcode and the point at which they were interviewed (interview points were often well inside the forest and therefore well away from the starting point of people's routes) shows that most visitors are relatively local- 43% were interviewed within 5km of their home postcode and further 20% between 5km and 10km.

The visitor modelling by Dolman *et al* derived predictions of visitor use under different housing scenarios and these were used by the RSPB to explore the potential for increased flushing of stone curlews (using their SCARE model, developed by Taylor *et al* (2007)) as a result of an increase in access levels resulting from new housing. Although this work used proposed housing growth in and around Thetford it is felt that the results can equally be applied to settlements in Forest Heath given the close geographical location of the two areas. As Thetford is proposed for more development than any individual settlement in Forest Heath applying the results from Liley *et al.* (2008) work would follow the precautionary principle prescribed by the Habitat Regulations.

For the work around Thetford the RSPB initially took all nest locations in the Thetford area for 2002-2007 (a 6 year period), giving a sample of 1365 nest locations. Of these, 499 were within 400m of a track (locations further away than this from tracks were considered almost certainly not affected by walkers). The 499 points were within 384 grid squares. For grid squares with more than one nest the nearest to a track was used, giving a sample of 384 nests. Of these 90 were on semi-natural habitat and 294 were on other habitats (mostly farmland). A random sample of 60 from the 90 semi-natural nests and 30 from the 294 other nests were then used in the SCARE model.

The RSPB then applied the SCARE model to each of the 90 selected nest sites. Using the estimated number of potential disturbance events (PDEs) per hour (average for March-October, walkers and walkers with dogs only) on each track within 400m of the nest site, provided from the UEA visitor survey (Dolman *et al*., 2008). The SCARE model estimated the number of responses per hour expected from the estimated number of PDEs per hour. Having done this separately for each track, the response rates across all tracks within 400m of the nests were then summed for each grid square. A fitted relationship between the probability of occupancy of an otherwise suitable site and expected active response rate (from Taylor *et al*., 2007) was then used to estimate the probability of occupancy by breeding stone curlews of each site.

The visitor models only predicted changes in access levels as a result of new housing development in Thetford, and therefore changes in visitor access levels were predicted only in the area adjacent to Thetford. The SCARE models suggest that probabilities of occupancy would remain unchanged for most stone curlew locations, as many were well away from Thetford, but for those locations close to Thetford the modelling provides evidence that some areas would be less likely to be used by stone curlews. Unfortunately, due to time constraints, the RSPB work was unable to estimate the total number of displaced birds and therefore the full implications for stone curlews cannot be determined. It can only be concluded that in some areas an unquantified number of stone curlews would be displaced. These results also apply within Forest Heath where growth in some areas would be away from locations used by stone curlews and some may be in locations that they will use and this could result in birds being displaced.

The predictions of visitor numbers (for both current housing levels and future scenarios), as described in Dolman *et al* (2008) were provided on a 3km x 3km grid, providing a coarse overview of the visitor totals for the SPA and adjacent land. The predictions were hourly rates, for the period 06.30-18.30, averaged across weekends and weekdays and averaged across all paths within each grid cell. This data is summarised in Figure 5.

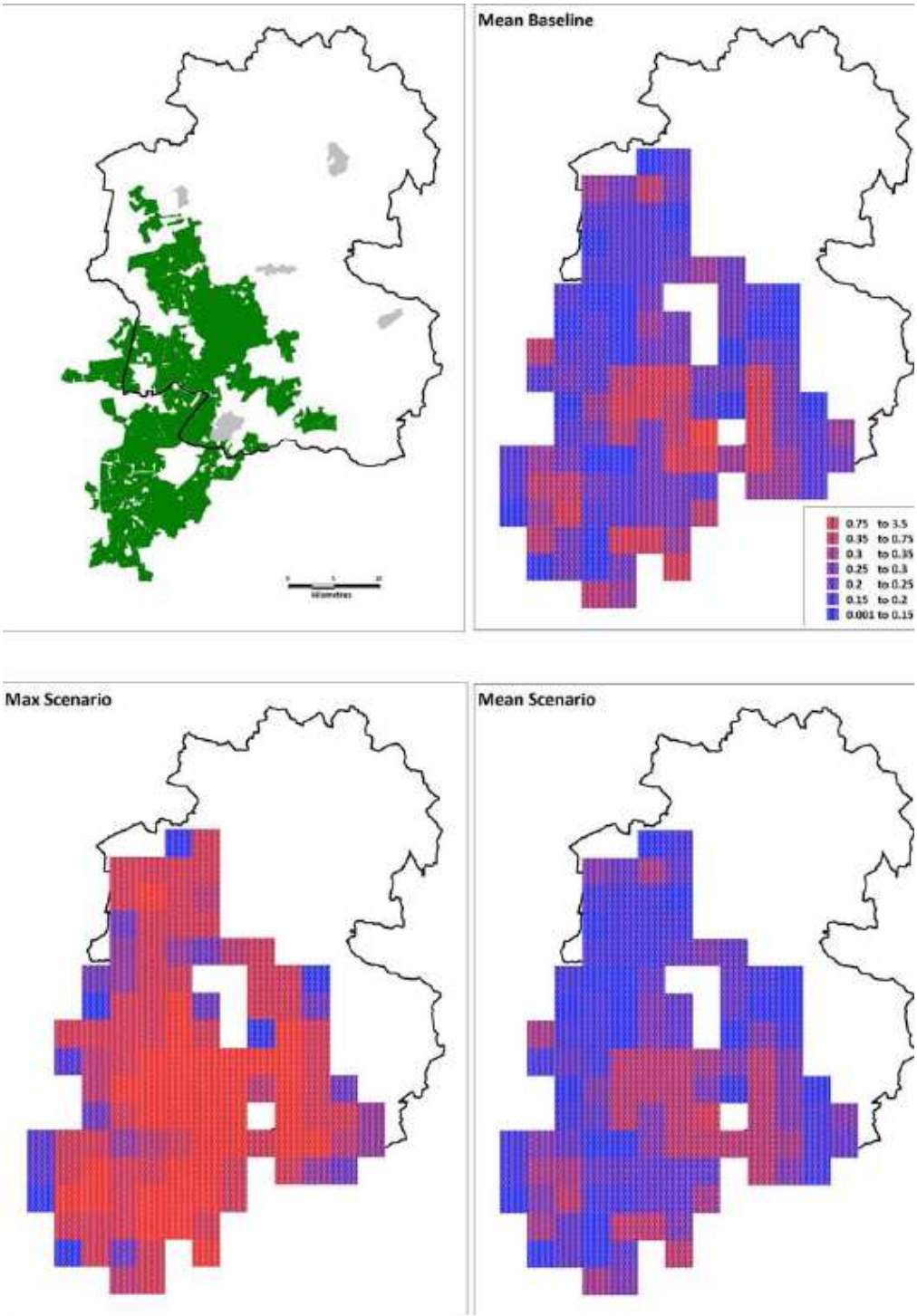


Figure 5. Current and future predictions of visitor numbers, based on a 3x3km grid, as provided by UEA. Data are the mean number of potential disturbance events per hour per track section, averaged over weekdays and weekends, for daylight hours 06:30-18:30. See Dolman *et al*. (2008) for more details (from Liley *et al*., 2008).

In summary:

- There were 119 grid cells.
- The length of path within each 3km cell ranged from 19m to 66,161m (66.16km), with a mean, per cell of 15,013m.

- The mean baseline (i.e. current) number of disturbance events per hour (averaged across all path sections within each cell) ranged from 0.04-1.10 (mean value per cell = 0.25, median = 0.22 events per hour).
- The mean number of disturbance events per hour per scenario (i.e. average across all scenario predictions across all path sections within the cell) ranged from 0.06 - 1.80 (mean value per cell = 0.27, median = 0.23).
- The scenarios simply focus on new development within Thetford, and therefore, not surprisingly, they show an increase for only 52 of the 119 grid cells (i.e. 44% of grid cells). The largest increase in visitor numbers was 0.70 events per hour, for the grid cell adjacent to Thetford.

Whilst the stone curlew population within Breckland is quite unique, other heathland sites elsewhere in the UK are recognised for their populations of the two other Annex I species; woodlark and nightjar. As a means of determining the likely scale of impacts of recreation on these two species, Liley *et al* (2008) attempted to make comparisons with other SPAs that support nightjars and woodlarks (Table 4). Such a companion is useful because detailed work on the impacts of disturbance has been conducted in other SPAs (particularly the Dorset Heaths), the visitor rates at these sites are also known and mitigation measures have been established to minimise the effects of future increases in visitor rates. Such broad brush comparisons allow it to be determined at least if visitor rates are broadly comparable, whether the volume of housing is similar and potentially provide a 'model' for mitigation measures.

Table 4. Comparison of Dorset Heaths, Thames Basin Heaths and Breckland SPAs. Details of how the different figures are derived are given beneath the table (from Liley *et al*., 2008).

	Dorset Heaths	Thames Basin Heaths	Breckland
Size of designated area (ha)[1]	8,169	8,294	39,280
Total area with access and inc. forestry (ha)[2]	10,718	7,348	18,058
Relevant European designations	SPA, SAC, Ramsar	SPA, SAC	SPA, SAC
Mean group size	1.5	1.8	2.0
Number of visitors per hour[3]	0.16	0.63	0.50
Total number car-park spaces	5,215	1,998	?
% of single person groups	64	52	50
% of visitor groups visiting daily	?	52	40
% visitors whose main purpose is dog walking	80	59	60[4]
No. Nightjars[5]	791	370	350
No. Woodlarks[6]	153	219	405
No. Houses within 500m[7]	42,522	38,579	11,687
No. of Houses within 5km	238,957	302,792	51,722

1. These areas are the total area designated- the Dorset Heaths SPA, the Thames Basin Heaths SPA and Breckland SPA.
2. This row is the approximate area of land with access and associated with SPA/SAC. For the Dorset Heaths forestry blocks (such as Wareham Forest) which are largely outside the SPA but support large numbers of woodlark and nightjar are included. The area given for Breckland is the area of the Breckland Forest SSSI.

[3.] These figures are impossible to make directly comparable and it is therefore suggested that they are used simply to provide a very crude comparison. The Breckland figure is calculated from the UEA data, using the mean number of disturbance events per cell (0.25) and then multiplying this by the mean group size (0.20) to give total people. For Dorset and Thames Basin these figures are the average from the two different models for each site, using the median value per 50m x 50m cell (Table 9 in Liley *et al*., 2006a), and then divided by 16 to give the hourly rate. The crucial difference is that the Breckland data is solely for paths, whereas the values for the other sites are for the entire area (i.e. off paths and on-paths).
[4.] This figure of 60% is based on the percentage groups, rather than visitors.
[5.] These figures from Conway *et al*. (2007), from the 2004 national survey.
[6.] These figures from actual territory centres, GIS data provided by Natural England from the 2006 national survey.
[7.] The data on the number of houses are from postcode data and are the number of residential properties for all postcodes that fall within the given distance of the SPA boundary.

The comparison reveals that the Breckland SPA (focussing on the forest and heath elements) represent a much larger parcel of land with public access than either Dorset or the Thames Basin Heaths. There are fewer houses adjacent to the Breckland SPA and the visitor rates (as might be expected given the larger area of land and fewer houses) appear approximately similar. It is potentially difficult to draw direct comparisons with the visitor data as these data are from surveys conducted in a different manner and the Breckland data was only made available at a relatively coarse scale. The predictions for the Dorset and Thames Basin Heaths are made for the entire site area; visitors in the models are spread out over the area of the site regardless of path networks. In reality people will mostly use paths and therefore it would be expected that in Dorset and Thames Basin Heaths these figures to be much higher if it were possible to generate estimates solely for paths, as was done for Breckland.

The coarse nature of the Breckland grid will result in visitor totals being 'flattened'; access levels will peak around car parks, visitor centres and access points and decrease with distance 'into' the forest. A relatively small proportion of people are likely to penetrate 3km from the start of their route, and therefore the average for a given 3km grid square will include quiet sections of paths and busier sections. The maximum value for any track section in Breckland was 3.35 disturbance events per hour and three 3km cells had maximum values above 2 disturbance events per hour. Even these maxima are very low compared to visitor numbers on the Dorset and Thames Basin Heaths.

As a consequence of these comparisons Liley *et al* (2008) suggest that access levels are currently relatively low in Breckland SPA and the level of increase in visitors, as a result of new housing, will still not bring the area into the same general level of visitor pressure as currently experienced on the Dorset and Thames Basin Heaths. Many of the grass heaths have CRoW access restrictions put in place each year due to the presence of stone curlews and this will minimise disturbance effects on those sites.

Bird distributions will change over time, particularly those of nightjar and woodlark in relation over time, particularly those of nightjar and woodlark in relation to forestry management. Locally visitor numbers may be high (however there is insufficient information available to pin-point these locations), and, with potential growth in Brandon, Mildenhall and Lakenheath, increased access levels and localised disturbance to some areas that have the potential to support (or currently do support woodlarks and nightjars) is likely.

In considering the likelihood of adverse effects arising from the indirect effects of additional housing, it is important to note that whilst comparisons with other SPAs are useful, the differences in visitor patterns and levels should not automatically lead to the conclusion that significantly lower visitor use of the Breckland SPA will not result in an adverse effect upon site integrity. There is no evidence to dispute the possibility that small increases in visitor use in less frequently used sites could have an impact upon the Annex I interest features.

Whilst the scale of impact may be less than that seen at other heathland SPAs, it is concluded, taking a very precautionary approach and in the absence of evidence to the contrary, that the relatively low level increase in visitors to the Breckland SPA could potentially result in adverse effects. The analysis of potential visitor increases and likely effects upon the Annex I species undertaken in this assessment will inform the level and types of mitigation necessary to prevent any visitor increases, albeit on a relatively low level, adversely affecting the ecological integrity of the Annex I species.

Other urban effects (All policies taken to Appropriate Assessment)

Disturbance to birds has been discussed in an earlier section. Other 'urban effects' include a wide range of impacts including: deliberate and accidental fires, litter, predation from people and pets, eutrophication and dumping/fly tipping. Attention was formally drawn to these issues in a report on the Dorset heaths to the Council of Europe in 1998 (De Molinaar, 1998). Various authors have since reviewed and summarised the various impacts (see Haskins, 2000, Liley *et al*., 2006b, Underhill-Day, 2005); a summary (from Liley *et al*., 2008) is provided in Table 5 and further discussion is provided below. These urban effects are viewed as potentially operating synergistically to influence the conservation interest of sites surrounded by high densities of housing.

Table 5. Summary of key negative impacts (besides disturbance to birds) of development close to European heathland sites (from Liley *et al*., 2008).

Effect	Description and Impact	Example of Species / Species Group Affected	Key References
Fragmentation	Loss of supporting habitats Lack of connectivity between sites preventing movement / genetic exchange between sites. Smaller site size increases edge effects from non-heathland species	Nectar feeding invertebrates; nightjar, woodlark, invertebrates, plants, reptiles, birds and mammals Invertebrates and plants	Alexander & Cresswell (1990) Webb (1989); Webb & Vermaat (1990); Webb (1990); Webb & Thomas (1994)
Predation and increased mortalities	Access by pet cats, some of which feed on the heath Different densities of mammalian predators such as foxes present on more urban heaths	Birds, invertebrates, reptiles and amphibians Birds, reptiles, mammals	Woods *et al*. (2003); Sims *et al*. (2008) Taylor (2002)
	Increase in crows and magpies on sites with greater human activity	Birds, invertebrates, reptiles and amphibians	Marzluff & Neatherlin (2006)
Roads	Road kills from traffic Increased levels of noise and light pollution	Birds, invertebrates, reptiles and amphibians Birds, invertebrates	Erritzoe (2002) Reijnen *et al*., (1997)
	Roads are barriers to species mobility	Invertebrates	Mader *et al*. (1990)
Pollution / Hydrology	Ground and surface water pollution from roads and hard surfaces, spills and dumping	Vegetation communities, macro invertebrates in watercourses	Armitage *et al*. (1994)

	Air pollution from industrial uses, fires and vehicles	Vegetation communities	Bobbink *et al*. (1998); Angold (1997); Bignal *et al*. (2007)
Trampling	Soil compaction Soil erosion from walkers, cyclists and horse riders Damage to breeding and wintering sites Creation of extensive path network increases spatial disturbance	Plant communities and species. Invertebrates Plant communities and species, some invertebrates benefit Invertebrates and reptiles Birds, reptiles	Taylor *et al.* (2002)
Vandalism	Damage to signs, fences, gates		
Eutrophication	Enrichment of soils from dogs excrement Dumping of household and garden rubbish. Enrichment along road corridors, effects of dust, salt, run-off	Plant communities and species, invertebrates Plant communities and species, invertebrates	Bonner & Agnew (1983); Taylor *et al*. (2005) Liley (2004) Angold (1997)
Fires	High fire incidence on urban heaths. Direct mortality of fauna. Temporary removal of breeding and foraging habitat. Long term vegetation change from repeated fires	Birds, invertebrates, reptiles and amphibians Vegetation communities	Kirby & Tantrum (1999) Bullock & Webb (1994)
Restrictions on management	Stock grazing, gates left open, dogs chasing animals, injury to stock. Objections to management eg. Tree clearance Increased costs of wardening		Woods (2002)
Negative public perception	Disregard of access and activity restrictions, hence trampling, dog fouling, fire lighting, illegal motorcycling etc	Vegetation communities, birds, invertebrates, reptiles and amphibians	

Controlled fires have been part of beneficial heathland management for many years, however, wild (i.e. unmanaged) fires can be a serious issue. Kirkby and Tantrum (1999) analysed 3,333 fire incidents in Dorset during 1990-1998. There was a clear peak during April-August, the period when potential damage to heathland flora and fauna is at its greatest. The authors found a clear link between fire frequency and urban areas, with heaths surrounded by more houses tending to be those with the most fires. Kirkby and Tantrum's survey of the causes of fire revealed that 59% were arson, 17% were campfires, 8% from management fires getting out of control and 7% from spreading bonfires.

Fire has a serious impact on ecological integrity. The effect of individual fires depends on date, fire temperature and duration, and the type of habitat burnt. Fire destroys vegetation, which, depending on substrate and fire characteristics, can take 4-20 years to re-establish, most areas going through successional grassland stages, and some on better soils ending up in woodland rather than heathland. Particularly hot, slow-moving fires can destroy seedbanks and even the peat layer, thus extending the time taken for heathland vegetation to re-establish. Invertebrates, reptiles, birds and other species will re-colonise once the vegetation has recovered.

There are estimates that cats account for one third of the mortality occurring in some bird populations (Churcher and Lawton, 1987) and in a five month period it has been estimated that Britain's c. 9 million cats bring home in the order of 92 million prey items (Woods *et al*., 2003). These prey items include birds, mammals, herptiles and invertebrates. Underhill-Day (2005) presents records of cats from 15 Dorset heathlands and evidence suggests that they roam up to 1,500m (particularly at night), so many heaths are well within territories of urban cats. While evidence for the population consequences of cat predation are mixed (e.g. Simms *et al*., 2008), the presence of an increased number of cats on Breckland heaths clearly has the potential for negative impacts to a range of interest features. The proximity of some heaths to urban areas may also result in an increase in the densities of other urban predators, such as foxes (Harris and Rayner, 1986, Taylor, 2002). On heaths with human activity, there is evidence of higher densities of avian predators such as crows ad magpies (Marzluff and Neatherlin, 2006; Taylor, 2002).

Trampling may occur as a result of horses, cycles, motorcycles or feet and can result in soil compaction, changes to soil hydrology or chemistry, changes to the soil invertebrate community (and an overall reduction in invertebrate numbers), changes in plant communities and, with heavy use, soil erosion and creation of bare ground. The degree of damage depends on several factors: soil type, slope, drainage and hydrology; the composition of the initial vegetation; and scale, frequency and seasonality of its wear (see Lowen *et al*., 2008 for reviews). The Breckland heaths are characterised by a high cover of lichen species, including several of conservation concern, and trampling may be a particular issue. The finest terricolous lichen communities in Breckland are limited to two trackways where it is thought pressure from the human foot is beneficial as it compresses the substrate, but there is concern about other types of use, especially in winter when heavy episodic use can churn the ground up (Gilbert, 2002).

Many visitors are accompanied by dogs (46% of the groups recorded by Dolman *et al*., 2008). The majority, 85% in the Dolman *et al* study, let their dogs off the lead. In addition to disturbance to birds and direct predation, dogs may chase livestock, disturb aquatic wildlife, cause physical damage to water body structure, and possibly chemical pollution and enrich soils through fouling. The local enrichment (eutrophication) effects, caused by inputs of nitrogen, phosphates and potassium, may last up to three years in grassland communities, and may have a similar duration of effect in heathlands; the enrichment effect on nutrient-poor soils such as heaths is significant.

For most of these urban effects, their occurrence and scale of impact is likely to be related to the amount of housing surrounding sites. Much of the work on urban effects to heathlands has come from the Dorset Heaths, where some heaths lie in the middle of the Poole/Bournemouth conurbation. In order to determine the extent to which the Breckland heaths compare with the Dorset Heaths in the degree of urbanisation surrounding them, Liley *et al* (2008) used postcode data (number of residential properties) within a GIS to determine how many houses surround component parts of the respective SACs. They extracted the number of houses at distance bands of 500m, 1000m, 2500m and 5000m, and these are summarised in Figure 6. It is clear that the Breckland heaths are, largely, much more rural in feel than the Dorset sites. For example the median number of residential properties within 2500m of the Breckland sites is 747 properties and for the Dorset Heaths the median is 6,351 properties.

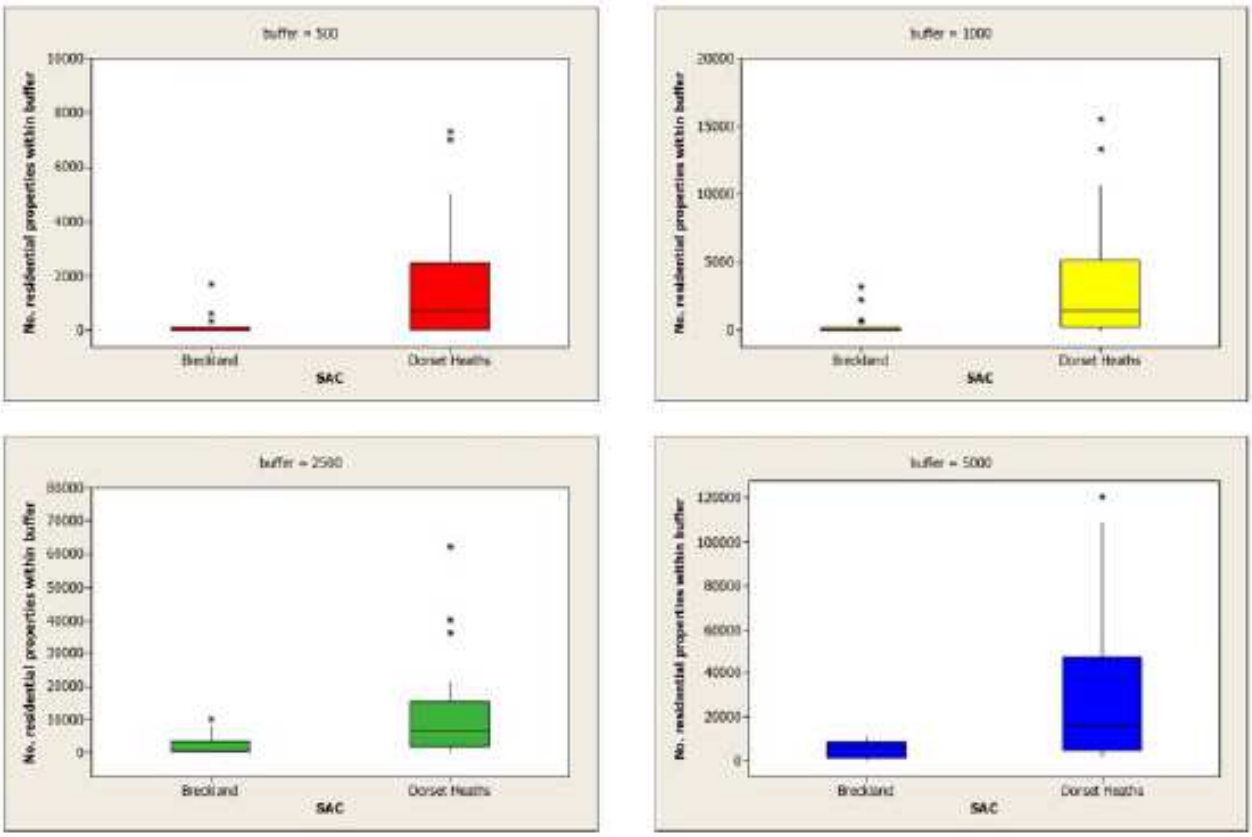


Figure 6. Comparison of the amount of housing surrounding component parts of the Breckland and Dorset SACs. Boxplots show the median (horizontal line), 25% and 75% quartiles (the box), the 95% and 5% percentiles (whiskers - vertical lines), and outliers (asterisks). Data for 19 Breckland sites and 29 Dorset sites. Housing data (postcode data describing numbers of residential properties, October 2007) extracted from buffers surrounding SSSI boundary within GIS (from Liley *et al*., 2008).

Despite this general trend, there are a smaller number of Breckland SSSIs with relatively high numbers of surrounding properties. Within Forest Heath those with more than 4000 within 2500m of the SSSI boundary are Weeting Heath, Wangford Warren and Carr, Cavenham-Icklingham Heath and Newmarket Heath. It is therefore assumed that it is likely to be these more urban heaths in the vicinity of the three Market Towns where the urban effects described above could be an issue. RAF Lakenheath SSSI is within 2.5km of 4000 properties, however this site is fenced off and are not publically accessible so therefore is not considered to be an urban heath. Newmarket Heath is also not always publically accessible and so is less likely to be subject to some of the urban effects listed above, also it does not have a European designation, so is not included for consideration within the HRA.

Following the appropriate assessment work on urban effects, it would therefore appear that urban effects are currently not a major issue for most Breckland sites. Current levels of housing are such that most heaths have a rural feel and urban effects are not currently a cause for unfavourable condition. Future development within the District may however result in an increase in these effects, and development in Brandon, Mildenhall and Lakenheath may be a cause for concern.

It is concluded that there is the potential for urbanisation effects to occur with increasing housing at Brandon, Mildenhall and Lakenheath. Taking a precautionary approach, mitigation measures should be sought for heaths within 2.5km of development in these areas..

10. Appropriate Assessment of potential effects on water cycles

Overview of issues and sources of information available, flood risk identification, wastewater discharges and treatment works capacity, river discharges and current water quality, water resources and water supply.

Overview of issues and sources of information available

A check of the Forest Heath Core Strategy for the likelihood of significant effects highlighted the potential for the implementation of a number of policies (Policies CS2, CS6, CS7, CS10 and CS12) to result in significant effects upon water resources and cycles, which could in turn significantly affect a number of European sites reliant on those water resources and important water cycles. Without further research and information gathering possible measures to prevent adverse effects in terms of impacts on water were not obvious. It was therefore determined that a more detailed level of assessment was necessary in order to conclude whether the policies promoted within the Core Strategy can be taken forward.

The information for the appropriate assessment of the impacts of the Forest Heath Core Strategy upon water resources and hydrological functioning is derived largely from the Forest Heath combined Strategic Flood Risk Assessment and Water Cycle Study (SFRA/WCS) which was carried out in partnership with St Edmundsbury Borough Council (SEBC). Stage 1 of this document was produced in January 2009, with the final stage 2 timetabled for publication in March 2009. This document was produced by Hyder Consulting for Forest Heath DC and St Edmundsbury BC and assesses the strategic flood risk and water cycle issues in the two areas. For Forest Heath the document is mainly concerned with the market towns of Brandon, Mildenhall and Newmarket, the key service centres of Red Lodge and Lakenheath and the primary villages of Beck Row, Exning, West Row and Kentford.

The sourcing, use and disposal of water can have a number of effects on the European sites in the area (from Liley *et al*., 2008):

- Groundwater abstraction can lower water tables and affect spring lines, seepages and standing water
- Surface water abstraction can reduce river flows, particularly during dry summer weather
- Increased abstraction can reduce soil moisture and therefore invertebrate food availability
- Discharges can increase nutrient levels, increase BOD and lower dissolved oxygen levels in rivers and other watercourses
- Discharges can increase velocities and levels and increase water temperatures below discharge points

Development proposed and supported by the Core Strategy is likely to impact upon water systems in a number of ways. It is considered that there is likely to be a significant effect upon water cycles arising from Policies CS2, CS6, CS7, CS10 and CS12 in relation to:

- Increased flood risk
- Waste water discharges reaching European sites sensitive to poor water quality
- Water abstractions

Each area of concern is dealt with in greater detail below. In considering the effects of the development proposed, impacts can occur as a result of water abstractions that have the effect of reducing water volume, water discharges that increase water volume and add nutrients to the water systems, or alter hydrological pathways to result in changes to water volume and movement.

Flood risk identification

The SFRA/WCS has identified various sources of flood risk. These include:

- Overflow from watercourses
- Breaching or mechanical, operational or structural failure of flood defences, hydraulic structures (pumps, etc) and water retention facilities
- Localised pluvial flooding- piped sewerage and highway drainage systems, surface runoff and/or overland flow
- Groundwater flooding

In most cases flooding does not constitute a risk to European wetland sites, some of which are at risk from drying out. However flooding with surface water, particularly where it contains untreated sewerage, could constitute a risk. Section 6 of the SFRA/WCS deals with flood risk within the District, including from sewer flooding. The evidence presented in the SFRA/WCS suggests that the majority of sewer flooding is the result of blockages with almost all of the other incidents resulting from ancillary failures. There are no particular sewer flooding "hot spots" identified. The report also identifies overland flooding and notes that rural runoff is a considerable risk across the area and some areas suffer repetitive problems, however as the SFRA/WCS is mainly concerned with flooding of settlements and new development it does not focus on this issue in rural parts of the District. The level 1 SFRA/WCS suggests that there are no major constraints to development areas from sewer flooding or overland flooding.

The SFRA/WCS also identifies that the District is geologically susceptible to groundwater flooding, due to the low lying nature of the land and the underlying permeable aquifers. Groundwater flooding is largely the result of repeat long-lasting rainfall events, which can take a considerable time to dissipate due to groundwater flow being appreciably slower than surface flow and being constrained by the surrounding substrata with water levels taking much longer to fall. Review of the Defra funded 'groundwater flooding scoping study' showed that previous groundwater flooding had occurred around Newmarket between 2000 and 2001. Whilst this would not have an impact on any of the European sites within Forest Heath it is possible that it may have an effect on the neighbouring sites in the Fenland SAC and the Chippenham Fen Ramsar site, although unless the flood water was contaminated it may have a positive effect on the sites in terms of wetting drying fen.

Floods have a source-pathway-receptor and if flooding, particularly from a sewer source, is diverted down the pathway of a ditch system the receptor of the water could be one of the watercourses which either supplies, runs through or discharges into a European site.

It is recommended that the risks of polluted surface water from overland sources including burst sewers render it impossible to conclude that European sites will not be adversely affected.

Wastewater discharges and treatment works capacity

Brandon waste water treatment works (WwTW) is located downstream of the town, it discharges into the Little Ouse, which then flows into the Great Ouse into the Wash. This could lead to discharges into the Little Ouse having a significant effect on the Breckland SAC, the Ouse Washes SPA/SAC/Ramsar sites, the Wash SPA/Ramsar sites and the Wash and North Norfolk Coast SAC.

The Lakenheath WwTW discharges into Twelve Foot Drain (via Crooked Dyke) which then flows into the Little Ouse and then into the Great Ouse and on into the Wash. Discharges from this WwTW could have a significant effect on the Ouse Washes SPA/SAC/Ramsar sites, the Wash SPA/Ramsar sites and the Wash and North Norfolk Coast SAC.

The Mildenhall WwTW, which also serves Beck Row and West Row, discharges into the River Lark downstream of Mildenhall, then into the Great Ouse and on into the Wash. This could lead to discharges from this WwTW having a significant effect on the Ouse Washes SPA/SAC/Ramsar sites, the Wash SPA/Ramsar sites and the Wash and North Norfolk Coast SAC.

Newmarket WwTW, which also serves Kentford and Exning, discharges into the River Snail downstream of Newmarket, this then flows into the New River and on into the River Cam, then into the Great Ouse and on into the Wash. Discharges from this WwTW could have a significant effect on the Fenland SAC (Chippenham Fen and Wicken Fen), Chippenham Fen and Wicken Fen Ramsar sites, the Ouse Washes SPA/SAC/Ramsar sites, the Wash SPA/Ramsar sites and the Wash and North Norfolk Coast SAC.

The Tuddenham WwTW also serves Red Lodge and Herringswell, is discharges into Tuddenham Mill Stream upstream of the village, the mill stream then flows into the River Lark (downstream of Mildenhall) and on into the Great Ouse and then the Wash. Discharges from this WwTW could have an effect on the Ouse Washes SPA/SAC/Ramsar sites, the Wash SPA/Ramsar sites and the Wash and North Norfolk Coast SAC.

The table below (Table 6) summarises where each of the waste water treatment works (WwTWs) within Forest Heath output and which European sites could possibly be effected by changes in the discharge quality or quantity of these WwTWs.

Table 6. Waste Water Treatment Works in Forest Heath and their discharge locations.

Waste Water Treatment Works (WwTW) (Area Served)	Receiving river	European Sites possibly effected
Brandon (Brandon)	Little Ouse	Ouse Washes SPA/SAC/Ramsar, The Wash SPA/Ramsar, The Wash and North Norfolk Coast SAC, Breckland SAC (Weeting Heath component SSSI)
Lakenheath (Lakenheath)	Twelve Foot Drain (via Crooked Dyke)	Ouse Washes SPA/SAC/Ramsar, The Wash SPA/Ramsar, The Wash and North Norfolk Coast SAC
Mildenhall (Mildenhall, Beck Row and West Row)	River Lark	Ouse Washes SPA/SAC/Ramsar, The Wash SPA/Ramsar, The Wash and North Norfolk Coast SAC
Newmarket (Newmarket, Kentford and Exning)	River Snail	Ouse Washes SPA/SAC/Ramsar, The Wash SPA/Ramsar, The Wash and North Norfolk Coast SAC, Fenland SAC, Chippenham Fen and Wicken Fen Ramsar
Tuddenham (Tuddenham, Red Lodge and Herringswell)	Tuddenham Mill Stream	Ouse Washes SPA/SAC/Ramsar, The Wash SPA/Ramsar, The Wash and North Norfolk Coast SAC

The following European sites and designated features could be affected by discharges:

- **Ouse Washes SPA** - Hen Harrier (*Circus cyaneus*), Bewick's Swan (*Cygnus columbianus bewickii*), Whooper Swan (*Cygnus cygnus*), Ruff (*Philomachus pugnax*), Northern Shoveler (*Anas clypeata*), Mallard (*Anas platyrhynchos*), Garganey (*Anas querquedula*), Gadwall (*Anas strepera*), Black-tailed Godwit (*Limosa limosa limosa*), Pintail (*Anas acuta*), Common Teal (*Anas crecca*), Eurasian Wigeon (*Anas penelope*), Common Pochard (*Aythya ferina*), Tufted Duck (*Aythya fuligula*), Mute Swan (*Cygnus olor*), Eurasian Coot (*Fulica atra*), Great Cormorant (*Phalacrocorax carbo*).
- **Ouse Washes SAC** - Spined Loach (*Cobitis taenia*)

- Ouse Washes Ramsar - Bewick's Swan (*Cygnus columbianus bewickii*), Whooper Swan (*Cygnus cygnus*), Eurasian Wigeon (*Anas penelope*), Gadwall (*Ana strepera strepera*), Eurasian Teal (*Anas crecca*), Northern Pintail (*Anas acuta*), Northern Shoveler (*Anas clypeata*), Mute Swan (*Cygnus olor*), Common Pochard (*Aythya ferina*), Black-tailed Godwit (*Limosa limosa limosa*).
- **Fenland SAC (Chippenham Fen and Wicken Fen)** - *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*), Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*, Spined Loach (*Cobitis taenia*), Great Crested Newt (*Triturus cristatus*).
- **Wicken Fen Ramsar site** - Criterion 1: One of the most outstanding remnants of the East Anglian peat fens. The area is one of the few which has not been drained. Traditional management has created a mosaic of habitats from open water to sedge and litter fields. Criterion 2: The site supports one species of British Red Data Book plant, fen violet (*Viola persicifolia*), which survives at only two other sites in Britain. It also contains eight nationally scarce plants and 121 British Red Data Book invertebrates.
- **Chippenham Fen Ramsar site** - Criterion 1: A spring-fed calcareous basin mire with a long history of management, which is partly reflected in the diversity of present-day vegetation. Criterion 2: The invertebrate fauna is very rich, partly due to its transitional position between Fenland and Breckland. The species list is very long, including many rare and scarce invertebrates characteristic of ancient fenland sites in Britain. Criterion 3: The site supports diverse vegetation types, rare and scarce plants. The site is the stronghold of Cambridge milk parsley (*Selinum carvifolia*).
- **The Wash SPA** - Little Tern (*Sterna albifrons*), Common Tern (*Sterna hirundo*), Bewick's Swan (*Cygnus columbianus bewickii*), Bar-tailed Godwit (*Limosa lapponica*), Northern Pintail (*Anas acuta*), Eurasian Wigeon (*Anas penelope*), Gadwall (*Anas strepera*), Pink-footed Goose (*Anser brachyrhynchus*), Ruddy Turnstone (*Arenaria interpres*), Brent Goose (*Branta bernicla bernicla*), Common Goldeneye (*Bucephala clangula*), Sanderling (*Calidris alba*), Dunlin (*Calidris alpina alpina*), Red Knot (*Calidris canutus*), Eurasian Oystercatcher (*Haematopus ostralegus*), Black-tailed Godwit (*Limosa limosa islandica*), Common Scoter (*Melanitta nigra*), Eurasian Curlew (*Numenius arquata*), Grey Plover (*Pluvialis squatarola*), Common Shelduck (*Tadorna tadorna*), Common Redshank (*Tringa tetanus*).
- **The Wash Ramsar site** - Eurasian Oystercatcher (*Haematopus ostralegus ostralegus*), Grey Plover (*Pluvialis squatarola*), Red Knot (*Calidris canutus islandica*), Sanderling (*Calidris alba*), Eurasian Curlew (*Numenius arquata arquata*), Common Redshank (*Tringa totanus totanus*), Ruddy Turnstone (*Arenaria interpres interpres*), Pink-footed Goose (*Anser brachyrhynchus*), Dark-bellied Goose (*Branta bernicla bernicla*), Common Shelduck (*Tadorna tadorna*), Northern Pintail (*Anas acuta*), Dunlin (*Calidris alpina alpina*), Bar-tailed Godwit (*Limosa lapponica lapponica*), Ringed Plover (*Charadrius hiaticula*), Black-tailed Godwit (*Limosa limosa islandica*), European Golden Plover (*Pluvialis apricaria apricaria*), Northern Lapwing (*Vanellus vanellus*).
- **The Wash and North Norfolk Coast SAC** - Sandbanks which are slightly covered by sea water all the time, Mudflats and sandflats not covered by seawater and low tide, Large shallow inlets and bays, Reefs, *Salicornia* and other annuals colonising mud and sand, Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*), Mediterranean and thermo-Atlantic halophilous scrubs (*Sarcocornetea fruticosi*), Coastal lagoons, Common seal (*Phoca vitulina*), Otter (*Lutra lutra*).
- **Breckland SAC (Weeting Heath component SSSI)** - Annex I habitats: Inland dunes with open *Corynephorus* and *Agrostis* grasslands; natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* type vegetation; European dry heaths; semi-natural dry grasslands and scrubland facies: on calcareous substrates (*Festuco-Brometalia*); alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*). Annex II species: Great Crested Newt (*Triturus cristatus*) and Barbastelle Bat (*Barbastella barbastellus*).

Of the five WwTWs in Forest Heath only Mildenhall and Newmarket have the existing capacity to accommodate the proposed Core Strategy growth in the period to 2031. The FHDC SFRA/WCS

has identified that the Lakenheath WwTW will have reached its flow capacity in the period 2010 to 2015 and the Tuddenham WwTW will have reached its flow capacity by 2025, although it has been identified that it would be possible to divert some of the demand from growth at Red Lodge to the Mildenhall WwTW. The Brandon WwTW will reach its flow capacity by 2030, although upgrades relating to phosphorus removal will be required between 2015 and 2020.

The table below (Table 7) is taken from the FHDC SFRA/WCS and summarises the existing capacities of the WwTWs in Forest Heath.

Table 7. Estimated amount of new dwellings feasible per WwTW (from FHDC and SEBC SFRA/WCS).

Authority	WwTW name	Predicted headroom against consent by 2031 (m^3/day)	Dwellings accommodated within existing consent headroom	Estimated period in which DWF reaches consent
FHDC	Brandon	14	1,354	Post 2031
	Lakenheath	-291	169	2010-2015
	Mildenhall	541	3,483	Post 2031
	Newmarket	1,119	5,210	Post 2031
	Tuddenham	-169	1,310	2025-2031
Key		Existing DWF + DWF from new development will exceed existing consent before 2031		
		Existing DWF + DWF from new development will be close to current consent by 2031		

It has been concluded within the SFRA/WCS that:

- the WwTW at Brandon can accommodate 1,354 new dwellings within the existing headroom consent, however the level of development proposed over the plan period will push the DWF (dry weather flow) close to its consent level. Also the WwTW will require upgrades relating to phosphorus removal in the period 2015 to 2020 to meet Water Framework Directive (WFD) "good" status.
- the WwTW at Lakenheath can accommodate 169 new dwellings and therefore will require upgrading in the period 2010-2015 in order to accommodate proposed growth levels.
- the WwTW at Mildenhall can accommodate 3,483 new dwellings at so has existing capacity to accommodate the growth proposed in the area, it has also been identified that the Mildenhall WwTW could accommodate some of the demand created by further growth at Red Lodge.
- the WwTW at Newmarket has existing headroom to accommodate 5,210 new dwellings and so can accommodate the growth proposed in the Core Strategy without the need for a capacity upgrade.
- the WwTW at Tuddenham has the headroom capacity to accommodate 1,310 new dwellings, as this WwTW also serves Red Lodge this is less than the capacity required to accommodate the growth proposed in the Core Strategy. The SFRA/WCS has identified that this WwTW will require upgrading in the period 2025-2031 in order to accommodate the proposed growth. It has also been identified that it could be possible to meet some of the demand for headroom from growth at Red Lodge through use of the Mildenhall WwTW.

River discharges and current water quality

Any reduction in water quality due to new development may be of detriment to European sites which are influenced by the rivers which the WwTWs discharge into (or are influenced by waters which the receiving rivers flow into).

All WwTWs in Forest Heath discharge into rivers which then flow into the Great Ouse and on into the Wash. Brandon WwTW discharges into the Little Ouse, Mildenhall WwTW discharges into the River Lark, Lakenheath WwTW discharges into Twelve Foot Drain which then flows into the Little Ouse, Tuddenham WwTW discharges into Tuddenham Mill Stream which then flows into the River Lark and Newmarket WwTW discharges into the River Snail which flows via New River and the River Cam into the Great Ouse.

The FHDC SFRA/WCS included examination and consideration of the current water quality of these receiving watercourses and the quality of discharges into them, it also compared the results to the requirements of the Water Framework Directive (WFD). A number of rivers within Forest Heath have been designated as sensitive areas under the Urban Wastewater Treatment Directive (UWWTD) as shown in table 8 below.

Table 8. Nutrient sensitive areas in Forest Heath

Sensitive Areas	Designation	Nutrient to reduce	WwTW affected
Cut-off Channel	UWWTD Sensitive area (Eutrophic)	Phosphorus	Mildenhall; Newmarket
River Lark	UWWTD Sensitive area (Eutrophic); Freshwater Fish Directive (Cyprinid)	Phosphorus	Mildenhall
Soham Lode/River Snail	UWWTD Sensitive area (Eutrophic)	Phosphorus	Newmarket
River Lark	UWWTD Sensitive area (Eutrophic)	Nitrate	Mildenhall
Little Ouse	UWWTD Sensitive area (Eutrophic); Freshwater Fish Directive (Cyprinid)	Nitrate	Mildenhall
Soham Lode/River Snail	UWWTD Sensitive area (Eutrophic)	Nitrate	Newmarket

The table below (Table 9) summarises the quality of the watercourses which receive discharges from WwTW and assess whether their current quality meets WFD “good” status (chemical).

Table 9. WwTWs and receiving watercourse water quality.

WwTW	Receiving Watercourse	UWWTD Sensitive Area		Freshwater Fish Directive		2006 Quality Status							Will current Quality meet WFD good status (chemical)?			
		P	N	Cyprinid	Salmonid	RE Target	RE Actual	RE Compliance	GQA Comp	GQA Bio	N	P	BOD	Amm	P	DO
Brandon	Little Ouse	Y	Y	Y	-	2	2	Compliant	B	A (2003)	5	4	Y	Y	Y/ N	Y
Lakenheath	Twelve Foot drain	-	-	-	-	3	4	Marginal	D	B	5	3	Y	Y	Y	N
Mildenhall	River Lark	Y	Y	Y	-	3	2	Compliant	B	A (2004)	5	4	Y	Y	Y/ N	Y
Newmarket	River Snail	Y	Y	-	-	3	3	Compliant	C	B (2004)	5	5	Y	Y	N	Y
Tuddenham	Tuddenham Mill Stream	-	-	-	-	2	2	Compliant	B	C	6	4	-	-	Y/ N	-

Note: Lakenheath discharge is not within a monitored reach, so the nearest d/s reach is listed.

The FHDC SFRA/WCS identified that all five WwTW in Forest Heath could currently fail to meet WFD "good" status, therefore they could cause negative effects on European sites which discharged waters flow into or through. Increased discharge from these works in the future may aggravate the situation further. Nutrient loads are currently shown to be a major issue, with phosphorus (P) known to be the major issue in terms of eutrophication in freshwater river systems. However the SFRA/WCS notes that it is likely that each of the works in Forest Heath will undergo some development to achieve greater phosphorus removal to level of 1mg/l, irrespective of having less than 10,000 PE, in line with known Best Available Techniques (BAT) for WwTW processes.

Environment Agency monitoring of the discharge receiving watercourses has also identified very high nitrate levels in the Tuddenham Mill Stream and low dissolved oxygen (DO) levels in Twelve Foot Drain, the Internal Drainage Board (IDB) who manage Twelve Foot Drain are also concerned about high nutrient levels in storm discharges. Ammonia levels in the River Snail are also at a point which would fail to meet WFD "good" status.

The results suggest that while there are existing levels of phosphates and nitrates from diffuse inputs into the watercourses in the District, the discharges from WwTWs are compounding this, particularly the phosphate discharges into all receiving watercourses and nitrate levels into Tuddenham Mill Stream.

There is a concern that the existing levels of nitrates and phosphates could be limiting. While it is accepted that phosphates are likely to be a more significant limiting factor in freshwater aquatic systems than nitrates, where phosphate levels are reduced, nitrates, previously masked by high phosphate levels, can also have effects.

The calculations from the SFRA/WCS of existing discharge capacity and future calculated flows are of considerable importance as the eventual discharges may impact on the river systems flowing into or through European sites. If capacities are exceeded this may result in eutrophication or pollution of river water if discharges are not compliant with quality.

Overall the conclusions from the SFRA/WCS are:

- In Brandon the potable supply network may require a network upgrade for development to the north, south and west of the town and that the sewerage network may require an upgrade or new main for development to the north, east or south of the town. Also the WwTW will require upgrade by 2031, an upgrade to phosphorus removal may be required before then.
- In Beck Row the sewerage network may require an upgrade for development to the north and west of the village.
- That current phosphorus and ammonia levels in the River Snail would fail to meet the WFD "good" status.
- In Lakenheath the potable supply network to development in the north, south and west may require an upgrade and the sewerage network to development in the east and south may require an upgrade or river crossing. Also the WwTW will require a capacity upgrade by 2015 and the downstream water quality is only marginally meeting RE3 due to low DO and concern over nutrients in storm discharges.
- In Mildenhall the potable supply network to new development in the east and south may require upgrading and the sewerage network to the east and south may require an upgrade. Upgrade of phosphorus removal at the WwTW may be required due to P levels in the downstream monitored stretch of the River Lark.

The above appropriate assessment work in relation to discharges and altered flows shows that additional treatment capacity will be required at Brandon, Lakenheath and Tuddenham WwTW at various stages in the period to 2031. There are also concerns that the water quality of the receiving watercourses will not reach WFD "good" status particularly for phosphate levels, and it is likely that discharges from the WwTWs are contributing to this.

It therefore cannot be concluded that the wastewater discharges from the proposed developments (and possibly the resultant flow alterations) will not have an adverse impact on affected European sites without putting in place mitigation measures which are adequate in terms of capacity, level of treatment and timing. The work carried out by Hyder Consulting in the SFRA/WCS sets out approximate phasing of upgrades to WwTW and will help coordinate these upgrades with the development proposed in the Core Strategy.

It seems probable that the requirements of the legislation and particularly the forthcoming enforcement of the WFD through the Environment Agency will provide a robust and effective way of achieving future development without adverse effects on European sites.

It should also be noted that discharges upstream and outside of Forest Heath are having some effect on the quality of the water in the watercourses in the District. This is particularly true of the water in the River Lark, which receives discharges from Fornham All Saints and Barrow WwTWs which serve Bury St Edmunds and the surrounding villages. It has been identified that the reach downstream of the Fornham All Saints WwTW (which is the main driver of water quality in the River Lark) has excessively high nitrate levels and very high phosphorus levels and would fail to meet WFD "good" status for phosphorus and ammonia. This will have an effect on water quality further downstream in Forest Heath. However remedies to this situation are beyond the control of Forest Heath District Council, the responsibility lying with the Environment Agency, AWS and St Edmundsbury Borough Council.

In considering the impacts of water discharges on European sites it is concluded that it cannot currently be demonstrated that there would not be an adverse effect upon European sites as a result of the proposed development within policies CS2, CS6, CS7, CS10 and CS12. WwTW upgrades will be required at Brandon, Lakenheath and Tuddenham and upgrades to phosphorus removal may be required at all WwTW to meet WFD "good" status.

Measures must now be considered to determine whether these requirements can be met prior to the potentially damaging new development.

Water resources and water supply

The SFRA/WCS has identified that at present, subject to the incorporation and delivery of the promoted water resource supply development schemes (external transfers) and demand management promoted within the dWRMP (draft Water Resource Management Plan), there is sufficient water resource capacity to accommodate the growth proposed in the Core Strategy up to 2031. A review of the surrounding Catchment Abstraction Management Strategy (CAMS) information suggests that there is limited capacity to support further abstraction to meet increased demand.

The following designated features on European sites may be affected by water abstraction:

- Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition*-type vegetation (Breckland SAC)
- Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Breckland SAC)
- Great Crested Newt (*Triturus cristatus*) (Fenland SAC, Breckland SAC)
- Stone Curlew (*Burhinus oedicnemus*) (Breckland SPA)
- Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* (Fenland SAC)
- Spined Loach (*Cobitis taenia*) (Fenland SAC)
- *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) (Fenland SAC)
- Cambridge Milk Parsley (*Selinum carvifolia*), Fen Pondweed (*Potamogeton coloratus*), Narrow-leaved Marsh Orchid (*Dactylorhiza traunsteineri*), Early Marsh Orchid (*Dactylorhiza incarnata* ssp. *ochroleuca*) (Chippenham Fen Ramsar)

- Invertebrates *Deltote bankiana, Clubiona rosserae, Parochthiphila spectabilis, Cyrturells albosetosa, Thaumatomyia* sp.*, Gyrophaena pseudonana, Tasciocera collini, Scrobipalpa pauperella, Heterosphilus fuscexilis, Phrudus badensis, Blacometeorus pusillus, Entedon marci*. (Chippenham Fen Ramsar)
- Fen Violet (*Viola persicifolia*), Fibrous Tussock Sedge (*Carex appropinquata*), Marsh Pea (*Lathyrus palustris*), Whorled Water-milfoil (*Myriophyllum verticillatum*), River Water Dropwort (*Oenanthe fluviatilis*), Milk Parsley (*Peucedanum palustre*), Fen Pondweed (*Potamogeton coloratus*), Flat-stalked Pondweed (*Potamogeton friesii*), Long-stalked Pondweed (*Potamogeton praelongus*) (Wicken Fen Ramsar)

Table 10 (below) shows that the nearby surface and ground waters are either over-licensed (little water available at low flows), over-abstracted or have no water available at present. Additionally, there is very little opportunity across the District for further surface or ground water development (extension of existing or new), particularly during the summer months. The water supply for the area is heavily dependent on ground water abstraction as a result of historical development and due to potential surface water sources having similar constraints.

The current approach from the EA is to secure licence variations by reducing the abstraction volumes in critical areas under its existing powers when abstraction licences are up for renewal.

Table 10. Surface and ground water availability in Forest Heath

Associated Main River	Resource Availability Status			
	Individual WRMU Status	Integrated WRMU Status	Target Status in 2013	Target Status in 2019
Water Resource Management Unit (Surface Water)				
River Snail	NWA	NWA	NWA	NWA
Upper River Lark	NWA	NWA	NWA	NWA
Lower River Lark	OL	OL	OL	OL
Upper Little Ouse	OL	OL	OL	OL
Lower Little Ouse	OL	OL	OL	OL
Ground Water Management Unit (Ground Water)				
River Snail Chalk	OA	OA	OA	OA
Upper River Lark Chalk	OA	OA	OA	OA
Lower River Lark Chalk	OA	OA	OA	OA
Upper Little Ouse Chalk	NWA	NWA	NWA	NWA
Lower Little Ouse Chalk	NWA	NWA	NWA	NWA

The availability of water is classified by the Environment Agency as:
- Water Available (WA): Water is likely to be available at all flows including low flows. Restrictions may apply.
- No Water Available (NWA): No water is available for further licensing at low flows. Water may be available at higher flows with appropriate restrictions.
- Over Licensed (OL): Current actual abstraction is such that no new water is available at low flows. If existing licences were used to their full allocation they could cause unacceptable environmental damage at low flows. Water may be available at high flows, with appropriate restrictions.
- Over Abstracted (OA): Existing abstraction is causing unacceptable damage to the environment at low flows. Water may still be available at high flows, with appropriate restrictions.

The classification for each of the rivers and groundwater areas in the District are shown in Table 10 above.

Forest Heath is within Water Resource Zone (WRZ) 09 (Cambridgeshire and West Suffolk Water Resource Zone) which enables Anglian Water (AWS) to take a flexible approach to manage water demand through an interlinked system, supplied by abstractions from the underlying Chalk aquifer. The majority of supplies to WRZ09 are from groundwater abstraction. The 2008 AWS draft Water Resource Management Plan (dWRMP) states that Forest Heath is in a water deficit area (deficit 0 to -7.49 Ml/d).

The SFRA/WCS identifies that Forest Heath is part of Anglian Water's Bury supply area, the following major water resource issues have been identified for this supply area by AWS:

- Increased capacity at Riddlesworth WS (11km from Stanton) may result in additional supplies being made available for the Ixworth resource zone.
- Barrow Heath, Kings Road, Rushbrooke and Risby comprise the Upper Lark Licence which is close to the prescribed annual limit. Potential solutions include the Long Melford booster (short term only) and diversion of resources from Stanton boreholes.
- Two new replacement boreholes (BHs) are required at Great Wratting WS.
- Kedington BH is proposed as a standby for the Wixoe large borehole at Great Wratting, however a new supply main to Great Wratting WS is required.
- The proposed borehole at Whelnetham has contamination problems and cannot be progressed currently.
- Existing and new BHs at Risby WS may have pesticide issues.
- Potential for sewer contamination at Brandon WS BH.
- Rationalisation of the Kings Road BHs is required to improve safety of supply.
- Investigations into potential scheme to trade water with Cambridge Water Company are ongoing.

AWS have identified that there are seven source works located in the Bury supply area, these are listed in Table 11 below.

Table 11. Public Water Supply works within the Bury Supply Area (that supply Forest Heath and St Edmundsbury)

Source Works	Source Type	Public Water Supply Zone (PWS)	Average 2006 Output (Ml/d)
Barrow Heath	Groundwater	Bury	7.7
Brandon	Groundwater	Brandon	1.58
Bury Kings Road	Groundwater	Rushbrooke	5.1
Risby	Groundwater	Bury	2.7
Rushbrooke	Groundwater	Rushbrooke	4.9
Stanton - Ixworth	Groundwater	Ixworth	4.6
Great Wratting	Groundwater	Haverhill	9.1

AWS dWRMP has the following network improvements planned for WRZ09:

- Great Ouse Groundwater Development Scheme (GOGDS): the availability of this scheme will be limited by the EA but it is thought that Bury St Edmunds could be one of the first Planning Zones to benefit from it (AMP5);
- Utilise the link between Brandon and Thetford Planning Zones to better exploit the GOGDS once this is incorporated into these planning zones (AMP5);
- Development of a strategic link between the Ely and Newmarket Planning Zones, again to utilise GOGDS (AMP7); and
- A strategic link between the Haverhill and Colchester Planning Zones (AMP7).

AWS and the EA are reviewing the future use of the GOGDS due to concern over the potential for environmental damage during times of high abstraction and because Essex and Suffolk Water are

developing alternative resources. AWS believe the GOGDS could be used to supply WRZ07 (North-East of Brandon and Thetford) and subsequently transfer to the surrounding WRZs, including WRZ09. Alterations to GOGD scheme could have effects on European sites outside of Forest Heath, this will need to be monitored by AWS and the EA in order to ensure that no negative effects occur.

The available information indicates that the main water demands in the District are around Newmarket, which is an area which has been highlighted for further development. This is inline with the development areas identified in the Bury Water Supply Strategy. The AWS dWRMP shows that for the baseline critical period scenario, WRZ09 will have a surplus of water resources available against target headroom until 2019. There are options of extending trunk mains to other WRZ in order to increase supply, these are set detailed in the SFRA/WCS.

The SFRA/WCS concludes that once the planned AMP4 schemes, together with further measures, such as leakage reduction and water efficiency strategies, are implemented in AMP5 period then there is sufficient water resource supply to accommodate the growth in the study area without increased abstraction having negative effects on European sites.

From the available documentation and the above appropriate assessment it appears that existing water resources will be sufficient to cater for the increased demand brought about by new development, although this may be dependent, to a certain extent, on water transfer schemes. However until Stage 2 of the SFRA/WCS is complete this can not be confirmed, so, following the precautionary principle, it is therefore concluded that it is not possible to determine that there will be no adverse effect upon the integrity of European sites as a result of water abstraction.

The Environment Agency's abstraction licensing system should serve to protect European sites from the negative effects of over-abstraction. Although it is important to ensure that new water supply solutions, such as water transfer schemes, do not have a negative effect on any European sites.

It also appears that some of the aquifers that serve Forest Heath are also shared with other Districts and may be affected by water abstraction from outside of Forest Heath. It is important that in-combination effects on European sites are considered by all HRAs in the region.

11. Appropriate Assessment of new or improved infrastructure and road improvement requirements (Policies CS10 and CS12)

New or Improved Infrastructure Provision

Policies CS10 and CS12 set out the identified infrastructure requirements (including transport improvements) for the District. New development may require new infrastructure to meet social and physical demands, and as such improvements will need to be made to existing infrastructure, and new social and physical infrastructure will be required.

The social infrastructure requirements (education, health and social facilities) are not taken forward to appropriate assessment, as it is not considered that this aspect of Policy CS12 is likely to have a significant effect upon any European site. There may be a need for project level appropriate assessments where the provision of such facilities cannot demonstrate that there would not be a likely significant effect, for example where such a facility is proposed at project level to be in close proximity to a European site.

The remaining elements of Policy CS12 and Policy CS10 relate to physical infrastructure. The provision of energy infrastructure is not taken forward to appropriate assessment, as it is considered that this is not likely to have a significant effect upon any European site. As specific energy projects are not referred to in policy CS12 it is considered that this aspect of the policy is

not likely to result in significant effects. There will however be a need for project level appropriate assessments where the provision of such infrastructure cannot demonstrate that there would not be a likely significant effect. Such projects may include wind farms, for example. Due to the complexity and multitude of potential effects upon European sites relating to water infrastructure, these have been dealt with in a separate section of this appropriate assessment (see section 10). Outstanding issues therefore remain in relation to the provision of adequate transport infrastructure.

Policies CS10 and CS12 refer to the need for new road infrastructure within the District, this includes both specific projects, such as the dualling of the A11, as well as new infrastructure and infrastructure improvements required to in relation to the sustainable urban extensions and employment growth set out in policies CS6 and CS7.n considering the Core Strategy it is essential that such road infrastructure requirements are considered, as the development creating a need for such improvements is set out within the Core Strategy. Once the lower tier plans are brought forward, the requirement for such infrastructure will already be set, and assessment will therefore become difficult. With the network of European sites particularly in the north and east of the District that are intersected by existing roads (see Figure 7), there is concern that improvements to these existing roads, and likely focus of need for new roads around the urban extensions and employment allocations could lead to adverse effects upon the site interest features.

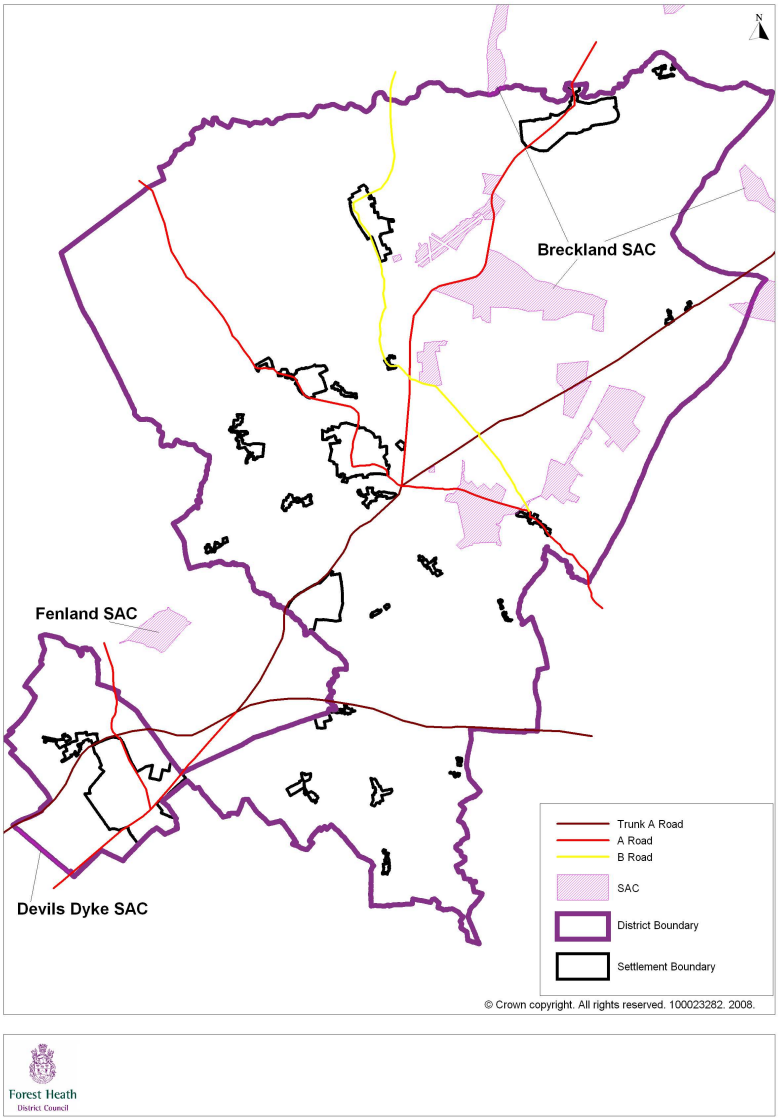


Figure 7. SACs in relation to the road network, showing close proximity of exiting roads to Breckland SAC and Devils Dyke SAC.

It is therefore considered that the requirements for new or improved road infrastructure provision, as set out in policies CS10 and CS12, are likely to result in the following significant effects:

- Increased levels of air pollution affecting sensitive features of SAC habitats.
- Potential reduction in the density of Habitats Directive Annex I bird species associated with the SPA, due to avoidance of areas close to new roads.

The Impact of Air Pollution on SAC Habitats

Heathland habitats are vulnerable to atmospheric pollution, and in particular the addition of nitrogen (Barker *et al*., 2004, Bobbink *et al*., 1998, Britton and Fisher, 2007, Power *et al*., 1998, Power *et al*., 1995, Terry *et al*., 2004). The severity of these impacts depends on abiotic conditions. The most important effects are the accumulation of nitrogenous compounds resulting in enhanced availability of nitrate or ammonia, soil-mediated effects of acidification and increased susceptibility to secondary stress factors. Long-term nitrogen enrichment results in increased

availability of nitrogen leading to competitive exclusion of characteristic species by more nitrophilic plants.

Breckland heaths may be particularly sensitive. There have been dramatic and rapid contractions in the distribution and abundance of Breckland lichen species and one species, Starry Breck-lichen (*Buellia asterella*), in now thought extinct (the first UK BAP priority species to go extinct). The cause of this decline is believed to be a result of the previously open grassland having closed up due to the spread of higher plants and bryophytes denying the lichens the calcareous mineral soil they require as a substrate. Increased aerial inputs of nitrogen are chiefly responsible for sward closure (Gilbert, 2002).

The A11 goes through the SAC and numerous other roads are close to the Breckland SAC, also the A1304 south-west of Newmarket runs adjacent to part of Devils Dyke SAC. The component SSSIs listed in Table 12 (below) fall within 200m of existing A roads.

Table 12. SSSI components of SACs within 200m of a road.

SSSIs within Forest Heath and within 200m of the A11	SSSIs within Forest Heath and within 200m of other A roads	SSSIs outside Forest Heath but within 200m of the A11	SSSIs outside Forest Heath but within 200m of other A roads
Weather and Horn Heaths, Eriswell (BSAC).	Cavenham-Icklingham Heaths (BSAC); Deadman's Grave, Icklingham (BSAC); Foxhole Heath, Eriswell (BSAC); Lakenheath Warren (BSAC); RAF Lakenheath (BSAC); Wangford Warren and Carr (BSAC); Devils Dyke (Not in BSAC).	Thetford Golf Course and Marsh (BSAC); Bridgham and Brettenham Heaths (BSAC).	Thetford Heath (BSAC); East Wretham Heath (BSAC); Barnhamcross Common (BSAC); Devils Dyke (Not in BSAC).

(BSAC - Breckland SAC)

The scale of proposed development within Forest Heath is such that there will be increases in traffic volumes, and possibly to the extent that road improvements and new road projects will be required. New road projects potentially include additional dualling of the A11 and bypass schemes at Brandon and Mildenhall.

If road improvements or new roads will be the likely consequence of development proposed within the Core Strategy, those likely consequences of development must also be considered in the HRA of the Core Strategy. Where any road improvements, including road widening or improvements for the purpose of increasing the traffic capacity of the road, would lie within 200m of a SAC, this is likely to result in an adverse effect. It is essential therefore that any possible measures to prevent adverse effects are considered at this stage. To leave consideration of road improvements until after the Core Strategy has been given effect would remove the possibility of applying mitigation measures in advance of the development and/or would remove the opportunity to consider alternative options. It therefore needs to be established whether road improvements will be the likely consequence of development proposed within the Core Strategy. If any will be likely, mitigation and potential alternative options must then be considered in light of the likely adverse effects of increased traffic and road infrastructure improvements.

The Avoidance of Roads by Stone Curlews

Stone curlews are summer migrants, associated with open, bare habitats, such as some heaths, downland and some arable. Within the Breckland they occur on grassy heaths (where densities

tend to be highest) and also on arable land. The numbers of birds nesting on arable land have been increasing over time, and there have been some slight declines in the numbers nesting on grassland sites in recent years (Sharp *et al*., 2008a). A clear avoidance, by stone curlews, of otherwise suitable habitat adjacent to major roads has now been demonstrated in a number of studies (Day, 2003, Green *et al*., 2000, Sharp *et al*., 2008).

The initial work by Green *et al* (2000) found that stone curlews avoided nesting on arable land near major roads, but that there was no significant effect of secondary roads. The apparent avoidance was thought not to be the result of a scarcity of suitable fields near roads, since the modelling approach taken by Green *et al*. had allowed for effects of nesting and foraging habitats. The authors cite work that shows that stone curlews are rarely killed on roads, and therefore they argue that the avoidance was a behavioural response, potentially as a result of noise of the movement of vehicles. They suggested that population density was diminished within 3km of roads.

Subsequent work, in an unpublished doctoral thesis (Day, 2003, cited in Liley *et al*., 2008) further explored the avoidance and tried to establish the underlying mechanisms. Day found that nesting stone curlews significantly avoided motorways and trunk A roads in each year (1985-2000) apart from 1989. Non trunk A roads were significantly avoided in most years, and there was little avoidance of B roads. The avoidance of trunk A roads became stronger over time - in a period in which road traffic increased particularly rapidly on trunk A roads. Day found no effect of roads on breeding success (such as nest success, chick growth rate, chick survival) or adult survival. He modelled noise and light levels in the vicinity of roads, and found that the density of stone curlew nests was more strongly related to modelled levels of light from vehicle headlamps than noise levels. He argues that the underlying mechanisms for the avoidance remain to be confirmed and therefore the design and effectiveness of mitigation measures remains uncertain.

More recently Sharp *et al* (2008a) found a significant avoidance of trunk roads by nesting stone curlews. Yearly data were grouped into four periods (1988-92, 1993-96, 1997-2000, 2002-2006) and for all four periods, the nest density on arable land within 500m of a trunk road was statistically lower than densities at greater distances. Over the first (1988-92) and last (2002-2006) periods, there was also statistically significant differences between nest densities on land in the 500-1,000m band relative to those at greater distances from trunk roads. With all years' data combined, the total nest numbers involved were sufficient for effects to be detectable up to 1,500m. A similar analysis if nest density in relation to distance from non-trunk A roads was carried out and showed a negative impact of the presence of non-trunk A roads on stone curlew nest density up to a distance of 500m.

Sharp *et al* compared individual roads within the study area and found that, in the majority of cases the same positive relationship between stone curlew nest density and distance from a road was present. The A11, a trunk road, and the A1065, a non-trunk A road, both have similar areas of habitat available within similar distance band, and both are avoided by nesting stone curlews. The densities are far greater around the A1065 than around the A11 and the avoidance is only observed in the nearest 500m for the A1065 while it is observed up to 3km for the A11. While there are a number of other factors which influence the choice of nest location by stone curlew, such as the surrounding habitat quality, settlements and field size, the A11, which is likely to have heavier traffic, appears to have a greater impact upon the spatial distribution of stone curlew nests than the A1065, which is likely to have lighter traffic.

In all time periods covered by the data, the nest density on arable land within 500m of a trunk road was statistically lower than densities at greater distances. Over the first (1988-1992) and last (2002-2006) periods, there was also statistically significant differences between nest densities on land in the 500-1,000m band relative to those at greater distances from the trunk roads. With all years' data combined, the total nest numbers involved are sufficient for effects to be detectable up to 1,500m. This would suggest that there is a negative relationship and potential negative impact of trunk roads on stone curlew nest density up to a distance of at least 1,000m, and maybe up to 1,500m.

Using a grid of 500m cells over the Breckland area, Sharp *et al* built predictive models to explore the effect of housing, roads and traffic on the density of stone curlew nests within each cell. The final model included weighted terms for all three variables (housing, length of road and traffic levels), indicating that each of these is significant in combination with the others. Both nest density and housing were average values over the period 2002-2006 as this coincides with the period over which traffic levels were available. When the daily traffic variable was zero (77% of all 500m cells), average nest density declined consistent with increasing values of the housing variable. When the housing variable had low values, then average nest density decreased as the daily traffic variable increased. Nest density also declined consistently with increasing daily traffic amongst all cells housing variables values in the next higher class 3001-7000.

Sharp *et al* suggest that there is a negative impact of trunk roads on stone curlew nest density on arable land up to a distance of at least 1000m, and maybe up to 2000m. For non-trunk A roads there is also a negative impact up to a distance of 500m. Any new road infrastructure, if occurring close to suitable stone curlew habitat is therefore likely to result in an impact. Increases in road traffic volumes would also be of concern. Data provided by Norfolk County Council on projected road traffic increases along the A11 suggest traffic could increase by as much as 35% over the period to 2026; this figure of 35% was used by Sharp *et al* in their modelling.

Road traffic increases are likely throughout Forest Heath and there is some likelihood of new roads being required. Given the scale of avoidance of roads shown for stone curlews, and the likely increases in traffic volumes, it is apparent that adverse effects upon the stone curlew interest feature are likely.

If road improvements or new roads will be the likely consequence of development proposed within the Core Strategy, those likely consequences of development must also be considered in the HRA of the Core Strategy. Indirect effects on European site features are likely, and in some cases the potential options for road improvements could directly result in an adverse effect. It is essential therefore that any measures possible to prevent adverse effects are considered at this stage. To leave consideration of road improvements until after the Core Strategy has been adopted would remove the possibility of applying mitigation measures in advance of the development and/or would remove the opportunity to consider alternative options. It now therefore needs to be established whether any new roads, or road improvements such as widening or other measures to increase the traffic capacity, will be the likely outcome of the development proposed and supported within the Core Strategy. Mitigation and potential alternative options would then need to be considered in light of the likely adverse effects of increased traffic and road infrastructure improvements.

12. Mitigation

Introduction, direct effects of built development, indirect effects (disturbance), other urban effects, flood risk, water quality and waste water discharge, water supply, air pollution from roads, avoidance of roads by stone curlews, conclusions, re-screening (if necessary).

Introduction

In accordance with Regulation 85B (1) of the Habitats Regulations, an appropriate assessment of the implications of the Forest Heath Core Strategy for European sites has been carried out. The appropriate assessment was undertaken on a number of policies within the Core Strategy where it was determined that those policies would be likely to have a significant effect upon a number of European sites. In light of the assessment made, and the requirements of Regulation 85B (4), Forest Heath District Council as the plan making body, should not give effect to the plan in its

current form because the appropriate assessment concluded that it could not be demonstrated that adverse effects upon the integrity of a number European sites would not occur.

It is therefore necessary to consider whether, in light of the assessment made, any mitigation measures could be applied to the plan in order to prevent any adverse effect upon the integrity of the European sites in question, and meet the requirements of Regulation 85B (4), to enable the plan to precede to adoption. The following sections consider the mitigation options available for each potential adverse effect, and the validity and robustness of those mitigation options.

Direct effects of built development

The appropriate assessment concluded that it could not be ascertained that adverse effects upon the three Annex I bird species; nightjar, woodlark and stone curlew, would not occur as a result of the Core Strategy in terms of the proposed new built development set out within the Core Strategy that would be located within in close proximity to habitat used by the three species. The assessment determined that, based upon the best ecological information available, the point at which effects could no longer be considered to be adverse was at a distance of between 1,000m and 2,500m between the new development and the Annex I bird species habitat. The habitat may lie within the SPA or occur as supporting habitat outside the SPA boundary.

There is no evidence to show that screening (such as shelter belts or landscaping) might reduce the avoidance of built development by stone curlews and enable the distance at which the effects are considered to be adverse to be reduced. Many fields do have existing shelterbelts, and the avoidance of housing is still clear across suitable arable land, suggesting that screening will not work as mitigation.

Provision of mitigation land or improved management of land within the SPA may be appropriate as mitigation for development within the proposed buffer zone. The creation of new areas of supporting habitat, replacing supporting habitat outside the SPA, away from building and disturbance could provide potential nesting locations for displaced birds that utilise land outside the SPA boundary. Also given that it is still unknown what impact an increased stone curlew population will have on the observed avoidance further research and monitoring of such effects will be required.

In developing strategies to avoid the effects of housing on heathland birds, competent authorities in close proximity to the Thames Basin Heaths and Dorset Heathlands have considered research findings that cat predation can affect heathland bird populations. The Dorset and Thames Basin strategies took the distance of 400m as a no build zone around the edge of SPA heathland site, this distance was chosen to minimise additional cat predation on the adjacent heathlands and also to reduce additional visitor pressure (with 400m being a typical distance that many people will travel on foot). Research in Dorset has indicated that cat predation is a particular problem for Dartford Warbler populations (Murison, 2007), a species that does not occur in the Brecks. Furthermore, the nesting patterns and densities of woodlark and nightjar within and around the Breckland SPA are quiet different, with the range of habitat available and limited urbanisation around parts of the SPA utilised by these two Annex I species. Development proposals within 400m that occur close to nightjar or woodlark habitat will be few, and it is therefore proposed that the Core Strategy simply states that development within 400m of the SPA will need to undertake a project level HRA.

It is therefore concluded that the way to prevent adverse effects upon the three Annex I species is to ensure the Core Strategy is amended to make certain that:

- Any development within 1,500m of the SPA boundary for those parts of the SPA that are classified for Stone Curlew will require a project level HRA to ensure that no adverse effect is had upon the SPA qualifying feature. Whilst no development is specifically proposed within

the 1,500m buffer in the Core Strategy this project level requirement will ensure that no adverse effect is had upon the integrity of the SPA. It will also allow for any changing information on the avoidance pattern of a larger stone curlew population to be taken into account.

- For any development within 400m of the parts of the SPA designated for Woodlark and Nightjar, a project level HRA will be required to demonstrate that the development will not have an adverse effect upon the integrity of the SPA.
- Areas outside the SPA that support stone curlews (Liley *et al.*, 2008 suggest 1km grid squares that have supported at least five nesting attempts since 1995) should also be buffered to 1,500m in the Core Strategy. In these areas new development will need to be assessed at the project level and mitigation (such as new areas of suitable habitat for stone curlews) be provided.
- These zones will possibly need to change in the future, in response to new survey information and in recognition that supporting habitat may change over time. The different zones should therefore be reconsidered at plan review.

The zones described above are shown in Appendix 2.

Avoidance and mitigation summary - Direct effects of built development

Core Strategy amendments

- Include the 1,500m zone map in the Core Strategy, with explanatory text.
- Ensure policy wording states that any development within the 1,500m buffer zone will require a project level Habitats Regulations Assessment (HRA). The project level HRA must be able to demonstrate that the development will not have adverse effects upon the Breckland SPA qualifying features, in this case Stone Curlew.
- Any development proposal that lies within the 400m SPA component buffer must be able to demonstrate, through project level HRA, that the Woodlark and Nightjar interest features of the SPA will also not be adversely affected by the proposal.

Further action

With the measures applied above, no further action is required.

Indirect effects: disturbance to Annex I birds associated within the SPA

The appropriate assessment took a precautionary approach in its consideration of the potential indirect effects of increased disturbance to Annex I species as a result of the proposals set out within the Core Strategy Final Policy Option. Whilst it was considered that increased access levels would be relatively low, it could not be ascertained that the predicted low level increases would not have an adverse effect.

It is considered that, in view of the low level of disturbance likely, a package of mitigation measures as outlined below would be sufficient to reduce, avoid and contain any disturbance impacts to the extent that adverse effects would be prevented. The different elements would need to be carefully developed and would involve partnership working with local landowners, agencies and conservation bodies, and therefore relies upon stakeholder consensus and the best available knowledge. The District Council would need to consider where it will be necessary to secure legal agreements to give certainty that the measures will be implemented.

All new tourism development such as new car parks and the promotion of honey-pot sites should only be taken forward in areas relatively unsuitable for Annex I birds (such as deciduous woodland).

The provision of alternative sites for dog walking close to areas of new development. Such sites would need to be of a suitable size to accommodate a range of different routes (including some of at least 2.5km), with car parking facilities, varied countryside and safe environs for dogs to be off leads and no potential conflicts with other users (such as children, mountain bikers or horse riders).

Work with Forestry Commission and other local landowners to develop a partnership approach to the protection and enhancement of European habitats. The following suggestions should be considered for implementation via a partnership approach:

- Seek ways to ensure access is focussed away from open habitats, for example by promoting way-marked routes for dog walkers, cyclists etc. These routes would need to be flexible in that they are changed every few years in response to forestry management.
- The creation of permanent areas of open habitat, suitable for woodlark and nightjar, in areas with low levels of access (i.e. away from areas of disturbance).
- Mobile wardens or rangers on sites where birds are present. Wardens/rangers would promote responsible access (dogs on leads etc.) and also be responsible for education initiatives, liaison with the public and liaison with access user groups.
- Maintenance and regular policing of access restrictions under CRoW for areas of open country supporting stone curlews.
- Access restrictions under CRoW implemented to ensure stone curlews are not deterred from settling due to recreational disturbance levels.

It is recommended that a mitigation and monitoring strategy be committed within the Core Strategy and written and implemented within a set timescale. Such a strategy would involve regular monitoring of birds (including nest monitoring to check for disturbance effects) in order to guide and target access management measures. Additional research could include work to explore the changes in numbers of key species in relation to habitat quality and disturbance.

Indications are that the low level of disturbance is not likely to have a significant effect, yet lack of research to the contrary has led to the precautionary conclusion that adverse effects could not be ruled out with the necessary certainty. With the application of the measures proposed, it is considered that the indirect effect of increased disturbance to Annex I birds will be completely avoided, and may even provide a net benefit in terms of more positive visitor management. With the avoidance of any adverse effect, it is considered that there will not be any remaining effects for consideration in-combination with any other plan or project.

Avoidance and mitigation summary - Indirect disturbance to Annex I birds

Core Strategy amendments

Include policy wording or supporting text to explain that the Council is committed to ensuring sustainable levels of recreation in and around the Breckland SPA, and work with partners including Natural England, RSPB and Forestry Commission to develop a strategy that sets out an access management and monitoring programme that provides measures to prevent increasing visitor pressure, and suitable mitigation (should monitoring indicate that Annex I species are failing to meet conservation objectives due to recreational pressure).

Further action

With the measures applied above, no further action is required.

Other urban effects

The appropriate assessment concluded that urban effects, which include a wide range of impacts such as increased fires, litter and eutrophication, would be likely to operate synergistically to adversely affect the conservation interest of European sites that are located within areas of high housing density.

It is therefore recommended that the following measures should be applied for any SAC or SPA sites close to development:

- Mobile wardens/ranger staff with a remit focussed on access management and promoting responsible access. Duties would include issuing dog bags, asking people to keep dogs on leads, watching for fires and illegal activity (such as off-road bikes) and promoting the conservation of the sites through one-to-one contact with visitors and education programmes.

- Close work with local conservation staff and the local emergency services to ensure rapid response to fires and to any illegal activity (such as off-road motorcycles). Response to fires should involve familiarisation of emergency staff with the sites, clear labelling of gates and access points and an accurate means of rapidly conveying locations of fires and suitable access routes.

- Provision of dog bins at suitable locations.

- The provision of suitable areas for dog walking and recreational use (walks etc). Such sites should be large enough to provide a range of routes, have varied terrain/range of habitats, safe parking and be suitable for dog owners to let their dog off a lead.

- Control of parking availability and limiting parking away from official car parks on designated sites.

- Access infrastructure as necessary to limit access by off-road vehicles to sensitive locations.

- Education programmes, promotion of nature conservation and responsible access with local communities. Potentially promotion of suitable areas for dog walking and other types of access.

The above measures could be included within the mitigation and monitoring strategy recommended to avoid any indirect adverse effects occurring in relation increased disturbance, or could be set in a separate commitment within the Core Strategy. It is concluded that, with the

application of measures proposed, the synergistic effects of increased urbanisation, in close proximity to the European sites will be prevented.

Further consideration should also be given to the possibilities of new open spaces, which could be paid for via developer contributions for development within certain distances of the more heavily used parts of the European sites.

Avoidance and mitigation summary - Urban effects

Core Strategy amendments

The Council will need to commit to developing a framework of developer contributions, secured by legal agreement, for any new development where heaths are likely to be used as local greenspace by the new residents or employees. Contributions will be used for the implementation of an urban heaths management plan, with the primary purpose of achieving SPA/SAC conservation objectives.

Further action

With the measures applied above, no further action is required.

Flood Risk

The appropriate assessment identified that there is a very slight risk that during flood events water polluted with sewerage from burst sewers could drain into watercourses that discharge to or flow through European designated sites. Although a Strategic Flood Risk Assessment (SFRA) has been carried out for the District, this is concerned with the risk of flooding to new and existing development and not the risks to European sites from floodwaters containing contaminants, particularly sewerage. A risk could arise from foul water drainage from new developments contributing to the overloading of existing sewer systems, or an increase in surface water drainage containing contaminants from hard surfaces contributing to surface water run-off and increased flood risk. The SFRA/WCS has identified where upgrades to the sewerage system will be required if the development proposed in the Core Strategy goes ahead and it will be vital that these upgrades are made at the appropriate times.

Due to the distances involved and the effects of dilution from main rivers and side streams, the risks from polluted waters to the Wash SPA/Ramsar and the Wash and North Norfolk SAC sites do not appear to be significant.

The risks are the responsibility of the Environment Agency as the consenting body to water discharges and AWS as the water company.

Avoidance and mitigation summary - Flood Risk

Core Strategy amendments

- Require any inadequate waste water infrastructure serving new development to be upgraded as required and operational in time to meet the demands of development.
- Ensure that requirement for all new developments to install infiltration and attenuation measures to dispose of surface water in accordance with recommended SUDS is retained.

Further Action

Seek confirmation through Stage 2 of the SFRA/WCS that existing capacity and available headroom in existing sewage systems is adequate to absorb additional discharges from new development, or that upgraded infrastructure is planned and implemented within the Core Strategy period. If these measures are applied no further action will be required.

Water Quality and Waste Water Discharge

The appropriate assessment concluded that the Lakenheath Waste Water Treatment Works (WwTW) (serving Lakenheath) and the Tuddenham WwTW (serving Red Lodge) have limited capacity to accommodate new development. In order to accommodate the growth proposed in the Core Strategy the WwTW at Lakenheath will need to be upgraded before it reaches its dry weather flow (DWF) consent between 2010 and 2015, the WwTW at Tuddenham will need to be upgraded prior to reaching its DWF in the period 2025 to 2031. The WwTW at Brandon will reach its DWF consented capacity around 2031 and so may require upgrading prior to this, it will also require upgrading in terms of phosphorus removal during the plan period and failure to do this would probably result in the river Little Ouse failing Water Framework Directive (WFD) “good” status for phosphorus levels. WwTWs at Mildenhall and Newmarket have enough consented headroom to accommodate the growth proposed in the Core Strategy and it may be possible for the Mildenhall WwTW to accept some of the demand created by new development at Red Lodge.

The assessment also concluded that that the water quality in a number of receiving watercourses is currently below what will be required to meet WFD “good” status. Water quality is within the jurisdiction of the Environment Agency (EA) and waste water discharge consents are under the control of the relevant water companies (in this case Anglian Water (AWS)), via Environment Agency consents.

With these matters outside the jurisdiction of Forest Heath District Council, their responsibilities are confined to obtaining assurances that the level of new houses proposed can be accommodated by existing WwTWs, or in due course by replacement or upgraded WwTWs that can be undertaken within the plan period. Policies and development proposed within the Core Strategy should not be taken forward if there is not the required level of certainty of their implementation without adverse effects.

In conclusion it is recommended that development in Brandon, Red Lodge and Lakenheath is appropriately phased to ensure that WwTW capacity is in place before the new development is completed. It may also be necessary to improve all the existing WwTW in order for their receiving watercourses to meet WFD “good” status.

Avoidance and mitigation summary - Water quality and waste water discharge

Core Strategy amendments

- Include reference in policies to ensure that appropriate Waste Water Treatment Works capacity is in place prior to new development being completed.
- Work with EA and AWS to ensure that appropriate WwTW capacity upgrades are timetabled and brought forward where necessary.

Further action
With the measures above applied no further action is necessary.

Water Supply

The appropriate assessment of the demands of increased water supply as a result of the development proposed within and supported by the Core Strategy concluded that there is only a very limited risk of increased water demand causing negative effects on European sites. The current supply system in place appears to be appropriate for supplying water to the proposed new development, especially as measures are underway to explore the possibilities of new or improved water transfer systems. Assessment of any new water supply schemes must take place to ensure that they have no adverse effect on European sites.

Existing water supplies are provided by Anglian Water from river abstraction and groundwater supplies under abstraction licences granted by the Environment Agency, the majority of water for Forest Heath comes from groundwater abstraction. Existing abstraction of groundwater is not believed to be causing problems but no significant further resource is available.

With the knowledge that future water supply will continue to be an important consideration, and in the interests of sustainable development water efficiency should be promoted through the Core Strategy. Whilst this is not an HRA requirement any reduction of existing demand will contribute to more favourable baseline conditions at the next plan review when the HRA work will be revisited.

Avoidance and mitigation summary - Water supply

Core Strategy amendments

- No amendments required as SFRA/WCS suggests that there is appropriate water supply to meet demand of new development without having an adverse effect on European sites. This issue should be monitored to ensure that there is not a sudden, unexpected, increase in demand which could result in negative effects on European sites.

Further action
No further action required other than monitoring of supply/demand.

Air pollution from roads

The appropriate assessment concludes that, given the development proposed within the Core Strategy at the Final Policy Option stage, increased volumes of traffic and road infrastructure improvements are likely in close proximity to the Breckland SAC. The development proposed within the Core Strategy is likely to lead to a requirement for road infrastructure improvements, and must therefore be considered as part of the HRA of the Core Strategy.

Habitat management (such as mowing, grazing, turf cutting and burning) can potentially help reduce the impacts of increased nutrient levels (e.g. Fottner *et al*., 2007, Hardtle *et al*., 2006, Terry

et al., 2004, Barker *et al*., 2004). High intensity management such as turf stripping is the most effective (Hardtle *et al*., 2006). Such measures cannot be repeated too much on a site and are likely to be required regardless of increases in road traffic, due to an increase in general levels of atmospheric pollutants. It is recommended therefore that habitat management should not be relied on as mitigation.

There may be opportunities for planting and management of trees along roadsides. Trees can directly absorb some air borne pollutants and may therefore improve local air quality by increasing the uptake rates of gaseous, particulate and aerosol pollutants from the atmosphere (Freer-Smith *et al*., 1997). The role of woodlands in reducing particulate pollution is reviewed by Beckett *et al* (1998) and a summary of more recent research is provided in Freer-Smith *et al* (2005). Conifers tend to be the most effective species for reducing air pollution (Beckett *et al*., 1998, Beckett *et al*., 2000), the height and thickness of vegetation cover is also important (Maning and Feder, 1980), as are local conditions such as wind speed (Belot *et al*., 1994).

Woodland strips will already be in place in some locations, and may not always be effective. Additional work may be required to determine where such planting might function as mitigation. Measures would need to be in place to ensure long term management, particularly to ensure no pine regeneration on the heaths themselves. With current information available, it is concluded that woodland strips cannot ensure the protection of the SAC with adequate certainty for reliance on such measures as mitigation.

Promotion and provision of public transport and the use of railways to transport freight may function to reduce road traffic volumes. Such promotion of alternative transport cannot guarantee a significant reduction in road traffic volume, nor can it guarantee that road infrastructure improvements would not be necessary, and as such measures cannot therefore be relied upon as adequate mitigation.

In conclusion it is advised that the potential road infrastructure improvements or even new roads that may arise as a result of the development proposed within the Core Strategy, occurring within 200m of Breckland SAC, are likely to adversely affect site interest features, and this effect cannot be adequately mitigated for. It is therefore necessary to ensure that development promoted within the Core Strategy can proceed without resulting in road infrastructure improvements or new roads within 200m of Breckland SAC. Once this is ascertained, the prevention of road infrastructure improvements or new roads within 200m of the SAC should be committed to within the Core Strategy.

The conclusions drawn in relation to the direct effect of built development upon European site interest features are likely to require amendments to the Core Strategy in terms of locations for new development, and possibly volumes of new development (in the north and west of the District). It is therefore suggested that the need to avoid road infrastructure improvements or new roads within 200m of the Breckland SAC and Devils Dyke SAC is also considered alongside those likely amendments, to enable a Core Strategy to be taken forward that will not result in any such impacts within 200m of the SACs.

In relation to the dualling of the A11 the effects of any road infrastructure improvements or new roads within 200m of the Breckland SAC will need to be considered by the Highways Agency / DfT as competent authority for the A11 trunk road. For other roads, improvements should not be taken forward and this should be incorporated within the plan.

Avoidance and mitigation summary - Air pollution from roads

Core Strategy amendments

The prevention of road infrastructure improvements or new roads within 200m of the SAC should be committed to within the Core Strategy.

Further action

With the measures applied above, no further action is required.

Avoidance of roads by stone curlew

The appropriate assessment considered the available scientific research with regard to the avoidance of roads by stone curlew, and concluded that it cannot be ascertained that stone curlews would not be adversely affected by increased traffic levels, new roads or road improvements that are likely to arise as a result of the proposed development promoted within the Core Strategy Final Policy Option.

Natural England and the RSPB have considered the evidence in the research by Liley *et al* (2008) and this appropriate assessment in relation to the avoidance of roads by stone curlew and have taken a precautionary approach and determined that the distance at which it can be ascertained that stone curlews will not be affected by road infrastructure improvements or new roads is the same as that for buildings, being 1,500m.

New road infrastructure or road improvements which will result in a significant increase in road traffic near to where stone curlews occur will require a project level Habitats Regulations Assessment (HRA) to ensure that there will be no additional avoidance of roads by stone curlew.

Avoidance and mitigation summary - Stone curlew avoidance of roads

Core Strategy amendments

Road infrastructure improvements or new roads within 1,500m of Breckland SPA designated for stone curlews will require a project level Habitats Regulations Assessment (HRA) to ensure no adverse effect is had on the qualifying feature.

Further action

With the measures applied above, no further action is required.

Conclusions related to mitigation

The findings of the appropriate assessment and consideration of potential mitigation measures can be summarised as follows:

- The direct effect of building and road development and the indirect effects of disturbance to Annex I birds can all be mitigated for with application of the avoidance/mitigation measures proposed (project level Habitats Regulations Assessments within 1,500m and 400m buffers).
- In relation to the road infrastructure requirements of development proposed in the Core Strategy, any such requirement for new or improved road infrastructure within 1,500m of stone curlew habitat will require a project level HRA. A zone of no new roads or road

improvements within 200m of any SAC site will be included to avoid adverse effects on these sites, the SACs affected will be the Breckland SAC and the Devils Dyke SAC.

- Upgrades will be required to WwTWs at Lakenheath, Tuddenham and Brandon during the plan period. All five WwTWs in the District may need to be upgraded in order to ensure that WFD "good" status is achieved by receiving watercourses. Water supply must be monitored during the plan period in order to ensure that demand is being met without having an adverse effect on European sites.

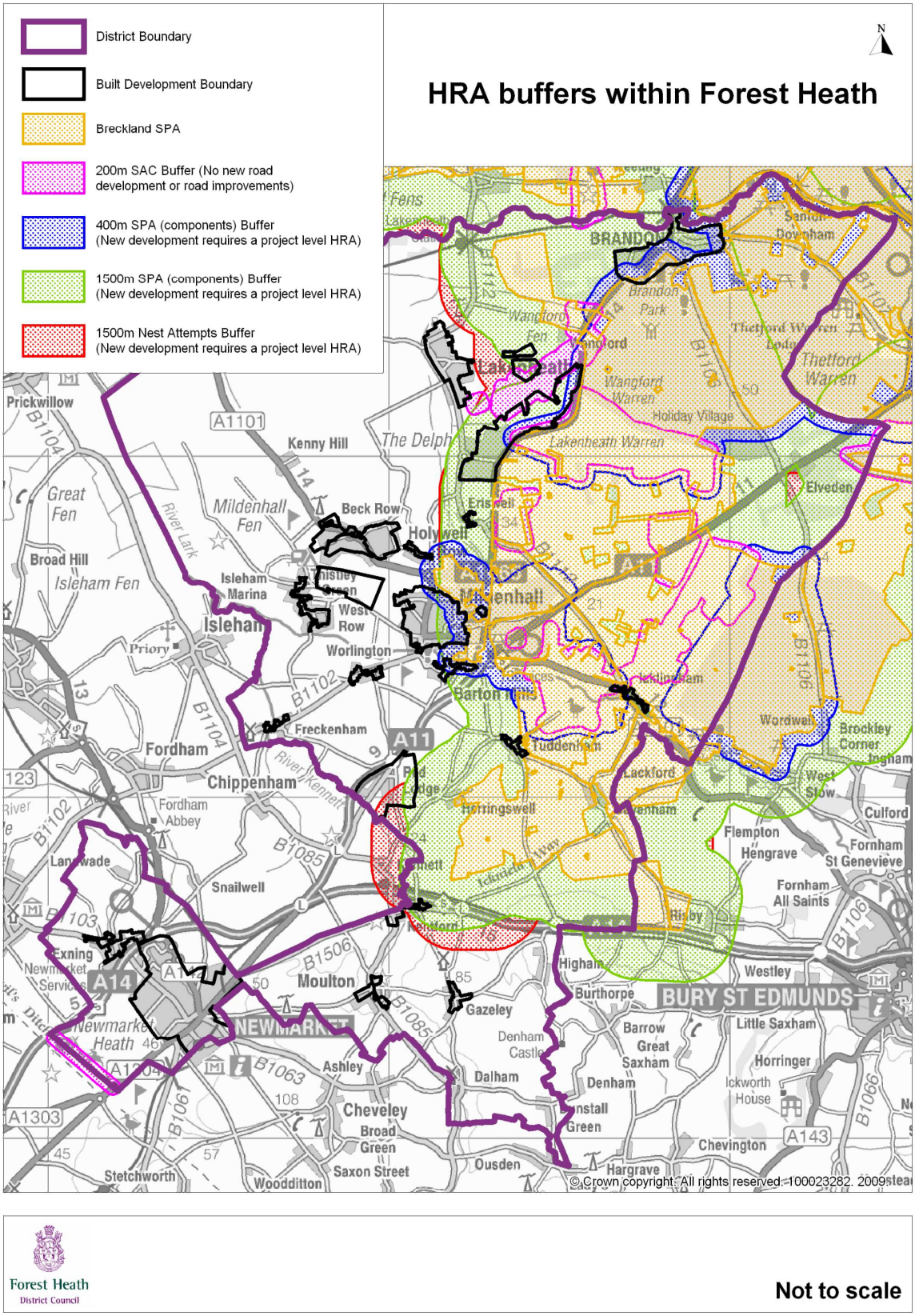
Re-screening of Core Strategy proposed submission document

The HRA has tracked alongside the emerging submission draft of the Core Strategy, and the appropriate assessment and mitigation sections were undertaken with consideration of the most up to date drafts of the emerging plan. However, in accordance with Regulation 85B (1) of the Habitats Regulations, the final Core Strategy, as presented for Examination should be rechecked to ensure that it can be ascertained that the plan in its final form is fully compliant, and any potential adverse effects upon the integrity of any European site have been either avoided or mitigated for. Where policy numbers have changed as the plan progressed from Final Policy Option to Submission, the original policy numbers are referred to throughout the assessment to maintain continuity. However as a final record of the submission document the table in Appendix 1 provides the new policy numbers as submitted. Where those policies were originally deemed likely to have a significant effect, the previous numbers are given. Assessment summaries refer to both the policy and its supporting text.

Appendix 1: Recheck of the Core Strategy at proposed submission stage

Core Strategy Final Policy Option Policy Number	Core Strategy Submission Policy Number	Recheck and assessment summary
Key Diagram	Key Diagram	Include SPA, Proposals Map will include buffer zones. No likely adverse effect.
CS1- Spatial Strategy for Forest Heath	CS1- Spatial Strategy	Umbrella policy for the Core Strategy. Spatial Strategy includes reference to buffer zones. No likely adverse effect.
CS2- Town Centre and Key Service Centre Strategies	Combined with CS1- Spatial Strategy	Combined with CS1- Spatial Strategy.
CS3- Natural Environment	CS2- Natural Environment	Amend to include reference to buffers.
CS4- Landscape Character	CS3- Landscape Character and the Historic Environment	No amendment. No likely adverse effect.
CS5- Climate Change	CS4- Reduce Emissions, Mitigate and Adapt to future Climate Change	No amendment. No likely adverse effect.
CS6- Economy and Tourism	CS6- Sustainable Economic and Tourism Development	Amend to include no significant effect on the environment.
CS7- Overall Housing Provision	CS7- Overall Housing Provision	Amend to ensure that no allocations are made within the buffer zones. Protection through CS2.
CS8- Provision for Gypsies and Travellers	CS8- Provision for Gypsies and Travellers	General policy without location specificity. No likely adverse effect.
CS9- Retail and Town Centre Strategy	CS11- Retail and Town Centre Strategy	Directs development away from European sites. No likely adverse effect.
CS10- Strategic Transport Improvements	CS12- Strategic Transport Improvements	Amend to ensure no significant adverse effect on the environment.
CS11- Design Quality	CS5- Design Quality and Local Distinctiveness	Design orientated. No likely adverse effect.
CS12- Infrastructure and Sustainable Communities	CS13- Infrastructure and Developer Contributions	Amend to ensure no significant adverse effect on the environment, protection through CS2.
Not in Final Policy Option Document	CS9- Affordable Housing Provision	Amend to ensure no significant adverse effect on the environment, protection through CS2.
Not in Final Policy Option Document	CS10- Sustainable Rural Communities	Amend to ensure no significant adverse effect on the environment, protection through CS2.

Appendix 2: Buffers Map



Appendix 3:

Deliverability of Core Strategy Housing Numbers in relation to the Core Strategy Habitats Regulations Assessment Buffers

Following further discussion with Mary Norden and James Dawkins of the RSPB issues regarding the deliverability of the housing figures detailed in the Forest Heath Core Strategy were raised. In order to address the issue of deliverability an analysis has been carried out to assess housing numbers deliverability, these numbers are set out in Table 1 below.

Settlement	Brownfield Total	Greenfield Total	Mixed Total
Newmarket	240	1,400	0
Mildenhall	260	1,000	70
Brandon	260	500	0
Lakenheath	70	600	0
Red Lodge	520	400	280
The Primary Villages of West Row, Kentford, Beck Row and Exning have a combined total of 700 dwellings for brownfield and greenfield.			

Table 1 – Core Strategy Housing Provision in Forest Heath

To assess the deliverability of the Core Strategy sites brought forward in the 2009 Forest Heath Strategic Housing Land Availability Assessment (SHLAA) were overlaid on a map of the four buffers identified in the Core Strategy HRA (*1,500m Stone Curlew SPA buffer, 1,500m Stone Curlew Nesting Habitat buffer, 400m Woodlark and Nightjar SPA buffer and 200m SAC Road Development buffer*). Sites were then graded in relation to their location with regard to the HRA buffers (*Green for no issue, Orange for possible issue and Red for definite issue*), these maps can be seen in Figures 1 to 4. Following this grading the dwelling capacity of each site was calculated for densities of 30 dwellings per hectare, 40 dwellings per hectare and 50 dwellings per hectare. This gives an idea of how deliverable the Core Strategy housing numbers are.

Of the nine settlements which the Core Strategy states will receive housing allocations, four are affected by the HRA buffers, these are Brandon, Mildenhall, Red Lodge and Kentford. Table 3 below details the dwelling capacities of each of the four settlements using known proposed development sites which have not been discounted by the 2009 SHLAA. All sites proposed for development will be consulted on and allocations made through the Site Specific Allocations DPD, however to give an estimation of the deliverability of the Core Strategy the SHLAA sites have been used as they are the most accurate available indication of potential development sites.

All sites graded red were then excluded from the analysis as development there is likely to have a significant adverse effect on the SPA. Sites graded orange may have a significant adverse effect on the SPA however assessment needs to be made on a site by site basis depending upon which buffers the site falls in. Finally sites graded green are highly unlikely to have a significant adverse effect on the SPA.

This analysis indicates that there is the possibility of a surplus of potential dwelling capacity in both Mildenhall and Kentford (approx. 5,490 dwellings at 30 DPH in Mildenhall and between 206 and 505 dwellings at 30 DPH in Kentford). In Brandon there is a potential shortfall of 718 dwellings, however providing appropriate mitigation can be found for the potential significant effects on woodlark and nightjar supporting SPA, this could result in the possibility of a surplus of 573 dwellings at 30 DPH. At Red Lodge there is a shortfall of between 509 and 548 dwellings at 30 DPH and between 48 and 113 dwellings at 50 DPH.

Due to the possibilities of shortfalls in the deliverability of the housing numbers at Brandon and Red Lodge it is possible that greenfield allocations for the later part of the plan period (2025-2031) may need to be revised and re-allocated to other settlements such as Newmarket, Mildenhall or Lakenheath where capacity exists to meet these requirements, unless future research indicates

that some form of mitigation is possible to enable development within the stone curlew SPA buffer. However the housing figures proposed in the Core Strategy for the period 2010 to 2025 (15 year land supply shown in Table 2) can be met in Brandon, Mildenhall and Kentford provided that a small amount of mitigation can be provided in Brandon for development within the 400m Woodlark and Nightjar buffer, as shown in Table 3. The deliverability projections are based on densities of 30 dwellings per hectare.

At Red Lodge the part of site FHDC/RL/06 which does not fall within the stone curlew SPA buffer has also been included within the analysis, this adds an additional 1.4 Ha to the total area of sites graded green. The Red Lodge dwellings calculations are based on 40 dwellings per hectare, 40 DPH has been used as the current phases of the Red Lodge Masterplan (1998) coming forward are of similar (or slightly higher) densities. This gives an available capacity on known proposed development sites of 921 dwellings (green and orange graded sites) at 40 DPH or 1,152 dwellings (green and orange graded sites) at 50 DPH. This means that to meet the requirement for 1,000 dwellings at Red Lodge (2010 to 2025) development will need to be of densities between 40 and 50 DPH, this will maintain enough capacity to meet the dwelling allocations to 2025.

Settlement	Brownfield (2010-2025)	Greenfield (2010-2025)	Mixed (2010-2025)	Total (2010-2025)
Brandon	260	350	0	510
Mildenhall	260	700	70	1,030
Red Lodge	520	200	280	1,000
Kentford	Approx. 125 on all land types			Approx. 125

Table 2 – Core Strategy Housing Provision 2010-2025 in settlements affected by HRA buffers

Brandon									
						Dwelling Capacity			
Site Ref	Site	Area (Ha)	Greenfield/ Brownfield	Grade	Buffer	30 dph	40 dph	50 dph	Details
FHDC/B/01	Land off Fengate Drove	0.98	Greenfield	Red	1500m Stone Curlew SPA	29	39	49	Site is within 1500m stone curlew SPA buffer and 400m woodlark and nightjar SPA buffer, site is not shielded by existing development.
FHDC/B/12	Land off Manor Road	3.68	Greenfield	Red	1500m Stone Curlew SPA	110	147	184	Site is within 1500m stone curlew SPA buffer and 400m woodlark and nightjar SPA buffer, site is not shielded by existing development.
FHDC/B/17	Land West of Brandon	103.6	Greenfield	Red	1500m Stone Curlew SPA, part 400m Woodlark and Nightjar SPA	3,108	4,144	5,180	Site linked to delivery of the Brandon relief road. Site is within 1500m stone curlew SPA buffer and 400m woodlark and nightjar SPA buffer, site is not shielded by existing development.
FHDC/B/13	Omar Homes, land off Brandon Way	5.43	Brownfield	Orange	1500m Stone Curlew SPA and 400m Woodlark and Nightjar SPA	163	217	272	Site is within both 1500m Stone Curlew SPA and 400m Woodlark and Nightjar SPA buffers, however it is surrounded by existing development on three sides and is adjacent to a forest block on the fourth side.
FHDC/B/14	Land off Green Road	37.6	Greenfield	Orange	1500m Stone Curlew SPA and 400m Woodlark and Nightjar SPA	1,128	1,504	1,880	Site is within both 1500m Stone Curlew SPA and 400m Woodlark and Nightjar SPA buffers, however it is shielded from SSSI sites designated for stone curlew and arable land by existing development to the north and forest blocks on the other three sides.
FHDC/B/06	Land off	1.19	Brownfield	Green	1500m	36	48	60	Within 1500m stone curlew SPA buffer,

	School Lane				Stone Curlew SPA				however the site is completely surrounded by existing development.
FHDC/B/08	Evergreen, Bury Road	0.2	Brownfield	Green	1500m Stone Curlew SPA	6	8	10	Within 1500m stone curlew SPA buffer, however the site is completely surrounded by existing development.
					Total	**4,580**	**6,107**	**7,634**	
					Red Total	**3,248**	**4,330**	**5,413**	
					Orange Total	**1,291**	**1,721**	**2,152**	
					Green Total	**42**	**56**	**70**	
					Orange and Green Total	**1,333**	**1,777**	**2,221**	
Mildenhall									
						Dwelling Capacity			
Site Ref	**Site**	**Area (Ha)**	**Greenfield/ Brownfield**	**Grade**	**Buffer**	**30 dph**	**40 dph**	**50 dph**	**Details**
FHDC/M/11	Land adjacent to College Heath Road	4.14	Greenfield	Red	1500m Stone Curlew SPA and 400m Woodlark and Nightjar SPA	124	166	207	Site is within 1500m stone curlew buffer and 400m woodlark and nightjar buffer, site is not shielded by existing development.
FHDC/M/16	Land North of Brandon Road	15.89	Greenfield	Red	1500m Stone Curlew SPA and 400m Woodlark	477	636	795	Site is within 1500m stone curlew buffer and 400m woodlark and nightjar buffer, site is not shielded by existing development.

					and Nightjar SPA				
FHDC/M/17	Land North of Thetford Road	16.02	Greenfield	Red	1500m Stone Curlew SPA and 400m Woodlark and Nightjar SPA	481	641	801	Site is within 1500m stone curlew buffer and 400m woodlark and nightjar buffer, site is not shielded by existing development.
FHDC/M/23	Land East of Mildenhall to A1065 and Fiveways Roundabout	64.05	Greenfield	Red	1500m Stone Curlew SPA and 400m Woodlark and Nightjar SPA	1,922	2,562	3,203	Site is within 1500m stone curlew buffer and 400m woodlark and nightjar buffer, site is not shielded by existing development.
FHDC/M/12	Woodlands Park off Brandon Road	2.45	Brownfield	Red	1500m Stone Curlew SPA and 400m Woodlark and Nightjar SPA	74	98	123	Site is within 1500m stone curlew buffer and 400m woodlark and nightjar buffer, site is not shielded by existing development.
FHDC/M/24	Land North of Mildenhall, East of A1101 (inc. Airfield landing lights)	69.64	Greenfield	Red	1500m Stone Curlew SPA and 400m Woodlark and Nightjar SPA	2,089	2,786	3,482	Site is within 1500m stone curlew buffer and 400m woodlark and nightjar buffer, site is not shielded by existing development
FHDC/M/02	Queensway	0.71	Brownfield	Green	None	21	28	36	Site is not within a buffer

	Farm, Queensway								
FHDC/M/08	Land to the rear of Mill Street	1.31	Brownfield	Green	None	39	52	66	Site is not within a buffer
FHDC/M/09	Land off College Heath Road	0.23	Greenfield	Green	1500m Stone Curlew SPA	7	9	12	Within 1500m stone curlew SPA buffer, however the site is completely surrounded by existing development.
FHDC/M/19	Land West of Mildenhall, South of West Row Road	202.5	Greenfield	Green	None	6,075	8,100	10,125	Site is not within a buffer
FHDC/M/21	Land West of Miles Hawk Way	3.57	Greenfield	Green	None	107	143	179	Site is not within a buffer
FHDC/M/27	Site adjacent to Parker's Mill	1.5	Greenfield	Green	None	45	60	75	Site is not within a buffer
FHDC/M/28	Land at 54 Kingsway	0.79	Brownfield	Green	1500m Stone Curlew SPA	24	32	40	Within 1500m stone curlew SPA buffer, however the site is completely surrounded by existing development.
FHDC/M/29	Land South of Worlington Road and adjacent to former Dairy Site	7.5	Greenfield	Green	None	225	300	375	Site is not within a buffer
FHDC/M/30	The Old Railway Station site	6.9	Brownfield	Green	None	207	276	345	Site is not within a buffer
					Total	**11,916**	**15,888**	**19,860**	
					Red Total	**5,166**	**6,888**	**8,610**	
					Orange	**0**	**0**	**0**	

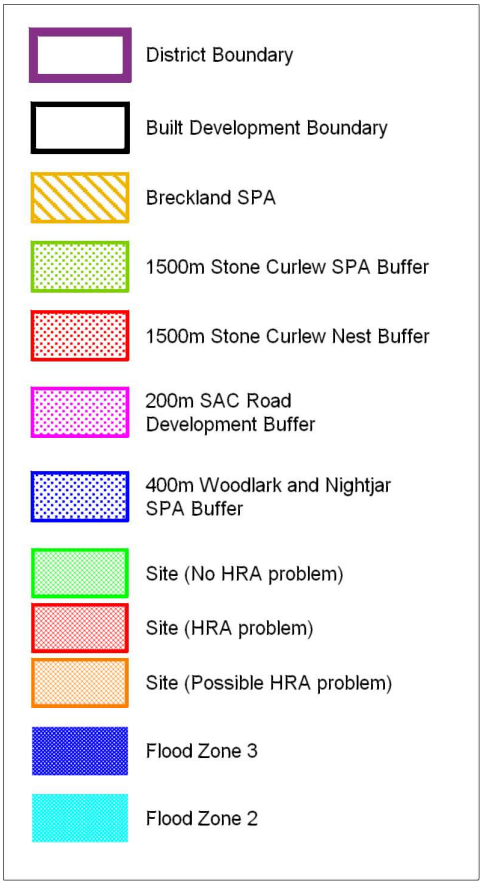
					Total				
					Green Total	**6,750**	**9,000**	**11,251**	
					Orange and Green Total	**6,750**	**9,000**	**11,251**	
Red Lodge									
						Dwelling Capacity			
Site Ref	**Site**	**Area (Ha)**	**Greenfield/ Brownfield**	**Grade**	**Buffer**	**30 dph**	**40 dph**	**50 dph**	**Details**
FHDC/RL/06	Land East of Warren Road (Yellow Land)	20.57	Greenfield	Red	1500m Stone Curlew SPA	617	823	1,029	Most of site is within the 1500m Stone Curlew SPA buffer
Part of FHDC/RL/06 not in buffer		*1.4*	*Greenfield*	*Green*	*None*	*42*	*56*	*70*	*Part of site FHDC/RL/06 not in Stone Curlew SPA buffer*
FHDC/RL/09	Land at Greenhays Farm	1.3	Mixed	Orange	1500m Stone Curlew Nesting	39	52	65	Very small part of site is within the 1500m Stone Curlew nest buffer
FHDC/RL/01	Land to the rear of 2-4 Elms Road and 6-8 Turnpike Road	1.08	Brownfield	Green	None	32	43	54	Site is not within an HRA buffer
FHDC/RL/02	Land to the rear 14-16 Turnpike Road	0.91	Brownfield	Green	None	27	36	46	Site is not within an HRA buffer
FHDC/RL/03	Land off Turnpike Road (Phase 2)	9.64	Brownfield	Green	None	289	386	482	Site is not within an HRA buffer
FHDC/RL/04	Coopers Yard and	1.99	Brownfield	Green	None	60	80	100	Site is not within an HRA buffer

	Café								
FHDC/RL/05	Land adjoining public house, Turnpike Road and Lane	0.95	Greenfield	Green	None	29	38	48	Site is not within an HRA buffer
FHDC/RL/08	Land to rear 4 to 14b Turnpike Lane	5.36	Mixed	Green	None	161	214	268	Site is not within an HRA buffer
FHDC/RL/10	The 'Gateway Site', Kings Warren	0.4	Greenfield	Green	None	12	16	20	Site is not within an HRA buffer
					Total	**1,266**	**1,688**	**2,110**	
					Red Total	**617**	**823**	**1,029**	
					Orange Total	**39**	**52**	**65**	
					Green Total	**652**	**869**	**1,087**	
					Orange and Green Total	**691**	**921**	**1,152**	
Kentford									
						Dwelling Capacity			
Site Ref	**Site**	**Area (Ha)**	**Greenfield/ Brownfield**	**Grade**	**Buffer**	**30 dph**	**40 dph**	**50 dph**	**Details**
FHDC/K/03	Land North of A14	11.73	Greenfield	Red	1500m Stone Curlew SPA	352	469	587	Site is within 1500m stone curlew buffer and 400m woodlark and nightjar buffer, site is not shielded by existing development
FHDC/K/04	Land North of Bury	6.6	Greenfield	Orange	1500m Stone	198	264	330	Site within 1500m Stone Curlew SPA buffer but shielded from SPA by development

	Road				Curlew SPA				and/or the A14
FHDC/K/05	South and East of Flint House, Bury Road (near village hall)	0.47	Greenfield	Orange	1500m Stone Curlew SPA	14	19	24	Site within 1500m Stone Curlew SPA buffer but shielded from SPA by development and/or the A14
FHDC/K/06	Opposite 1-4 Bury Road	2.9	Greenfield	Orange	1500m Stone Curlew SPA	87	116	145	Site within 1500m Stone Curlew SPA buffer but shielded from SPA by development and/or the A14
FHDC/K/07	Former Friskies Pet Care site (Kennett Park), Moulton Road	6	Brownfield	Green	None	180	240	300	Site not within any buffer
FHDC/K/08	Lanwades Business Park	3.25	Brownfield	Green	None	98	130	163	Site not within any buffer
FHDC/K/09	Fothergills, Gazeley Road	2.41	Brownfield	Green	1500m Stone Curlew SPA	72	96	121	Site within 1500m Stone Curlew SPA buffer but surrounded on all sides by existing development
FHDC/K/10	Land West of Herringswell Road	1.05	Greenfield	Green	1500m Stone Curlew SPA	32	42	53	Site within 1500m Stone Curlew SPA buffer but surrounded on all sides by existing development
					Total	**1,032**	**1,376**	**1,721**	
					Red Total	**352**	**469**	**587**	
					Orange Total	**299**	**399**	**499**	
					Green Total	**381**	**508**	**636**	
					Orange and Green	**680**	**907**	**1,134**	

	Total				

Table 3 – Analysis of sites in the Forest Heath Strategic Housing Land Availability Assessment (SHLAA) (2009)



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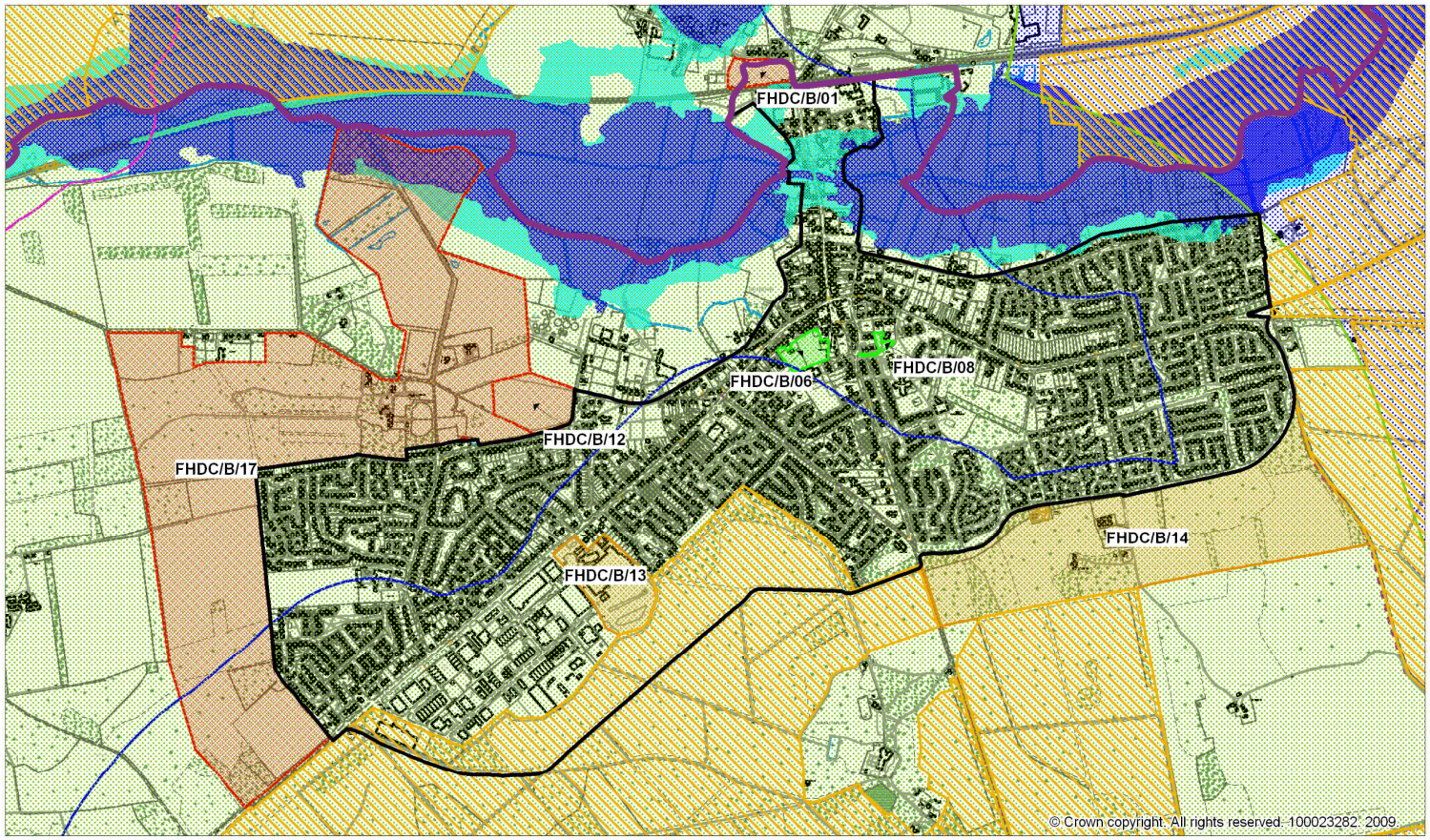

Forest Heath
District Council

Brandon HRA Buffers and SHLAA Sites (2009)

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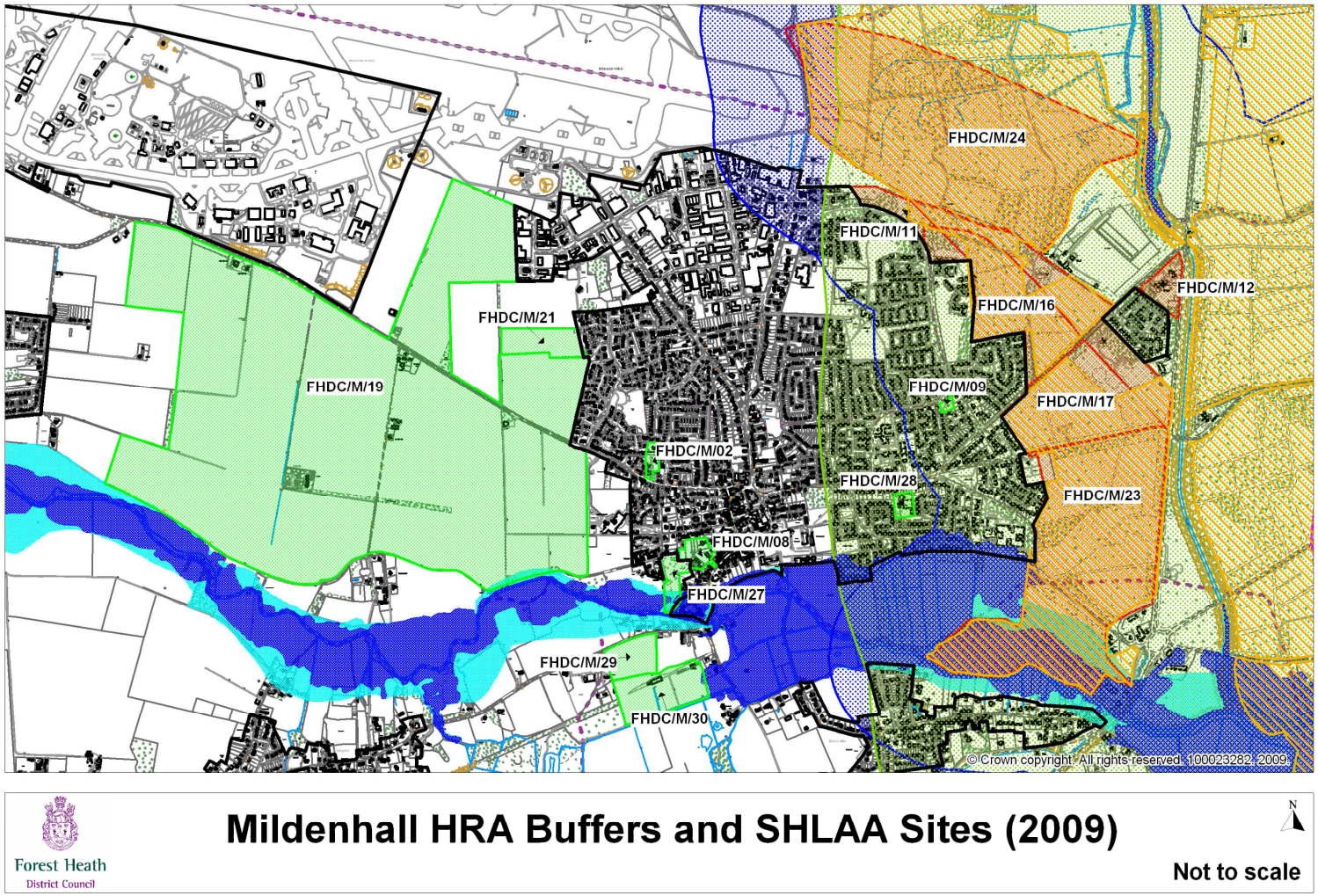
Figure 9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Forest Heath
District Council
Mildenhall HRA Buffers and SHLAA Sites (2009)
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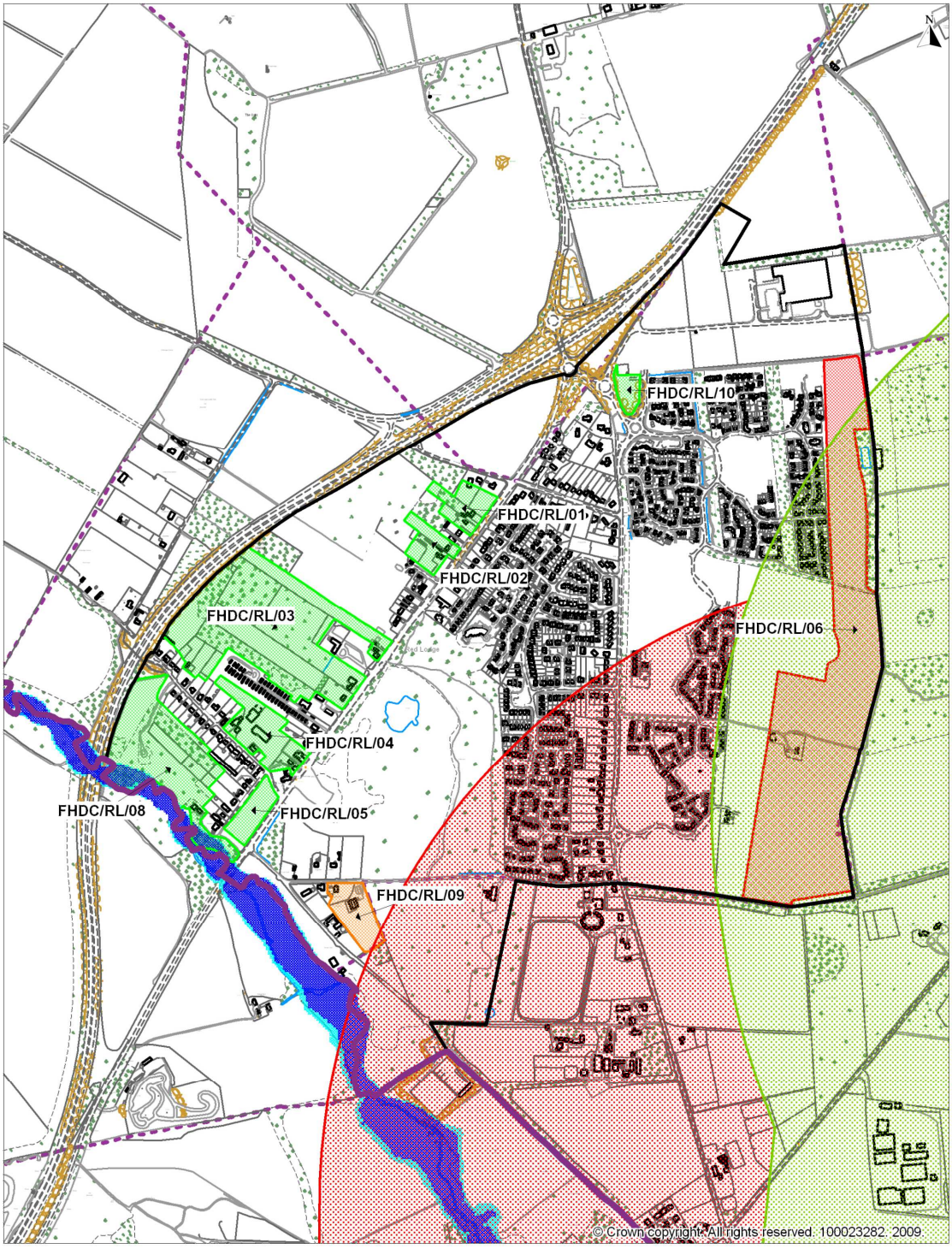
Figure 10

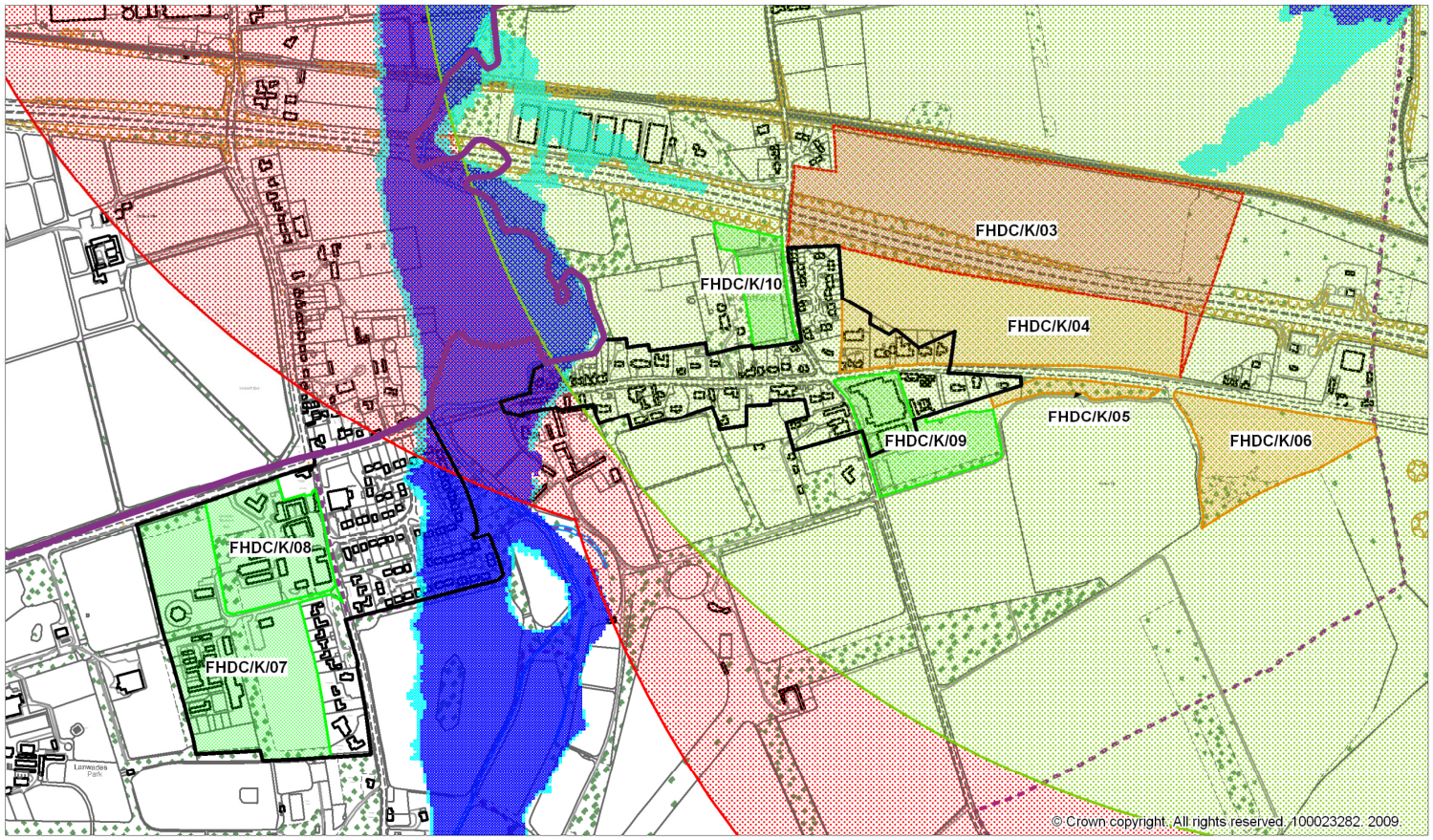


Forest Heath District Council

Red Lodge HRA Buffers and SHLAA Sites (2009)

Not to scale

Figure 11



Forest Heath District Council

Kentford HRA Buffers and SHLAA Sites (2009)

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Not to scale

Figure 12

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