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INTRODUCTION

11.1 Hatfield Aerodrome lies between the conurbations of Hatfield to the east and St Albans to the west on land to the north of the A1057. The airfield ceased operation in the 1990's and the easternmost part, on the fringe of Hatfield itself and incorporating the former hangars and other main buildings, was redeveloped in the 1990s/00s. That area now houses a business park, the University of Hertfordshire campus, areas of housing and a landscaped linear park.

11.2 The remaining undeveloped areas of former airfield are identified in the adopted Hertfordshire Minerals Local Plan 2007 as a 'Preferred Area' for sand and gravel extraction. Pursuant to this allocation, Brett Aggregates Limited instructed Bioscan (UK) Ltd in July 2014 to commence a programme of ecological surveys to inform the design and subsequent assessment of a proposal for mineral extraction on leasehold land within the western part of the Preferred Area. The proposal is for the phased extraction of some eight million tonnes of sand and gravel, with on-site processing, and for progressive restoration using imported inert fill.

11.3 The undeveloped parts of the airfield have since the early 2000's been managed as an informal country park (Ellenbrook Fields) and are today crossed by permissive paths with interpretation sign-boards stationed at a few key locations. Parts are also actively grazed or mown. The restoration scheme has been drawn up with the intention of reinstating similar uses in the future, and in cognisance of national and local nature conservation objectives, the site's geology and its historical and present-day ecology. As part of this process the Hertfordshire and Middlesex Wildlife Trust have been actively consulted in drawing up the restoration proposals.

11.4 This Ecological Impact Assessment (EcIA) considers the likely significant effects of the proposal on ecological resources following the guidelines set out by the Chartered Institute of Ecology and Environmental Management (CIEEM 2006, 2016). The following chapters set out the information sources that have informed the assessment (including the methodologies and results of surveys undertaken); the baseline ecological conditions existing at the site; the key ecological receptors; the likely significant ecological effects on these receptors arising; the mitigation measures proposed if and where appropriate to prevent, reduce or compensate for any of these effects adjudged to be significant and adverse; and finally the predicted residual effects after these measures have been employed (including any positive benefits arising).

ECOLOGICAL CONTEXT AND PRE-EXISTING SURVEY DATA

Physical and Ecological Context of the Site

11.5 The application red-line encompasses some 87ha in the western part of the former British Aerospace landholding (Figure 1). It is bordered to the south by the A1057, with a nursery/garden centre and small-scale development off Oaklands Road bordering the site to the south-west. An existing sand and

gravel quarry (Hatfield CEMEX Quarry) adjoins the site to the northwest, with the CEMEX landholding also including the mature woodland of Home Covert immediately to the north. Bordering the application site to the north-east is the remaining undeveloped area of the former airfield, with the University of Hertfordshire sports pitches adjoining the site to the south-east.

11.6 The mineral deposit comprises glacio-fluvial origin sands and gravels in two horizons lying over the Upper Chalk and separated by a boulder clay interburden layer. In the natural condition, the upper deposit would be covered by chalky boulder clay and silty drift soils, mapped as belonging to the Hamble 2 association[1], and tending to moderately droughty with some seasonal waterlogging[2]. However, the modern depth of soil cover on the site has been influenced by significant episodes of disturbance during the 20th Century and there are localised areas on the site where more stony and gravelly subsoils are apparent at the surface.

11.7 In terms of regional ecological characteristics, the application site sits towards the northern edge of the London Basin Natural Area[3] . The nature conservation priorities set out for this natural area in 1997 remain relevant today, and include protection and enhancement of a range of priority habitats characteristic of the region, including (of particular relevance here) neutral and acid grassland and grass-heath. These priorities are also reflected in the 'appropriate actions and principles' for the site indicated by the Hertfordshire Ecological Network Mapping project[4], which uses a county-wide habitat inventory to generate opportunity maps identifying areas most suitable for targeted and appropriate habitat creation or enhancement efforts in order to maintain or enhance landscape-scale networks.

Pre-existing Surveys

11.8 The former airfield has been subject to several previous campaigns of ecological surveys dating back to 1999. These have been undertaken in connection with the now completed redevelopment of the easternmost portion, the subsequent management of the remainder as an informal country park, and more recently the promotion of the eastern area for housing. These studies are discussed in chronological order below.

11.9 Cresswell Associates reported on an ecological appraisal of the airfield in June 1999, and subsequently produced a management plan for the undeveloped balance of the site in July 2001, a report on botanical surveys (also in July 2001) and a report on ground-nesting birds and brown hare surveys (December 2001). Esus Forestry and Woodland also produced a survey and management plan for Home Covert, Round Wood and Cut Field Wood, north of the airfield, in April 2001.

[1] Jarvis et al (1984). Soils and their Use in Eastern England. Soil Survey of England and Wales Bulletin No. 13. Harpenden
[2] Other sources (e.g. De Haviland Plain landscape character area description) identify Gresham series soils as present on the airfield site
[3] Natural Area Profile 66 – London Basin. English Nature (1997)
http://www.naturalareas.naturalengland.org.uk/Science/natural/profiles%5CnaProfile70.pdf
[4] http://www.hertswildlifetrust.org.uk/sites/default/files/files/Hertfordshire's%20ecological%20networks%20report%20-%20Final%20Aug%202014.pdf

11.10 This body of work was reviewed and updated in an ecological assessment produced for the current site owners, Goodman, in 2008[5] . This report also set out the results of an updated desk study, Phase 1 habitat survey and a protected species assessment. It assessed the grassland resource on the site as falling short of qualification as a County Wildlife Site, identifying the adjoining Home Covert as of greater habitat and botanical interest. The site's population of great crested newts was assessed as unlikely to be of more than local value, although no surveys of population size were carried out. The report refers to both slow worm and grass snake having been recorded in 1999-2001 and suggested that common lizard and/or adder could also be present, by virtue of the extent of suitable habitat. Barn owl was noted as present (in both 2001 and 2008) and attention was drawn to the high density of skylark and meadow pipit, and the presence of other declining farmland birds (lapwing was recorded as a breeding species in 2001). Reference was made to local records of four bat species, and to the presence of a number of mature trees and buildings potentially suitable for use by roosting bats, although no bat surveys were carried out. The presence of brown hare was also noted, with signs of badger, but no setts, found.

11.11 Based on recommendations for further survey work set out in the above study, and to inform proposals to open up the remainder of the airfield for public recreation, further targeted surveys were commissioned and carried out during 2010[6] . These included detailed surveys for great crested newts, reptiles, breeding birds and water voles. These surveys identified the following:

- a 'medium' population of great crested newts occupying ponds scattered across the airfield site and potentially linked to a wider metapopulation centred on the adjoining gravel pits to the north;
- no reptiles, despite the availability of abundant suitable habitat;
- a breeding bird assemblage assessed to be of 'importance in a local context' with high densities of skylark, meadow pipit and whitethroat and with cuckoo and barn owl also present;
- no evidence of water voles;
- the presence of badger setts.

11.12 The above survey work informed a review and updated ecology assessment carried out by LDA Design in 2013[7] in connection with the promotion of land to the east for residential development, although no further survey work was commissioned at that time.

11.13 Separately, in 2013, the Wildlife Sites Survey team of the Hertfordshire and Middlesex Wildlife Trust carried out a series of habitat and botanical survey visits, focussed on the eastern and northern part of the airfield, but covering

[5] Cresswell Associates/Hyder Consulting (2008) Ecological Appraisal of Hatfield Green. Report No. WX82186/C1186/V1 Produced for Goodman UK Ltd.
[6] Cresswell Associates/Hyder Consulting (2010) Hatfield Green Summary of Ecological Surveys. Briefing document Produced for Goodman UK Ltd
[7] LDA Design (2013) Hatfield Green Ecology Assessment. Report produced as Appendix 2 to a 'Landscape and Energy Strategy' for Goodman UK Limited.

around half of the Brett application site[8] . They classified the areas of former airfield they surveyed as a mixture of species-poor and locally quite species-rich, predominantly neutral, grasslands, with ranker areas and areas of scrub and ponds. They also noted a number of local indicator species and concluded that much of the site met the criteria for designation as a Local Wildlife Site (LWS).

11.14 Most recently, further baseline survey work for the land to the east of the application site was commissioned by Goodman in 2015. This survey work, which was carried out by LDA Design in parallel with the Bioscan surveys of the application site, and in some instances overlapping, included an Extended Phase 1 Habitat Survey and a great crested newt habitat suitability survey[9] and latterly a great crested newt eDNA survey of certain ponds[10] . The results have been shared with Bioscan and, where relevant to the assessment, are assimilated into the baseline conditions section of this chapter.

SCOPING

Scoping Submission

11.15 3.1.1 A request for a scoping opinion was submitted to Hertfordshire County Council in June 2015. The request was accompanied by a report outlining draft details of the project, including the intended restoration to a combination of nature conservation and amenity after-uses and including a summary of relevant ecological issues identified by the surveys and data reviews carried out up to that point, including the confirmed presence of great crested newts and barn owl, and a range of other bird species of elevated conservation significance that use the site regularly or on a transitory basis.

Scoping Responses

11.16 Hertfordshire County Council's formal screening and scoping opinion was received in November 2015. In respect of nature conservation matters, the Council's response was informed by consultation responses from Natural England, the Environment Agency and the Council's outsourced ecological advisor Martin Hicks (Hertfordshire Ecology).

11.17 Each of these screening and scoping responses relevant to ecology is reviewed below:

Natural England

11.18 Natural England's response to HCC, dated 10 August 2015, sets out generic guidance for what should be included in an Environmental Impact Assessment, based on established case law and guidance. No specific

[8] Wise, et al (2013) Wildlife Site Survey Report for: Ellenbrook Fields. Unpublished report for Hertfordshire and Middelsex Wildlife Trust.
[9] LDA Design (2015). Hatfield EIP Allocation – Ecology Appraisal. Report for Goodman UK Ltd.
[10] LDA Design (2015). Hatfield EIP Allocation: GCN eDNA Report. Report for Goodman UK Ltd.

comments on particular ecological receptors, or on the ecological information provided within the scoping report, were provided.

Environment Agency

11.19 The Environment Agency's response to HCC dated 2 October 2015 made no specific reference to ecological receptors, but commented upon the need for the restoration scheme to consider the potential for bromate contamination and indicated that the likely requirement for imported fill would necessitate an Environmental Permit.

Hertfordshire Ecology

11.20 The response from Hertfordshire Ecology offered a more detailed review of the approach set out in the scoping document. The proposal to restore to a wildlife and amenity end use was welcomed, and suggestions were made as to appropriate approaches to restoration, and how phasing and aftercare should be detailed in the ES. The response goes on to state that the ES needs to include clear demonstration of how net loss will be avoided and net gain delivered, and suggests that the evaluation of the existing resource should be informed by reference to the existing Wildlife Site criteria. On the scope of the baseline ecological surveys, the response stated that "these should be sufficient to enable a satisfactory description of the site and its principle (sic) ecological interests to be made".

Scoping Decision Notice

11.21 The final scoping opinion notice issued by Hertfordshire County Council on 19th November 2015 echoed Hertfordshire Ecology's comments in seeking details of restoration phasing, and further confirmed that the ES should address how the suggested future country park would be delivered, including management to minimise disturbance to wildlife. It also indicated that the assessment should extend to impacts on county wildlife sites and resources of geological significance.

BASELINE DATA COLLECTION

Methodology

Rolling Desk Study & Data Review

11.22 A broad range of data sources have been consulted and in many instances re-consulted over time in assembling information on the baseline ecological conditions on the site, and putting it into the appropriate context, as follows:

Web-based and Archive Search

11.23 A search of relevant internet sources included the on-line 'Magic' database managed by Natural England (http://magic.defra.gov.uk/home.htm) for information on statutory designations and priority habitats, the planning

portals of both Welwyn Hatfield and St Alban's Council for information from any ecological surveys submitted with current or recent planning applications for adjoining land, and web-based literature on the relevant Natural Area and on the Hertfordshire and Middlesex Wildlife Trust's 'Living Landscapes' and ecological networks projects. Local special-interest websites, including the Hertfordshire Natural History Society, Herts Bird Club and Herts and Middlesex Bat Group were also accessed for sighting data and other records pertaining to the site, and to put the records obtained from fieldwork into context.

11.24 A review of Bioscan's in-house data archive was also conducted.

Environmental Records Centre

11.25 A formal data request was submitted to the Hertfordshire Environmental Records Centre (HERC) in October 2015, and information was received on protected / notable species records as well as areas designated for their nature conservation interest. HERC were asked to provide records within a 2km radius of the centre of the site (taken as TL199083).

Herts and Middlesex Wildlife Trust

11.26 Early in the design and survey processes of the project, the Herts and Middlesex Wildlife Trust were consulted on appropriate restoration principles and objectives, and a visit to their offices was made in order to review data related to the ecological networks project and unpublished information they held from surveys of the site carried out in 2013. The latter survey data was later obtained once appropriate landowner release-permissions had been secured.

Previous Consultancy Survey Reports

11.27 The reports of previous ecological surveys of the airfield were obtained from LDA Design in October and November 2015. These reports comprise the following:

- Ecological Appraisal of Hatfield Green (Cresswell Associates/Hyder 2008)
- Hatfield Green Summary of Ecological Surveys (Cresswell Associates/Hyder 2010)
- Hatfield Green Ecology Assessment (LDA Design 2013)
- Hatfield Ecology Appraisal (LDA Design 2015)
- Hatfield GCN eDNA Report (LDA Design 2015)

11.28 The data within these reports is summarised and drawn upon where relevant in the description of baseline conditions.

Barn Owl Nest Box Monitoring Data

11.29 By agreement with Goodman, four barn owl nest boxes and one kestrel nest box have previously been erected on mature trees falling within the Brett application site, with additional boxes in other parts of the Goodman and/or adjoining CEMEX landholdings. These boxes are monitored by Barry Trevis[11], who is also the warden of the nearby Herts and Middlesex Wildlife Trust reserve at Lemsford Springs. Information from the monitoring undertaken of these boxes is supplied by Mr Trevis to Goodmans, who in turn have supplied the latest report (relating to the 2014 breeding season) to Bioscan. Mr Trevis also supplied the same information to Bioscan via the Wildlife Trust.

11.30 Information from all of the above listed sources has been used in this assessment where corroborated by up-to-date survey or otherwise considered to still be relevant to assessing the baseline ecological status of the land.

Extended Phase 1 Habitat Surveys

11.31 An extended Phase 1 survey of the application site by Bioscan took place over several dates during the course of 2014 and 2015. An initial walkover survey and Phase 1 habitat mapping was carried out in July 2014, with completion and refinement taking place on subsequent visits and ultimately finalised in November 2015. The many visits for bird surveys and other purposes between these two dates were also used to augment and refine the mapping and botanical recording element, ensuring coverage across all seasons. In this way, a detailed picture of current habitat distribution and quality has been built up.

11.32 The habitat and botanical work followed the Phase 1 approach as devised by the former Nature Conservancy Council (now Natural England), and updated periodically by the Joint Nature Conservation Committee[12] . This technique provides an inventory of the broad habitat types present on the site and targets areas of more interest which are then subject to more detailed examination either at the time or on subsequent visits. Additional detail was provided in the form of representative lists of species compiled for each habitat (an 'extended' Phase 1 survey).

11.33 The habitats on the site were also assessed to see if any qualify as 'priority' habitats, as listed by the Government further to the provisions of sections 40-41 of the Natural Environment and Rural Communities Act 2006. Where appropriate this involved consideration of grassland community assemblages up to NVC/Phase 2 level - i.e. against the community classifications set out in the National Vegetation Classification[13] . The site's hedgerows were further assessed for their potential to meet the ecological criteria of an 'Important' hedgerow as defined by the Hedgerows Regulations 1997. This involved assessing the number of woody species (as listed on Schedule 3 of the

[11] British Trust for Ornithology Ringing Licence Number A3821
[12] JNCC, (2010), Handbook for Phase 1 habitat survey - a technique for environmental audit
[13] Rodwell, J (ed) British Plant Communities Volumes 1-5. Cambridge

Hedgerows Regulations 1997) in a sample 30m stretch of hedgerow (for hedgerows between 100m and 200m in length two 30m stretches of hedgerow were surveyed and an average taken, and for hedgerows in excess of 200m in length, three 30m stretches of hedgerow were surveyed and an average taken). Relevant features along each hedgerow were recorded, such as ditches, banks, standard trees, lack of gaps, parallel hedgerows, multiple connections with other hedgerows/woodland/ponds, and woodland ground flora (as listed on Schedule 2 of the Hedgerows Regulations 1997).

11.34 A hedgerow is considered to be 'Important' under the Regulations if it, amongst other criteria, has:

- an average of at least 7 woody species per 30m length
- averages at least 6 woody species per 30m and has at least 3 qualifying additional features (e.g. ditches and banks)
- averages at least 5 woody species per 30m and has at least 4 qualifying features
- averages at least 6 woody species per 30m including one of: black poplar, large-leaved lime, small-leaved lime or wild service-tree
- averages at least 4 woody species per 30m, has at least 2 qualifying features and is adjacent to a public right of way (PROW)

11.35 For the purposes of this assessment, a hedgerow was also considered to be 'species-rich' if it contained five or more native woody species per 30m section on average, and 'species-poor' if it contained four or fewer native woody species per 30m section on average.

11.36 In addition to habitat classification and mapping, attention was also focused during the Phase 1 surveys on searching for any signs of protected species utilising the area, such as field sign evidence of badger *Meles meles,* potential bat roosting opportunities and any field signs of other protected species that could utilise the site. The results were used to inform and/or augment the separate targeted work on great crested newts, reptiles, bats, badgers, birds and invertebrates that is described below.

Bat Surveys

Bat Activity Survey

11.37 The principal aim of the bat activity surveys were to assess the overall levels of bat activity within the site, the bat species composition, and to identify any landscape features used for commuting/foraging. The methodology for this survey was derived from the industry-standard BCT Survey Guidelines[14] for a large site of low quality bat habitat. The guidelines state for this category that there should be '*one visit per transect each season (spring, summer and autumn)*'.

[14] Hundt, L. (2012). Bat surveys – good practice guidelines, 2nd edition. Bat Conservation Trust.

11.38 Transect surveys were undertaken in June, July and September 2015. During the June visit the site was walked as a continuous transect by a single surveyor, and for the July and September visits two surveyors each covered separate areas of the site (broadly the northern part of the site and the southern). The transects not only followed existing landscape features such as hedgerows, footpaths, woodland edges, but due to the relative paucity of upstanding landscape features, the transect also covered the more open aspects of the site (see Figure 2 for the transect routes walked on each survey).

11.39 Surveyors were equipped with an Anabat (SD1, SD2 or Express) and a Pettersson D240X time expansion and heterodyne bat detector connected to a MP3 recorder. The Pettersson is employed in addition to the Anabat to aid real-time identification in the field, to allow reactive effort to be directed towards obtaining good recordings of any unusual or uncertain species and to provide supplementary recordings for use in corroboration of the Anabat data more generally.

11.40 The June transect survey commenced at around sunset and the subsequent July and September 2015 transect surveys commenced approximately one hour after sunset, following on from emergence surveys (see below). Table 11-1 below provides the details of each survey.

Table 11-1
Dates, Timings and Weather for each Bat Activity Survey in 2015

Date	23/06/2015	29/07/2015	07/09/2015
Cloud	1/8	8/8	3/8 at start to 0/8 at end
Wind	Little/ none	Little/ none	Little/none
Moon	1st quarter	Not visible	Not visible
Start temperature (^{o}C)	16	13	14
End temperature (^{o}C)	12	12	9.5
Start time	21:33	21:53	20:35
End time	23:40	23:46	22:11
Sunset	21:25	20:53	19:35

11.41 Analysis of the survey recordings was undertaken at the Bioscan offices using propriety software (Analook for the Anabat recordings and Batsound v10.0 software for the D240X recordings).

11.42 The Anabat system records in 15 second segments when sound (bats or otherwise) triggers the detector. For example, if one bat is detected for two seconds one sound file is created; if four bats are recorded continuously for 15 seconds again one sound file is created. Identifying and labelling bat calls within recording segments was undertaken with the aid of published species call parameters[15] , as well as Bioscan's in-house library of calls. The label(s) for each sound file were then tallied to produce the file count for each transect. It should be noted that registration or call tallies derived from

[15] J Russ, (2012). British Bat Calls: A Guide to Species Identification. Pelagic Publishing

Anabat recordings reflect the number of sound files for each species rather than reflecting the number of bats present. The D240X recordings were used to corroborate and/or cross-check uncertain or difficult calls identified from the Anabat analysis.

Automated Bat Survey

11.43 Additional detectors were deployed at various locations around the site to collect data over a longer time-series, helping to improve certainty about the overall species-composition present, but also providing additional data on foraging and commuting activity specific to certain landscape or habitat features. The methodology for this survey was derived from the BCT Survey Guidelines[16] for a large site of low quality bat habitat. This category recommends that there should be '1 [automated detector] location per transect. *Data to be collected on 4 consecutive nights each season (spring, summer and autumn)'.*

11.44 Anabat Express detectors were deployed in three different locations in each of June, July and September and were left to record for a minimum of four nights (Figure 2 provides the locations where each Anabat Express was deployed). Table 11-2 below provides details of the duration and weather conditions of each static survey period.

Table 11-2
Details of the Automated Bat Detector Surveys

Month of survey	June	July	September
Deployment location	A1	A2	A3
Start date	23/06/2015	29/07/2015	07/09/2015
End Date	29/06/2015	12/08/2015	16/09/2015
Total number of nights recorded	6	15	9
Average mean night-time temperature over each survey period (°C)[17]	14.7	14.6	11.7
Lowest recorded night-time temperature over each survey period (°C)[17]	9	6	7.5

Bat Tree Roost Assessment

11.45 The mature trees within the site were subject to an initial (ground-based) examination to identify any features that could be of potential use for roosting bats (such as splits, cracks, rot holes, coverings of ivy, peeling bark, or similar), using binoculars where necessary. The potential of each tree to support roosting bats was then ranked in accordance with the following criteria:

- **Negligible Potential** - Trees which lack any significant opportunities for bats to roost.

[16] Hundt, L. (2012). Bat surveys – good practice guidelines, 2nd edition. Bat Conservation Trust.
[17] The Anabat Express contains a temperature logger and records the temperature approximately every five minutes. This temperature information is downloaded concurrently with the extraction of the bat calls.

- **Low Potential**- Trees with minor roosting opportunities such as loose bark plates, small cracks in limbs or ivy cover.
- **Medium Potential** - Trees with medium roosting opportunities such as significant areas of flaking bark or relatively large splits or cracks.
- **High Potential** - Trees with major roosting opportunities such as woodpecker holes or large, deep cracks or fractures, thereby having the potential to support roosting bats all year round.

Built Structure Inspection

11.46 The only built structure within the application site (B1) is the former radio beacon/aerial lighthouse building located in the east of the application site. This was subject to a structural inspection for evidence of bats, and the likelihood of it being utilised by roosting bats assessed.

Bat Emergence Survey

11.47 Two trees were identified on the site that appeared to a) fall within the proposed extraction area and b) contained features that could be utilised by roosting bats (see T1 and T2 on Figure 2 for their location). Two surveyors undertook emergence surveys of these trees prior to the July and September bat activity surveys. The surveys commenced approximately 15 minutes prior to sunset and were concluded approximately one hour after sunset when it became too dark to determine with certainty if any bats subsequently detected had emerged.

Great Crested Newt survey

11.48 Few ponds are indicated as being present on the site by OS mapping, however it rapidly became apparent during the early phases of survey work that in addition to these the site contains a number of both well-established and recent artificial ponds not shown on OS maps. Whilst undertaking the wintering bird survey visits of the site, the locations of all waterbodies present within and immediately adjacent to the site were therefore recorded on a map. In total eight waterbodies or waterbody complexes were found within the application site boundary, with an additional three accessible for survey outside of the site but within close proximity. Figure 3 provides the locations of these waterbodies. Around one of these, Pond P1, fencing has been erected and a sign indicates that great crested newts are present. Efforts were made to establish the origin of this sign and whether it related to past mitigation work (e.g. speculated to relate to the use of the site as a film set in the 1990's). However neither Goodman nor the Hertfordshire and Middlesex Wildlife Trust were able to confirm its origin.

11.49 Presence/absence and population size class assessment surveys for great crested newts were carried out between April and June 2015 following industry-standard methodology[18] . Survey visits were conducted between the 29th April 2015 and 9th June 2015. The commencement of the survey was deliberately delayed because of the exceptional run of low overnight

[18] Following English Nature (2001*): Great Crested Newt Mitigation Guidelines*

temperatures experienced in southern England during spring 2015. In the event, sub-optimal overnight temperatures lasted well into May, but it was evident from the survey results that this did not preclude amphibian activity.

11.50 During each survey visit a minimum of three survey techniques were used. The techniques were primarily egg-searches, torching and bottle trapping, although netting was deployed in later visits within certain waterbodies that were close to drying out. A minimum of four survey visits to each waterbody was made in this period, with those ponds confirmed as supporting great crested newts subject to a total of six visits to obtain data from which to derive a broad population 'size class' for assessment purposes.

11.51 Each waterbody was also assessed for its habitat quality and/or potential to support great crested newts using the Habitat Suitability Index[19] (HSI) system. This allocates scores to ten physical attributes of the waterbody and its surrounding environment that are known to affect the likelihood of newt presence, and is now the standard repeatable technique applied when assessing how suitable a waterbody is for great crested newts. A HSI score of 1 suggests optimal habitat and 0.01 suggests unsuitable habitat, although the system has to be applied with caution as it is not sufficiently precise to be able to conclude that a pond with a high score will support newts, or that a pond with a low score will not[20] .

Reptile Survey

11.52 The presence of reptiles was assessed on the initial visits as being likely, due to the large expanses of suitable habitat in the form of rough grassland over the majority of the site. In order to sample the species assemblage and derive broad population size-class assessments, a reptile survey using artificial refugia was conducted over the spring and early summer of 2015. A total of 466 refugia, comprising a mixture of corrugated bitumen sheeting and roofing felt approximately 0.5m^2 in size, were placed within the five areas of highest quality reptile habitat within the site. The refugia were placed in each of these areas to a density of approximately ten per hectare. For general surveying purposes a minimum of five to ten refugia per hectare is recommended[21] . Therefore, the density of the refugia placed on the site is on the higher side of that suggested by applicable best practice guidelines. Each refugium was checked on at least seven occasions throughout the survey period (due to the high number of refugia deployed not all could be checked during suitable weather conditions during one visit).

11.53 Refugia of this type heat up faster than the surrounding substrate, and they therefore serve as an attractant for reptiles to bask on and shelter beneath in order to attain optimal body temperature more efficiently. The technique thereby allows these often elusive animals to be detected more readily.

[19] Oldham R.S., Keeble J., Swan M.J.S. & Jeffcote M. (2000). Evaluating the suitability of habitat for the Great Crested Newt *(Triturus cristatus).* Herpetological Journal 10(4), 143-155.
[20] Amphibian and Reptile Groups of the United Kingdom advice note 5: Great Crested Newt Habitat Suitability Index. ARG UK May 2010
[21] Froglife (1999) Reptile Survey: an introduction to planning, conducting and interpreting surveys for snakes and lizard conservation. Froglife Advice Sheet 10. Froglife, Halesworth

11.54 Table 11-3 below provides the number of refugia used in each reptile survey area R1-R5 and the size of each area. Figure 3 provides the locations of these areas.

Table 11-3
Size and Number of Reptile Refugia uses in each Area

Reptile Area	Approximate size of area (ha)	Number of refugia deployed
R1	14	140
R2	7.5	80
R3	11	110
R4	9	126
R5	1	10
Total	42.5	466

Bird Survey

Wintering Birds

11.55 Continuous transect surveys of wintering bird activity within the application site were undertaken in each of November 2014, December 2014, January 2015 and February 2015. The methodology essentially replicates the territory mapping technique used for breeding surveys and based on the British Trust for Ornithology's (BTO) Common Bird Census[22] technique. The surveyor attended the site soon after sunrise in the morning of each visit and walked a continuous transect around the site taking in all field boundaries and concentrations of scrub, as well as more open habitats, and recording all visual and aural registrations of birds present onto a large scale map using standard species identification and activity notation. The start and end point and direction of travel along transects was varied between visits to avoid sequential bias.

11.56 Due to the known historic use of the site by owls, including in particular short-eared owl *Asio flammeus* and barn owl *Tyto alba*, a visit was made in the late afternoon/ early evening of the January visit in order to detect these species. The visit involved walking the site as a transect concentrating on areas perceived to offer high quality owl foraging habitat.

11.57 Table 11-4 below provides the details of each wintering bird survey visit.

Table 11-4
Details of Wintering Bird Survey Visits

Date	28/11/2014	15/12/2014	20/01/2015	20/01/2015	25/02/2015
Start time	07:25	08:10	08:10	15:27	06:55
End time	10:30	11:15	11:30	17:10	11:35
Sunrise	07:41	08:02	07:57	-	07:01

[22] Bibby, C. J., N.D. Burgess, D.A. Hill, and S.H. Mustoe. 2000. Bird census techniques. 2nd ed. Academic Press, London and San Diego, Calif. 302 p.

Date	28/11/2014	15/12/2014	20/01/2015	20/01/2015	25/02/2015
Sunset	-	-	-	16:27	-
Cloud	8/8	0/8 to 8/8	0/8 to 8/8	8/8	8/8
Wind	Breezy at times	Little/no wind	Little/no wind	Little/no wind	Little/no wind
Temperature	10°C	6°C to 8°C	-3.5°C rising to 4°C	4°C dropping to 3.5°C	5°C to 8°C
Notes	Survey commenced prior to sunrise in order to detect owls		Heavy frost	Dusk survey	Light drizzle through most of survey. Clearing towards end.

Breeding Birds

11.58 A continuous transect breeding bird survey of the application site was undertaken during each of April, May and June 2015. The methodology is based up the application of the territory mapping technique as forms the basis of the British Trust for Ornithology's (BTO) Common Bird Census[23] approach. The surveyor attended the site just after sunrise and walked a continuous transect around the site taking in all field boundaries, as well as the more open aspects of the site, recording all visual and aural observations of birds present onto a large scale map using standard species identification and behavioural notation. Table 11-5 below provides the details of the breeding bird survey visits.

Table 11-5
Details of Breeding Bird Survey Visits

Date	15/04/2015	21/05/2015	24/06/2015
Start time	06:15	05:30	05:31
End time	10:25	10:00	09:48
Sunrise	06:04	04:58	04:41
Cloud	0/8	0/8	7/8- high cloud
Wind	Little/no wind	Little/no wind	Westerly 2-3
Temperature	5.5°C to 12.5°c	4.5°C to 13.5°C	14°C to 18°C

11.59 Surveys were only carried out during suitable weather; conditions that could suppress bird activity or otherwise compromise the effectiveness of the technique (e.g. strong wind, rain) were avoided.

11.60 Each species recorded during the survey was assigned to one of the following evidence categories[24] to assess the likelihood of breeding within the study area. The highest category observed over the three visits is used to inform the breeding status assessment for each species.

[23] Bibby, C. J., N.D. Burgess, D.A. Hill, and S.H. Mustoe. 2000. Bird census techniques. 2nd ed. Academic Press, London and San Diego, Calif. 302 p.
[24] Derived from the methodology of the UK Breeding Bird Atlas 2007-11

Non-breeding

- Flying over
- Feeding on the site only (likely to be breeding off-site)

Possible breeder

- Species observed in suitable nesting habitat
- Singing male in suitable nesting habitat

Probable breeder

- Pair present in suitable nesting habitat
- Territory present between survey visits
- Courtship/ displaying
- Visiting probable nest
- Agitated behaviour from a parent bird
- Nest building

Confirmed breeding

- Recently fledged young in suitable nesting habitat
- Adults entering or leaving a nest site
- Adult carrying a faecal sac or food
- Nest with eggs
- Nest with young

11.61 At the completion of the three surveys, the visit maps were analysed and the number of apparent territories, based on individual singing males or other indications of territory holding/breeding, were counted to arrive at a site territory total for each species.

Badger survey

11.62 Badger field signs searched for include prints, push-throughs, snagged hair, latrines, foraging evidence, paths and active or disused setts. Setts were assessed for activity and classified according to standard criteria[25] . Incidental observations of badgers were also made during the bat and bird surveys undertaken during 2014 and 2015.

Invertebrate survey

11.63 A specific assessment of the invertebrate interest of the study area was conducted between June and October 2015. Three different surveyors, with different specialist skills, were involved in the site visits in order to maximise the potential for recording different invertebrate groups.

11.64 The site was visited and terrestrial invertebrates were sampled on a total of five occasions as follows:

- 13th May 2015,

[25] Harris, Cresswell & Jefferies (1989) Surveying Badgers. The Mammal Society

- 12th June 2015,
- 7th August 2015,
- 7th September 2015, and
- 7th October 2015.

11.65 On these dates, terrestrial invertebrate sampling was undertaken by direct observation and by the following active sampling methods:

- sweep-netting. A stout hand-held net is moved vigorously through vegetation to dislodge resting insects. The technique may be used semi-quantitatively by timing the number of sweeps through vegetation of a similar type and counting selected groups of species.
- beating trees and bushes. A cloth tray, held on a folding frame, is positioned below branches of trees or bushes and these are sharply tapped with a stick to dislodge insects. Black or white trays are used depending upon which group of invertebrates has been targeted for search. Insects are collected from the tray using a pooter – a mouth-operated suction device.
- suction Sampling. This consists of using a converted leaf blower to collect samples from grass and other longer ground vegetation. The sample is then everted into a net bag and the invertebrates removed with a pooter. The advantage of suction sampling is that it catches species which do not fly readily or which live in deep vegetation. It is particularly productive for Coleoptera, some Diptera and Arachnida.

11.66 In addition, overnight moth trapping was undertaken over the following nights:

- 13-14th June 2015
- 28th-29th July 2015
- 12th-13th August 2015
- 7th-8th October 2015

11.67 The methods used during each nocturnal visit comprised the following:

- MV light-trapping. Mercury-vapour (mv) light bulbs are used to attract nocturnal insects - especially moths. These bulbs emit ultra-violet light at a wavelength which causes moths to be attracted, but the wavelength used is harmless to humans. The bulbs are mounted over catching chambers filled with cardboard egg-trays and moths entering the chambers settle on these trays and may be examined. Bulbs were powered from portable generators. Light trapping is the single most effective method of recording moths. It is also valuable for recording some other nocturnal insect groups.
- actinic light trapping. Small size actinic traps, operated from 12-volt burglar-alarm batteries were left running from early evening to the following morning. These units are discrete because, whilst still having an output in the safe zone of the UV range, their light output in the visible part of the spectrum is reduced; thus, they can be tucked away in undergrowth at the side of a track without passers-by noticing them. For

the same reasons, they attract moths and other insects from a much shorter distance and so the resultant catch is usually more representative of the habitat selected, in comparison with that in mercury vapour traps which attract flying species from a much wider area of the countryside.

11.68 The moth recording was not designed to be exhaustive; the objective was to obtain representative samples of the moth fauna from the various habitats present to ensure complete sampling coverage.

11.69 **Passive sampling**. This occurs in the absence of the surveyor. The use of a malaise trap for this purpose was regarded as highly desirable, but given the near constant presence of the general public on the site it was judged likely that the trap would probably not survive. Consequently, malaise trapping was judged impractical, and pitfall trapping was used.

- **Pitfall trapping**. Vending-machine cups or similar are placed in the ground with the rim flush with, or slightly below, the surface. A fluid is added, containing ethylene glycol, sodium chloride and formalin with a little detergent to reduce surface tension. Traps may be covered or uncovered and are typically left in position for a month at a time. Holes made in the sides of the cups a couple of centimetres below the rim permit flood or rain water to drain without the traps over-flowing and the catch becoming lost. Invertebrates simply fall into the traps. This is the single most effective means of recording ground beetles *(Carabidae)* but is also effective for rove beetles *(Staphylinidae),* some other beetle groups, spiders and most non-insect soil-dwelling arthropods.

11.70 **Survey constraints**. The main constraint of the invertebrate survey related to the digging up of the pitfall traps by dogs or foxes. Therefore, a limited amount of data was obtained from using this survey technique.

Baseline Conditions

Nature Conservation Designations

11.71 The application site is not subject to any statutory or non-statutory nature conservation designation.

11.72 Table 11-6 below lists statutory nature conservation designations within 5km of the application site boundary.

Table 11-6
Statutory Nature Conservation Sites within 5 km of the Application Site Boundary

Site Name	Designation	Brief description	Distance and orientation from site
Colney Heath	Local Nature Reserve	One of the few remaining acid heathlands in Hertfordshire.	South. 1.9km
Howe Dell	Local Nature Reserve	Comprises a stream lying at the bottom of a deeply incised valley containing a woodland.	East. 2.3km
Oxleys Wood	Local Nature Reserve	A woodland providing habitat for insects and common birds.	South-east. 2.4km
The Wick Wood	Local Nature Reserve	Ancient semi-natural woodland, with a seasonal pond and an informal playing field.	West. 2.5km
Stanborough Reedmarsh	Local Nature Reserve	A wet woodland, reed marsh, and river bank.	North-east. 3.3km
Water End Swallow Holes	Site of Special Scientific Interest	A site of geological importance. Although there is a willow carr/ swamp community that is of biological importance.	South-east. 4.4km
Watercress Wildlife Site	Local Nature Reserve	Old watercress beds and allotments. Bounded by the River Ver.	South-west. 4.6km
Wheathampstead Development Centre	Local Nature Reserve	Secondary woodland with scrub and unimproved neutral grassland.	North-west. 4.7km

11.73 In addition to the above, there are 23 non-statutory Local Wildlife Sites (LWS) within two kilometres of the application site boundary. Appendix 11/1 provides a list of the sites along with the description for each.

11.74 The nearest LWS is 'Home Covert & Round Wood' LWS which adjoins the northern boundary of the application site. The description provided by HERC for this site states the following:

"*Two areas of ancient semi-natural broadleaved woodland. Home Covert is predominantly Pedunculate Oak* (Quercus robur*) and Ash (*Fraxinus excelsior*) with remnant Hazel (*Corylus avellana*) coppice with some old Hornbeam (*Carpinus betulus*), including pollards, around the woodland edge. Sycamore (*Acer pseudoplatanus*) is frequent and Pedunculate Oak has been planted. Other canopy species include* Betula pendula*, Field Maple (*Acer campestre*) and rare Beech (*Fagus sylvatica*). The ground flora supports woodland indicators such as Bluebell (*Hyacinthoides non-scripta*), Dog's Mercury (*Mercurialis perennis*), Yellow Archangel (*Lamiastrum galeobdolon*) and Common Dog-violet (*Viola riviniana*) along with a good fern flora of Broad Buckler-fern (*Dryopteris dilatata*) and Male Fern (*Dryopteris filix-mas*). Round Wood is primarily a Hornbeam coppice with some Ash and Silver Birch standards and an occasional Holly (*Ilex aquifolium*) with Bluebell below. The bank along the eastern margin supports old coppiced Hornbeam, and Pedunculate Oak and Field Maple also occur at the woodland edge. Wildlife Site criteria: Ancient Woodland Inventory site; woodland indicators."*

11.75 Reviewing the Ancient Woodland Inventory provided by HERC highlighted that Home Covert was not mapped as an Ancient Woodland Inventory site, and a review of old map evidence similarly suggested it was secondary in origin. Subsequent correspondence with HERC revealed that the site was designated as a LWS on the basis of the presence of ancient woodland indicator species, rather than due to it being ancient woodland per se.

11.76 A total of seven Ancient Woodland Inventory Sites are however present further afield, and within 2km of the application site boundary. The closest, Oak Wood, is located approximately 0.75km to the north-west. Appendix 11/2 provides the list of these sites.

11.77 The application site is identified as lying within an opportunity area for 'acidic' grassland and/or heath creation in the Hertfordshire Ecological Networks Project.

Habitats

11.78 The application site contains the following main habitat types:

- Unmanaged neutral grassland
- Species-poor semi-improved mown grassland
- Grazed neutral grassland
- Neutral to acidic grassland
- Early succession communities with calcareous element
- Tall ruderal
- Hedgerows
- Scattered / dense scrub
- Recent plantation

- Waterbodies
- Watercourse / wet ditches
- Recently disturbed/bare ground
- Hard surfaces

11.79 A description of each habitat follows below, with an account of the dominant or more notable plant species recorded in each. A full list of vascular plant species recorded on the application site is given in Appendix 11/3.

Unmanaged Neutral Grassland

11.80 This is the dominant habitat type across large areas of the site, presenting itself as a more or less homogenous expanse of tall graminoid dominated vegetation punctuated by scattered saplings and small bushes, which locally become closer-spaced and mark a transition to scrub. The community owes much of its outward homogeneity to the dominance of a few bulky grass species, of which false oat-grass *Arrehantherum elatius* is the most typical, although in some areas it is subordinate to cocksfoot *Dactylis glomerata* in cover. A broad range of other grass species make up the rest of the bulk in these outgrown swards, typically including timothy *Phleum pratense*, Yorkshire fog *Holcus lanatus*, couch *Elytrigia repens*, meadow foxtail *Alopecurus pratensis*, and occasionally, tall fescue *Festuca arundinacea*. Finer leaved species include rough meadow grass *Poa trivialis*, creeping bent *Agrostis stolonifera* and red fescue *Festuca rubra* – the increasing dominance of the last of these marking a transition to typically more herb-rich examples. Of more scattered occurrence are perennial rye-grass *Lolium perenne,* soft brome *Bromus hordaceus*, barren brome *Anisantha sterilis,* sweet vernal grass *Anthoxanthum odoratum*, common bent *Agrostis capillaris,* smooth meadow grass *Poa pratensis* and more localised still are wood false brome *Brachypodium sylvaticum*¸ tufted hair-grass *Deschampsia cespitosa* and crested dog's-tail *Cynosurus cristatus*. A few clumps of the non-native pampas grass *Cortaderia sp*. and pendulous sedge *Carex pendula* (here likely to derive from imported material or of garden-escape origin) are also present in the central part of the site.

11.81 Herb diversity in these swards varies from areas where ruderals are prominent, to fairly species-rich swards, within which are a restricted suite of species indicative of semi-natural 'unimproved' conditions. The former areas are characterised by the presence of stinging nettle Urtica dioica, creeping thistle *Cirsium arvense*, hogweed *Heracleum sphondylium* and cleavers *Galium aparine* while the latter areas, the most diverse of which are often signposted by an increase to co-dominance of red fescue amongst the graminoid component, are commonly characterised by stands of common knapweed *Centaurea nigra*, with a variety of other herb species. These include, variously, wild carrot *Daucus carota*, bird's-foot trefoil Lotus corniculatus, stone parsley Sison ammomum, common toadflax *Linaria vulgaris,* ox-eye daisy *Leucantheum vulgare,* goat's-beard *Tragopogon pratensis*, smooth tare *Vicia tetrasperma,* tufted vetch *Vicia cracca*, red clover *Trifolium pratense,* hedge bedstraw *Galium mollugo,* lady's bedstraw *Galium verum,* red bartsia *Odontites vernus*, hawkweed ox-tongue *Picris hieracioides* meadow vetchling *Lathyrus pratensis* and hairy tare *Vicia*

hirsuta. A notable find was the county-rare green-winged orchid *Orchis morio,* present in a relatively short-sward area in the central part of the site (see target note 1)

11.82 In general, there appears to be a good representation of the various sub-communities of *Arrehatherum elatioris* grassland recognised as community MG1 in the NVC. The F. rubra subcommunity MG1a, including both the *Bromus sterilis* and *Epilobium angustifolium* variants is certainly present, as is the *Urtica dioica* sub-community MG1b (including the *Artemisia vulgaris* variant). The more species-rich knapweed-dominated stands on the site also conform to the *Centaurea nigra* sub-community MG1e, with a particular concentration of these in the central part of the site along the course of the former run-way, and potentially indicative of the exposure of low-fertility soils beneath the now-removed concrete. In some ways, the chief interest of these grasslands, which are not dissimilar to the type of unmanaged grasslands commonly found on road-verges, over and above their unbroken extent (which is unusual), is the presence in one place of several sub-communities of MG1.

Species-poor semi-improved mown grassland

11.83 This habitat occurs in the western part of the application site, occupying one large irregularly shaped area that is maintained by periodic mowing. It is essentially little different in composition to the more species-poor examples of MG1 described above, although false oat-grass is sub-dominant in this area and the increased presence of species such as perennial rye-grass and robust fodder varieties of timothy and meadow foxtail testify to some input of fertiliser or other nutrients, either recently or in the past. Herb-wise, this area is very poor in species, with species such as creeping buttercup Ranunculus repens, ribwort plantain Plantago lanceolata and creeping cinquefoil Potentilla reptans being typical, although bird's-foot trefoil was still noted in one area.

Grazed neutral grassland

11.84 The eastern part of the application site encompasses part of a fenced-in enclosure that is subject to grazing by longhorn cattle. The sward here is close-cropped, although punctuated by scattered taller individuals of less palatable species (such as ragwort Senecio jacobaea and knapweed), and with scattered topiaried survivals of pre-existing scrub, indicating that these areas were much like any other neglected area on the airfield prior to the comparatively recent introduction of grazing. More established thickets of (predominantly willow) scrub in this area are also developing a clear browse-line. The grassland species diversity here is quite high, probably reflective of the choice of location for the grazing enclosure more than a response to the grazing, with species such as wild carrot, yarrow *Achillea millefolium*, bird's-foot trefoil, common sorrel *Rumex acetosa*, meadow buttercup *Ranunculus acris,* hoary ragwort *Senecio erucifolius* and self-heal *Prunella vulgaris* noted here. The alien species goat's rue *Galega officinalis* is also present in this part of the site, probably introduced with disturbance associated with the break-out of the former runway.

Neutral to acidic grassland

11.85 This habitat occurs mainly in an area of rabbit-grazed short sward in the northern part of the site, with outlying representations occurring to the north and east of here at the boundaries of Home Covert. It is distinguished by the presence of certain species collectively indicative of a change in soil chemistry, and by the differing proportions of more broad-tolerance species such as common bent and sweet vernal grass, which become more prominent. In the main area, between Pond P1 and Home Covert, rabbit grazing acting in concert with past disturbance and compaction, has resulted in an expanse of close-cropped short turf with localised ruts and depressions that hold water after rain and during the winter. The grassland is comprised mainly of red fescue, common bent, creeping bent, Yorkshire fog, smooth meadow grass and annual meadow grass *Poa annua* with the moss *Rhytidiadelphus squarrosus* abundant throughout. Herb species recorded here include bird's-foot trefoil, lesser trefoil *Trifolium dubium*, common centaury *Centaurium erythraea,* self-heal, dove's-foot cranesbill *Geranium molle,* sticky mouse-ear *Cerastium glomeratum*, sheep's sorrel *Rumex acetosella,* wall speedwell *Veronica arvensis,* thyme-leaved speedwell *Veronica serpyllifolia*, changing forget-me-not *Myosois discolor*, procumbent pearlwort *Sagina procumbens*, common centaury, parsley piert *Aphanes arvensis* and creeping cinquefoil. In seasonally damp ruts and depressions, creeping bent becomes prominent with creeping buttercup, procumbent pearlwort, fleabane *Pulicaria dysenterica*, marsh cudweed *Gnaphalium uliginosum* and the moss *Calliergonella cuspidata* with upstanding clumps of compact rush *Juncus conglomeratus* and hard rush *Juncus inflexus*, and a little toad rush *Juncus bufonis* also found. A seedling stage, green-leaved sedge assumed to be false-fox sedge *Carex otrubae* was also recorded here. Bracken *Pteridium aquilinum* and lesser stitchwort *Stellaria graminea* become prominent components of the drier and taller woodland edge grasslands eastwards of here and adjoining Home Covert, and similarly indicate a more acidic substrate.

Neutral-calcareous grassland

11.86 In a very few areas of the site, recent episodes of disturbance appear to have exposed lenses of quite calcareous boulder clay, or disturbed soils have otherwise been admixed with crushed concrete or other calcium-rich artificial substrates. In these areas, and in addition to the more typical suite of neutral grassland species, a very limited suite of *calcicoles* is found, including blue fleabane *Erigeron acer* but with wild marjoram *Origanum vulgare*, hawkweed ox-tongue, and wild basil *Clinopodium vulgare* also noted, alongside typically higher cover of bird's-foot trefoil, knapweed and wild carrot.

Early succession communities

11.87 Grass-poor and herb-rich communities with a high proportion of bare ground occur in certain areas of the site that have been subject to disturbance in the relatively recent past. Examples include the steep banks bordering pond P7, and locally along the course of and around the end of the former runway, with

similar, although more species-poor, examples also found encroaching onto tarmac at the edges of the former taxi-way.

11.88 Typical dominants in these areas include creeping cinquefoil, smooth hawk's-beard Crepis capillaris, dove's-foot cranesbill, black medick Medicago lupulina, ribwort plantain, daisy Bellis perennis, scented mayweed Matricaria recutita, perforate St. John's wort Hypericum perforatum, colt's-foot Tussilago farfara, scarlet pimpernel Anagallis arvensis, American willowherb Epilobium ciliatum and Canadian fleabane Conyza canadensis. Less frequent are more robust rosette-forming herbs such as teasel Dipsacus fullonum, weld Reseda luteola and great mullein Verbascum thapsus.

Tall ruderal

11.89 This habitat is found on raised banks of loosely consolidated material, associated with two main areas of the site. Growing on these are tall, near monotypic stands of stinging nettle, with other species including elder, broad-leaved dock *Rumex obtusifolius*, hogweed and mugwort *Artemisia vulgaris.*

Hedgerows

11.90 The hedgerow resource on the site is relatively sparse given the extent of land area, reflecting rationalisation of Enclosure-age field boundaries and later 20th century removals to create the open area of the airfield. Consequently, most of the hedgerows on the site occur as remnant stretches, with the most robust examples demarcating the western and southern boundaries of the former airfield. Each hedgerow is described below with reference to Figure 1:

<u>Hedgerow H1</u>

11.91 This hedgerow extends into the site from the eastern boundary, is partly sited on an indistinct bank, and adjoins a public right of way. It is dominated by hawthorn *Crataegus monogyna*, field maple *Acer campestre* and blackthorn *Prunus spinosa*, the last of which is suckering outwards into the adjoining grasslands in places. Less frequent woody species include hazel *Corylus avellana,* holly Ilex *aquifolium,* elder *Sambucus nigra*, oak *Quercus robur,* ash *Fraxinus excelsior* and hornbeam *Carpinus betulus*. There are a small number of standards, comprised of ash, oak and field maple, some of which are multi-stemmed from past cutting, with hornbeam at the western end. The ground-flora is species-poor, in part due to intense rabbit activity, although hedge garlic *Alliaria petiolata,* wood dock *Rumex sangineus* and wood false brome are present. Woody species-diversity is around five species per 30m, which in conjunction with the adjoining public footpath, qualifies it as 'Important' under Schedule 2 of the Hedgerows Regulations 1997.

<u>Hedgerow H2</u>

11.92 This is an eastward continuation of H1 above, although without the adjoining public right of way. The same complement of species are present, with standards comprised of ash, hornbeam and field maple. The hedgerow is

close to the qualification threshold for an 'Important' hedgerow set out under Schedule 2 of the Hedgerows Regulations but likely to fall just short.

Hedgerow H3

11.93 This is a relict stretch of hedgerow extending part-way into the former airfield site from the southern boundary and with a shallow associated ditch. It comprises remnant lengths or isolated shrubs of woody vegetation, in between which are gaps filled with linear thickets of bramble *Rubus fruticosus agg*, itself permeated with ruderals such as stinging nettle and rosebay willowherb *Chamerion angustifolium.* Woody species diversity averages around 2-3 per 30m, comprising hawthorn, with elder and suckering elm *Ulmus procera* at the southern end, an area of dense blackthorn thicket in the central stretch, two small oak standards and one ash. The ground flora contains no woodland species. This hedgerow does not meet the criteria for importance under Schedule 2 of the Hedgerows Regulations 1997.

Hedgerow H4

11.94 Another stretch of relict hedgerow extending a short way northwards into the site from Popefield Farm. The longest stretch is almost entirely dominated by blackthorn, which has expanded outwards to form a dense domed thicket. Closer to Popefield Farm the species mix includes goat willow *Salix caprea*, hawthorn and oak. This hedgerow does not meet the criteria for importance under Schedule 2 of the Hedgerows Regulations 1997.

Hedgerow H5

11.95 This mature hedgerow runs along the southern boundary of the application site adjoining the A1057 Hatfield Road. It is an unmanaged feature with a significant complement of large mature trees, including specimens of probably 19th century planted origin east of Popefield Farm. The woody species complement, in approximate order of abundance, includes hawthorn, oak, field maple, blackthorn, elder, ash, hazel, holly, wild cherry, common lime, beech, field maple and Norway maple, the last five of which occur as standards in the easternmost section. West of Popefield Farm the standards are mostly oak, with some ash. Ground flora includes wood avens, wood dock, rough meadow grass, lords and ladies, wood false brome and herb Robert. East of Popefield Farm, the northern side of this hedgerow is gradually beginning to merge with adjoining scrub, with a intervening transitional band of the non-native snowberry *Symphoricarpos alba* present here. This hedgerow averages between five and six qualifying woody species per thirty metres and in conjunction with other features meets the criteria for importance under Schedule 2 of the Hedgerows Regulations 1997.

Hedgerow H6

11.96 A mature hedgerow, locally a double-rowed feature on indistinct banks, which forms the south-western boundary of the site and adjoins a public right of way. It is a neglected feature, suffering from the effects of damage from foot traffic, dumping (including of garden waste) and shading due to proximity of

buildings, but retains a fine complement of mature standards, mostly of oak but with some ash. Other woody species include hazel, hawthorn, hornbeam, field maple and holly. Ground flora includes greater stitchwort *Stellaria holostea*, wood avens, wood dock and hedge garlic. This hedgerow averages between five and six qualifying woody species per thirty metres and in conjunction with other features such as the presence of the public right of way within or adjoining it, meets the criteria for importance under Schedule 2 of the Hedgerows Regulations 1997.

Scattered / dense scrub

11.97 Scattered self-sown scrub is an ever-present feature over the majority of the grasslands on the site, the main exception being the regularly mown areas in the south-west. Generally it comprises shrubs and small trees up to around 3-4m in height occurring as isolated individuals, small groups or more concentrated patches which are beginning to occlude the remaining areas of grassland and influence their composition through light competition.

11.98 The make-up of the scrub across the site appears to vary based on soil conditions and/or the history of past disturbance. In the driest and least-disturbed areas, hawthorn is generally the most prevalent species, with localised dense thickets of blackthorn, but there are also areas in the southern part of the site east of Popefield Farm where oak seems to be dominant or co-dominant. Over most of the central and eastern portion of the site, these species give way to willow, variously goat willow, white willow *Salix alba* or (very locally) *osier Salix viminalis* and grey willow *Salix cinerea*, with hybrids between these also appearing to be present. More locally encountered are dog rose *Rosa canina* and field maple.

11.99 Scattered through this backdrop of hawthorn, oak or willow dominated scrub are various other species, some of which have evidently arrived as garden throw-outs or in otherwise imported material, have been actively planted or in some instances may be bird-sown. They include cherry plum *Prunus cerasifera var 'Atropurpurea'*, damson *Prunus domestica*, laburnum *Laburnum anagyroides*, golden willow *Salix alba var 'Vitellina'*, apple *Malus domestica,* silver birch *Betula pendula*, false acacia *Robinia pseudoacacia*, Italian alder *Alnus cordata*, buddleia *Buddleja davidii* and broom *Cytisus scoparius.*

11.100 The expanse of occluding scrub cover in the south-western part of the site is influencing the composition of the grasslands beneath, with an increase in shade-tolerant species such as male fern *Dryopteris filix-mas* and increases in the cover of mosses such as *Brachythecium rutabulum*.

Recent Plantation

11.101 Several discrete areas of recent tree and shrub planting are present in the south-western part of the application site, at the edges of the open area of mown grassland. The complement of species used is diverse, with blackthorn, field maple, goat willow, hornbeam, hawthorn and dog rose present, alongside dogwood *Cornus sanguinea*, silver birch, wild privet

Ligustrum vulgare, guelder rose *Viburnum opulus* and other species that are otherwise scarce on the site.

Waterbodies

11.102 Contained within the application site are a restricted number of long-established ponds, and a similar number of more recently created waterbodies. Each is described below with reference to Figure 3. Only those ponds falling within the application site boundary are fully described below, hence the numbering is not sequential:

Pond P1

11.103 This pond is indicated on 19th century maps as a former small gravel pit. It now consists of two adjoining basins (P1a and P1b) set within an area of scrub and mature trees and enclosed within post and wire fencing of recent origin. P1a is the larger, western depression and the more heavily shaded, with emergent vegetation restricted to a little reed canary grass *Phalaris arundinacea* and yellow flag iris *pseudacorus* at the southern end. The pond appears to dry out annually, although in the summer the invasive non-native aquatic plant New Zealand Pigmyweed *Crassula helmsii* becomes abundant. P1b is part unshaded, and although it also appears to dry up annually or near-annually, supports a much more luxurious complement of emergent vegetation, including reed canary grass, yellow flag, soft rush *Juncus effusus*, gypsywort *Lycopus europeaus*, bittersweet *Solanum dulcumara*, clustered dock *Rumex conglomerates*, marsh bedstraw *Galium palustre*, pale persicaria *Persicaria lapathifolia*, common duckweed *Lemna minor*, marsh cudweed, water forget-me-not *Myostotis scorpiodes*, and a drawdown zone with rough meadow grass, chickweed *Stellaria media* and many-seeded goosefoot *Chenopodium polyspermum*. Moorhen nests in this pond.

Pond P2

11.104 This is actually a group of three very small depressions (potentially bomb craters left over from the WWII film set), close to P1 and overshaded by grey willow. Two retain standing water in the early part of the year, although the only vegetation associated with them is a mat of creeping bent.

Pond 3

11.105 This waterbody is a somewhat larger crater-like steep-sided depression close to P1. It retains standing water in the early part of the year, and is shaded on two sides by dense willow, bramble, dog rose and tall ruderals. Wetland vegetation comprises mainly a dense mat of creeping bent, but there is also a little creeping buttercup, gypsywort and water forget-me-not.

Pond P4

11.106 Rather than a pond, this is a length of steep-sided ditch forming part of the course of the Nast, and which retains standing water for much of the winter and the early part of the year. It only appears to function as part of a flowing water system in periods of high precipitation and surface water run-off.

Emergent vegetation includes tufted hair grass, lesser pond sedge *Carex acutiformis*, water mint, meadow vetchling, compact rush, hoary willowherb *Epilobium parviflorum*, and bittersweet with, of some note, sneezewort *Achillea ptarmica* and he hybrid mint *Mentha x verticillata* also noted*acutiformis,* water mint, meadow vetchling, compact rush, hoary willowherb *Epilobium parviflorum*, and bittersweet with, of some note, sneezewort *Achillea ptarmica* and he hybrid mint *Mentha x verticillata* also noted.

Pond P5

11.107 This is an artificial waterbody of recently created origin and set down between steep raised banks. It appears to hold standing water on a semi-permanent basis, and has a reasonable complement of emergent vegetation including reedmace *Typha latifolia*, water plantain *Alisma plantago-aquatica,* common spike rush *Eleocharis palustris*, jointed rush *Juncus articulatus,* marsh bedstraw*,* branched bur-reed *Sparganium erectum* and cyperus sedge *Carex pseudocyperus*, with grey willow saplings.

Pond P7

11.108 This is a complex of small, very shallow depressions within a stand of willow, and supporting sparse but tall growth of common reed *Phragmites australis*. They all dry up by late spring/early summer.

Pond P8

11.109 This waterbody close to Popefield Farm at adjoining the southern boundary of the application site pre-dates the airfield and appears on 19th Century maps. Currently, it is a fairly good-sized but silted, shallow and heavily shaded feature by virtue of the adjoining outgrown hedgerow and associated dense scrub, and retains little emergent vegetation. It appears to also receive surface water run-off from the adjoining A1057 which may affect its water quality.

Pond P9

11.110 Similar to P4 in that this is a section of the surface water drainage ditch system that carries the flow of the Nast watercourse. This section is immediately upstream of the culvert that takes the Nast below the airfield, and the frequency of standing water here may be a symptom of backing up of flow (for example if the culvert capacity is compromised by collapse or silting up). Mostly it is densely overshaded with no aquatic or emergent vegetation, but there are unshaded lengths with dense stands of great willowherb *Epilobium hirsutum,* lesser pond-sedge and/or reed canary grass.

Watercourse / wet ditches

11.111 Crossing the northern part of the application site is a narrow ditch carrying a minor watercourse known as the Nast. South of Home Covert this watercourse enters a culvert which takes it beneath the main area of the former airfield, to re-emerge at a point adjacent to the A1057 Hatfield Road.

The remaining sections of open channel are for much of the year dry or only damp, although locally holding ponded lengths of static water in the spring (see P4 and P9 above).

11.112 Where not densely overshaded by adjoining scrub, the dampest areas support wetland vegetation distinct from the surrounding grasslands. In places this is merely stands of great willowherb, but there are also sections dominated by lesser pond sedge and reed canary grass with associates including clustered dock, soft rush and false fox-sedge *Carex otrubae*. In other (typically no more than damp) stretches, species include creeping bent, tufted hair-grass, bittersweet, water mint and meadow vetchling. In the section described above as P4, sneezewort and the hybrid *Mentha x verticillata* were recorded.

Recently disturbed / bare ground

11.113 This habitat occurs in two distinct areas of the site – a patch of ground in the northern part of the site which appears to have been recently stripped and laid to hardcore, and a fenced-off mounded area, and adjacent spoil heaps, in the central part of the site comprised of crushed concrete and other materials, and which is evidently still being regularly treated with herbicide to address Japanese knotweed contamination. The complement of pioneer species found in these areas is close to that described under 'Early Succession Communities' above, but with certain ruderals and opportunists such as teasel, colt's-foot, buddleia and American willowherb being particularly prevalent.

Hard surfaces

11.114 This habitat type is restricted to the still-sealed concrete surface of the former taxi-way and the former Airfield Radio Beacon / Aerial Lighthouse: a single surviving, small, brick-built airfield structure adjoining the eastern boundary of the application site. No plant species not already described or otherwise of any particular note are associated with these areas.

Bats

Desk Study

11.115 HERC provided a total of 71 bat records for the search area, with these records relating to soprano pipistrelle *Pipistrellus pygmaeus*, common pipistrelle *Pipistrellus pipistrellus*, pipistrelle sp., brown long-eared bat *Plecotus auritus*, *noctule Nyctalus noctula*, Natterer's bat *Myotis nattereri* and unspecified "bat species". No bat records were listed as specific to the application site itself, although brown long-eared bat, Natterer's bat and common pipistrelle records were provided for the three 1km squares[26] in which the site sits. These are the only pre-existing data obtained - none of the previous surveys of the airfield reviewed earlier in this chapter incorporated specialist bat surveys.

[26] TL1907, TL2008 and TL1908

Bat activity surveys

11.116 Figures 4 to 6 afford an appreciation of the distribution of bat registrations recorded on each of the three transect surveys carried out in June, July and September 2015. Table 11-7 below lists the species recorded and the number of sound files for each recorded on each survey visit.

Table 11-7
Species and Number of Sound Files Recorded for each Species during each Bat Transect Survey

Species	Scientific Name	23/06/2015	29/07/2015		07/09/2015		Total	Percentage of files
Area		All	South	North	South	North		
Common Pipistrelle	*Pipistrellus pipistrellus*	35	39	40	31	16	161	69.1
Pipistrelle sp. (Nathusius'/common)[27]	*Pipistrelle sp.*	1	8	4	4	5	22	9.4
Pipistrelle sp. (common/soprano)[28]	*Pipistrelle sp.*	6	1	0	4	0	11	4.7
Soprano Pipistrelle	*Pipistrellus pygmaeus*	13	1	3	3	1	21	9
Noctule	*Nyctalus noctula*	3	4	1	2	3	13	5.6
Long-eared bat[29]	*Plecotus sp.*	1	0	0	1	0	2	0.9
Daubenton's bat[30]	*Myotis daubentonii*	0	0	0	1	0	1	0.4
Whiskered/Alcathoe/Brandt's bat[30]	*Myotis mystacinus/ Myotis alcathoe/ Myotis brandtii*	0	0	0	0	2	2	0.9

11.117 By far the most frequently recorded species on the transect surveys was common pipistrelle, which accounted for at least 69% of all registrations. Much less frequently encountered were soprano pipistrelle (at least 9% of registrations), noctule (5.6%), Daubenton's bat (0.4%) and whiskered/Alcathoe/Brandt's bat (0.9%). A significant number of registrations around the 40kHz frequency were made, but none were conclusively attributable to the rare Nathusius' pipistrelle, and it remains possible that the species labelled as 'Pipistrelle sp. (Nathusius'/common)' in Table 11-8 may be common pipistrelle bats calling at unusually low frequency.

11.118 Figure 7 shows the locations of confirmed foraging and other constant activity recorded across the study area over all of the surveys. The areas of the site most frequently utilised by bats were, not surprisingly, locations which held water, mature trees and/or shelter (e.g. hedgerows).

[27] Where Pipistrelle calls were around 40kHz these have been noted to genus level only, as the calls could not be definitively attributed to either Nathusius' or common pipistrelle.
[28] Where Pipistrelle calls were at approximately 50kHz these have been noted as Pipistrelle sp. Both species can produce calls at or around 50kHz and as such it is not possible to directly attribute a call of this frequency to either species.
[29] Almost certainly brown long-eared bat.
[30] The use of the 'slope' function in Analook is used to aid in the identification of *Myotis* species (*Myotis* calls are generally difficult to attribute to species); however, where slope is ambiguous these have been noted as *Myotis* sp. Calls attributed to Daubenton's bat and to the WAB group (whiskered/Alcathoe/ Brandt's bat) are 'probable' identifications.

Automated Bat Survey

11.119 Table 11-8 below provides the results of the automated bat surveys carried out on the site during each of June, July and September 2015.

Table 11-8
Number of Files for each Species at each Automated Survey Point

Survey Period	June 2015		July 2015		September 2015			
Detector Location (see Figure 2)	A1		A2		A3		Total	
Species	No. of files	%	No. of files	%	No. of files	%	No. of files	%
Common pipistrelle	124	59.62	1512	84.19	69	41.07	1705	78.5
Pipistrelle (Nathusius'/common)[31]	44	21.15	106	5.90	0	0.00	150	6.9
Noctule	12	5.77	30	1.67	32	19.05	74	3.4
Pipistrelle (common/soprano) [32]	5	2.40	83	4.62	27	16.07	115	5.3
Long-eared bat[33]	7	3.37	4	0.22	15	8.93	26	1.2
Natterer's bat[34]	0	0.00	2	0.11	19	11.31	21	1.0
Myotis sp.[34]	5	2.40	21	1.17	3	1.79	29	1.3
Soprano pipistrelle	5	2.40	28	1.56	1	0.60	34	1.6
Nathusius' pipistrelle	4	1.92	2	0.11	1	0.60	7	0.3
Whiskered/Alcathoe/Brandt's bat[34]	1	0.48	0	0.00	0	0.00	1	0.0
Bat (unidentified)[35]	1	0.48	2	0.11	1	0.60	3	0.1
Daubenton's bat[34]	0	0.00	1	0.06	0	0.00	1	0.0
Serotine/Noctule[36]	0	0.00	5	0.28	0	0.00	5	0.2

11.120 Broadly speaking, the automated results mirror those obtained on the transect surveys with again by far the most frequently recorded species being common pipistrelle (at least 78% of all registrations). Non-Pipistrellus species cumulatively make up less than 10%; they include noctule, long-eared bat (almost certainly brown long-eared), Daubenton's, Natterer's and whiskered/Alcathoe/Brandt's bat, with five sound-files (0.28% of the total) possibly attributable to serotine.

[31] Where calls were around 40kHz these have been noted to genus level only, as the calls could not be definitively attributed to either Nathusius' or common pipistrelle.
[32] Where Pipistrelle calls were at approximately 50kHz these have been noted as Pipistrelle sp. Both species can produce calls at or around 50kHz and as such it is not possible to directly attribute a call of this frequency to either species.
[33] Likely to be brown long-eared bat.
[34] The slope function in Analook is used to aid in the identification of *Myotis* species (*Myotis* calls are generally difficult to attribute to a specific species); however, where slope is ambiguous these have been noted as *Myotis* sp. The *Myotis* species above (Daubenton's bat, Natterer's bat, whiskered/Alcathoe/ Brandt's bat) are probable identifications and are in addition to the number of *Myotis* files.
[35] This label has been used where it is possible to identify that a bat was present, but where there was insufficient call data to attribute the registration to Family or Genus level.
[36] This label was used where a 'big bat' (Eptesicus/Nyctalus sp) was present but due to the quality of the call it was difficult to determine the species.

Assessment of Roosting Potential

11.121 Table 11-9 below provides the results of the bat tree roost assessment of the two mature trees near the centre of the site (T1 and T2), and of the Airfield Radio Beacon / Aerial Lighthouse building adjoining the eastern boundary (B1).

Table 11-9
Bat Roosting Assessment

Tree/Building Reference	Bat roosting potential	Notes
T1	High	Two woodpecker holes- 12m east. Decaying branch on south-east with raised bark and cracks present.
T2	Medium/high	Decaying branch on south side, with knot holes at end of branch and at fork. Rotted knot hole on south side of main trunk
B1	Negligible	Brick built single storey structure, with a flat roof and no void. Small gaps behind barge-boarding filled with cobwebs or too narrow for bat access. No bat droppings noted inside and interior signs of both vandalism and use by cattle.

11.122 The two trees (T1 and T1) were additionally subject to emergence surveys in July and September 2015, with no bats found to emerge.

Evaluation of bat interest of the site

11.123 By far the most frequently detected bat species during the bat activity and automated surveys was common pipistrelle. This species is Britain's and Hertfordshire's[37] most common bat species and can be found in a wide range of habitats[38] . Common pipistrelle is showing long-term (and short-term) increases in population trends in the UK[39] . This species is a generalist being found in a wide variety of habitats, and its occurrence on the site is entirely to be expected.

11.124 Soprano pipistrelle was also encountered on the site, but to a substantially reduced degree compared with common pipistrelle. This is likely to be due to the relative lack of this species' preferred foraging habitats, which tend to be more focused on riparian and wetland habitats than the more generalist common pipistrelle. As with common pipistrelle, this species is a common bat in both Britain and Hertfordshire36.

11.125 There were low levels of activity indicated for Nathusius' pipistrelle on the site, with seven registrations recorded during the automated bat survey

[37] http://hmbg.org.uk/bats-in-hertfordshire-middlesex/
[38] Hundt (2012). Bat Surveys- Good Practice Guidelines, 2nd Edition. Bat Conservation Trust, London.
[39] Bat Conservation Trust (2014) The State of the UK's bats- National Bat Monitoring Programme Population Trends 2014. BCT

element. Nevertheless, there were approximately 170 records/files of pipistrelles calling within the 40kHz range, some of which could also be Nathusius' pipistrelle. This species is considered by Hertfordshire and Middlesex Bat Group (HMBG) to be widespread, but scarce. Nationally this species is considered rare, and confirmed roosts are not often found, but there has been an increase in records in recent years. This may be due to an increase in bat surveyors looking for this species coupled with advances in technology and analysis software.

11.126 Noctule was regularly though sparsely recorded during the surveys, with most registrations being of bats flying high over the site, often very soon after sunset, and possibly indicative of transient bats commuting over the site to more favoured foraging habitats (possibly the gravel pit settling ponds to the north). HMBG describes the status of this species as "widespread, but relatively scarce". The species has shown population declines in Britain in the past due to the loss of good feeding habitats, mainly from agricultural intensification. However, there does not appear to currently be a significant change in the population trend for this species38.

11.127 Due to the difficulty of identifying bats from the Myotis genus to species level, especially where foraging in terrestrial environments rather than over open water, many of the Myotis species records from the site have been identified to genus level only. However, probable identification to species level was attempted using the recordings from the Anabat and the 'slope' feature in Analook. This analysis identified probable Daubenton's bat, probable Natterer's bat and probable whiskered/Alcathoe/Brandt's bat, but it should be stressed that these are probable identifications; the most conclusive method of identifying these species is through capture and identification in the hand. Of these species, Natterer's has been recorded from the locality in the past [source: HERC data].

11.128 Different Myotis species prefer different habitats but the habitat requirements of the above species assessed to be present on the site are met, particularly given the presence of mature woodland adjoining the application site to the north. On balance it is considered likely that the majority of the unspecified Myotis registrations made will be from, Natterer's, Daubenton's and whiskered or Brandt's bats.

11.129 Daubenton's bat population trends are showing a very slight steady increase, whilst for whiskered/Brandt's bat the trend has shown an increase with a slight decrease in the last few years[40] . Daubenton's bat is fairly widespread in Hertfordshire[41] and the UK, whilst whiskered bat is assumed to be rare[42].

11.130 Although there were 28 registrations of long-eared bats encountered on the site, this is likely to be unrepresentative due to the difficulty that bat detectors have in picking up the very quiet calls from the Plecotus genus. The most likely Plecotus on the site, brown long-eared bat, is one of the UK's and Hertfordshire's commonest bat species. Its habitat preferences include

[40] Bat Conservation Trust (2014) The State of the UK's bats- National Bat Monitoring Programme Population Trends 2014.BCT
[41] http://hmbg.org.uk/bats-in-hertfordshire-middlesex/
[42] Bat Conservation Trust (2010) BCT Brown long-eared - Species information leaflet. Bat Conservation Trust

woodland, as well as rivers, lakes and grassland . Brown long-eared bats are currently showing a slight long-term and short-term decrease in population; the reasons for this are unknown but may be related in part to the management neglect of woodlands and the loss of traditional agricultural buildings to neglect or conversion.

11.131 Overall, the bat activity recorded on the site was comparatively low in consideration of the site area. This is not unexpected given the open nature of the site, the relative lack of upstanding features and habitat 'edges' and the sparseness of favoured foraging resources such as woodland, waterbodies, and hedgerows.

Great Crested Newt Survey

Desk Study

11.132 HERC provided fifteen great crested newt records for the search area, with the nearest relating to a site 0.4km to the west, and the latest record from 2006.

11.133 The 2008 Cresswell Associates report stated that in 1999, two ponds (P1 and P3 on Figure 3) contained a small population of great crested newts. A site walkover in 2010 by Cresswell Associates also encountered a great crested newt under a refugium near a bund approximately 30m south-east of P3. An update survey by Cresswell in 2010 again found great crested newts in P1 and P3, with this species also confirmed in P5 and P8 (see Figure 3). It was assessed at this time that there was a 'medium-sized' population on the site.

11.134 In 2015 LDA Design undertook a great crested newt eDNA survey of 13 waterbodies within the vicinity of the northern part of Ellenbrook Fields. Two of the surveyed waterbodies (P7 and P10 on Figure 3) were also encompassed within the scope of the great crested newt surveys undertaken by Bioscan in 2015. The results from the eDNA survey confirmed the presence of great crested newt within three of the waterbodies; these comprised a waterbody to the north of Home Covert, a pond within the Ellenbrook Linear park at the eastern edge of the airfield and P7 immediately east of the application site. A negative result was also returned for P10 (off-site and within Home Covert).

11.135 Further great crested newt records for ponds to the north and north-west of the application site were obtained from a review of the St Alban's District Council planning portal. These relate to a live planning application for restoration of part of the CEMEX Hatfield Quarry, the supporting information for which refers to positive records for great crested newts in ponds at Beech Farm (c.300m NW of the application site) and Ball's Copse (just under 375m north of the application site)

Ponds Surveyed

11.136 Habitat descriptions of each waterbody within the application site are given earlier in this section. Table 11-10 below lists further details of the suitability

of each of these for great crested newts, including HSI scores, as well as equivalent details for three further waterbodies outside the application site, but which were also included within the great crested newt surveys carried out in 2015 by Bioscan and/or LDA Design. The locations of each of these waterbodies are indicated on Figure 3.

Table 11-10
Waterbody Information and HSI Results

Waterbody Reference	Approximate size (m^2)	Notes/Brief description (see also habitat descriptions above)	HSI Score	Suitability for GCN
P1a and P1b	P1a- 190 P1b- 100	The water level in P1a became very low by the end of the newt surveys, whilst P1b had dried up by the fifth visit.	P1a- 0.78 P1b- 0.58	P1a- Good P1b- Below average
P2	3	Two to three crater-like depressions to the east of P1. These had dried up by the third newt survey visit.	0.36	Poor
P3	30	Few suitable egg laying plants were noted. The water level decreased through the newt surveying season, and by the sixth visit no water remained.	0.59	Below average
P4	30	Part of the Nast ditch system. It was very shallow and became dry by the third visit.	0.55	Below average
P5	70	A deep linear feature near Home Covert. A wide variety of invertebrates were noted. The water level decreased during each survey visit, but it did not dry out.	0.75	Good
P6	480	A linear feature just outside of the site boundary. Surrounded by young willows, although the waterbody is still relatively open. Dry by the summer. Appears to be used by the grazing cattle as a watering resource.	0.79	Good
P7	40	Shallow depressions in a stand of trees. Dried up by the fourth visit.	0.40	Poor
P8	200	Immediately adjacent to the A1057 (Hatfield Road). It is fairly shallow and looks to be fed from surface water run-off from the road.	0.63	Average
P9	150	Part of the Nast ditch system and on the edge of Home Covert. Large parts of the periphery of waterbody are overgrown with vegetation. Dry by the second visit.	0.51	Below average
P10	1900	A large long-established pond in Home Covert. The waterbody has a small island. Due to the large amounts of leaf litter the depth of the waterbody could not be determined. The presence of spent shotgun	0.65	Average

Waterbody Reference	Approximate size (m²)	Notes/Brief description (see also habitat descriptions above)	HSI Score	Suitability for GCN
		cartridges suggests this waterbody is used for shooting waterfowl. It may also have fish.		
P11	80	Two shallow depressions next to a path. Likely to be used by the grazing cattle as a water resource. Dried up by the fourth visit.	0.49	Poor

Survey Results

11.137 Five of the 11 waterbodies surveyed in 2015 within and immediately adjacent to the site were found to support great crested newt, although only two of these were confirmed as in use for breeding or attempted breeding. Table 11-11 below shows the peak number of great crested newts encountered whilst torching and bottle trapping, together with the results of the egg searches.

Table 11-11
Peak Number of Great Crested Newts Recorded from Torching and Bottle Trapping over the Survey Period and the Results of the Egg searches for each Waterbody

Waterbody reference (Fig 3)	Maximum number of GCN recorded during torching	Maximum number of GCN recorded during bottle trapping	Maximum number of GCN recorded from both methods	GCN eggs present?
P1a	26	12	26	Yes
P1b	2	1	2	No
P2	0	0	0	No
P3	2	1	2	No
P4	0	0	0	No
P5	1	1	1	No
P6	8	2	8	Yes
P7	0	0	0	No
P8	0	0	0	No
P9	2	1	2	No
P10	0	0	0	No
P11	0	0	0	No

11.138 Terrestrial surveys for the species were not carried out, but during the reptile survey a great crested newt was found under a reptile refugium along a bank in the western corner of area R1 (see Figure 3) during a visit on the 30th April 2015.

Evaluation

11.139 Using the population size class assessment system[43] , the results from the field survey indicate that the site supports a 'medium' population of great crested newts. Taking each waterbody individually, P1a supports a medium population, whilst the remainder of the waterbodies where the species was found support a small population. A review of historic maps and aerial photographs of the site shows that P1 has been in existence for at least 110 years, whilst P5, P6, P7 and P11 were created between 2000 and 2005, and this may in part explain the population sizes of each waterbody.

11.140 The presence of an individual adjacent to the gravel pits to the north could indicate that these off-site waterbodies on CEMEX land are used by great crested newts and could be part of the metapopulation within the area. The Cresswell Associates 2010 report stated the following in regards to this: *"Given the proximity of the gravel pits to the airfield site it is considered likely that the newts breeding on the airfield may be part of a larger population that breed in the gravel pits. Given the size of the gravel pits it is considered possible that they may support a 'large' sub-population of great crested newts."*

11.141 The results of the eDNA sampling undertaken by LDA Design in 2015 of the two off-site waterbodies P7 and P10 corroborate the simultaneous Bioscan surveys of these ponds, with great crested newt confirmed in P7 and a negative result returned for P10.

Other amphibians

11.142 In 2008 Cresswell Associates reported the presence of common frog *Rana temporaria* and common toad *Bufo bufo* on the site. These species were also recorded by Bioscan in 2015 whilst carrying out the great crested newt surveys, along with good numbers of smooth newts. Table 11-12 below provides the peak count of smooth newt and the results of the egg searches for each waterbody shown on Figure 3.

[43] English Nature (2001) Great crested newt mitigation guidelines. English Nature

Table 11-12
Peak Count of Smooth Newt and the Results of the Egg Search for each Waterbody

Waterbody reference	Maximum number of smooth newt recorded during torching	Maximum number of smooth newt recorded during bottle trapping	Maximum number of smooth newt recorded from both methods	Smooth newt eggs present?
P1a	18	32	32	Yes
P1b	4	0	4	No
P2	0	0	0	No
P3	18	35	35	Yes
P4	2	0	2	No
P5	36	32	36	No
P6	18	6	18	Yes
P7	3	1	3	No
P8	2	7	7	No
P9	0	0	0	No
P10	2	3	3	No
P11	3	1	3	No

11.143 In total, smooth newts were encountered in nine waterbodies, with a 'medium' population[43] of this species on the site. Higher numbers of individuals were found in P5, P3 and P1a.

Reptile Survey

Desk Study

11.144 HERC provided 14 records of reptiles for the search area. Of these records, eleven relate to grass snake Natrix natrix, three for slow-worm *Anguis fragilis* and one for common lizard *Zootoca vivipara*. The closest records to the application site relate to grass snake, the nearest being 0.65km to the south-west of the application site boundary. The most recent reptile record provided by HERC is from 2007.

11.145 Creswell Associates reported in their 2008 report on the results of a survey of the whole Ellenbrook Fields site in 1999 when *"small numbers of slow-worm were … recorded within the grassland and a single grass snake was also found".* It is unknown which part of Ellenbrook Fields these individuals were recorded from. However a later reptile survey undertaken in 2010 by Cresswell Associates of "strategic locations across the site" did not confirm the presence of any reptiles.

2015 Field Survey

11.146 Table 11-13 below provides a summary of the results of the reptile survey carried out during 2015. Just one reptile, a grass snake, was encountered on

the site during the total of seven surveys (the location of this individual is provided on Figure 3). This individual was found on the last reptile survey visit, 24th June 2015, in the eastern part of R4.

Table 11-13
Results of the Reptile Survey during 2015

Reptile Area	Number of grass snake recorded
R1	0
R2	0
R3	0
R4	1
R5	0
Total	1

Evaluation

11.147 Whilst population sizes derived from refugia data are notoriously unreliable, the results from the survey would suggest, based on Froglife's population score system[44], that the site supports a 'low' population of grass snake. At first pass this is somewhat surprising given the presence of large areas of what appears to be suitable reptile habitat on the site. A combination of factors could explain the apparent absence of reptiles, including the historic use of the site as an aerodrome (and the likely intensive mowing of any grassland at that time), the lack of reptile populations within the vicinity from which colonisation of the site could occur once it became neglected and more suitable, the presence of roads surrounding the site which may act as further barriers for reptile colonisation, and the regular waterlogging of the site during the winter which may reduce opportunities for reptile hibernation.

Bird Survey

Desk Study

11.148 The results from the data request from HERC produced 18,168 bird records for the search area (nearly 93% of all the records provided by HERC). A total of 402 of these records relate directly to either 'Ellenbrook Fields' and/or 'Hatfield Aerodrome'. It should be noted that both Ellenbrook Fields and Hatfield Aerodrome comprise a larger area than the application site; nevertheless, all records with these site names have been included in the analysis given below. In addition, 113 bird records are made at a coarser 1km scale, and relate to the three 1km squares in which the application site sits, not necessarily to the site itself.

11.149 In total, 75 species have been noted for Ellenbrook Fields, Hatfield Aerodrome or for the three 1km squares straddled by the application site.

[44] Froglife (1999) Reptile Survey: an introduction to planning, conducting and interpreting surveys for snakes and lizard conservation. Froglife Advice Sheet 10. Froglife, Halesworth

This is broken down into 54 species for Ellenbrook Fields/Hatfield Aerodrome and 43 for the three 1km squares as shown by Table 11-14 below.

Table 11-14
Number of Records relating to Ellenbrook Fields and Hatfield Aerodrome, and for the three 1 km squares in which the Sit sits

Species	Number of records pertaining to 'Ellenbrook Fields' and/or 'Hatfield Aerodrome'	Number of records for the three 1km squares in which the site sits
Barn Owl	13	0
Black Redstart	2	0
Black-headed gull	0	7
Black-tailed Godwit	1	0
Blue tit	0	5
Bullfinch	4	1
Buzzard	9	3
Canada goose	0	1
Coal tit	0	1
Common gull	0	2
Cuckoo	58	1
Curlew	1	0
Dunnock	0	6
Fieldfare	21	2
Goldcrest	0	1
Goldfinch	2	5
Grasshopper Warbler	20	0
Great spotted woodpecker	0	3
Great tit	0	6
Green Woodpecker	4	5
Grey Partridge	8	0
Grey Plover	1	0
Grey Wagtail	3	0
Hen Harrier	1	0
Herring gull	0	2
Hobby	4	1
House Martin	6	0
House Sparrow	1	6
Kestrel	4	0
Lapwing	5	1
Lesser black-backed gull	0	1
Lesser Redpoll	1	1
Lesser Spotted Woodpecker	2	0
Linnet	4	2

Species	Number of records pertaining to 'Ellenbrook Fields' and/or 'Hatfield Aerodrome'	Number of records for the three 1km squares in which the site sits
Little owl	0	1
Mallard	0	3
Mandarin Duck	16	0
Marsh Harrier	1	0
Meadow Pipit	10	0
Moorhen	0	2
Peregrine	1	0
Pied wagtail	0	5
Pochard	0	1
Quail	1	0
Red Kite	24	1
Redshank	5	0
Redstart	5	0
Redwing	11	2
Reed Bunting	3	0
Ring Ouzel	4	0
Robin	1	7
Sand Martin	1	0
Short-eared Owl	16	0
Skylark	12	0
Snipe	10	0
Song thrush	0	3
Sparrowhawk	4	1
Spotted Flycatcher	5	0
Starling	3	5
Stock dove	0	1
Stonechat	3	0
Swallow	7	2
Swift	2	1
Tawny Owl	2	0
Teal	0	1
Tufted duck	0	1
Waxwing	2	0
Wheatear	24	1
Whinchat	16	0
Whitethroat	14	1
Willow Warbler	9	1
Woodcock	4	0
Wren	0	5

Species	Number of records pertaining to 'Ellenbrook Fields' and/or 'Hatfield Aerodrome'	Number of records for the three 1km squares in which the site sits
Yellow Wagtail	5	0
Yellowhammer	1	3

11.150 The background records listed at Table 11-14 above indicate that the site is fairly well monitored by local ornithologists and that it supports a range of resident and transient species that is typical of inland airfield sites. This includes scarcer wintering species not uncommonly found on airfield sites by virtue of their open nature, such as short-eared owl, barn owl and peregrine, as well as passage migrants attracted to open country such as wheatear and ring ouzel, and scarcer or declining breeding species present at least in some years by virtue of the large expanses of grassland, such as grasshopper warbler, grey partridge and cuckoo.

11.151 The 2008 Cresswell Associates report stated that "*in 2001 the site supported a number of bird species of conservation concern, including song thrush, skylark and lapwing. The presence of these species on the site was reconfirmed in 2008*".

11.152 A breeding bird survey was undertaken by Cresswell Associates in 2010 of the northern part of Ellenbrook Fields. The 2010 report stated "*The collated results suggest that the site of County Importance for ground nesting birds including skylark, meadow pipit and cuckoo; and scrub-nesting species including whitethroat. This is indicated by the large numbers of these species recorded on site during each survey visit and can be attributed to the extent of suitable nesting and foraging habitat and the relative lack of disturbance.*"

11.153 The most recent annual report (2014) produced for Goodman by Barry Trevis in relation to the barn owl and kestrel nest boxes erected on the site revealed that of the four barn owl boxes on the site three were used to successfully rear barn owls in that year. Other species noted to be nesting in the boxes include stock dove *Columba oenas*, and Mandarin duck *Aix galericulata* (with 25 eggs present- probably from two females); however, this nest was abandoned, possibly due to the box having been taken over by a pair of barn owls. No kestrels were reported to have nested on the site in 2014. It was stated in the report that in previous years barn owl use and occupation of the nest boxes on the site "*was considered to be generally low taking into account the amount of suitable foraging habitat*". However, 2014 was more successful, and this appears to have mirrored the national trend for this species for that year, with the Barn Owl Trust stating that "*2014 turned out to be an exceptional year for barn owls across the UK*[45]". The reason/s for the breeding success of barn owl in 2014 could have been due to the larger small mammal populations, the previous milder winter, and a dry and warm spring and summer.

[45] http://www.barnowltrust.org.uk/wp-content/uploads/State-of-the-UK-Barn-Owl-Population-2014-updated-links.pdf

11.154 The latest Birds of Hertfordshire publication[46] (largely incorporating data from the 2007-2011 BTO-run bird atlas survey) reports that short-eared owls have been regular at Ellenbrook Fields (along with other sites such as the adjacent Beech Farm Gravel Pits) and the site now has a certain notoriety for this species amongst local ornithological circles, albeit with concerns that increasing public use may be suppressing its interest for disturbance-sensitive species.

2015 Wintering and Breeding Bird Surveys

11.155 A total of 57 bird species were noted on the site over the wintering and breeding bird survey visits. This is broken down into 41 species recorded during the wintering bird survey, and 47 species recorded during the breeding bird survey. Figures 8 to 11 provide the results of each wintering bird survey, and figures 12 to 14 provide the results of each breeding bird survey visit. Table 11-15 below summarises the number of individuals recorded during the wintering bird survey, and the number of territories assessed to be present during the breeding season.

Table 11-15
Results of the Wintering (2014/15) and Breeding Bird Survey (2015)

		Number of individuals during wintering bird survey				Breeding bird survey	
Common Name[47]	Conservation status*	28/11/2014	15/12/2014	20/01/2015	25/02/2015	Estimated number of territories in 2015	Highest breeding evidence
Barn owl	Sch1	0	0	1	2	1-3	Pair occupying box
Blackbird		29	34	21	14	4-8	Permanent territory
Blackcap		0	0	0	0	5-8	Permanent territory
Blue Tit		18	30	31	16	8-12	Fledged young
Bullfinch	SPI/Amber	3	5	2	1	2-3	Suitable habitat
Buzzard		0	0	1	0	0-1	Suitable habitat
Carrion Crow		1	0	1	3	0-1	Suitable habitat
Chaffinch		2	2	2	9	4-7	Permanent territory
Chiffchaff		0	0	0	0	4-6	Permanent territory
Coal tit		0	0	2	0	-	-
Cuckoo	SPI/Red	0	0	0	0	0-1	Permanent territory
Dunnock	SPI/Amber	17	8	8	18	12-17	Permanent territory
Fieldfare	Sch1/Red	37	1	8	0	-	-
Garden warbler		0	0	0	0	0-1	Singing
Goldcrest		2	0	0	1	1-2	Singing

[46] Smith, K., Dee, C., Fearnside, J. & Ilett, M. (2015) Birds of Hertfordshire. *Hertfordshire Natural History Society*
[47] See Appendix 5 for the scientific names of each species

Common Name[47]	Conservation status*	Number of individuals during wintering bird survey				Breeding bird survey	
		28/11/2014	15/12/2014	20/01/2015	25/02/2015	Estimated number of territories in 2015	Highest breeding evidence
Goldfinch		18	2	10	13	0-1	Suitable habitat
Great Spotted Woodpecker		1	0	0	0	0	Suitable habitat
Great Tit		11	7	31	20	2-4	Fledged young
Green Woodpecker		5	5	2	3	0-1	Suitable habitat
Greenfinch		2	0	1	0	0-1	Suitable habitat
Grey Heron		2	0	0	0	0	Flying over
Jackdaw		0	0	0	0	0	Not breeding
Jay		3	5	0	2	0	Flying over
Kestrel	Amber	2	1	2	1	0-1	Flying over
Lapwing	SPI/Red	0	0	0	0	0	Flying over
Lesser whitethroat		0	0	0	0	0-1	Singing
Linnet	SPI/Red	4	0	1	6	8-10	Permanent territory
Long-tailed Tit		11	4	9	7	1-3	Suitable habitat
Magpie		16	8	11	17	5-8	Suitable habitat
Mallard	Amber	4	0	0	4	0-1	Suitable habitat
Meadow Pipit	Amber	7	17	18	56	0-1	Suitable habitat
Moorhen		0	0	0	0	1	Suitable habitat
Partridge sp.		0	0	3	1	-	Suitable habitat
Pheasant		3	6	4	2	1-3	Suitable habitat
Pied Wagtail		6	1	2	1	-	Suitable habitat
Red-legged partridge		0	0	0	0	1-2	Suitable habitat
Red Kite	Sch1	0	1	0	1	0	Flying over
Redwing	Sch1/Red	17	4	10	6	-	Not breeding
Reed Bunting	SPI/Amber	8	4	2	6	6-8	Permanent territory
Reed warbler		0	0	0	0	0-1	Singing
Robin		18	11	13	21	10-14	Permanent territory
Sedge warbler		0	0	0	0	0-1	Singing
Skylark	SPI/Red	1	3	1	12	8-11	Permanent territory
Snipe	Amber	1	0	3	1	-	Not breeding
Song Thrush	SPI/Red	10	8	13	15	1-2	Permanent territory
Sparrowhawk		2	0	0	0	-	Not breeding
Starling	SPI/Red	0	0	0	0	0	Not breeding
Stock Dove	Amber	0	3	2	3	1-3	Pair
Stonechat		2	0	3	3	-	Not breeding
Swallow		0	0	0	0	0	Flying over

Common Name[47]	Conservation status*	Number of individuals during wintering bird survey				Breeding bird survey	
		28/11/2014	15/12/2014	20/01/2015	25/02/2015	Estimated number of territories in 2015	Highest breeding evidence
Wheatear		0	0	0	0	0	Migrant
Whitethroat		0	0	0	0	26-31	Permanent territory
Willow warbler	Amber	0	0	0	0	5-7	Permanent territory
Woodcock	Red	3	2	3	4	-	Not breeding
Woodpigeon		13	24	9	5	2-3	Permanent territory
Wren		16	23	12	8	6-8	Permanent territory
Yellowhammer	SPI/Red	1	1	0	0	-	Not breeding

*Notes:
Sch.1: Schedule 1 species that are specially protected under Part 1 of the Wildlife and Countryside Act 1981 (as amended)
SPI: Species of Principal Importance further to s.40 of the Natural Environment and Rural Communities Act 2006.
Red/Amber List: Species having undergone a decline of >50% in the 25 years to 2009 (Red List) or a 25-49% decline over the same period (Amber List). (After Eaton *et al.* (2015)[48]

11.156 During the targeted owl survey undertaken in the late afternoon/early evening of the January visit, two barn owls were noted. The first bird was noted at 15:30 hunting over a small field of rough grassland immediately north-west of the application site (outside the site boundary). The second bird was noted at 16:08 hunting in the south-east of the application site. No short-eared owls were noted.

11.157 Whilst undertaking the targeted owl visit in January, a relatively large number of corvids, particularly jackdaw as well as magpie, were noted to enter a roost within the dense scrubby area in the south-west of the site.

11.158 Birds were also recorded just outside the site boundary whilst undertaking the bird survey visits, and these species may overfly or otherwise use the site on occasion. Such species included common gull *Larus canus* (sitting on the University playing fields to the south-east), great spotted woodpecker *Dendrocopos major*, jay *Garrulus glandarius*, nuthatch *Sitta europaea*, treecreeper *Certhia familiaris* and woodpigeon (>1000 leaving roost) in Home Covert and both coot *Fulica atra* and water rail *Rallus aquaticus* in the reedbed/ gravel pits to the north of the site. Species of note recorded just outside the site during the breeding bird survey include great spotted woodpecker, jay and treecreeper (in Home Covert), and little grebe *Tachybaptus ruficollis* and reed warbler *Acrocephalus scirpaceus* in the CEMEX reedbeds to the north.

[48] Eaton MA, Aebischer NJ, Brown AF, Hearn RD, Lock L, Musgrove AJ, Noble DG, Stroud DA and Gregory RD (2015) Birds of Conservation Concern 4: the population status of birds in the United Kingdom, Channel Islands and Isle of Man. British Birds 108, 708–746

Evaluation

11.159 In order to place the results into the local context, the species list and the numbers present on the site were assessed against the requirement for record submission by Hertfordshire Bird Club (HBC). This revealed that no species found on the site are considered to be 'rare'. There are, however, seven species that fall within the 'All' category (i.e. all records of a species are required). The presence on the 'All' list is likely to indicate that a species is uncommon in the county or otherwise of elevated local interest. These species comprise barn owl, cuckoo, red kite, snipe, stonechat, wheatear and woodcock. Records of breeding for selected species are also requested by HBC; with these species on the site comprising bullfinch, goldcrest, kestrel, linnet, reed bunting, skylark and stock dove (and possibly buzzard, green woodpecker, meadow pipit, red-legged partridge and reed warbler). HBC also request records of minimum numbers of individuals of certain species; the following species were found to exceed the quoted numbers on the site; blue tit, fieldfare, goldfinch, great tit, long-tailed tit, magpie, meadow pipit, reed bunting and skylark.

11.160 No short-eared owls were recorded during the bird surveys of the site, and it would appear based on the data from HERC and from BirdTrack[49] that this species has not been regularly recorded at Hatfield Aerodrome since the end of 2011. The reason/s for the absence of this species from what appears to have been a regular site is not known but could be related to the increase in scrub cover and/or the increasing levels of diurnal human activity.

11.161 Overall, the bird interest of the site is not atypical of what would be expected on any inland airfield site of equivalent size that has undergone transition from a more intensively managed operationally active site with short grass to a neglected site with coarse grassland and developing scrub. That transition is likely to be implicated or a contributing factor in the loss of breeding lapwing from the site since the early 00s, but is likely to have increased the suitability of the site for other species, including barn owl, snipe, stonechat and woodcock. The breeding bird assemblage is again typical of the habitats present, although the high number of whitethroat territories is of note, as well as the number of breeding territories of dunnock, linnet, reed bunting and willow warbler. Other breeding species of elevated interest include cuckoo and barn owl. The site also evidently receives passage use by species such as wheatear and, in some years, ring ouzel.

Badger Survey

Desk Study

11.162 The desk study identified 27 badger records for the search area. The closest badger record was approximately 0.9km to the west, with this record pertaining to a sett recorded in 2011.

[49] http://app.bto.org/birdtrack/main/data-home.jsp

11.163 The 2008 Cresswell Associates ecological report identified badger pathways and a latrine along the southern boundary of the site and an inactive outlier sett in Home Covert. The 2010 Cresswell Associates ecological summary report identified the presence of an active main sett near the centre of the site.

Field Survey

11.164 Mapped badger activity is provided in a separate confidential annex to this document with restricted circulation in order to avoid it falling into the hands of anyone involved in the illegal persecution of the species. In summary a 20 entrance hole main badger sett is present near the centre of the site (the same sett identified by Cresswell Associates in 2010). Other than occasional foraging signs, and two outlying latrines, no other signs of activity were found on the site.

Invertebrates

Desk Study

11.165 A total of 1140 invertebrate records were provided by HERC for the search area. Approximately half of the records relate to butterflies, with the other half largely relating to moths. Of the 1140 records, 12 relate to 'Ellenbrook Fields'/'Hatfield Aerodrome' with all 12 of these pertaining to the small heath *Coenonympha pamphilus* butterfly.

2015 Field Survey

11.166 A total of 806 terrestrial invertebrate species were recorded on the site, of which 248 were moths. Appendix 11/4 provides the full invertebrate species list obtained, with a summary of the more notable species set out below under the relevant tiers of formal conservation status:

11.167 Species **of Principal Importance/ Priority Species/Section 41 species (former UK BAP species).** UK BAP priority species were those that were identified as being the most threatened and requiring conservation action under the UK Biodiversity Action Plan (UK BAP). The original list of UK BAP priority species was created between 1995 and 1999. In 2007, a revised list was produced, following a 2-year review of the priority species and habitats lists. Following the review, the list of UK BAP priority species increased from less than 600 to 1150.

11.168 As a result of devolution, and new country-level and international drivers and requirements, much of the work previously carried out by the UK BAP is now focussed at a country-level rather than a UK-level, and in July 2012, the UK BAP was succeeded by the UK Post-2010 Biodiversity Framework. However the UK list of priority species remains an important reference source and was used to draw up statutory lists of species and habitats of principal importance in England, Scotland, Wales and Northern Ireland pursuant to the obligations levied by the Natural Environment & Rural Communities Act, 2006 (sections 40-42).

11.169 No UKBAP priority invertebrates or invertebrate species of principal importance were noted to be present on the site.

11.170 **Red Data Book**. Eight of the species recorded are listed in the British Red Data Books[50],[51]. Table 11-16 below provides each of these Red Data Book species along with notes regarding their ecology and current conservation status.

Table 11-16
Red Book Data Book Species Recorded on the Site

Species	English Name	Notes
Hecatera dysodea	Small Ranunculus moth	This species has re-colonised Britain after one hundred years of apparent extinction. Caterpillars feed on developing seeds of prickly lettuce *Lactuca serriola* and great lettuce *Lactuca virosa*. The species is now widely recorded on neglected and brownfield land in the home counties and the formal Red Data status is no longer warranted.
Stictopleurus abutilon	A ground beetle	Another species formerly believed to be extinct in Britain. It is now recorded fairly widely in warm open flower rich grassland in the south-east. The Endangered status is no longer warranted; a review of the conservation status of several invertebrates is currently in progress and the status of this species may be formally reduced to Nationally Local when it is published.
Stictopleurus punctatonervosus	A ground beetle	As for above species.
Cistogaster globosa	A tachinid fly	This species is known from a few localities in southern England, and given its distinctiveness it is unlikely to be overlooked; it is thus probably genuinely rare, though very recently there seems to be an expansion in range and frequency of both host and fly. It parasitises shield bugs, especially *Aelia acuminata*. The fly appears to favour dry grassland where the host is usually found. Adult flies have been seen nectaring on wild carrot but other species of plant are also likely to be visited.
Datonychus urticae	A weevil	This species is found in tall herb communities and at woodland edges and may be a component of the fauna that occupies transitional zones (edge habitats). The larvae feed in hedge woundwort *Stachys sylvatica*, almost certainly internally within the stems. It is present in southern England and is apparently rare; however, it might be overlooked in some places as it closely resembles another more common species.

[50] Shirt, D. B., (1987). "*British Red Data Books: 2. Insects.*" NCC
[51] Bratton, J. H. , (1991). *"British Red Data Books: 3. Invertebrates other than insects."* NCC

Species	English Name	Notes
Lygus pratensis	A plant bug	This species has apparently always been a polyphagous species in Europe, found in weedy species, but in Britain it has long been regarded as an indicator of quality ancient woodland. In the last few years, however, this species has been widely recorded away from woodland in the south of England. The status of Near Threatened is currently unwarranted.
Tephritis matricariae	A picture-winged fly	This species has until recently been recorded in Kent and Essex only. Its host plants are probably *Crepis vesicaria* ssp. *Taraxacifolia* and *Crepis capillaris*. It is currently provisionally classified as a Red Data species within the 'unknown' category K.
Liorhyssus hyalinus	A bug	This species has historically regarded as a rare vagrant to Britain, it has appeared much more frequently since the 1990s and has become established in some areas. Foodplants include storksbill and various composites.

11.171 **Nationally Scarce Species**. Twenty-six Nationally Scarce species were recorded on the site, with eight of these in the former Nationally Notable Na category (see Appendix 11/4). Table 11-17 below provides the Nationally Scarce species in the former Nationally Notable Na category.

Table 11-17
Nationally Scarce Species in the former Nationally Notable Na category recorded on the site

Species	English Name	Notes
Eupithecia millefoliata	Yarrow Pug	Mainly confined to the south-east of Britain. There were no records for this species prior to 1987, and it is now likely to be expanding its range.
Hylaeus cornutus	Yellow-faced Bee	This species is largely confined to the south-central and south-eastern counties of Britain. It is largely found where wild carrot and other white umbellifers are numerous.
Lasius brunneus	Banded Tree Ant	There are insufficient historic records of this species to plot changes in abundance and distribution; however the overall impression is that it has become more common in the south-east in recent years.
Phalacrus championi	Smut Beetle	There is little known information regarding this species beyond the fact that it seems to be rare.
Platynaspis luteorubra	A ladybird	This species is largely found to the south-east of a line between the River Severn and the Wash. The Herts Beetle Recorder has indicated that this is an extremely rare species in this county.

Species	English Name	Notes
Rhinocyllus conicus	Thistle-head Weevil	This species is widespread, but apparently very localised in the southern coastal counties of Britain. Despite this species largely pertaining to coastal areas, the identification of this species was confirmed by the County Beetle Recorder and therefore represents a significant record.
Rhyzobius chrysomeloides	A ladybird	This species was first found in Britain in 1996 in Surrey. Since then it has spread and therefore its formal conservation status as nationally scarce is probably inappropriate.
Xantholinus elegans	Rove Beetle	This species' precise requirements are unknown, but other members of the group are found in tussocks and the adults may be predatory on other invertebrates.

11.172 A further 18 of these Nationally Scarce species are in the former Nationally Notable Nb category or are uncategorised Nationally Scarce ('Notable') Diptera. These are listed at Table 11-18 below. Several of these species do not appear on the latest version of the JNCC 'Taxon designations' spreadsheet, indicating that they have been demoted from the nationally scarce category following recent reviews, most commonly due to significant expansions in population and range (e.g. in the case of Roesel's bush cricket):

Table 11-18
Nationally Scarce (Categories Nb and N) Invertebrates Recorded on the Site

Species	English name	Main ecological associations
Agnocoris reclairei	a mirid bug	Willows, especially *Salix alba*, in Fens and gravel pits
Athysanus argentarius	a plant hopper	in a variety of grassland habitats, usually near the coast
Bembecia ichneumoniformis	Six-belted Clearwing	*Lotus*, *Anthyllis* and *Hippocrepis* – in the rootstock
Bianor aurocinctus	a spider	dry, ruderal sites
Drymus latus	a plant bug	amongst vegetation litter, moss etc
Evergestis pallidata	a pyralid moth	cruciferous plants - especially *Barbarea vulgaris*
Hippodamia variegata	variegated ladybird	ruderal or sandy habitats
Idiocerus herrichi	a plant hopper	on Poplars and Willows and also on Alder
Longitarsus dorsalis	a flea beetle	Ragworts (*Senecio* species) – now a fairly common species in the south
Metrioptera roeselii	Roesel's Bush-cricket	tall grassland, now everywhere in the south of England
Microplontus triangulum	a weevil	associated with *Achillea millefolium*; the larvae feed inside flowering stems
Philodromus albidus	a spider	lower branches of broad-leaved trees at the edge of woodland rides
Poecilium alni	a longhorn beetle	larvae feed in small branches and

Species	English name	Main ecological associations
		twigs of various tree species
Ptilodon cucullina	Maple Prominent	field maple, very rarely on sycamore
Sibinia primitus	a weevil	dry sandy areas
Sitona waterhousei	a weevil	*Lotus corniculatus*
Trichosirocalus barnevillei	a weevil	Yarrow (*Achillea millefolium*) in ruderal habitats
Merzomyia westermanni	a picture-winged fly	various ragwort species

11.173 **Nationally Local Species**. Twenty-five species are listed formally as Nationally Local. Table 11-19 below provides a list of the Nationally Local species recorded on the site.

Table 11-19
Nationally Local Invertebrates Recorded on Site

Species	English name	Main ecological associations
Acidia cognata	a picture-winged fly	*Tussilago* and *Petasites* plants – mining the leaves
Acupalpus dubius	a ground beetle	damp moss, damp litter and similar habitats
Agalenatea redii	a spider	lower than one metre in heather and gorse, and also in rough grassland
Amara tibialis	a ground beetle	open, sandy areas, especially costal dunes
Anaceratagallia ribauti	a plant hopper	on the ground amongst grasses in dry places - common in the south-east
Anomoia purmunda	a picture-winged fly	Larva feeds in the flesh of hawthorn Berries
Aphrodes bicinctus	a plant hopper	grasses in dry situations
Aphthona euphorbiae	a leaf beetle	widely polyphagous
Apolygus lucorum	a plant bug	low plants
Bruchidius villosus	a leaf beetle	On broom
Byrrhus pilula	a pill beetle	associated with moss or rabbit-grazed turf, in open situations.
Centrotus cornutus	a froghopper	oak, aspen and other sapling trees
Chorthippus albomarginatus	Lesser marsh Grasshopper	grasslands - has spread inland from coastal stations
Chrysotoxum festivum	a hoverfly	grassland with open scrub - the larvae feeding on root aphids
Chrysotoxum verralli	a hoverfly	grassland with associated scrub
Cordylepherus viridis	a beetle	a common grassland species
Coremacera marginata	a snail-killing fly	dry habitats, especially grasslands
Corizus hyoscyami	a plant bug	Stork's-bill, mainly south-western
Crossocerus nigritus	a sand wasp	nests in broken stems of shrubs and reedmace (*Typha*)
Cryptocephalus fulvus	a leaf beetle	possibly on sheep's-sorrel, but adults are found on a variety of flowers
Curculio glandium	a weevil	Oak trees - in developing acorns
Cyclosa conica	a spider	spring species of trees and bushes, preferring damp, dark woodland
Cymus melanocephalus	a plant bug	associated with *Juncus* wherever it

Species	English name	Main ecological associations
		grows
Eilema depressa	Buff Footman	lichens and algae on trees
Epitrix pubescens	a beetle	associated with Woody Nightshade
Euproctis chrysorrhoea	Brown-tail	rosaceous trees and shrubs - sometimes other trees and shrubs
Hypena rostralis	Buttoned Snout	hops - hibernating as adult in sheds, hollow trees, cellars etc
Hypsosinga pygmaea	a spider	grassland (especially calcareous) and low vegetation
Idaea rusticata	Least Carpet	withered leaves of ivy, *Clematis*, *Alyssum saxatile*, etc
Kalama tricornis	a lacebug	Dry ruderal habitats and sand dunes
Lamprotettix nitidulus	a plant hopper	arboreal species, mostly in the south
Mangora acalypha	a spider	Gorse and Heather in heathland and woodland in southern Britain
Metidiocerus rutilans	a plant hopper	on sallows, but found overwintering in pines
Neoscona adianta	a spider	rough grassland and heathland.
Notiophilus substriatus	a ground beetle	open, usually dry habitats especially if there is minimal vegetation
Oedemera lurida	a beetle	a common grassland species
Olibrus liquidus	a smut beetle	possibly associated with sap runs on trees
Oncotylus viridiflavus	a plant hopper	widespread in grassland habitats, usually on flowering heads of knapweed
Oxystoma craccae	a seed weevil	feeds in the developing seeds of vetches
Pipiza fenestrata	a hoverfly	Edge habitats
Pseudovadonia livida	a longhorn beetle	larvae feed in dead wood of deciduous and coniferous trees
Psylliodes chrysocephala	a leaf beetle	various Cruciferae
Rhamphus oxyacanthae	a weevil	larva mines in leaves of hawthorn
Rhopalus subrufus	a plant bug	St John's Wort (*Hypericum perforatum*)
Sphenella marginata	a picture-winged fly	on various ragwort species, in late summer and autumn
Stigmella aceris	a micro moth	caterpillar mines leaves of maple
Taeniapion urticarium	a weevil	nettles - larvae feed inside stem nodes
Tephritis formosa	a picture-winged fly	larvae gall the flowers of sow thistle
Tetrix subulata	Slender Ground-hopper	bare mud and sparse vegetation in marshy places, especially dune slacks
Tritomegas luctuosus	a plant bug	feeds on forget-me-nots (*Myosotis* species) in dry places
Tychius junceus	a weevil	*Medicago lupulina*
Xanthogramma pedisequum	a hoverfly	larvae feed in ants nests

11.174 **'Research Only' UKBAP moths:** The original list of UK BAP Priority Species of moths was divided into two sections. In the first, a total of 81 species are afforded the status of UK BAP Priority Species; none of these is recorded in the surveyed area nor is any likely to be present. However, the second section is a list of 69 species that have declined in population by a

significant amount in the past 25 years. These were defined as “not yet rare” and were flagged as UK BAP species for the purposes of further research only. They may be seen as having equivalence with bird species listed on the UK amber list by virtue of recent population declines as opposed to genuine rarity.

11.175 Table 11-16 below provide the “Research Only” moth species recorded on the site.

Table 11-16
“Research Only” Moth Species Recorded on the Site

Species	English name	Caterpillar food plant
Acronicta psi	Grey Dagger	deciduous trees and bushes
Agrochola litura	Brown-spot Pinion	deciduous trees and shrubs and herbaceous plants (requires both)
Agrochola lychnidis	Beaded Chestnut	deciduous trees and shrubs and herbaceous plants (requires both)
Allophyes oxyacanthae	Green Brindled Crescent	rosaceous trees and shrubs
Apamea remissa	Dusky Brocade	grasses
Aporophyla lutulenta	Deep-brown Dart	grasses, hawthorn, blackthorn
Atethmia centrago	Centre-barred Sallow	ash - buds then flowers
Callistege mi	Mother Shipton	coarse grasses, including reeds
Caradrina morpheus	Mottled Rustic	herbaceous plants
Chiasmia clathrata	Latticed Heath	*Medicago*, *Trifolium*
Diarsia rubi	Small Square-spot	herbaceous plants
Ecliptopera silaceata	Small Phoenix	willow herbs, enchanter's nightshade
Ennomos fuscantaria	Dusky Thorn	Ash
Hoplodrina blanda	Rustic	herbaceous plants
Scotopteryx chenopodiata	Shaded Broad-bar	vetches and clovers
Spilosoma lubricipeda	White Ermine	herbaceous plants
Spilosoma lutea	Buff Ermine	herbaceous plants and also trees and shrubs
Timandra comae	Blood-vein	Polygonaceae
Tyria jacobaeae	Cinnabar	Ragwort
Watsonalla binaria	Oak Hook-tip	oak - occasionally birch

Evaluation

11.176 In order to provide a high level indication of site quality, useful for comparison with other sites with a broadly similar level of recording effort, a Species Quality Index can be calculated. This requires that recorded invertebrate species are scored according to their national status as follows:

- RDB species 100 points
- Notable - Na species 50 points
- Notable - Nb species 40 points
- Notable - N species 40 points
- Local species 20 points
- Common species no score

11.177 These scores are derived from Ball (1986)[52]. Adding together the scores in each category provides an 'Invertebrate Index' which is then calibrated for sampling effort through simple division of the total Invertebrate Index by the total number of species recorded.

11.178 On sites where it is evident that a significant number of the species recorded have exhibited dynamic positive or negative changes in national status that are not always reflected in the formal categorisations, it may be appropriate to revise scorings to better reflect current rarity. This is appropriate here where, amongst other things, three of the species found were considered 'extinct' in Britain prior to 1994 but have since either been re-found or have recolonised, and furthermore gone on to become widespread in south-east England. Revised scorings suggested for this site are indicated in Table 11-20.

Table 11-20
Revised allocation of invertebrate scores and calculation of Species Quality Index

Status category	Score in Ball (1986)	Revised score	Number of taxa on this site	Total Score for site	SQI
BAP(Research only)*	-	20	20	400	-
Extinct*	100	20	3	60	-
RDB 1	100	100	1	100	-
RDB 3	100	100	2	200	-
RDB K	100	100	2	200	-
NS(Na)	50	50	8	400	-
NS (Nb & N)	40	40	18	720	-
Local	20	20	25	500	-
Subtotal	-	-	**79**	2580	-
Common	0	0	727	0	-
Totals	**-**	**-**	**806**	**2580**	**3.20**

*specifically the species recorded in this present report only.

11.179 In the context that Species Quality Index outputs can be categorised as indicating a site of national importance where above 7, the total revised Species Quality Index value of 3.20 is fairly low and indicates a site of modest importance to invertebrate conservation. This is despite the inclusion of 'Research only' UKBAP moths, many of which remain very common, and despite no correction being made for certain other species that are undoubtedly abundant but retain a formal 'nationally scarce' status, such as Roesel's bush cricket. On the other hand, the high proportion of the invertebrate species total that relates to moths may skew the result because the vast majority of moths recorded in light traps are common species and for most sites moths are unlikely to have been recorded to an equivalent degree. As a consequence, the analysis of the full species dataset from the application site may not be directly comparable with other areas. This can be corrected for by removing the 248 moth species from the calculation and recalculating using only the remaining 558 non-moth invertebrates. This results in only a modest increase in SQI value, however: to 4.62.

[52] Ball, S. C. (1986) Terrestrial and freshwater invertebrates with Red Data Book, Notable or habitat indicator status. Invertebrate Site Register internal report number 66. NCC

11.180 Invertebrate Species-habitats Information System. An alternative means of evaluation commonly employed in modern invertebrate assemblage assessments is the Invertebrate Species-habitats Information System (ISIS). This is a tool introduced by Natural England and used by them to undertake common standards monitoring (i.e. to monitor the condition of invertebrate assemblages), score them based on the invertebrate assemblage types present (similar to how the NVC is used to assess plant communities) and evaluate their conservation value. It is thus a tool designed to measure invertebrate conservation value within the context of certain pre-existing parameters, and must be used on sites outside that context only with care.

11.181 The ISIS assemblage types are defined by lists of characteristic species that are generally found together in assemblages under natural or semi-natural. Broad assemblage types (BATs) are a comprehensive series of assemblages characterised by more widespread species. Specific assemblage types (SATs) are characterised by stenotopic (ecologically restricted) species, and therefore are more likely to be of intrinsic nature conservation value.

11.182 The software can therefore be used to approach the question of invertebrate habitat value assessment from the opposite direction i.e. predicting both the habitat types present, and their quality and value in invertebrate conservation terms, by looking at the full suite of species recorded and cross-checking their habitat requirements. Thus, if a large proportion of the total possible species with a particular specialised habitat requirement are present, the software indicates that the habitat must be both a) present and b) in good (favourable) condition.

11.183 Using the full dataset of 806 recorded invertebrate species, ISIS generates the following results for the application site:

11.184 **Broad Assemblage Types.** The top Broad Assemblage Types identified as present are presented in Table 11-21 below.

Table 11-21
The Broad Assemblage Types from ISIS assessment of the invertebrates recorded on the application site.

BAT	BAT name	Representation (1-100)	Rarity	Condition	BAT species richness
F2	grassland & scrub matrix	19	123		238
A1	arboreal canopy	9	125		117
F1	unshaded early successional mosaic	5	245	favourable	62
A2	wood decay	2	150		20
W2	mineral marsh & open water	1	111		18
F3	shaded field & ground layer	1	142		12
W3	permanent wet mire	1	100		11

11.185 Not surprisingly, the largest assemblage is associated with the grassland and scrub matrix. The arboreal canopy lies in second place and is undoubtedly so positioned because of the presence of a large number of moths on the list. The unshaded early successional mosaic assemblage of species is in

favourable condition; the state of the habitat that supports this assemblage is, therefore, of high quality.

11.186 **Specific Assemblage Types:** The most important Specific Assemblage Types identified as present from ISIS analysis of the species inventory are presented in Table 11-22 below.

Table 11-22
The Specific Assemblage Types from the ISIS assessment of the invertebrates recorded on the application site.

SAT	SAT name	No.	Condition	Percentage of national species pool	Related BAT rarity score
A215	epiphyte fauna	3		15	150
F001	scrub edge	15	favourable	8	
F112	open short sward	12		6	245
F002	rich flower resource	6		2	
A212	bark & sapwood decay	12		2	150
F003	scrub-heath & moorland	7		2	
F111	bare sand & chalk	6		1	245
A211	heartwood decay	2		1	150

11.187 The results of analysis of the species inventory using ISIS therefore indicate that the site's value for invertebrates is primarily centred on the presence of unshaded early successional mosaic habitats and scrub edge. Thus the areas of the site recovering from past disturbance may hold a disproportionate amount of the invertebrate interest, although it is also clear that the large expanses of grassland in association with scrub also have value, despite the relative absence of 'flower-rich' representations of this habitat.

Other fauna

11.188 The 2008 Cresswell Associates report stated that in 2001 the site supported up to six brown hares *Lepus europaeus*, with individuals also noted during visits in 2008. Only a single record of this species was made during the survey work carried out in 2014 and 2015, and this was outside the application site in the north-eastern part of the former airfield. It is possible that the increased presence of dogs in the more heavily trafficked areas of the site may be suppressing the site's potential value to this species. Other mammals noted during the course of the fieldwork in 2014 and 2015 included muntjac *Muntiacus reevesi*, grey squirrel *Sciurus carolinensis*, field vole *Microtus agrestis*, fox *Vulpes vulpes* and common shrew *Sorex araneus*.

EVALUATION AND IDENTIFICATION OF KEY RECEPTORS

Evaluation Criteria

11.189 For the purposes of assessing likely significant effects, key ecological receptors are drawn out from the baseline information set out in the preceding section. The decision as to which ecological receptors are 'key' in this context is to a substantial extent a value judgement, informed by factors such as national and local conservation status and legal protection. The current guidance for Ecological Impact Assessment issued by the Chartered Institute for Ecology and Environmental Management (CIEEM)[53] recognises that professional judgement and a certain level of subjectivity is unavoidable when apportioning value to individual ecological receptors. However certain parameters and points of reference can be used to help ensure consistency – these are discussed below.

11.190 Sites already possessing statutory or non-statutory nature conservation designations will have been subjected to some form of evaluation process in the past, and their importance defined at a geographical scale (e.g. international, national, local). For these, evaluation will generally reaffirm their qualifying attributes, or in some cases may identify where designation may no longer be appropriate.

11.191 Factors such as extent, naturalness, rarity, fragility and diversity are all relevant to the determination of ecological value, and for the evaluation of sites and habitat features outside designated sites, these and other criteria as described by Ratcliffe (1977), may be applied. Ratcliffe's criteria are integral to the procedure for selecting both Sites of Special Scientific Interest and many non-statutory designation systems in the UK, and therefore remain an accepted standard for site evaluation.

11.192 In applying these criteria, attention may be drawn to the relative scarcity or abundance of features within the survey area and in the wider geographical context. Some criteria are however absolute and not relative to scale. Ancient woodland, for example, is fragile irrespective of whether it is being considered in an international or local context. Similarly, the value of an otherwise poor habitat may be elevated if it is central to the survival of a rare species.

11.193 Where evaluation is important for the purposes of informing decisions related to land-use planning and development control, the above approach needs to be supplemented by consideration of whether individual species are subject to legal protection[54], or whether habitats or species are present which have been identified as 'priorities' for biodiversity conservation in the UK[55]. Planning authorities have a statutory duty[56] to have regard to protected

[53] CIEEM (2016) *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal, 2nd edition*. Chartered Institute of Ecology and Environmental Management, Winchester

[54] Principal legislation being the Wildlife and Countryside Act 1981 (as amended) and the Conservation of Habitats and Species Regulations 2010 which implements the EC Habitats Directive. Some animals are protected under separate legislation (e.g. the Protection of Badgers Act 1992).

[55] As published by the Secretary of State further to their duties under Section 41 of the Natural Environment and Rural Communities Act 2006

[56] Section 40 of the Natural Environment and Rural Communities Act 2006.

species and to further biodiversity objectives and the presence of such resources may therefore be material to the determination of development control decisions (ODPM Circular 06/2005).

11.194 Finally, attention may be drawn to species not necessarily subject to legal protection or identified by Government as a priority for biodiversity conservation, but which nonetheless have an 'unfavourable' conservation status as defined by the Red Data Book system[57] or the Red and Amber lists for birds[58], or which are otherwise known to be rare or scarce in a local or regional context.

11.195 Scales of comparison varying from international to the context of the local area may be used to define the measure of importance (or value) attached to individual features. The definition of geographic terms can vary, but in this evaluation the following geographic frame of reference is used:

- International;
- UK;
- National (i.e. England/NI/Scotland/Wales);
- Regional (e.g. relevant Natural Area or area covered by a regional records' centre)
- County (or Metropolitan - e.g. in London);
- District (or Unitary Authority, City, or Borough);
- Local or Parish; and
- within zone of influence only (which might be the project site or a larger area)

Evaluation and Identification of Key Receptors

11.196 The application site is not subject to any statutory or non-statutory nature conservation designation. The nearest such site is Home Covert, a Local Wildlife Site which adjoins the application site to the north-east. Being in sufficient proximity to fall within the zone of influence of certain potential impacts, this site is identified as a key receptor.

11.197 The application site itself is dominated by essentially dry unmanaged grasslands, with varying amounts of associated scrub, although there are also areas of grassland actively managed by livestock grazing or mowing. These grasslands range from species-poor examples reflecting past 'improvement' or other enrichment to those with a species composition variously indicative of the chemical properties of the underlying substrate. None of these grasslands are exceptional in terms of quality, most being examples of a widespread community commonly found elsewhere on road verges and other marginal land. Rather than their intrinsic interest, it is their unbroken expanse over large areas that is both unusual and worthy of note. Indeed it is this property, in combination with the relative lack of upstanding features such as hedgerows and other field boundaries, that attracts certain

[57] Following the British Red Data books published by the JNCC/RSNC and the Nationally Notable (Nationally Scarce) categorisations recognised by the JNCC

[58] Eaton, M.A., *et al*. (2009) *Birds of Conservation Concern 3: the population status of birds in the United Kingdom, Channel Islands and the Isle of Man*. British Birds 102, pp296–341.

of the more specialist taxa recorded. Prominent amongst these are open country birds, including large breeding populations of whitethroat, as well as breeding cuckoo, barn owl, kestrel, skylark and meadow pipit, and a wintering assemblage that includes good numbers of woodcock, as well as stonechat, snipe, barn owl and in past years short-eared owl. The site's invertebrate interest is also heavily centred on early successional, scrub edge and open grassland species, and amongst other things includes several nationally and locally rare species of Coleoptera.

11.198 Added to this grassland-focused backdrop are a number of small waterbodies that support great crested newts and other amphibians, and along with the few hedgerows and denser areas of scrub, these also act as feeding loci for local bat populations, which although dominated by one or two common species, also appear to include occasional use by uncommon and scarce species such as Nathusius' pipistrelle. The hedgerows and (mainly by virtue of the presence of great crested newts) four of the ponds also qualify as Habitats of Principal Importance further to section 41 of the Natural Environmental and Rural Communities Act 2006, with three of the hedgerows also meeting the criteria of 'Important Hedgerows' further to the Hedgerows Regulations 1997. Other protected species present include badgers and a sparse population of grass snake.

11.199 Although the site has no Local Wildlife Site (LWS) designation, the areas surveyed by the Herts and Middlesex Wildlife Trust in 2013, including around half of the application site, were all assessed to qualify against the incumbent criteria for LWS designation, based largely on the presence of semi-improved and unimproved grassland supported by 29 qualifying indicator plant species. Within this, a core area of the richest habitats was identified that included the central-eastern part of the application site, as well as much of the former airfield land outside the application site to the east and north. This suggested designation was never ratified and the LWS criteria for Hertfordshire have since been revised[59], however it is evident that the site would qualify for designation under the same, and indeed additional, grounds, under the new criteria and, furthermore, the northern part of the application site (which was not surveyed by the Wildlife Sites team, in 2013), would probably also qualify for inclusion. This is to a large degree a function of the relatively inclusive nature of the LWS criteria; based on intrinsic botanical interest alone, it is arguable at best whether the grassland quality is sufficient to be worthy of designation, however the unbroken extent of the habitat is unusual and provides carrying capacity for a range of species of fauna that are likely to have rather restricted habitat opportunities elsewhere across the county. For this reason, the unmanaged grassland component of the site, together with its associated scattered scrub, is identified as a key receptor of county importance.

11.200 Taking into account the baseline information amassed, and the overall evaluation above, the key receptors to consider in respect of the potential impacts affecting the application site are considered to be as set out in Table 11-23 below:

[59] Hertfordshire Local Wildlife Sites Partnership (2014) Selection Criteria for Local Wildlife Sites in Hertfordshire (9th version).

Table 11-23
Key Receptors

Scale	Key Receptor
International	No receptors of international importance are assessed to be within range of any likely significant effects arising from the proposed development.
UK/National	No receptors of national importance are assessed to be within range of any likely significant effects arising from the proposed development.
Regional	No receptors of regional importance are assessed to be within range of any likely significant effects arising from the proposed development.
County	1. The Home Covert & Round Wood Local Wildlife Site abuts the site to the north. This site was designated due to the presence of ancient woodland indicator species, but is not ancient woodland. Due to the proximity of this designation, there is the potential for indirect hydrological, dust and noise impacts from the proposals. 2. The unmanaged grassland habitat on the site is collectively assessed to be of county importance due to its unusually large and unbroken extent and interconnectivity, and the carrying capacity this provides for associated fauna species, rather than due to its intrinsic botanical interest, which is limited, even though a very few notable (e.g. county-rare) species are present (green-winged orchid, whorled mint). Where scrub occurs as a loose matrix with this grassland resource, providing shelter and habitat edges, this is included as part of the county-valued mosaic.
District	1. Great crested newts: the population on the site is assessed as falling within the 'medium' size class, but it forms part of a wider metapopulation likely to be of District importance. 2. Breeding birds: the site is likely to contain a significant proportion of the total breeding populations of whitethroat and barn owl in the relevant Districts, and in some years also that of other species such as grey partridge and grasshopper warbler. 3. Wintering birds: the site is one of very few in either of the relevant Districts that is likely to be able to accommodate high profile species such as short-eared owl and hen harrier, as well as significant numbers of wintering woodcock. 4. Passage birds: the background records and the site's geography and character suggest it is likely to be a local staging focus for migrating open-country birds and warblers passing between the conurbations of St Albans and Hatfield, especially in Spring. 5. Invertebrates: while county-significant species of Coleoptera have been recorded during the baseline studies, the effect of uneven recording coverage has to be taken into account, and the overall assemblage appears unlikely to exceed the District level of importance given the fairly cosmopolitan habitat preferences of the scarcer species found.
Parish	1. Other grassland habitats, including livestock-grazed and mown areas: These are extensive, but include a more restricted range of species weakly indicative of semi-natural circumneutral grasslands, but no rarities, and their structure precludes significant value for the higher fauna associated with the rougher grasslands on the site. 2. Hedges, mature trees, ponds and denser scrub. These habitat components add to the site mosaic, and in the case of great crested newt, underpin the site population, however their intrinsic interest is relatively modest, by

Scale	Key Receptor
	comparison with neighbouring and wider areas, with some being recent in origin and therefore of low fragility. Of the hedgerows on the site, three qualify as 'Important' under the Hedgerows Regulations 1997, and all qualify as habitats of principal importance, along with (by virtue of the presence of great crested newts) four of the ponds/waterbodies. 3. Bats. In the main, bat use of the site is modest and dominated by a small number of common species, with no roosts found or likely to be affected. However intermittent or localised use of peripheral areas and internal linear or wetland features by a greater range of species evidently occurs, including the nationally uncommon Nathusius' pipistrelle. There are no indications that the site receives any more than transient use by the more uncommon species recorded, and the site's open nature in comparison with surrounding land suggests that it is unlikely to be of elevated importance by comparison. 4. Brown hare. The application site is probably still used by this species of principal importance, although it was only recorded on adjoining airfield land in 2015 and not at the numbers cited in previous surveys.
Immediate local (within zone of influence only)	1. Badgers. A main sett with 20 entrance holes is present near the centre of the site. 2. Reptiles. Just one grass snake was found during the survey. The scope for metapopulation level impacts is assessed as negligible but effects on individual animals are possible, and the species is therefore retained as a key receptor. 3. The representations of other habitats within the application site are either small, of negligible value, or both, and are similarly assessed as of only immediate local (i.e. site) value. They are therefore scoped out as a key receptor

11.201 The remaining sections of this document consider the potential for, and the magnitude and significance of, any impacts arising on the above key receptors from the project, along with any mitigation and/or compensation proposed, and its likely efficacy.

AVOIDANCE BY DESIGN AND DESCRIPTION OF PROPOSALS

Ecological Input to Design Process

11.202 Ecological input has been a significant driver in the design of the proposed restoration scheme, including in terms of seeking to reinstate the key habitat elements for which the site has current value, exploiting opportunities created by extraction in terms of the exposure of mineral substrates and their potential to develop semi-natural plant communities, exploiting opportunities created by changes to drainage patterns and responding to local and national initiatives in terms of appropriate habitat creation objectives, including taking account the views of the Hertfordshire and Middlesex Wildlife Trust, as canvassed at three meetings with their representatives. This has allowed key objectives to be set towards the creation of semi-natural habitats appropriate to the locality and the geology – in particular acid grassland, and to secure significant opportunities for certain fauna, including birds and invertebrates in particular, but also herpetofauna and other taxa.

Summary Description of The Proposals in the Context of Likely Ecological Effects

11.203 Initial establishment of the quarry will include creation of a new site access onto the A1057, involving removal of a section of hedgerow H6 although also exploiting an existing weak point and gap, and the linking of this access to a new processing plant, offices, stockpile area and weighbridge in the northern part of the application site by means of new haul roads that will in part run alongside existing established hedgerows H5, H1 and H2. Establishment of the new processing plant will follow the deposition of a layer of sand and gravel extracted from the recharge lagoons (see below) in order to raise levels. This phase will require the removal of ponds P1, P2 and P3, and will require the diversion of the existing ditch system carrying the Nast watercourse, resulting in the removal of P4. New fresh water and silt lagoons will also be constructed in this part of the site.

11.204 The two recharge lagoons will be excavated at the eastern boundary of the application site, connecting respectively with the upper and lower mineral horizons. Once established, soil and overburden stripping and extraction of mineral is anticipated to take place in a sequence of seven phases, with the working 'cells' progressing east to west. Stripped materials will be stored in peripheral storage mounds and restoration of exhausted phases will progress in tandem with the working sequence, using both on-site materials and imported inert fill sourced from the construction and demolition waste sector and imported to the site under the terms of an Environmental Permit.

11.205 On completion of extraction, each worked out cell will be backfilled with inert material to achieve the required contours to ensure surface water flow is broadly re-established in a NW to SE alignment, towards an overflow connecting to an existing pipe which currently takes the ephemeral Nast flows along or under the A1057. The inert fill material will be covered by an engineered barrier / cap comprised of site-won interburden over which a 'restoration soil profile' of around 1.2m depth will be laid. Restoration soils will be carefully screened and selected to ensure they have suitable physical and chemical properties for the intended after-uses, including in particular acid grassland, species-rich circumneutral grassland and small areas of calcareous grassland. In the early phases of extraction, restoration materials may have to be stockpiled and stored, but in later phases, direct placement may be possible as part of progressive restoration. Micro-topographical diversity, including 'ridge and furrow' will be created in the final phases of restoration and in conjunction with preparation of soils and substrates for seeding, planting or natural regeneration as appropriate.

11.206 Restoration will comprise active planting interventions, potentially including use of harvested seed or 'green hay' from suitable donor sites in the locality, with hedgerow and tree planting sourced from nurseries able to guarantee native provenance. The recharge lagoons will be retained but remodelled to create a single permanent waterbody, with other smaller and more ephemeral waterbodies also created, e.g. through placement and compaction of low permeability materials in shallow depressions. Following an appropriate establishment and aftercare period, the site would be managed

in accordance with an approved management plan, likely to major on livestock grazing to maintain grassland diversity and controlled visitor management to ensure some areas are subject to reduced levels of disturbance as compared with the existing situation.

IMPACT ASSESSMENT

Methodology

Terms of Reference

11.207 The assessment of likely significant ecological effects arising from the project follows the guidelines produced for EcIA by the Chartered Institute for Ecology and Environmental Management (CIEEM)[60]. The approach taken is set out below:

Determining the Sensitivity of Key Receptors

11.208 In order to determine whether a specific effect on the key ecological receptors listed in Table 3 above is 'significant', the sensitivity of the affected habitat, site or species must be considered. The sensitivity of an individual receptor is a product of various factors including:

- habitat extent or population size (at a given geographical level)
- habitat or population fragility (including ability to recover)
- the rarity of a species or habitat; and
- susceptibility to environmental change (e.g. from disturbance or pollution).

11.209 Applying the above criteria, the sensitivity of individual receptors can be put into 'High', 'Moderate' or 'Low' categories as follows:

Table 11-24
Sensitivity

Sensitivity	Habitat Example	Species example
High	Habitat is highly susceptible to nutrient enrichment or invasion from competitive species Habitat has highly specialised hydrological or soil/geology requirements (e.g. calcareous fen) Habitat is present as small and isolated fragments vulnerable to edge effects Habitat takes an extended period to develop full suite of components (e.g. ancient woodland)	Species is highly intolerant of disturbance or pollution Species is present in a small and isolated population and/or has low dispersal rates Species has low recruitment rates and population recovery is likely to be very slow

[60] Institute of Ecology and Environmental Management (2006) *Guidelines for Ecological Impact Assessment in the United Kingdom* and CIEEM (2016) *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal, 2nd edition*. Chartered Institute of Ecology and Environmental Management, Winchester

Sensitivity	Habitat Example	Species example
Moderate	Habitat can tolerate some elevated levels of pollution or will recover within a short-medium term (e.g. <20 years) Habitat has hydrological or soil/geology requirements that can be recreated or are fairly widely met Habitat may be isolated, but is present at an extent that provides resistance to edge effects and is better able to accommodate damage Habitat develops over a moderate timescale given the right conditions (e.g. unimproved acid grassland)	Species is able to tolerate some levels of disturbance or pollution (e.g. sub-lethal effects). Species population is restricted, but large enough to accommodate some temporary reduction without long term consequences for viability. Species has moderate recruitment rates
Low	Habitat is highly resistant to nutrient enrichment or other forms of pollution and physical disturbance (e.g. improved grassland) Habitat has non-specific requirements that are readily met elsewhere Habitat is extensive and well able to accommodate localised or more extensive damage Habitat is easily recreated over a short timescale (e.g. arable)	Species is highly resistant to disturbance and pollution (e.g. most urban wildlife) Species' population is widespread and recolonisation in the wake of any localised range reduction likely to occur readily Species has high recruitment rates likely to lead to rapid recovery of population levels

11.210 As with the identification of key receptors, a certain amount of subjectivity and the application of professional judgment is unavoidable when determining sensitivity, however in addition to firsthand experience of the species/habitat and locality in question, a wealth of scientific literature and/or local conservation status information can often be drawn upon to inform such judgements.

Identification of Impacts and their Magnitude

11.211 Impacts arising from the proposals that have the potential to be significant are identified from review of the scheme details, and tandem assessments for other environmental disciplines based on them, including in this instance the following in particular;

- Environmental Statement Chapter 3 (Development Description) and accompanying drawings HQ 3/1, 3/3, 3/6, 3/7, 3/8, 3/9 and 3,10 showing initial preparation works and extraction phases.
- Proposed final restoration scheme drawing (drawings HQ 3/11 and 3/12).
- Environmental Statement Chapter 6 – Water
- Environmental Statement Chapter 9 – Air Quality
- Environmental Statement Chapter 10 - Noise

11.212 The following terms are used to quantify the 'magnitude' of identified impacts in this assessment:

Table 11-25
Impact Magnitude

Impact Magnitude	Definition
Very High	An example of a very high magnitude impact would be direct mortality or displacement of a significant proportion of a species' population or loss of habitat at a level likely to remove its continued representation at the given geographical level being considered.
High	An example of a high magnitude impact would be direct mortality, indirect displacement or habitat loss that would be likely to substantially reduce the population level or degree of representation at the given geographical level being considered.
Moderate	Moderate impacts include those likely to result in a net reduction of population or habitat representation (at least in the absence of effective mitigation or compensation) at the given geographical level being considered
Minor	Minor impacts include those that may result in loss of a few individuals from a species' population or minor reduction in habitat extent at the given geographical level being considered.
Negligible	Negligible impacts are those that are not likely to give rise to measurable effects on population level or habitat representation at the given geographical scale.

Significance of Effects

11.213 Whether a potential effect is 'significant' or not at the given geographical level that the receptor is valued at, is determined by quantifying the magnitude of effect on each of the receptors identified. Thus for receptors of national or international value and high sensitivity, negative effects measured at high or very high magnitude are likely to represent a significant impact at that geographical scale. In development control terms, such impacts are very likely to conflict with planning policy. At the other end of the scale, minor magnitude effects on receptors of low sensitivity and only immediate local value are likely to be below significance thresholds, and to merit relatively low weight in planning decisions. Substantial effects on high value receptors that are of low sensitivity may fall either side of the significance threshold - in such cases further avoidance or mitigation may be able to be employed to ameliorate effects. A key consideration is whether the 'integrity' of a site or ecosystem (e.g. the coherence of its structure and function) and/or the 'conservation status' of a species or habitat (e.g. the ability of a population/habitat to maintain itself at pre-development levels/quality) will be compromised.

Impact Prediction Confidence

11.214 For the impacts identified, confidence levels in the assessments made may be attributed and/or discussed where there is a significant degree of uncertainty.

Assessment

Potential effects

11.215 Identification of potential effects and their zone of influence has included review of the development description and working scheme (ES Chapter 3) and the results of tandem assessments on water resources (ES Chapter 6), landscape (ES Chapter 8), air quality (ES Chapter 9) and noise and vibration (ES Chapter 10).

11.216 Taking the above into account, the project is considered to have the potential to give rise to a range of potentially significant direct and indirect effects on ecological receptors, including *inter alia*:

11.217 Implementation *phase - direct effects*

- direct and permanent loss of existing grassland, hedgerow and disturbed ground habitats to phased top-soil/overburden stripping, materials storage and the establishment of haul routes, highway access and the processing plant site;
- loss of five waterbodies or waterbody complexes, two of which are known to support breeding great crested newts
- loss of an established, main, badger sett
- loss of habitat for nesting birds, including loss of current barn owl nesting locations in artificial boxes
- loss of habitat used by reptiles, invertebrates and with localised scarce plants

11.218 Implementation *phase - indirect effects*

- potential effects on retained peripheral and adjoining habitat features (including Home Covert LWS and ponds that support great crested newts) from lighting, noise, dust and groundwater drawdown;
- displacement and/or disturbance of fauna using application site due to habitat loss and/or operational activities;
- development and progressive expansion of temporary early-succession habitats in operational and ancillary areas, with potential colonisation by associated fauna.

11.219 *Completed* scheme - *direct effects*

- reinstatement of expansive grassland habitats, with localised scrub and hedgerow and an expanded wetland component;

11.220 Completed *scheme - indirect effects*

- likely changes in use of the site by fauna already associated with the site;
- likely changes involving other species (e.g. colonisation by species not currently present)

Assessment of effects in the absence of mitigation

11.221 Table 11-26 overleaf sets out the likely significant effects on the key ecological receptors identified prior to the application of any additional mitigation measures for both the implementation phase of the project and the post-completion phase. It thus takes into account the avoidance, mitigation and compensation measures taken as part of the design process, as previously set out in this chapter.

Table 11-26
Predicted Effects on key receptors in the absence of additional avoidance or mitigation

Receptor	Value I N R C B/D P ZoI	Potential effects	Magnitude	Significance	Additional Avoidance or Mitigation measures proposed?
Home Covert and Round Wood Local Wildlife Site (LWS)	*	1) Indirect effects – disturbance to light-sensitive fauna, or disruption of behaviour through introduction of new sources of artificial light	1) Lighting proposed for plant site only during the winter months (ES chapter 3 para 3.63). Taking account of design mitigation (directional designs and adherence to industry standards for good design practice), potential for minor magnitude residual impacts of a temporary (medium-long term) nature on western side of LWS concentrated on woodland edge, although unlikely to penetrate far into designated area.	1) Not significant in relation to the integrity of the LWS designation. See also 'bats' below.	1) No
		2) Indirect effects – disturbance to noise- sensitive fauna, or disruption of behaviour through introduction of new sources of significant noise	2) Taking account of design mitigation (e.g. cladding of processing plant) and the noise-attenuation effect of peripheral storage bunds (where present) residual potential for minor magnitude impacts of a temporary (medium-long term) nature on western side of LWS concentrated on woodland edge, but unlikely to penetrate far into designated area.	2) Not significant in relation to the integrity of the LWS designation. See also 'breeding birds' below.	2) No
		3) Indirect effects – physical impacts on plant communities affected by windborne dust, and potentially on contained surface water systems affected by significant deposition	3) Potential for negligible to minor magnitude impacts of a temporary (medium- long term) nature on western side of LWS and concentrated on immediate woodland edge.	3) Not significant in relation to the integrity of the LWS designation.	3) No
		4) Indirect effects – groundwater derogation with potential related effects on available soil water for LWS vegetation and habitat features.	4) Essentially free-draining nature of soils in south-western part of LWS, re-charge of retained adjoining section of Nast surface water system via diverted ditch, and design mitigation measures (including re-charge during de-watering of Upper Mineral Horizon and subsequent installation of clay bunds – see Chapter 6, para 6.125) renders the scope for any effects negligible.	4) No likely significant effect on the LWS.	4) None proposed or required.
Unmanaged circumneutral grassland	*	1) Progressive direct loss of c.90% of existing resource on application site.	1) Impact magnitude ameliorated by phased sequence of extraction and restoration such that development of similar vegetation on land released from current grazing or mowing management, and/or reinstated following progressive completion of restoration, is likely to reduce magnitude of loss to perhaps no more than 50% of the existing resource at any given point in time.	1) Significant unavoidable impact on resource arguably qualifying for LWS status (County importance) but the relatively species-poor nature of the existing resource, in part due to its recent origin, means that replication of value in incidentally developing or post-restoration areas likely to be close to 100%, even in worst case.	1) None practical, achievable or proportionate over and above the adoption of phased removal and compensation (through restoration) as already proposed.

Receptor	Value I N R C B/D P ZoI	Potential effects	Magnitude	Significance	Additional Avoidance or Mitigation measures proposed?
Great crested newts	*	1) Loss of 2no breeding ponds (P1 and P3) and de-facto loss of up to 70% of terrestrial habitat within 500m of these, through exclusion and/or operational activities.	1) Major in terms of the on-site population but this is evidently part of a larger metapopulation with a range extending significantly north and east, so metapopulation-level effects no higher than moderate.	1) Potentially significant in terms of maintenance of favourable conservation status at District level. In any event, impact on even one animal would have legal implications and therefore further consideration of avoidance and mitigation techniques is required.	1) Yes – replacement breeding ponds would be created as part of initial operations and a full translocation, including clearance of GCN from aquatic and terrestrial habitat within application site, and exclusion for duration of operations, will be carried out under licence.
		2) Potential for groundwater derogation effects on 2no additional ponds used by the species (P5 and P6) and to be retained close to extraction area.	2) Minor. Scope for significant dewatering of P5 limited by ground-water re-charge through retained (diverted) Nast system and re-charge lagoons and for both P5 and P6 by design mitigation measures (including re-charge during de-watering of Upper Mineral Horizon and subsequent installation of clay bunds – see Chapter 6, para 6.125).	2) Worst case predictions of impact magnitude are for short-term temporary drawdown impacts during earliest phases of operation (e.g. excavation of recharge lagoons). These are unlikely to give rise to significant meta-population level effects but any impact on egg or larval life-stages would have legal implications and therefore further consideration of avoidance and mitigation techniques is required.	2) Yes – monitoring of water levels in these waterbodies is proposed in order to identify any need for intervention. If critical operations (e.g. excavation of re-charge lagoons) occur outside the period when GCN may breed in these ponds, the scope for impact may be avoided entirely.
		3) Loss of 30-40% of terrestrial habitat within 500m of off-site breeding pond P6 through exclusion and/or operational activities, although reinstated in medium-long term.	3) Minor. Much of the terrestrial habitat in question is of reduced suitability for terrestrial phase GCN due to grazing and/or likely to be exploited to a lesser degree than other unaffected habitats (e.g. Home Covert)	3) Assessed as likely to fall below significance thresholds in terms of conservation status at District level. However, impact on even one animal would have legal implications and therefore further consideration of avoidance and mitigation techniques is required	3) Yes. A full translocation, including clearance of GCN from terrestrial habitat within application site, and exclusion for duration of operations, will be carried out under licence.

Receptor	Value I N R C B/D P ZoI	Potential effects	Magnitude	Significance	Additional Avoidance or Mitigation measures proposed?
Breeding birds:	*	1) Direct impacts on bird nests, eggs or young through site stripping or other operational activities	1) Phased nature of workings reduces scope for any more than a minor magnitude impact, even at the site level.	1) Not significant at District level for most species, although potentially approaching or exceeding such levels if restricted site population of certain scarcer species (e.g. barn owl, cuckoo) was impacted.	1) Yes. Impact on any active nest would have legal implications and therefore further consideration of avoidance and mitigation techniques is required.
		2) Progressive direct loss of 90-100% of existing breeding bird habitats on the site compromising breeding success or leading to wholesale displacement	2) Minor to moderate in the context of the geographical scale indicated. Scope for higher magnitude effects restricted significantly by phased working sequence which will leave extensive areas under rough grassland initially, and by later phases restoration is likely to have generated suitable replacement breeding conditions for a significant proportion of affected species (e.g. skylark, whitethroat).	2) Not significant at District level for most species due to amelioration effect of phasing, although potentially approaching or exceeding such levels if site population of certain species (e.g. barn owl, cuckoo) was impacted in any given operational phase.	2) None, over and above the measures employed to ensure legal compliance as per (1) above and the incorporated design mitigation.
		3) Changes in breeding bird assemblage using the site in response to temporary exclusion of public, and development of ephemeral and subsequent long-term replacement habitats through progressive restoration.	3) Neutral to minor (positive or negative) depending on uptake of ephemeral habitats by species of conservation importance (e.g. sand martin, little ringed plover), and the success of the restoration scheme long-term in reinstating the current level of ecological interest.	3) If minor magnitude positive or negative effects are manifested these would be significant at District level due to the site's relative importance at that geographical scale.	3) No
Wintering Birds	*	1) Progressive direct loss of 90-100% of existing wintering bird habitats on the site compromising site's attractiveness to such species or leading to wholesale displacement	1) Minor to moderate in the context of the geographical scale indicated. Scope for higher magnitude effects restricted significantly by phased working sequence which will leave extensive areas under rough grassland initially, and by later phases restoration is likely to have generated suitable replacement conditions for a significant proportion of affected species. Given the above, exclusion of public (albeit temporarily) may even temporarily enhance conditions for sensitive species such as short-eared owl.	1) Not significant at District level for most species due to amelioration effect of phasing, although potentially approaching or exceeding such levels if wintering population of certain species (e.g. barn owl) was impacted in any given operational phase.	1) None, over and above incorporated design mitigation.
		2) Changes in wintering bird assemblage using the site in response to temporary exclusion of public, and development of ephemeral and subsequent long-term replacement habitats through progressive restoration.	2) Neutral to minor (positive or negative) depending on uptake of ephemeral habitats by species of conservation importance (e.g. green sandpiper), and the success of the restoration scheme long-term in reinstating the current level of ecological interest, and subsequent management in maintaining that interest.	2) If minor magnitude positive or negative effects are manifested these would be significant at District level due to the site's relative importance at that geographical scale.	2) No.

Receptor	Value I N R C B/D P ZoI	Potential effects	Magnitude	Significance	Additional Avoidance or Mitigation measures proposed?
Passage Birds	*	1) Progressive direct loss of 90-100% of existing bird habitats on the site compromising site's attractiveness to such species or leading to wholesale displacement 2) Changes in passage bird assemblage using the site in response to temporary exclusion of public, and development of ephemeral and subsequent long-term replacement habitats through progressive restoration.	1) Minor. The nature of passage bird use is that the types of habitat change that will occur during the operational phase and progressive restoration are not likely to significantly affect the openness of the site and its existing attractiveness to passage species. 2) Minor to moderate positive given that the development of ephemeral habitats associated with active extraction is likely to create an additional attractant for species not currently associated with the site. Following restoration, some of this positive change might be retained depending on management and levels of public access.	1) Not significant due to the low magnitude of change and the nature of passage bird use. 2) If minor to moderate temporary or longer-term positive effects are manifested these would be significant at District level due to the site's relative importance at that geographical scale	1) None, over and above incorporated design mitigation. 2) No
Invertebrates	*	1) Direct impacts on individuals or populations through site stripping or other operational activities 2) Progressive direct loss of 90-100% of existing invertebrate habitats on the site 3) Changes in invertebrate assemblage using the site in response to development of ephemeral and subsequent long-term replacement habitats through progressive restoration.	1) Phased nature of workings and large expanse of macro-habitats reduces scope for any more than a minor magnitude impact, even at the site level. 2) Minor in the context of the geographical scale indicated, and the likely site-wide and local distribution of the species of higher conservation importance. Scope for higher magnitude effects restricted significantly by phased working sequence which will leave extensive areas under rough grassland initially, and by later phases restoration is likely to have generated suitable replacement conditions for a significant proportion of affected species, with some expansion of currently more restricted habitat opportunities (e.g. wetland, acid grassland). 3) Neutral to minor (positive or negative) depending on uptake of ephemeral habitats by species of conservation importance (e.g. solitary bees and wasps), and the success of the restoration scheme long-term in reinstating the current level of invertebrate interest.	1) Unlikely to be significant at the assemblage/metapopulation level for any species. 2) Unlikely to be significant at the assemblage/metapopulation level for any species. 3) Positive impacts up to District level of significance are possible.	1) No. 2) None, over and above incorporated design mitigation. 3) None, over and above incorporated design mitigation.
Other grasslands	*	1) Progressive direct loss of c.100% of existing resource on application site.	1) Impact magnitude ameliorated by phased sequence of extraction and restoration such that development of similar vegetation through progressive restoration is likely to reduce magnitude of loss to perhaps no more than 25% of the existing resource at any given point in time, with equivalent or expanded resource re-created.	1) Taking into account design mitigation, impacts not significant above the immediate site context, and potentially net positive for this receptor.	1) None, over and above incorporated design mitigation.

Receptor	Value							Potential effects	Magnitude	Significance	Additional Avoidance or Mitigation measures proposed?
	I	N	R	C	B/D	P	ZoI				
Hedges, mature trees, ponds and denser scrub						*		1) Progressive direct loss of up to c.30-40% of existing resource on application site	1) Minor (ponds, scrub) or negligible (hedges, mature trees) in comparison with Parish resource, with advanced compensatory provision proposed in relation to ponds	1) Not significant above the immediate site level	1) None, over and above incorporated design mitigation.
Bats						*		1) Potential indirect habitat fragmentation effects on local bat populations from permanent losses or breaches of hedgerows.	1) Minor (see also under hedges and mature trees above) in terms of the integrity of commuting and foraging routes in the short-medium term and compensated in the long-term by enhanced conditions for the species recorded, as delivered through the restoration scheme.	1) Effects predicted to remain well below significance thresholds in terms of local population integrity for any bat species	1) Yes – any affected mature trees will be re-surveyed prior to initial operations and prior to each stripping phase to ensure no roosts are established or to inform appropriate mitigation if required in the future.
								2) Temporary loss of foraging area due to removal of vegetation in active extraction areas	2) Minor to negligible. The phased working sequence will limit the extent of land devoid of vegetation at any one time and losses are likely to be compensated or outweighed by benefits as the restoration sequence progresses.	2) Effects predicted to remain well below significance thresholds in terms of local population integrity for any individual bat species.	2) None required
								3) Increased habitat diversity delivered by progressive restoration through operational phase delivering compensatory or new representations of semi-natural grassland, wetland and scrub.	3) Negligible through to minor positive as restoration progresses in tandem with working.	3) Negative effects predicted to remain well below significance thresholds. Significant positive effects progressing from immediate local to Parish level by the completion of the restoration due to enhanced wetland foraging opportunities.	3) None required.
Brown hare						*		• Loss of cover and foraging area due to removal of vegetation in active extraction areas	1) Minor to negligible. The phased working sequence will limit the extent of land devoid of vegetation at any one time and losses are likely to be compensated or outweighed by benefits as the restoration sequence progresses, including temporary benefits from reduced disturbance	1) Negative effects predicted to remain well below significance thresholds in terms of local population integrity. Significant positive effects at the Parish population level are possible, although these may be rendered temporary depending on the future management of public access.	1) None, over and above incorporated design mitigation.
Badgers						*		1) Loss of main sett and high proportion of associated foraging area	1) Major at the geographical level specified (immediate zone of influence) although likely to be no more than minor at Parish or above levels.	2) Potential for significant negative effects up to parish level in the absence of mitigation. Impacts would have legal implications and therefore further consideration of avoidance and mitigation is required.	1) Yes. An artificial sett will be constructed and badgers encouraged to use it prior to the closure of the existing sett under licence. Loss of foraging area adjudged not to require mitigation because progressive restoration will ensure continued availability of sufficient resource.

Receptor	Value							Potential effects	Magnitude	Significance	Additional Avoidance or Mitigation measures proposed?
	I	N	R	C	B/D	P	ZoI				
Reptiles							*	1) Small-scale scope for impacts on individuals from sparse local population of grass snake.	1) Minor. Only very low numbers likely to be at risk.	1) Effects not predicted to be significant in terms of local populations. Effects likely to be reduced by recovery in the short-term.	1) Yes – habitat manipulation will be employed out of season to discourage grass snakes (and any other reptiles colonising/re-colonising in the future) from areas affected by works and/or phased translocation will be employed.
								2) Loss of foraging habitats in ponds and grassland.	2) Negligible through to minor negative effects as restoration progresses in tandem with working. In the longer term, increased habitat diversity for reptile species delivered by progressive restoration through operational phase delivering new representations of semi-natural grassland, wetland and scrub.	2) Not significant.	2) None, over and above incorporated design mitigation

FURTHER AVOIDANCE, MITIGATION, COMPENSATION AND ENHANCEMENT

Specially Protected Species

Great Crested Newts

11.222 Further mitigation is required in respect of this European Protected Species due to the confirmed loss of breeding ponds and damage to/loss of large areas of terrestrial habitat during the operational phase. Due to the extended period of operation, and in order to minimise the loss of foraging area (either through vegetation removal or de-facto loss through exclusion using amphibian fencing) it is proposed that mitigation will be put into effect in phases. These may or may not conform to the seven proposed working phases of the quarry – decisions on the optimum phasing approach for great crested newt mitigation will be made in consideration of factors such as ensuring adequate amount of breeding and foraging habitat is available to displaced great crested newts at any given time, practical considerations (including timing to minimise the scope for impact on breeding or hibernating newts) and cost considerations. It is intended that the pre-application screening service offered by Natural England will be employed to ensure the mitigation approach is designed in consultation with the statutory authority. For the purposes of planning determination however, it is necessary to set out how the mitigation approach can and will meet the three tests imparted by the Habitats Directive in order for derogation to be given in the form of a licence.

11.223 The case that there is overriding public interest in the development proceeding and that there is no satisfactory alternative to the development relates to the site's allocation for minerals extraction in the adopted Minerals Local Plan and the significant contribution it makes to local supply of sand and gravel and the importance of that supply to the local and regional economy. This is as set out in the planning statement (Volume 1) submitted with the application.

11.224 The favourable conservation status of great crested newts, here measured in terms of the site and local metapopulation, will be secured through the following:

- Advanced construction of a minimum of four compensatory breeding ponds at the northern edge of the application site in a location that provides terrestrial habitat corridors to the east and west, and free dispersal routes towards suitable habitat for the species to the north.
- Phased trapping and exclusion of great crested newts from the plant site and eastern areas of the application site initially, and then in a phased progression east to west across the extraction area, thereby ensuring that restored habitats are made available as compensatory provision for the retained on and off-site population.

- The implementation of a restoration scheme that will secure enhanced terrestrial and wetland habitat provision for the species as compared to the existing situation.

Bats

11.225 As set out in Table 7, no impacts on bat roosts are predicted due to the absence of evidence of any roosts in the limited number of mature trees and the single structure on the site, as confirmed by specific survey. This assessment is likely to remain current with respect to most vegetation removed during set up operations, but further checks of mature trees that will be removed during this phase (e.g. in and around the plant site) and of the building in the south-eastern edge of the application site, will be made immediately prior to their felling or demolition respectively.

11.226 In relation to the remainder of the site, while current roosting opportunities are absent or highly limited, the elapse of time over the operational phase renders it possible, albeit unlikely, that the baseline situation could change. To address this, a repeat appraisal of the possibility of roosts being present will be made prior to the commencement of site preparation works on each future phase, and if potential roosts sites are identified these will be subject to full surveys (emergence/climbing) to ascertain that no bat constraint has developed. If bat roosts are found, appropriate mitigation under licence will be enacted prior to the commencement of preparatory works for that phase.

11.227 As an ancillary and unrelated enhancement for bats, the opportunity will be taken to install bat boxes on a number of retained mature trees at the site margins, including the part of the Brett lease-holding that extends party within edge of Home Covert. This would represent an enhancement in terms of the current poor level of bat roosting opportunities on the site.

Badgers

11.228 The main badger sett present on the site will not be affected until the mid to late part of the phased working sequence. The substantial lead-in time before this sett needs to be removed will therefore be used to construct an artificial sett at an appropriate location near to the site boundary, and to begin the process of encouraging badgers to begin using it, in order that they are habituated to it well in advance of staged closure of the existing sett being required under licence. It is envisaged that the detail of the badger mitigation strategy will be secured pursuant to a condition attached to the planning permission, and will in any event be required to inform an application for a licence to close down the existing sett.

11.229 In addition to the above, prior to the commencement of stripping on each working phase, a repeat badger survey of that area will be carried out. If any additional setts are found to have become established, appropriate mitigation measures up to and including exclusion of animals from any sett that happens to be active at that time will be taken under the terms of the relevant licences.

Barn owl

11.230 To ensure an unbroken continuity of nest and winter roost site opportunities for this specially protected species, the existing barn owl boxes on the site will be relocated in the post-breeding / pre-winter period (i.e. once certain any chicks have fledged) prior to their location being affected by any individual working phase. Consideration will be given to the erection of additional permanent pole or tree mounted boxes as part of the final restoration.

Reptiles

11.231 In advance of groundworks on any individual phase, suitably timed habitat manipulation (strimming and/or mowing) will be employed to displace and discourage reptile species from habitat with the potential to support them. Because of the low populations present on the site, and because compensatory habitat will develop in short order on peripheral or already restored land as the working sequence progresses, this is considered an appropriate, proportionate and adequate means to negate or minimise the scope for inadvertent killing or injuring of any individual animals from the sparse local population of grass snake on the site, and indeed any residual population of slow worm.

Phasing of Works to Avoid Impact on Nesting Birds

11.232 It is intended that vegetation removal, overburden stripping and related groundworks for the preparatory phases (including conveyor construction) and for each working phase, will be timed to take place in the autumn or winter period preceding the works themselves. This should avoid conflict with nesting birds. No particularly early nesting species are anticipated on this site and so this approach is likely to successfully avoid any impact from this source.

RESIDUAL EFFECTS

11.233 The residual effects anticipated to arise as an overall consequence of the project (i.e. taking into account both the design mitigation set out above, and the further avoidance, mitigation and compensation measures) are summarised for each of the key receptors in Table 11-28 below.

Table 11-27
Residential Effects

Receptor	Residual effect
Home Covert and Round Wood LWS	With the adoption of best practice and industry guidance in respect of minimising the indirect effects on the LWS habitats from lighting, noise and dust, no significant residual impacts are predicted in terms of the integrity of this designated site.
Unmanaged grasslands	The phased nature of extraction, the likely development of ephemeral unmanaged grassland habitats of not dissimilar nature and conservation significance, and the active creation and future management of such habitats following the completion of restoration ensures that any negative impacts will be of minor to moderate magnitude, temporary and fully compensated in the long term. Residual effects after restoration assessed as not significant and may be positive subject to restoration success and future management.
Great crested newts	A comprehensive mitigation scheme for this species will be implemented, involving the advance construction of replacement breeding ponds, and phased trapping and exclusion from affected habitats. The scheme will require derogation from the provisions of European and UK legislation in the form of a licence from Natural England. The three tests upon which the grant of a licence is contingent are capable of being met. Residual impacts on the species are assessed to be below significance thresholds on the successful completion of mitigation, with scope for significant positive effects in the long-term due to the enhanced wetland habitat provision forming part of the restoration scheme.
Breeding birds	The phased nature of extraction and progressive restoration, in conjunction with the incidental development of ephemeral habitats in operational areas and the exclusion of public access from operational areas during the active working or restoration phase, is likely to ensure operational phase impacts on this receptor remain below significance thresholds. Post-restoration, there is scope for significant positive impacts at the District level to be secured, subject to future management.
Wintering birds	Similarly to the above, the phased nature of extraction and progressive restoration, in conjunction with the incidental development of ephemeral habitats in operational areas and the exclusion of public access from operational areas during the active working or restoration phase, is likely to ensure operational phase impacts remain below significance thresholds. Post-restoration, there is scope for significant positive impacts at the District level to be secured, subject to future management.
Passage birds	The scope for significant negative effects is assessed as remote due to the transient nature of site use by this group of receptors and the phased nature of extraction and progressive restoration, in conjunction with the incidental development of ephemeral habitats in operational areas and the exclusion of public access from operational areas during the active working or restoration phase. Positive effects significant up to the District level are possible post-restoration, subject to an appropriate management regime being delivered.
Invertebrates	Scope for significant negative effects restricted by phased working sequence which will leave extensive areas under rough grassland/scattered scrub initially, and by later phases restoration is likely to have generated suitable replacement conditions for a significant proportion of affected species, with some expansion of currently more restricted habitat opportunities (e.g. wetland, acid

Receptor	Residual effect
	grassland) potentially delivering significant positive effects long-term.
Other grassland habitats	Losses anticipated to be below significance thresholds at the relevant (Parish) geographical level, due to progressive nature of site working and restoration and the compensatory (or expanded) provision built in to the restoration scheme.
Hedges, mature trees, ponds and denser scrub	Losses anticipated to be below significance thresholds at the relevant (Parish) geographical level, in large part due to progressive nature of site working and restoration and the compensatory (or expanded) provision built in to the restoration scheme in respect of ponds, hedges and scrub.
Bats	Short term effects likely to be neutral or net positive (although sub-significant in relation to conservation status of resident local populations) due to very minor habitat loss or fragmentation effects being outweighed by delivery of improved habitat diversity through extraction and progressive restoration. In medium term, mitigation proposed to militate against and/or address future effects further obviates scope for significant effects. Post completion (long term), effects are likely to be significant positive (Parish level) due to expansion and improvement of habitat resources, including provision of new wetland habitat foraging and roosting opportunities in particular.
Brown hare	Negative effects predicted to remain well below significance thresholds in terms of local population integrity. Significant positive effects at the Parish population level are possible during the operational phase, due to exclusion of public (and dog) access although these may be rendered temporary depending on the future management regime.
Badgers	The significant lead-in time available to secure adequate mitigation for sett loss and the effect of phased working and progressive restoration of the site in terms of maintenance of foraging area reduce the scope and magnitude of potential impacts, with residual effects adjudged to be well below Parish-level significance even in the worst case.
Reptiles	With precautionary mitigation, no significant effects anticipated due to phased habitat loss being compensated by delivery of improved habitat by progressive restoration. In medium to long term, effects are likely to be significant positive (Parish level) due to expansion and improvement of habitat resources.

CONCLUSIONS

11.234 As can be seen from Table 11-27, the net residual effect of the proposals in terms of the key ecological receptors is anticipated to be at worst neutral and at best a positive effect measurable at least at the District level of significance. The difference relates to a degree of residual and unavoidable uncertainty over the success of the restoration scheme and subsequent long-term management in securing similar or enhanced habitats to the baseline position and, in particular, the extent of visitor pressure and its management over the long-term.

11.235 The project will give rise to minor temporary negative effects on certain key faunal receptors (in particular great crested newts and badgers) during various stages of the working sequence, but none of these receptors are predicted to be subject to negative effects of high magnitude (e.g. significant in terms of wider local populations), subject to mitigation measures which, in respect of great crested newts and badgers, are required under statute in any

event. There is no impediment to mitigation proposals being delivered that are in accordance with standard best practice, and in that context there is no cause to believe that the requisite licenses will not be forthcoming in due course. There is also a high certainty that all temporary negative effects on key faunal receptors related to habitat loss will be at least fully compensated in the long-term through the restoration scheme.

11.236 The proposals for restoration focus on replication of the higher-value elements of the site in its baseline condition, including in particular the large expanses of rough circumneutral grassland, but also seek to exploit opportunities to secure expanded representations of other semi-natural vegetation, in particular acid grassland and wetland habitats, providing replacement and expanded opportunities for species of conservation importance, including declining open-country birds, scarce plants and insects, great crested newts and others. Depending on the success of restoration delivery, and the future management of the site, the project has the potential to ultimately deliver significant positive effects at District level or above, and to qualify the restored site for non-statutory designation within a relatively short time frame.