British Energy Group PLC
Sizewell Bat Survey Report 2008

1. Introduction

1.1 Background to Development

British Energy (BE) is at the early stages of investigating the feasibility of building new nuclear power stations at a range of sites within their UK land holding. Sizewell has been identified as one potential site for investigation and likely progression to EIA. Entec UK Ltd has been appointed by BE to lead and co-ordinate the baseline terrestrial ecological work and assessment for Sizewell and has subcontracted Baker Shepherd Gillespie (BSG) to undertake baseline bat surveys of the area. This report presents the results of survey work undertaken within the BE land holding by BSG in 2008 to progress the baseline assessment for bats.

1.2 Proposed Works

An area of land directly north of the Sizewell 'A' and 'B' Power Stations has been identified as having the potential to accommodate nuclear new build. This area, which covers 0.32km2/32ha and has an approximate central grid reference of TM473640, is referred to in this document as 'the preliminary works area'. It should be noted that this initial development footprint is purely indicative; environmental, landscape and visual, hydrological and other constraints have not yet been considered and taken into account. These would all be addressed as a matter of course as part of an EIA.

No detailed information on the exact nature of the proposed nuclear power station can be provided at this stage, but it is assumed for the present that the power station would be water-cooled and that there would be a requirement for additional works associated with this in the sub-tidal zone. Due to the presence of statutorily designated sites of nature conservation importance to the north and east of the preliminary works area, it is likely that the route of any access road to this block of land will be through the area of plantation forestry (Goose Hill and surrounding afforested areas) to the east. Further, it is likely that any construction compounds for the build would adjoin this access road, taking in further areas of plantation and adjacent arable land.

Figure 1 shows the proposed footprint of the new power station (the preliminary works area) and the area covered by the 2007 (Entec report reference 19801cb114) and 2008 bat surveys (referred to as the 'study area') for the baseline ecological assessment for bats. The positions of the access track and construction compounds are indicative at this stage.

1.3 Preliminary Works Area Description and Context

The preliminary works area comprises open sheep grazed pasture, fringed by reinstated coastal dune vegetation, parts of which have been planted with trees and scrub. The hydrology and pedology of the site were irreversibly altered as a result of works associated with the building of the Sizewell 'A' and 'B' Stations (adjacent to its southern boundary), and as a result it has lost

much of its botanical merit. Habitats adjoining or in close proximity to the site are of considerable ecological interest however. These include wet meadows (and associated wetland habitats and ditch systems), dune systems, shingle plant communities and wet semi-natural woodland. The quality of the shingle, grazing marsh and associated wetland habitats have led to substantial areas of these in close proximity to the site being designated for their ecological interest. Previous bat surveys have recorded nine bat species on the Sizewell Estate including barbastelle *Barbastellus barbastellus*, one of the UK's rarest species, and one of only five UK bat species listed on Annex II of the EU Habitats Directive.

1.4 Legislation and Policy Guidance

1.4.1 Biodiversity Action Plan

Seventeen species of bat are known to be resident in the UK, seven of which are on the new list of priority species[1] in the UK Biodiversity Action Plan (BAP), adopted by the Government in 2007. Species included on this list have been identified by the UK Government as needing special conservation help because of their rarity and/ or decline in numbers over recent decades. Species Action Plans (SAPs) have been developed to identify conservation priorities, propose action, and set targets to try and maintain and restore populations. Bat populations are at risk from changes to the landscape (such as those caused by agricultural practices or land development), which can cause loss of roosting, foraging or commuting habitat and be a contributing factor to population decline.

A clear understanding of the level and nature of use of a site by bats is necessary to ensure that environmental measures (mitigation, enhancement and offsetting) associated with a development can be appropriately targeted, and put in the context of local and National conservation priorities. The SAPs promote the favourable management of land, especially in the vicinity of known roost sites, and aim to maintain and enhance existing bat populations. These can lead to the designation of important sites for rarer species and notification to the local authority of important roosts such as maternity or hibernation sites.

Most of the Species Action Plans (SAPs) in the Suffolk Biodiversity Action Plan are based on National Biodiversity Action Plans. The process of identifying BAP priorities in Suffolk began in 1997, and an initial plan (Tranche 1) was produced in 1998. Priority species included the common pipistrelle bat *Pipistrellus pipistrellus*. Tranche 2, published in 2000 has been withdrawn and revised plans are in production. Priority species on Tranche 2 included barbastelle.

1.4.2 Protective Legislation Relating to Bats

All bat species and their roosts are protected in the UK under the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) which implements the EC Directive 92/43/EEC (the Habitats Directive). In addition, the lesser and greater horseshoe bat *Rhinolophus hipposideros, R ferrumequinum* Bechstein's bat *Myotis bechsteinii* and barbastelle are listed in Annex II of the Habitats Directive, which requires sites to be designated by member states for their protection.

[1] Priority bat species in the UK BAP: *Barbastelle Barbastellus* barbastellus, Bechstein's *Myotis bechsteinii*, noctule *Nyctalus noctula*, soprano pipistrelle *Pipistrellus pipistrellus*, brown long-eared *Plecotus auritus*, greater horseshoe *Rhinolophus ferrumequinum* and lesser horseshoe *R. hipposideros.*

All bat species and their roosts are also protected under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended), and under the Countryside and Rights of Way Act 2000. Taken together, these Acts and Regulations make it illegal to:

- Intentionally or deliberately kill, injure or capture bats;
- Deliberately or recklessly disturb bats;
- Damage, destroy or obstruct access to bat roosts;
- Possess or transport a bat or any part of a bat, unless acquired legally; and
- Sell, barter or exchange bats or parts of bats.

In response to a European Court Judgment (ECJ) that ruled the United Kingdom had not correctly transposed the Habitats Directive into UK law in a number of areas, recent changes have been made to the Habitats Regulations. Caselaw driving these changes included judgments in 2004 and 2005 which ruled that existing species protection provisions in the Habitats Regulations were not fully compatible with the strict species protection regime required by the Habitats Directive (www.defra.gov.uk). The Conservation (Natural Habitats, &c.) (Amendment) Regulations 2007 made changes to the Habitats Regulations to meet this judgment. Further amendments have been made in 2009 (the Conservation (Natural Habitats, &c.) (Amendment) Regulations 2009) and came into force on the 30th January 2009.

The Natural Environment and Rural Communities Act 2006 (NERC Act) states, in Section 40(1), that "*every public authority must, in exercising its functions, have regard, so far as is consistent with the proper exercise of those functions, to the purpose of conserving biodiversity*". Section 40(3) of the NERC Act 2006 goes on to state that "*conserving biodiversity includes, in relation to a living organism or type of habitat, restoring or enhancing a population or habitat*".

Section 41(1) of the NERC Act 2006 states that "*the Secretary of State must, as respects England, publish a list of the living organisms and types of habitat which in the Secretary of State's opinion are of principal importance for the purpose of conserving biodiversity*". All seven species of bats that are priority species in the UK Biodiversity Action Plan (see Section 1.4.1) are also considered Species of Principal Importance for the Conservation of Biodiversity under Section 41 of the NERC Act.

In paragraph 16 of Planning Policy Statement 9, the Government indicates that local authorities should take steps to further the conservation of species of principal importance for the conservation of biodiversity in England and should ensure that that these species are protected from adverse effects of development, where appropriate, by using planning conditions or obligations.

Developments that compromise the protection afforded to bats under the provisions of the Conservation (Natural Habitats, &c.) Regulations 1994 almost invariably require a licence from Natural England. Three tests must be satisfied before a licence to permit otherwise prohibited acts can be issued:

- Regulation 44(2)(e) states that licences may be granted by Natural England to 'preserve public health or public safety or other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment';

- Regulation 44(3)(a) states that a licence may not be granted unless Natural England is satisfied 'that there is no satisfactory alternative';
- Regulation 44(3)(b) states that a licence cannot be issued unless Natural England is satisfied that the action proposed 'will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range'.

In conclusion, a licence permits otherwise unlawful actions and it is the responsibility of the developer, or their appointed advisor, to decide whether a licence is required for work that has the potential to affect bat populations. It is important that the developer carries out a thorough survey and accurate assessment to help avoid committing offences. It is also the responsibility of the developer to design and implement a mitigation scheme that meets the licensing requirements and ensures, as far as possible, the long-term future of any bat population affected. Licence applications (under Regulation 44(2)(e) of the Habitats Regulations) will be determined by Natural England.

1.5 Status of Bats in Suffolk

Of the seventeen species of bat that are known to be resident in the UK, the species listed in **Table 1** are known to occur in Suffolk:

Table 1 Status of Bat Species in Suffolk

English name	Scientific name	Status in Suffolk	Notes	Source of information
Common pipistrelle	*Pipistrellus pipistrellus*	Common and widespread	-	Richardson (2000)
Soprano pipistrelle	*Pipistrellus pygmaeus*	Common and widespread	-	Richardson (2000)
Brown long-eared bat	*Plecotus auritus*	Common and widespread	Second only to pipistrelles in terms of number of 10km squares recorded in, in the county	Suffolk Bat Group
Natterer's bat	*Myotis nattereri*	Regularly recorded	The number of records trebled following the bats in barns survey in 1996. The species uses most of the known hibernation sites in the county.	Suffolk Bat Group
Whiskered bat	*Myotis mystacinus*	Extremely scarce	Until January 2000 all records were from two hibernation sites, and refer to single animals. A breeding roost has yet to be discovered in the county	Suffolk Bat Group
Brandt's bat	*M. brandtii*	Extremely scarce		Richardson (2000)
Daubenton's bat	*M daubentonii*	Widespread and locally common		Richardson (2000)
Noctule	*Nyctalus noctula*	Widespread (in low numbers)	Widespread throughout the county albeit in small numbers	Richardson (2000) and Suffolk Bat Group

Table 1 (continued) Status of Bat Species in Suffolk

English name	Scientific name	Status in Suffolk	Notes	Source of information
Leisler's bat	*N. leisleri*	Uncommon	Only three nursery colonies are known in the county. Appears to be confined to the north-west of the county	Suffolk Bat Group
Serotine	*Eptesicus serotinus*	Widespread (in low numbers)	There are approximately 45 known colonies in Suffolk.	Suffolk Bat Group
Barbastelle	*Barbastella barbastellus*	Scarce		Richardson (2000)
Lesser horseshoe bat	*Rhinolphus ferrumequinum*	Very rare (very few records)	A single bat (presumed to be the same individual) has been recorded at a hibernation site in February for the last nine to fourteen years.	Suffolk Bat Group and Alan Miller of the Suffolk Wildlife Trust

1.6 Purpose of Survey Work

The bat surveys carried out in 2008 form part of the baseline survey programme that commenced in 2007[2] and is being conducted to inform the ecological assessment section of an Environmental Statement (ES) for the proposed development. Bat activity surveys in 2007 recorded nine species of bats in the study area, including soprano pipistrelles, brown long-eared bats, noctule bats and the rare barbastelle bat. Barbastelle bats are known to have roosted in a barn at Upper Abbey Farm and have previously roosted in a barn at Lower Abbey, both of which are within the Sizewell Estate. Noctules and soprano pipistrelles have been recorded in bat boxes in Kenton Hills.

The 2008 survey work was commissioned by BE to address recommendations made in the 2007 Sizewell bat survey report (Entec doc ref 19801cb114). The aims of the 2008 surveys were therefore:

- To determine the status of the barbastelle bat roosts at Upper Abbey Farm and Lower Abbey and establish if a breeding colony is likely to be present;
- To establish if other buildings close to the study area are suitable roost sites for barbastelle;
- To determine the level and nature of bat use in the study area in April and May (through undertaking baseline surveys early in the year, using comparable survey methods as employed in 2007, thereby extending the overall survey period);

[2] A programme of ecological survey work began at Sizewell in April 2007. An ecological scoping report was issued to consultees in June 2007, since which time there has been a series of meetings and teleconferences to discuss ecological issues and survey results.

- To monitor known flightlines for barbastelle bats and to survey potential flightlines in and around the study area to help determine the nature and level of barbastelle activity in habitats within the study area;
- To monitor Goose Hill, Kenton Hills and Nursery Covert plantation woodlands to help determine the nature and level of use by barbastelle bats and the likelihood the woodland supports maternity roosts and is therefore a core area for the colony;
- To survey trees in the study area when they are not in leaf, to confirm the number of trees with bat roost potential;
- To identify information gaps that need to be addressed through further appropriate survey and determine the need to use more intrusive methods of survey (such as mist netting) to establish a higher level of certainty to inform ecological impact assessment and;
- To recommend appropriate mitigation, enhancement and compensation measures to ensure the bat interest of the area is maintained and enhanced.

2. Methods

2.1 Desk Study

2.1.1 Landscape Appraisal

An appraisal of the landscape using aerial photographs and Ordnance Survey maps was carried out in March 2008 to identify potential commuting routes for barbastelle bats, and buildings with the potential to support a maternity colony of barbastelle bats. Female barbastelles will travel several kilometres to foraging areas. Distances are likely to vary depending on the availability of roosts and favourable foraging habitats. Females from a colony on Dartmoor were found to forage up to 4km from their roost (www.dartmoor–npa.gov.uk), whilst studies in Sussex found the average length of flightlines of females was 8km. However, the distance individuals travel to forage is influenced by the connectivity and layout of available flightlines in the landscape. Changes in the landscape, typically brought about by human influences, can drastically increase the distance an individual bat may have to fly between its roost and favoured foraging areas and distances of 16-18 kilometres have been recorded occasionally in some studies. The landscape appraisal in the current study considered buildings within approximately 6km and potential commuting and foraging habitats within approximately 3km of the preliminary works area and proposed access track.

Examination of the aerial photographs for buildings that may support a maternity colony of barbastelle bats involved looking for large, old agricultural buildings such as the barn at Upper Abbey Farm. Studies in Sussex indicate that breeding clusters of barbastelle bat in woodlands will regularly move from one roost to another and will divide into sub-groups (Greenaway, 2001). Therefore, it is likely that any buildings that support a breeding colony of barbastelle bats must be timber framed and large enough to provide a variety of roosting opportunities. Observations of barbastelle bats roosting in Paston Great Barn, Norfolk (the only known breeding colony of barbastelle bats in a building in Britain) have revealed that barbastelles display roost switching behaviour, indicating that the combination of roost sites available in the barn and associated buildings is a probable reason why these buildings are used for breeding (LDA, 2003). Local workers for the Suffolk Wildlife Trust (SWT) at Upper Abbey Farm with

knowledge of the area were asked if they knew of any such barns in the local area. Alan Miller of the SWT was able to explain recent changes in land use within the study area. Robin Harvey, the assistant warden at the RSPB Minsmere reserve, was contacted in January 2009 to enquire if they had any records of barbastelle bats, which may suggest barbastelles are foraging in habitats associated with the reserve. The reserve is approximately 6km from the preliminary works area.

The appraisal of the landscape for potential flightlines used by barbastelle bats involved identifying hedge lines, woodland strips and woodland edges, and natural features such as the coastline.

2.1.2 Analysis of 2007 Baseline Data for Barbastelle Bats

The baseline survey data for bats gathered in 2007 (to inform the early stages of an Environmental Impact Assessment at Sizewell (Entec doc ref 19801cb114)) has been included in this assessment. As part of the 2008 study, the time of night that each of the barbastelle bat records was obtained in 2007 was investigated to determine how long after sunset the bats were on site. Records of barbastelles soon after dusk would indicate there may be a roost close to the study area.

2.2 Field Surveys

2.2.1 Roost Surveys

Upper Abbey Farm

Barbastelle bats were first recorded in the large threshing barn at Upper Abbey Farm (hereafter referred to as Upper Abbey Barn) by the Suffolk Wildlife Trust in 1997 (Alan Miller SWT, pers. comm.). Small numbers of barbastelle bats were recorded in subsequent years, but there has been no evidence of breeding. To determine if barbastelle bats are breeding in Upper Abbey Barn the barn was monitored between April and August 2008.

A daytime inspection of the interior of the barn to look for fresh bat droppings was carried out by Anton Kattan, with assistance from Laura Jennings, on the 28th April 2008 between 14:30hrs and 15.45hrs. Fresh droppings are generally shiny, whilst older droppings become dull and greyish. The size, shape and texture of bat droppings can provide a good indication of species identity, although there is a wide range of variation in these parameters within species. Droppings were collected from the barn for analysis and verification by a second bat ecologist[3]. The structure and size of bat droppings collected from Upper Abbey Barn were compared to measurements published in *Which Bat is it? A guide to bat identification in Great Britain and Ireland* (Stebbings, Yalden & Herman, 2007). A second daytime inspection was carried out by Anton Kattan and Dr Sandie Sowler on the 18th June 2008 between 14:30hrs and 15:45hrs. Evidence of fresh droppings was searched for and the location of accumulations of droppings was recorded. Close focusing binoculars and a powerful Clulite torch were used to examine the roof of the barn.

A Batbox Duet bat detector connected to a Sony minidisk recorder was placed in Upper Abbey Barn on the 28th April 2008 to record dusk emergence bat activity. The bat detector was positioned in the middle of the barn, between the two large south facing double doors, approximately 1.5m off the ground. The bat detector microphone pointed towards the roof and

[3] Dr Sandie Sowler MIEEM, an experienced bat surveyor with over 20 years of experience carrying out roost visits, verified the species identification

was positioned in a location that was considered most likely to record bats flying in the barn. Recording commenced at 20:10hrs and ended at 22:15hrs. Sunset time was 20:17hrs and weather conditions for the evening are shown in **Table 3**.

One surveyor was stationed at the south-eastern end of Upper Abbey Barn on the 19th May 2008 for 1 hour 45 minutes after dusk to identify bats flying from the direction of the barn towards the farm track that leads to Fiscal Policy.. The aims of the survey were to record species that may be roosting in the barn and commuting towards Goose Hill and the adjoining afforested areas. A dawn re-entry watch was undertaken by Anton Kattan and Sandie Sowler on the 12th August 2008. The prevailing weather conditions, surveyors' location, sunset times, start and finish times and duration of each survey are set out in **Table 2**.

Table 2 Upper Abbey Barn Dusk Exit and Dawn Re-Entry Surveys

Date	Surveyor	Position	Start/ finish times	Sunset/ sunrise time	Duration	Temperature (°C)	Wind speed (mph)	Rain	Cloud cover (%)
19/05/08	Laura Jennings	SE end of the barn	20:30 - 22:15	20:50	1hr 45mins	10.2-8.10	1	No	35
12/08/08	Anton Kattan	Eastern end of barn	04:10-05:50	05:40	1hr 40mins	16	2	Very light	90
	Sandie Sowler	NW corner of barn							

An Anabat SD1 (an automated recording frequency division bat detector with timed sound file feature) was used as a datalogger to monitor bat activity in Upper Abbey Barn in May and June. Recordings were made from the 20th to 27th May and on the 5th June 2008. The Anabat unit was attached to a wooden pillar near the centre of the barn at a height of approximately 2m with the microphone pointing up towards the roof and programmed to record bat activity between dusk and dawn each night.

Lower Abbey Farm

A daytime inspection of the large threshing barn at Lower Abbey Farm was carried out by Anton Kattan and Sandie Sowler on the 18th June 2008 between 11:45hrs and 12:55hrs. An assessment to identify potential roost sites and the likelihood of them having been occupied by bats was made. Particular attention was paid to mortice joints and junctions between timbers and walls. Evidence of occupancy by bats, such as droppings, urine staining, scratch marks and staining from fur oil on the timber was searched for. A search was also made of the ground for accumulations of droppings or bat carcasses. A high powered Clulite torch and close-focusing binoculars were used to inspect upper areas of the barn.

Leiston Abbey

An external examination of Leiston Abbey was carried out by Anton Kattan and Laura Jennings on 29th April 2008. The desk based assessment of the buildings from aerial photographs and a website for the venue (www.leistonabbey.co.uk) indicated that the all the buildings, including the old barn, had been converted for use as a conference centre and wedding venue. The purpose of the visit was to confirm that the buildings no longer offered suitable shelter for barbastelle bats.

Trees in Goose Hill Plantation and Adjoining Afforested Areas

The 2007 Sizewell Bat Report (Entec doc ref 19801cb114) included a list of trees with potential as bat roost sites, with each tree graded according to its level of potential in this respect (low-high). However, the 2007 inspection of the trees was carried out in June when foliage may have masked some features (holes, splits etc.) with potential as roost sites. A further inspection of these trees was therefore carried out by Lynn Whitfield, an Entec ecologist (Natural England bat licence no. 20073526) on 6 March 2008, before the leaves had regrown (on the deciduous trees).

Trees were inspected from ground level using close-focusing binoculars and, where appropriate, a high-power lamp. Features that could be used as bat roosts were searched for, including woodpecker holes, rot holes, splits and loose bark. Any trees considered to have potential in this respect and not noted in the previous report were recorded.

2.2.2 Bat Activity Surveys

Walked and Driven Transects

Six evening bat activity surveys were undertaken between the 28th April and 11th August 2008. Walked and driven transects were used to sample habitats within the study area and connecting habitats between Lower Abbey Farm, Upper Abbey Farm, and the study area. Both driven and walked transects are recognised methods for bat activity surveys (Bat Conservation Trust, 2007). The decision as to whether to carry out walked or driven transects was determined by the distance of the proposed transect route, with the intention of sampling each section of the transect route for an equal amount of time. Driven transect speeds were between 5 and 10mph. Each transect route was covered once and incorporated regular listening stops of 1-3 minutes. Bat activity was recorded for between 1 and 3 minutes and the time of arrival at each listening stop was noted so that the recorded bat calls could be assigned to the surveyor's location when the recording was analysed. Surveys commenced around sunset and lasted between 2 and 3 hours. The prevailing weather conditions, sunset times, start and finish times and duration of each survey are set out in **Table 3**.

Figures 2 and **3** show the transect routes covered for each month.

Table 3 Times, Dates and Weather Conditions during Bat Activity Surveys

Date	Surveyor*	Sunset time	Temperature (^{O}C)	Wind	Rain	Cloud	Start/ finish	Duration	Bat detector
28/04/08	AK and LJ	20:17	12 -10.5	2	No	95%	20:35-22:25	2hrs50mins	Batbox Duet and Sony minidisk
19/05/08	AK	20:50	10.2-8.1	1	No	35%	20:40-23:15	2hrs35mins	Batbox Duet and Sony minidisk
19/05/08**	LJ	20:50	10.2-8.1	1	No	35%	22:15-23:22	1hr7mins	Anabat
20/05/08	AK and LJ	20:50	10-8.7	6-9	No	60%	20:46-23:42	3hrs12mins	Anabat
18/06/08	AK and SS	21:20	15-14.5	2	Light	100%	21:32-23:50	2hrs18mins	Anabat
24/07/08	AK and EB	21:00	17.5	1	No	10%	21:11-23:30	2hrs19mins	Anabat
11/08/08	AK and SS	20:31	16	1-2	Occasional	100%	20:46-22:52	2hrs6mins	Anabat

*****AK Anton Kattan, EB Edward Bodsworth, LJ Laura Jennings, SS Sandie Sowler.

** This transect was a short transect carried out after a dusk exit watch at Upper Abbey Farm.

The purpose of the bat activity survey varied each month. The purpose of the walked transect on the 28th of April 2008 was to monitor possible barbastelle flightlines around the known roost at Upper Abbey Farm and to provide survey data in spring when female barbastelles congregate to form breeding colonies. The surveys on the 19th and 20th May followed the survey methodology used to gather baseline data in 2007 for the Environmental Impact Assessment at Sizewell (Entec doc ref 19801cb114), thereby providing baseline information early in the year. Driven transects on the 18thJune and 24th July surveyed potential flightlines that may be used by barbastelle bats as commuting routes between the study area and other areas of their home range. The walked transect on the 11th August concentrated on surveying the plantation woodland within the study area to determine if there are high levels of barbastelle activity that may suggest that the woodland is a foraging habitat for female and juvenile barbastelles. Juvenile barbastelles in colonies that have been studied[4] in the UK seem to use large productive foraging zones close to the core area of the maternity colony where the breeding roosts are located (Greenaway, 2004).

During each survey, surveyors used an Anabat SD1 frequency-division detector to record bat sound onto a Compact Flash (CF) card or a Batbox Duet frequency-division detector connected

[4] Most of what is known about foraging habitats and flightlines of barbastelles in the UK is based on studies of two colonies in West Sussex by Frank Greenaway. Recent studies by Matt Zeale (Bristol University) on the foraging behaviour of barbastelles in a colony on Dartmoor appear to show similar patterns of behaviour to those recorded in Sussex (Anton Kattan pers. comm.).

to a Sony minidisk recorder. The bat detector system used to record bat sound during each survey is shown in **Table 3**. Batbox Duet detectors were used on every survey to allow surveyors to listen to the heterodyne output, which allowed field notes to be made about species presence and activity at various points along the transect. Notes were taken of all bat sightings (to assist with their subsequent identification) in conjunction with the Anabat and Batbox Duet recordings. Field notes included a record of the time of each bat encounter, allowing results to be cross-referenced with the recorded data.

Anabats and Batbox Duets with minidisk recorders were also used as automated, fixed location bat detectors. The Batbox Duets were collected at the end of the transect (because each minidisk can only store approximately 2-3 hours of continuous recording) and the Anabats, which can record for much longer, were left to record overnight. The fixed location bat detectors were positioned in a variety of habitats and in different parts of the survey area. The locations of the automated, fixed location bat detectors are shown on **Figure 4**.

Automated Datalogger Bat Detectors

The Anabat SD1 unit can be set up as an unmanaged recording unit (also referred to as a datalogger) and will record bat sound on successive nights for several days (subject to battery power). Three Anabats were deployed in a variety of locations across the site to monitor Upper Abbey Barn, and potential flightlines and foraging habitats for barbastelle bats between April and August. The locations of the Anabats are shown on **Figure 4**. Each unit was programmed to be active each night between dusk and dawn. Alan Miller of SWT replaced batteries and moved units to new positions to help maximise the number of locations monitored. The Anabat units were positioned in buildings, in the canopy of trees or in vegetation at least 1m from the ground. The period of monitoring for each Anabat unit is detailed in **Table 4**; the positions of the Anabats are shown on **Figure 4**.

Table 4 Monitoring Periods for Anabat Dataloggers

Date	Monitoring period	Figure 4 label	Location
28/04/08	28-29/04	6	North of Upper Abbey on track
28/04/08	28/04/08	16	South of Upper Abbey on track
28/04/08	28-29/04	7	West of Upper Abbey on farm track
30/04/08	30/04-07/05/08 and 15-19/05/08	15	North of Upper Abbey, in large oak tree on track
30/04/08	30/04-05/05/08 an07/05-19/05/08	4	Junction of tracks at Old Abbey Farm
20/05/08	21-27/05/08 and 05/06/08	9	In Upper Abbey Barn
20/05/08	20/05/08	17	Junction of tracks at Old Abbey Farm
21/05/08	21-22/05/08 and 26-27/05/08	8	Track by Ash Wood, TM4590664910
02/06/08	02-08/06/08	10	The Grove, TM4663765262

Table 4 (continued) Monitoring Periods for Anabat Dataloggers

Date	Monitoring period	Figure 4 label	Location
13/06/08	13,16&18/06/08	14	Track by Ash Wood
19/06/08	19-28/07/08	11	Ash tree with roost potential on access track
25/07/08	25/07/08-01/08/08	12	Reckham Pits Wood

2.3 Personnel

The survey work in April and May was undertaken by Anton Kattan MIEEM[5] Full member of the Institute of Ecology and Environmental Management. and Laura Jennings (Assistant Ecologist). Survey work in June and August was carried out by Dr Sandie Sowler MIEEM and Anton Kattan. Survey work in June was undertaken by Anton Kattan and Dr Edward Bodsworth MIEEM. Dr Lynn Whitfield MIEEM is a specialist bat ecologist with Entec. All surveyors, with the exception of Laura Jennings, are experienced Natural England licensed bat ecologists[6].

2.4 Bat Detector Systems

The Anabat SD1 and Batbox Duet are both frequency division bat detectors. This method uses a device called a zero-crossing circuit to identify the fundamental frequency component of a bat's echolocation call (Altringham, 2003). They are broadband detectors and are able to pick up species echolocating between 10 and 150 kHz (without the need for the operator to tune the detector). Although not as much information on the bat's echolocation is preserved as with other bat detectors, such as time-expansion systems, frequency division detectors provide clear depictions of important call details that allow species identification. Frequency division bat detectors record continuously, unlike time-expansion detectors that capture the signal from the bat's echolocation and play it back to the operator at a slower speed, during which time it is not recording. This enables frequency division detectors to record all bat calls captured by the microphone, rather than only the first signal received (as in the case of time-expansion detectors), or only the frequency the detector is tuned to (as with heterodyne bat detectors). This is considered to be a significant advantage, particularly when trying to detect barbastelle bats that have a fast, directional flight and short call lengths.

The Anabat SD1 creates dated and timed sound files when a bat's echolocation is detected. Each sound file records for 15 seconds when the unit is triggered. If bat activity continues for more than 15 seconds successive sound files are created and in so doing provides a series of recordings of the continuous bat activity.

[5] Full member of the Institute of Ecology and Environmental Management.

[6] Natural England licence numbers: Anton Kattan 2007049, Edward Bodsworth 20083291, Lynn Whitfield 20073526 and Sandie Sowler 20071050.

2.5 Evaluation Methodology

In order to evaluate the importance of ecological features identified in the desk study and field surveys, a set of standard measures are outlined in guidance produced by the Institute of Ecology and Environmental Management (2006). For each site, habitat and species/assemblage, a summary grade is determined based on the levels of value recommended in the guidance. This places the importance of each feature in a geographical context, using the following hierarchy:

- International;
- UK;
- National (i.e. England, Northern Ireland, Scotland or Wales); ;
- County (or Metropolitan - e.g. in London);
- District (or Unitary Authority, City or Borough);
- Local (or Parish); or
- Site - within immediate zone of influence only (the development site and surrounds).

Where possible, formal criteria are used to set features of conservation importance within this geographical context. For example, the Guidelines for the Selection of Biological SSSIs (Nature Conservancy Council, 1989) can be used as a basis for the assessment of features at a National level. Similarly, published guidelines for the selection of SINCs (Sites of importance for nature conservation) can be used as a basis for assessing features of county level importance.

The significance of bat populations has been determined using the principles described in the IEEM *Guidelines for Ecological Impact Assessment in the United Kingdom* (www.ieem.net). Particular consideration has been given to distribution and rarity at different geographical levels. In this case, reference has been made to:

- UK BAP;
- Suffolk Local BAP;
- Distribution atlas of bats in Britain and Ireland 1980-1999 (Richardson, 2000)
- The state of the UK's bats: National Bat Monitoring Programme Population Trends (Bat Conservation Trust 2007).

2.6 Survey Limitations

A walked transect to sample Goose Hill and surrounding afforested areas on the 29th April 2008 was abandoned due to heavy rain, which made the recording of bats in the field impossible. However, surrounding habitats were sampled on the 28th April.

Weather conditions in 2007 and 2008 have been unusually cold and are likely to have affected the breeding behaviour and breeding success of bats. Continued monitoring of the site will therefore help provide an accurate appraisal of the use of the site by bats

One to two surveyors were used to carry out roost watches at Upper Abbey Barn. The barn is a very large structure and there are numerous exit and entry points for bats. Therefore it was not

possible to watch all possible exit points. Surveys in previous years by the Suffolk Bat Group using 10-15 surveyors failed to pick up all exit points (Alan Miller SWT, pers. comm.). However, the aim of the survey was to pick up the presence of barbastelle, on the assumption that any barbastelle flying around the barn (especially close to dusk) would indicate possible roosting. Other methods of monitoring the barn (such as fixed position bat detectors within the barn) could be used to corroborate the findings of the roost watches.

The Anabat bat detectors datalogger systems that were deployed from April to August, with the intention of monitoring foraging habitats and flightlines, failed to record continuously despite the use of 12-volt batteries (to provide power for up to 1 month) and Alan Miller changing standard AA batteries weekly. Two Anabats failed to record any data between July and August. Despite this, the deployment of dataloggers within the study area has allowed flightlines, potential roost sites and foraging habitats to be monitored throughout the period from April to August and contributed sufficient data to inform this assessment.

Identification of some species, especially bats of the Myotis genus, from recordings can be difficult. Where the identification to species has been made this has been done using 'the slope' feature of the analysis software ('Analook'), and has only been recorded to species where the identification confidence is greater than 60%.

Finally, certain bat species are especially difficult to detect – in particular, long-eared bats have a very quiet echolocation call and therefore tend to be under-reported in surveys using aural bat detectors.

3. Results

3.1 Desk Study

3.1.1 Landscape Appraisal

A number of potential flightlines that extend north from Goose Hill and Kenton Hills plantation woodland were identified from aerial photographs and OS maps. These were mainly strips of woodland that connect to the plantation, and farm tracks bordered by hedgerows. These potential flightlines connect to the access track along the northern edge of Kenton Hills and Nursery Covert plantation, which has been identified as a flightline for barbastelle bats (Entec doc ref 19801cb114). A number of rides interconnect through the plantation woodlands within the study area, and barbastelle bats have been recorded on the southern margins of Kenton Hills and Nursery Covert. Sizewell Belts, to the south of the plantation woodlands, contains multiple potential flightlines along the network of drainage ditches associated with the grazing marsh, and along hedgerows and woodland strips. Sandy Lane to the south of Sizewell Belts presents a potential east-west flightline through the grazing marsh. To the south of Sizewell B Power Station the landscape changes character and is dominated by arable fields.

Potential flightlines that were identified as possible commuting routes for barbastelle bats are illustrated on **Figure 5**.

The examination of aerial photographs for buildings with suitability for barbastelle bats to roost revealed that only the known barns at Upper Abbey Farm and Lower Abbey Farm had potential as roost sites. No records of barbastelle bats are held by the RSPB for their Minsmere reserve, but this is possibly because of a lack of surveys for bats at the reserve.

3.1.2 Analysis of 2007 Baseline Data for Barbastelle Bats

The distribution of barbastelle bat records from the baseline surveys in 2007 has been plotted on **Figure 6**. A code from 1 to 10 against each record indicates the length of time after sunset the bat was recorded. The 'sunset codes' represent 20 minute periods after sunset, 1 being 0-20minutes and 10 being 181-200 minutes after sunset. The results show that the two earliest records are between 20-40 minutes after sunset. These records are along the southern edge of the plantation woodland at Goose Hill and Nursery Covert. Six barbastelle passes were recorded between 31-40 minutes after sunset, one was recorded 101-120 minutes after sunset and four were recorded 121-140 minutes after sunset.

Thirteen sound files[7] with barbastelle calls were recorded between the 7th June and 28th August 2007. Seven sound files were recorded on the night of the 6th July, with a further three sound files on each of the nights in June and August.

3.2 Field Surveys

3.2.1 Roost Surveys

Upper Abbey Farm

Upper Abbey Barn is approximately 32m long by 8m wide. It has a wooden beam frame and queen-post structure with traditional mortice joints. The thatched pitched roof is approximately 15m high at the apex and sections of the thatched roof on the northern side of the barn have been repaired with corrugated metal sheets. The walls are constructed from overlapping boards and there are two large double doors on the southern side of barn.

The daytime internal inspections of Upper Abbey Barn in April and June recorded Natterer's, brown long-eared and pipistrelle bat droppings in the barn. Accumulations of Natterer's bat droppings were recorded in two locations at the eastern end of the barn directly under mortice joints of the roof beams. Alan Miller (SWT) has recorded Natterer's bats in these locations for several years. The droppings were not fresh and were unlikely to be from bats roosting in 2008. An accumulation of brown long-eared bat droppings was noted on the northern edge of the barn along with some old Natterer's bat droppings. Old and fresh brown long-eared, pipistrelle and Natterer's bat droppings were scattered throughout the barn, confirming that the barn has been a bat roost for many years and is still used by these species. The number of fresh droppings suggests that low numbers of bats shelter in the barn.

The Batbox Duet bat detector placed in Upper Abbey Farm on the 28th April 2008 recorded brown long-eared bats in the barn at 21:02hrs, 45 minutes after sunset. Common and soprano pipistrelle bats were recorded at 21:15hrs to 21:30hrs and later in the evening at approximately 21:56hrs. Pipistrelle activity was recorded constantly from 21:56hrs until recording stopped at 22:15hrs.

The exit watch on the 19th May 2008 recorded two common pipistrelle bats exiting from the top of the gable end on the eastern side of the barn. The first bat exited at 20:56hrs and the second bat emerged at 21:13hrs. Both bats stayed in the vicinity of the barn and were recorded feeding. At 21:46hrs a pipistrelle bat was seen returning to the barn and at 21:56hrs a pipistrelle bat emerged from the barn. Pipistrelle bats appeared to be foraging in and around the barn during

[7] The Anabat SD1 creates a sound file when a bat's echolocation is detected. Each sound file records for 15 seconds when the unit is triggered. For further details refer to Section 2.4.

most of the survey. Two noctule bats were recorded at 21:20, but they did not emerge from the barn.

Four or five Natterer's bats, one common pipistrelle bat and a brown long-eared bat were recorded returning to roost in Upper Abbey Barn on the 12th August 2008. The Natterer's bats foraged around the barn for around 40 minutes before entering the barn through two gaps under the roof on the eastern gable end at 04:38hrs. The brown long-eared bat was seen entering a gap approximately 3m from the ground on the corner of the southern and eastern walls at 04:58hrs. The common pipistrelle bat returned to the roost at 05:15hrs, entering a gap in the middle of the gable end wall.

There is a brown long-eared bat roost in the loft of the SWT workshops at Upper Abbey Farm. The roost is monitored by Alan Miller at the SWT. 12 brown long-eared bats were recorded in the roost by Anton Kattan on 29th April 2008.

The Anabat datalogger recorded a total of 276 sound files between the 20th and 27th May and on 5th June. 226 of these sound files contained recordings of common pipistrelle activity and 19 sound files were recordings of soprano pipistrelles; a further 22 recordings of pipistrelle calls could not be split into species. In total, five sound files of brown long-eared bats were recorded in the barn on the 22nd and 24th May. *Myotis* species were recorded on the 21st and 22nd May on three sound files. One sound file contained bat sound that could not be identified to genus level, but was thought to be either a brown long-eared bat or species of *Myotis*. The high number of sound files generated by pipistrelle bats is thought to be a result of bats flying in the barn.

Lower Abbey Farm

The barn at Lower Abbey Farm has a similar construction and is of comparable size to Upper Abbey Barn. It measures approximately 30m by 5m and is timber framed with queen-post roof construction and wooden walls. The thatched roof has been replaced with corrugated iron.

The barn is currently used to house livestock; at the time of the inspection goats were being kept in the barn. The doors of the barn are left open all day (and possibly at night). The owner Anne Mann reported that owls bred in the barn in 2007, but she was unable to confirm which species.

Gaps in the mortice joints of the timber frame and between overlapping boards that form the walls of the barn are considered to offer suitable shelter for bats, but the presence of owls in the barn is a serious deterrent to bats. The open barn doors, which allow predators such as owls to enter the barn, is also likely to alter the microclimate of potential roost spaces. The thermal qualities of the corrugated metal roof are far less favourable for bat roosts than a thatched roof because of poorer insulating qualities. Without a thatched roof on the barn, roost spaces in the barn are very unlikely to provide the constant humid microclimate required by barbastelle bats (pers comm. Dr Peter Shepherd).

No evidence of bat activity was recorded in the barn. Alan Miller believes that barbastelle bats may no longer be roosting at Lower Abbey Farm because of the changes in the use of the barn to house livestock (Alan Miller, pers. comm.).

Leiston Abbey

The visit to Leiston Abbey on the 29th April 2008 confirmed that there were no suitable buildings that could offer shelter for a breeding colony of barbastelles. All the barns have been

converted for alternative use, therefore the internal spaces of the barns are no longer suitable for bats.

Trees in Goose Hill and Surrounding Afforested Areas

The survey results confirmed the assessment of potential of the trees in the previous bat survey report. In addition, three further trees considered to have potential as possible roost sites were noted: these are listed in **Table 5**.

Table 5 Results of Winter Tree Survey

Zone	Tree species	Feature	Height (m)	Aspect	Potential as a bat roost site	Notes
A	*Acer pseudoplatanus*	Loose bark		All	Medium	
H	*Pinus sylvestris*	Holes – possible cavities	Various	Various	Medium	Dead stump (one of a pair)
H	*Pinus sylvestris*	Large split in upper side of east-facing limb	3	E	Medium	Third large pine from N end of Zone H[8]

A plan showing the location of each zone is provided in Appendix A.

3.2.2 Bat Activity Surveys

The following sections of this report should be read with reference to Figures 7 to 12, which show the distribution of bat activity within the study area and the 'sunset code' (see Section 3.1.2) for time after sunset that barbastelle bats were recorded. The distribution of barbastelle bat records from the baseline surveys in both 2007 and 2008 are displayed on **Figure 1**3.

Walked and Driven Transects

The detailed results of the walked and driven transect surveys are presented in Appendix B. Summary information is presented in **Table 6**. This table shows the number of sound files that were generated by each species recorded

[8] The zones are defined within the original report.

Table 6 Number of Bat Passes Generated for Each Species During Bat Activity Surveys

Date	No. of sound files	No. of species	Common pipistrelle	Soprano pipistrelle	Noctule	Serotine	Leisler's bat	*Myotis* sp.	Whiskered/ Brandt's bat	Natterer's bat	Long-eared bat	Barbastelle
28/04/08*	81	6	48	23		1		4		4	1	
19/05/08*	166	8	82	58	2	1	0	8	1	0	5	1
20/05/08	140	7	38	78	5	1	0	1	0	0	3	4
18/06/08	49	6	30	15	1	0	1	1	0	0	0	1
24/07/08	98	4	50	42	0	4	0	2	0	0	0	0
11/08/08	116	6	52	49	1	1	0	3	0	0	0	5

* These transect results include calls recorded from Batbox Duet detectors and were analysed using BatSound software. The number of bat passes (totals and for each species) are listed, instead of number of Anabat sound files.

Four UK BAP bat species, noctule, brown long-eared, soprano pipistrelle and barbastelle (which is also on Annex 2 of the Habitats Directive) were recorded in 2008.

Noctule bats were recorded at Upper Abbey Farm, on the track from Upper Abbey Farm to Fiscal Policy, and in Kenton Hills and Nursery Covert plantation woodland (see **Figure 7**). In May, they were recorded as early as 20:31hrs near Upper Abbey Farm, some 20 minutes before sunset.

Brown long-eared bats, which are known to roost at Upper Abbey Farm, were recorded on the track between Upper Abbey Farm and Fiscal Policy and throughout the plantation woodlands.

Barbastelle bats were recorded in May, June and August 2008 (see **Figures 2** and **3**). Barbastelle were recorded on the track between Upper Abbey Farm and Fiscal Policy, at Leiston Carr, on the footpath to the south of Goose Hill and (a single recording) within the preliminary works area. The earliest recording after sunset of a barbastelle bat was on the 18th June 2008, when a bat was recorded 71 minutes after sunset at the junction between the track from Upper Abbey Farm and the access track through the plantation woodland. The first recording of barbastelle on the 20th May was at 21:47hrs, 91 minutes after sunset, over the coastal dune vegetation within the preliminary works area. In August, the first recorded barbastelle was 88 minutes after sunset. The location and 'sunset code' for all barbastelle bat passes recorded during transect surveys and with datalogger bat detectors are shown on **Figure 11**.

Common and soprano pipistrelle bats were recorded on every visit between April and August 2008 and occurred in most of the study area. Common pipistrelle was the most numerous species. High levels of soprano pipistelle activity were recorded on the access track along the northern edge of Nursery Covert. Serotine were recorded from the footpath that passes through the southern part of the plantation woodland at Goose Hill. Myotis species were recorded along the track from Upper Abbey Farm, and in the plantation woodland south of Goose Hill. Natterer's bats were recorded and seen foraging along the track in the vicinity of Upper Abbey Barn on the 28th April, when four bats were noted flying together.

Automated Datalogger Bat Detectors

The period of monitoring, location of each datalogger and a summary of the species recorded are displayed on **Figure 12.**

Table 7 provides a summary of the bat species recorded by each of the dataloggers. The datalogger label corresponds to the label given to each datalogger on **Figure 12**.

Table 7 Summary of Species Recorded by Dataloggers

Datalogger label on Figure 4	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**Total**
Species																		
Barbastelle	2				2						3				1			9
Serotine							3								1			4
Whiskered/Brandt's bat					1										7		2	10
Myotis species	2			2	4		1		3						7	7	3	29
Leisler's bat											2							2
Noctule	2	1	1	2		3	3	7			22	7			3	1	2	54
Common pipistrelle	39	5	5	85	111		13	1	226	96	78	1	55	12	629	24	36	1416
Soprano pipistrelle	29	10		23	50		115	3	19	93	22	3	41	2	825	18	17	1270
Pipistrelle species	5	1		36	11				22	1	3			2	78			159
Long-eared bat	1	1	1	1	3	1	2		5		1			7	3	2		268
Unidentified			1	4	4		3	4	1	7	21	4			8	13		70
Total	**81**	**18**	**8**	**151**	**187**	**4**	**137**	**15**	**276**	**197**	**156**	**15**	**96**	**23**	**1562**			**2926**

Barbastelle bats were recorded on dataloggers in May, June and August 2008. The results are as follows:

- Datalogger 2 - recorded a barbastelle bat at 03:37hrs on the 12th May. This is at the junction between the track from Upper Abbey Farm and the access track through the plantation woodland. This is 95 minutes before sunrise.
- Datalogger 5 - recorded barbastelles at 22:05hrs, 44 minutes after sunset, and then again at 01:41hrs on the footpath through the plantation woodland south of Goose Hill on the 20th May.
- Datalogger 11 – recorded barbastelles on the 22nd and 26th June. The bats were recorded at 22:22hrs on the 22nd June, and 22:14 hrs and 00:08hrs on the 26th June. The first calls on each evening were between 53 and 61 minutes after sunset.
- Datalogger 1 – near the turf pits recorded two barbastelle calls 30 minutes apart, one at 22:07hrs and the second at 22:37hrs, on the 11 August. These calls were 96 and 126 minutes after sunset, respectively.

3.2.3 Summary of weather conditions and breeding success of bats in 2008

2008 began with slightly above average temperatures. Spring was wet, with May having above average temperatures. There was heavy rainfall in August, and this could adversely affect the development of juvenile bats born in 2008. The breeding success of some species of bats has been attributed to poor weather conditions in 2008. Surveys of 47 target woodlands for the Bat Conservation Trust's Bechstein's Bat Project found that colonies dispersed before most of the bats gave birth. Observations from Bechstein's bat populations in Sussex that are part of a long-term monitoring programme found only an estimated 20% of females with reproductive capacity actually continued the pregnancy on to parturition (www.bats.org.uk).

3.3 Evaluation

3.3.1 Revision of the Preliminary Evaluation of the Importance of the Survey Area to Bat Populations

This section revises the preliminary evaluation of the importance of the bat assemblage undertaken in 2007. The evaluation of resources has been conducted in accordance with IEEM EcIA guidance (see Section 2.5 Evaluation Methodology). For the purpose of clarity, the revised evaluation follows the same arrangement for dividing the study area into sectors for evaluation that is presented in the 2007 bat survey report (Entec doc ref 19801cb114). These are:

- Goose Hill plantation, north of the east–west access track;
- The corridor of the east-west access track from Fiscal Policy to the preliminary works area;
- Kenton Hills and Nursery Covert south of the existing east-west access track which runs from Fiscal Policy in a Northeast direction towards Goose Hill;
- The preliminary works area.

It was not considered necessary to survey the north-south tree line north of Nursery Covert in 2008 because this feature was not found to be used extensively by bats in 2007.

3.3.2 Goose Hill and Surrounding Afforested Areas

Transect routes in 2008 did not sample the Goose Hill as extensively as in 2007. However, transect routes that pass through the southern section of the plantation woodland recorded regular barbastelle bat activity along the wide open ride and footpath leading towards the preliminary works area. Soprano pipistrelle bats forage along the ride, with high levels of activity being recorded near the turf pits. Large bats (*Nyctalus* sp.) were also recorded on two occasions. Barbastelle bats were recorded commuting along the corridor of the east-west access track from Fiscal Policy to the preliminary works area in 2007 and it now appears that they also use rides through Goose Hill plantation between the access track and the coastline.

Goose Hill and surrounding afforested areas is a large plantation woodland comprising mainly Corsican pine *Pinus nigra* ssp. *laricio* and Scots pine *P. sylvestris* of uniform age (NVC report, Entec doc ref 19801cb145). Goose Hill accounts for approximately 53ha of the 85.34ha of dry coniferous woodland within the study area. The trees are planted on heathland where the underlying soil is sandy and free draining (NVC report, Entec doc ref 19801cb145). Plantation coniferous woodland accounts for the majority of the woodland in the locality of Sizewell. The bulk of the plantation woodland in the Suffolk Coast and Heaths Natural Area is concentrated in large blocks, those being Dunwich Forest and Aldewood Forest (English Nature, 1997), but there are small plantations in privated ownership scattered throughout the Natural Area The plantation was established to partially screen the built nuclear plant (a planning condition), although there is small scale commercial felling and restocking and management objectives with respect to public recreation and nature conservation (Alan Miller pers. comm.). The majority of medieval parks and wood pasture in Suffolk are on clay. Ancient woodlands of the Suffolk Coast and Heaths Natural Area are located mostly in the parishes of Sudbourne, Wantisden, Rendlesham and Iken (English Nature, 1997). A search on MAGIC, the government's interactive countryside information system (www.magic.gov.uk), revealed that there are no ancient and semi-natural or ancient replanted woodland sites within 5km of the preliminary works area. Therefore, plantations are the only significant woodland habitat available to bats.

Rides through Goose Hill and surrounding afforested areas appear to provide important commuting routes for bats. Although large areas of the plantation do not appear to be favoured by bats, the size of the woodland is considered important because it allows bats to move to new areas when existing foraging and commuting habitats are lost, for a example, as a result of woodland management operations. This is particularly important in woodlands such as Goose Hill where areas are periodically clear felled and restocked.

The wide rides with short woody vegetation (such as that along the southern boundary of Leiston Carr, Kenton Hills and Nursery Covert) are likely to be of greatest value for bats because gradual vegetation transition of the glade provides a wide range of invertebrate habitats (Kirby, 1992). Flying insects congregate in sheltered areas along the ride providing favourable foraging habitats for bats.

Taking into account the presence of the nationally rare barbastelle bat and the possible presence of noctules (a UK BAP species) this sector of the survey area is regarded as being of county value to bats.

3.3.3 Corridor of East-West Access Track

This permissive footpath, which runs from Fiscal Policy, along the north side of Kenton Hills and the southern edge of Goose Hill to the preliminary works area was found to support the highest levels of bat activity in 2008. Fewer species were recorded than in 2007, but barbastelle, brown long-eared, soprano pipistrelle and common pipistrelle bats were noted along

the track. Soprano pipistrelle were recorded on every visit and foraged constantly in areas with deciduous trees. Other species of bat noted along the access track during the 2007 surveys were recorded in nearby habitats, confirming their continued presence. The habitat structure and character of the access track has not changed since the surveys in 2007. There remains a variety of adjacent habitats and a vegetative diversity that is likely to support a high insect biomass. Therefore, it is considered that this sector remains of county value for bats.

3.3.4 Kenton Hill and Nursery Covert

Five species of bat, including the four UK BAP species (barbastelle, noctule, soprano pipistrelle and brown long-eared bats) known to occur in the study area, were recorded in Kenton Hill and Nursery Covert plantation woodland. The southern edge of the woodland that fringes Sizewell Belts grazing marsh attracts high levels of bat activity. The character and diversity of the habitat has not changed since the bat surveys in 2007. Therefore, it is considered that this sector remains of county value for bats.

3.3.5 Preliminary Works Area

A barbastelle and a noctule were recorded over the preliminary works area on the 20th May 2008. These are the first recordings of the barbastelle and noctule in this area. Surveys in 2007 recorded two bat species, the common and soprano pipistrelle. Levels of bat activity within the preliminary works area in 2007 and 2008 were consistently very low with only occasional bat passes being recorded.

Barbastelle bats from the colony at Paston Barn, Norfolk are known to use productive coastal habitats along sheltered coastal cliffs at Mundesley (Sizer, 2002). It is possible that barbastelles at Sizewell are using the coastline in a similar way. The area within the preliminary works area is made ground and comprises shrub, tree stock and areas of rough grassland (NVC report, Entec doc ref 19801cb145). It is therefore questionable how valuable the area is as a foraging resource for bats. There is no evidence that any bat species forages over the site for a substantial amount of time, although tall vegetation such as continuous lines of scrub may offer cover for commuting bats . However, taken together the 2007 and 2008 surveys have identified three UK BAP species, including the nationally rare barbastelle. The preliminary works area is therefore considered to be of site / local value.

3.4 Evaluation of Roosts in Buildings

3.4.1 Upper Abbey Farm

One or two common pipistrelle and brown long-eared bats, and four to five Natterer's bats were recorded roosting in Upper Abbey Barn in 2008. Accumulations of droppings indicate these species have occupied roosts in the barn in previous years. The Suffolk Bat Group monitors the barn and has recorded barbastelle bats in the barn in previous years. Daytime roost inspections, dawn and dusk surveys and monitoring with Anabat dataloggers did not find any evidence to suggest barbastelle bats have occupied the barn in 2008. Whilst the survey work in 2008 cannot discount the possibility that barbastelles roost in the barn on an occasional basis, the barn does not appear to be used by a maternity colony. Barbastelles will return to a favoured area to breed (as will other bat species). Females will change roost frequently even once the maternity colony has formed, but when roosting in buildings they will seek a variety of roost sites within the buildings that meet specific roost requirements. Similar behaviour has been recorded with barbastelles that roost in trees in woodland. Research on a colony in a woodland in Sussex has shown the group rarely moves more than 150m and frequently moves to roosts no more than a few metres away (Greenaway, 2001). Therefore, if barbastelles were breeding at Upper Abbey

Farm it would be expected that frequent recordings would have been made throughout the breeding season from May to August.

The roosts at Upper Abbey Farm currently support a low number of species that are widespread and common in southern Britain and the roosts are considered to be of local value. The large tithe barn is also known to have supported low numbers of barbastelle bats, which is probably due to the variety of roosting opportunities in the building. Tithe barns, particularly ones that are still used for agricultural purposes, and can offer a variety of roosting opportunities and accommodate species such as barbastelle bats are uncommon in the district. Upper Abbey Barn is therefore considered to be of at least district value.

4. Conclusions

4.1 Baseline Data

Habitats within the study area for the proposed footprint of the new power station at Sizewell have been surveyed for bats over a two year period. Frequency division bat detectors were used in both years. The surveys in 2008 followed survey methods used in 2007, but also used Anabats as dataloggers to monitor habitats and roosts for the periods between site visits. The results of the 2008 bat activity surveys for species assemblages and levels of bat activity were consistent with those recorded in 2007. This is clearly illustrated by comparing the number of bat passes per species for 2008 in **Table 6**, to the number of bat passes per species for 2007, shown in Appendix C. The use of the site by bats has probably not changed significantly because the character of the study area and habitats has not altered. The consistency of the results between 2007 and 2008 allows the evaluation of habitats for bats within the survey areas to be carried out with a greater level of confidence than a single year's survey data would have given (see Section 4.1).

4.2 Assessment of Habitats for Bats within the Study Area

The landscape and habitats within the study area are typical of those found in the parishes of Leiston and Aldringham Cum Thorpe, in which Sizewell is situated. Large swathes of land have been turned over to arable production. There are also some areas of grazing marsh and pasture. Plantation woodlands are the most frequent woodland habitat and are therefore likely to be important for local bat populations such as barbastelles whose key foraging habitats include scrub and woodland rides.

Goose Hill and surrounding afforested areas dominate the study area. The rides and glades through the woodland are considered to be the most important habitats within the woodland because they support the greatest diversity of invertebrate habitats. The open area at the intersection of the ride network near the turf pits, an area identified as supporting high levels of bat activity, proved to be species-rich in terms of rare and uncommon invertebrate species when sampled in 2007 for the Invertebrate Survey Report, 2007 (Entec doc ref 19801cb183). Goose Hill and surrounding afforested areas are dominated by Corsican pine (around 50 years old), but deciduous trees and scrub create a diverse woodland edge around the periphery of the pine plantation, which attracts foraging and commuting for bats. The following areas are considered to be key areas for bats in the study area:

- The corridor of the east-west permissive footpath: the variety of adjacent habitats along the corridor of the east-west track, by virtue of their vegetative diversity and

likely consequent invertebrate diversity, have been shown by the surveys in 2007 and 2008 to support the greatest numbers of bat species and highest levels of activity, especially along the eastern half of the track. The lower levels of bat activity on the western end of the track is likely to be a consequence, in part, of the lower vegetative diversity

- The southern margins of Kenton Hill Nursery Covert have mature deciduous trees and are adjacent to grazing marsh. The woodland edge has similar qualities to the east-west permissive footpath. The wet grassland over Sizewell Marshes SSSI and the watercourse of the dyke system make ideal foraging habitats for barbastelle bats because they support a high diversity and abundance of micro-moths, the major prey of barbastelles. The southern edge of the plantation woodland is likely to benefit from the drift of insects from the adjacent fields of Sizewell Marshes.
- Footpaths through the southern section of Kenton Hills and Nursery Covert linked to the east-west permissive footpath provide a series of flight paths through the woodland. Several barbastelle records were obtained here in 2008.

The value of the preliminary works area has been revised from negligible to site value because of records of barbastelle and noctule bats from within the area. The presence of these species was discovered from sound files recorded during a walked transect. The bats were not observed in the field, so no additional information to determine the type of behaviour being displayed, or the exact location of the bat, is available. Further sampling of the preliminary works area (and the coastline) may be necessary to further refine the value and establish in greater detail how bats are using the area.

4.3 Status of Barbastelle within the Study Area

Upper Abbey Barn does not appear to be occupied by barbastelle bats on a regular basis. Natterer's bats, brown long-eared bats and pipistrelle bats regularly roost in the barn in small numbers. The absence of frequent use by barbastelle bats in the months between May and August suggest that they are not breeding in the barn. No other buildings within 6km of the study area have been identified as suitable breeding sites for barbastelle. As with most species of bat, males will shelter in roosts with less favourable environmental conditions than females because they do not have the same energetic demands or thermoregulatory requirements. It is possible that the barbastelle roost in Upper Abbey Barn supports male bats. Males will visit a series of scattered roost sites, sometimes forming loose associations with other males. These groups of males seem to be located some distance from female nursery roosts (Greenaway, 2004). This may account for the presence of barbastelle bats without the presence of a nursery colony, or evidence of a suitable roost site for a maternity colony.

The plantation woodland in the study area is unlikely to have a sufficient number and diversity of tree roosting opportunities required to support a maternity colony of barbastelles. Unlike most species, barbastelles utilise storm cracks, narrow splits and loose bark (Greenaway, 2001); vertical v-shaped splits are a typical feature that they will select. These features have less favourable microclimates than deep holes and crevices selected by other species of bats and consequently the local microclimate of the woodland has greater importance. Roosts therefore tend to be at least 25m from the woodland edge (Greenaway, 2001). The interior of the plantation is dominated by pine trees that are approximately 50 years old. Damage to these trees (which could provide roosting opportunities) is scarce, probably because of the commercial management practices in the woodland, protection from strong winds by the dense

woodland planting and the young age of the trees. Many of the trees identified as having potential bat roosts are deciduous trees that are at the edge of the woodland and therefore unlikely to have a suitable microclimate.

Ancient oak woods and wood pastures, a favoured habitat of barbastelle bats, are located mainly in southern parishes in Suffolk (Iken, Wantisden, Rendlesham and Sudbourne). These habitats have the potential to support a breeding colony of barbastelle bats. Bats from these southern parishes would have to commute at least 7km to reach the study area. This area is the nearest location to Sizewell with the potential to support a barbastelle colony that was identified by desk study. Barbastelle bats at Snape Maltings (grid reference TM 392574) have been observed flying directly towards the estuary (Dr Peter Shepherd, pers. comm.). They could then fly the 6-7km up the coastline. Although barbastelle bats can travel up to 16-18km in a night, females in maternity colonies tend to have smaller ranges, typically around 6-8km from the colony core (where the roosts are located). Frank Greenaway (a leading expert on the species) likens the arrangement of flightlines of the colony studied in Sussex as resembling tall, branching trees with several bats sharing the path along the trunk and major limbs, but separating off into smaller branches, each of which ends in a discrete individual foraging area. High quality foraging areas closest to the roost are usually shared between the colony members and may seasonally be left clear by adults as exclusive juvenile foraging zones (Greenaway, 2004). Juvenile bats are not able to fly the long distances covered by adults and most colonies seem to have one large productive foraging zone very close to the core area of the breeding colony.

Male bats will forage in a wide range of woodland types, including dry woodland such as that found in the study area. Females require habitats that support higher insect biomasses, especially habitats that are productive in micro-lepidoptera, the major prey of barbastell[9] . Pregnant females must forage all night in productive habitats. Established, unfertilized wet grassland meadows such as Sizewell Belts fulfil this requirement because they are highly productive invertebrate habitats. Barbastelle bats primarily catch their prey on the wing (Altringham, 2003). Sheltered areas in productive habitats, such as the boundary between Kenton Hill Nursery Covert plantation and Sizewell Belts, are likely to attract aggregations of flying insects, which increases insect availability for bats. The availability of good quality foraging habitat near the study area may thus attract both male and female barbastelle bats to feed. It is considered unlikely that females with dependent juveniles are foraging within the study area or over Sizewell belts because these habitats do not appear to be close enough to a breeding roost, although this does depend on the availability of good quality foraging in the area around the maternity roost sites.

The number of survey records of barbastelle bats from the study area supports the theory that the plantation woodland is not a core foraging area for a maternity colony. Females are thought to defend areas of woodland, typically hundreds of metres square, that have productive invertebrate habitats and prey availability to allow juveniles to feed (Sandie Sowler pers comm.). Low numbers of bat were recorded in 2007 and 2008: 13 records were obtained in 2007 and 20 records (9 of which were from dataloggers) in 2008. If females with juveniles were using the woodland, higher numbers of records would have been expected. In addition, records of barbastelle within the study area in 2008 were picked up more than 70 minutes after sunset. This is 10-20 minutes after barbastelles tend to emerge from their roost; bats could cover several kilometres in this time. Earlier records of barbastelle on the southern edge of

[9] Barbastelle are moth specialists and micro-lepidoptera account for over 90% of their diet

Kenton Hills Nursery Covert from surveys in 2007, between 20-40 minutes after sunset, could be males that are roosting nearby, such as at the roost in Upper Abbey Barn. However, foraging barbastelles are spread very thinly across the landscape (Greenaway, 2004). Both male and female bats fly rapidly, even when foraging, and travel in a single direction moving on to new areas. The result of this foraging strategy is that relatively low numbers of bat passes tend to be recorded by bat detectors, even in productive foraging habitats. Consequently, it is difficult to determine with any confidence from bat detector surveys alone the importance of a habitat as a feeding area for barbastelles. The only way of determining if breeding females are feeding or commuting in the woodland is to catch individual bats from known flightlines and determine their sex and reproductive status in the hand.

It is currently unclear how barbastelle bats are reaching the study area. Monitoring of hedgerows and woodland edges in 2008 failed to identify new commuting routes. A single barbastelle pass was recorded near the coastline within the preliminary works area, suggesting they may commute along the coast, but it cannot be concluded with any certainty that this is a flight path at this juncture. The value of the commuting route along the east-west permissive footpath from Fiscal Policy to the preliminary works area is dependent on whether breeding females are using the route or whether it is predominantly males.

4.4 Potential Impacts

The protection afforded to bats and their roosts under the Conservation (Natural Habitats & c.) Regulations 1994 (as amended 2009), may include key seasonal flightlines and flightlines between breeding sites and core foraging areas of species including barbastelle.

The assessment of the potential impacts on Goose Hill and surrounding afforested areas and the east-west permissive footpath from Fiscal Policy to the preliminary works area in the 2007 Bat Survey Report ((Entec doc ref 19801cb114) is considered relevant to this report. That is:

- Use of Goose Hill for location of site compounds

  Goose Hill and surrounding afforested areas is considered of county importance to bats, largely because of the use of its rides and edges by commuting and feeding barbastelle, noctule and serotine as well as two pipistrelle species. Depending on how the site compounds are located within the forest, the proposals may have a significant effect on bat populations and environmental measures to address these effects would therefore be required. Barbastelle bats are very faithful to their commuting routes. Anecdotal evidence from radio tracking studies by Matt Zeale at Bristol University has demonstrated this by tracking a single individual using the same commuting route on subsequent years (Matt Zeale, *pers. comm.*).

- Widening of parts of the east-west permissive footpath from Fiscal Policy to the preliminary works area

  The east-west permissive footpath has been valued at the county level, because of the presence of nine bat species (of the twelve bat species known to occur in Suffolk). Most of these species were recorded as commuting and foraging along this track and most of the high potential roost trees are adjacent to it. Any development that might degrade or reduce the value of this ‘corridor’, could significantly affect bat populations of importance at county level. The loss of this corridor may disrupt an important commuting route for barbastelle bats.

- Lighting the proposed access track to the preliminary works area

Several bat species, including barbastelles, avoid lit areas, therefore lighting associated with the proposed access route to the preliminary works area could deter bats from using the commuting routes through Goose Hill and surrounding afforested area. Breaks in commuting routes can delay the onset of foraging by bats, and might even prevent the use of important feeding areas. Male barbastelles are likely to adapt more easily to changes in flight paths than females because they do not have the energetic requirements associated with breeding. Breeding females need to forage all night in productive habitats (Greenaway, 2004). Therefore, the magnitude of the impact from the proposed access route will be greater if females are present.

- Removal of hedgerows for heathland creation

It is currently unknown if any of the hedgerows in the surrounding arable fields are bat flightlines. The level of impact from the removal of flightlines will depend on whether breeding females, in particular barbestelles, use them, because changes in the landscape that may delay them reaching core foraging areas may have a severe impact on their breeding success. If males alone are using the flightlines, the impact is considered to be far lower and the availability of existing alternative routes for the bats would need to be considered when assessing the impact. If alternative routes are available the impact is likely to be negligible to low (and mitigation may not be necessary). Mitigation would be required for the loss of flightlines used by breeding females and this is likely to require the provision of good quality foraging habitat for the bats.

5. Recommendations

The current survey work has enabled the survey area to be valued in terms of bat usage with some degree of confidence. The results of the survey are likely to remain valid, for the purpose of ecological impact assessment, for approximately two years.

5.1 Further Survey

The survey work has also established with a good degree of confidence that barbastelle bats are not breeding within the study area or close to the preliminary works area. The juxtaposition of the plantation woodland and Sizewell Belts grazing marsh provides productive foraging habitats for barbastelle bats and therefore may attract males and breeding females from colonies over 6-7km from the study area. Disruption to commuting routes, such as those Goose Hill and surrounding afforested areas, can cause dramatic alteration to the breeding success of barbastelle colonies. The value of the commuting routes and the level of impact on barbastelle bats from the loss or disruption to commuting routes is dependent on whether female bats are using it. Therefore, if the proposed access route to the preliminary works area follows the current alignment, it is considered necessary to determine whether the east-west permissive footpath is used by lactating/breeding female barbastelles. To establish this information with sufficient confidence for a robust EIA, a mist netting exercise to catch barbastelle bats and determine the sex of individuals is recommended. The mist netting exercise should be undertaken in late May and early June. Mist nets would be set up in three locations along the alignment of the proposed access track, in areas with the highest number of barbastelle records. Barbastelle bats are very adept at avoiding mist nets. To address this, an acoustic lure would be

used to attract bats into the net; this has proved successful in a number of studies, including those by Frank Greenaway and Matt Zeale.

The opportunity to continue monitoring the woodland rides and Upper Abbey Barn by extending the bat detector survey in 2009 is recommended. This would provide a third season of results, to support the current conclusions, especially given the poor weather conditions in 2007 and 2008. This is considered important for a species such as barbastelle that commute and forage over a wide area and continually move through the landscape all night. Their fast, directional flight means they can be easily missed. As already mentioned, barbastelles are good at avoiding mist nets and therefore successfully catching them in the mist net cannot be guaranteed in one survey season. The additional bat detector surveys will therefore provide supporting data for 2009 in the event bats are not caught by mist netting.

The requirement for further survey work in 2009 is dependent on the level of impact on Goose Hill and surrounding afforested areas. Further field survey work in this area is not considered necessary if the access track is re-aligned to avoid commuting routes used by barbastelles, and the Environmental Statement is submitted in the next two years.

If hedgerows are to be removed, such as for heathland creation, they should be monitored in 2009 to determine if they are barbastelle flightlines. Static Anabat dataloggers should be deployed on hedgerows to be removed to obtain data from April to August, the months when females are moving between breeding roosts and foraging areas.

It is recommended that local land owners within 15km of the study area are contacted to help confirm if there are any suitable buildings or woodland that could support a breeding colony of barbastelle. Dialogue with statutory and non-statutory consultees and the local bat group to exchange information and ideas to define the task should be maintained. A site visit may then be required to verify the information.

5.2 Mitigation and Enhancement

The extent of mitigation required for the loss of foraging and commuting routes depends on whether they are used by breeding female bats. If only males are present, providing alternative commuting routes to direct bats around the preliminary works area and over the access track will be appropriate. This can be achieved by planting new hedgerows, or providing some other type of linear landscape feature that will provide cover for them as they fly. If female barbastelle bats are present, maintaining connectivity in the landscape alone is unlikely to be adequate. Females require flightlines that they can feed along, allowing them to forage throughout the night as they move towards core foraging areas. An appropriate package of measures to create habitats that both support a high biomass of insect prey and connect existing foraging habitats would need to be determined through consultation with national experts and Natural England.

The proposed access road will almost certainly be lit, although the specification for the lighting is not known. Barbastelle bats, and other species, generally avoid lit areas. Therefore the road may act as a barrier and could delay bats trying to reach foraging areas. Unlit crossing points may therefore be required to prevent habitat fragmentation. These crossing point are likely to need to be approximately 10m wide.

It is likely that heathland creation on arable land will be part of the environmental management plan at the site. This will necessitate the removal of hedgerows, which may have an impact on the availability of flightlines for bats including barbastelles. Providing alternative flightlines

may therefore be necessary and research into the opportunities of providing features in the heathland, to satisfy the interests of both heathland creation and a landscape for bats, may be required. Barbastelle colonies in the New Forest, Hampshire occupy territories with large areas of heath and any studies/observations of these animals may provide useful information when considering habitat enhancement opportunities for barbastelles.

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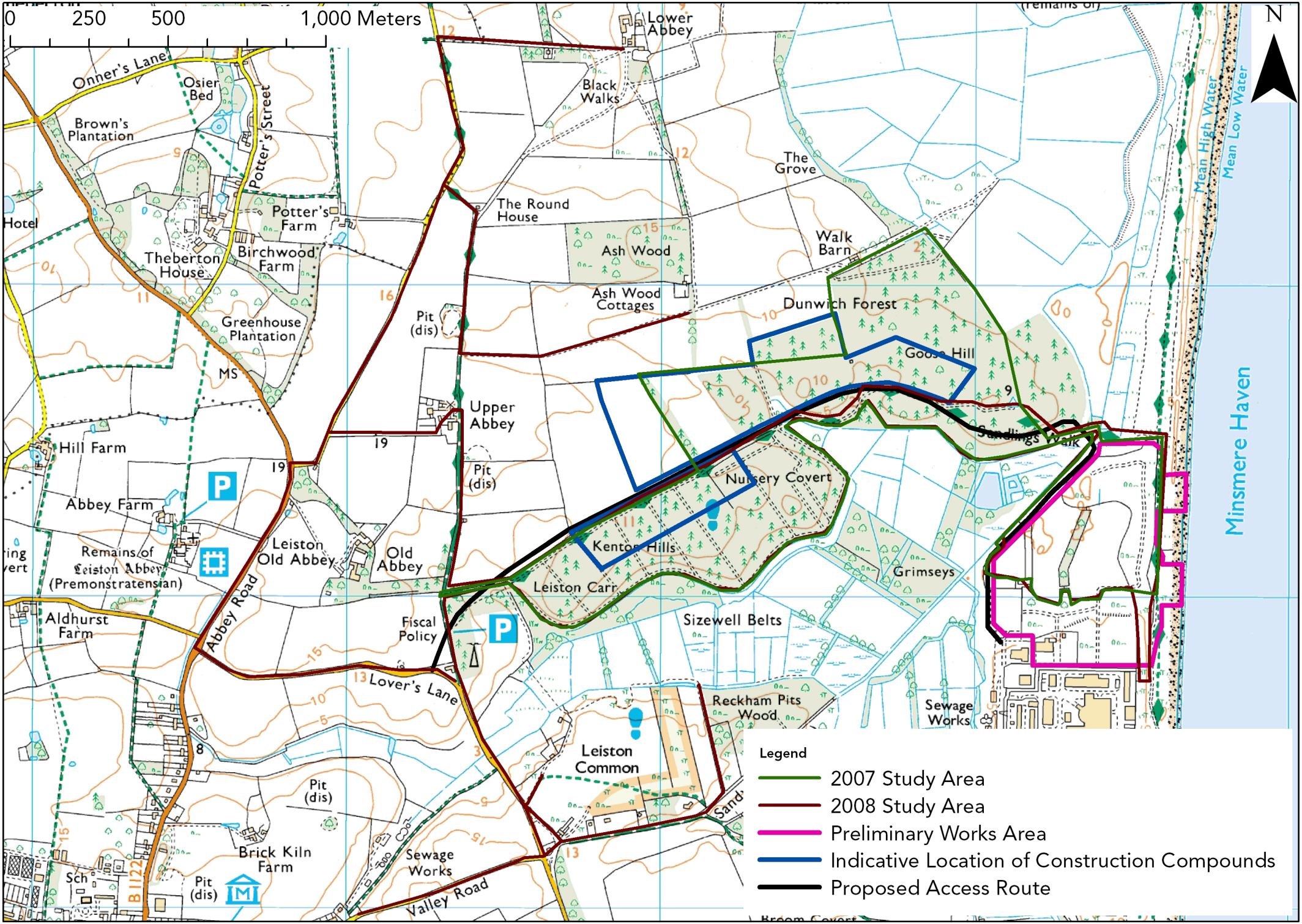
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Goose Hill
Sandlings Walk
Nursery Covert
Kenton Hills
Leiston Carr
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Minsmere Haven
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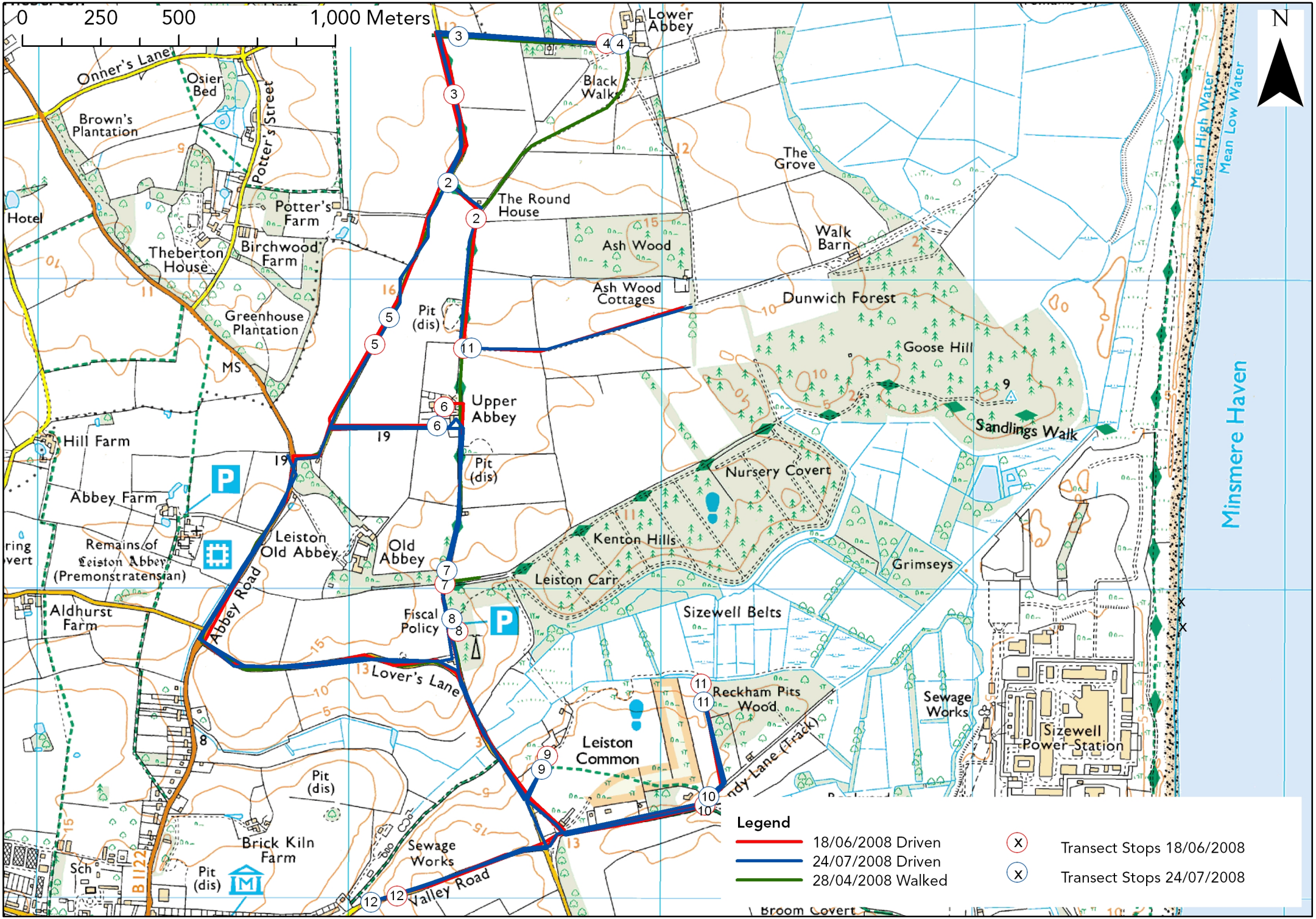
2008 Study Area
Preliminary Works Area
Indicative Location of Construction Compounds
Proposed Access Route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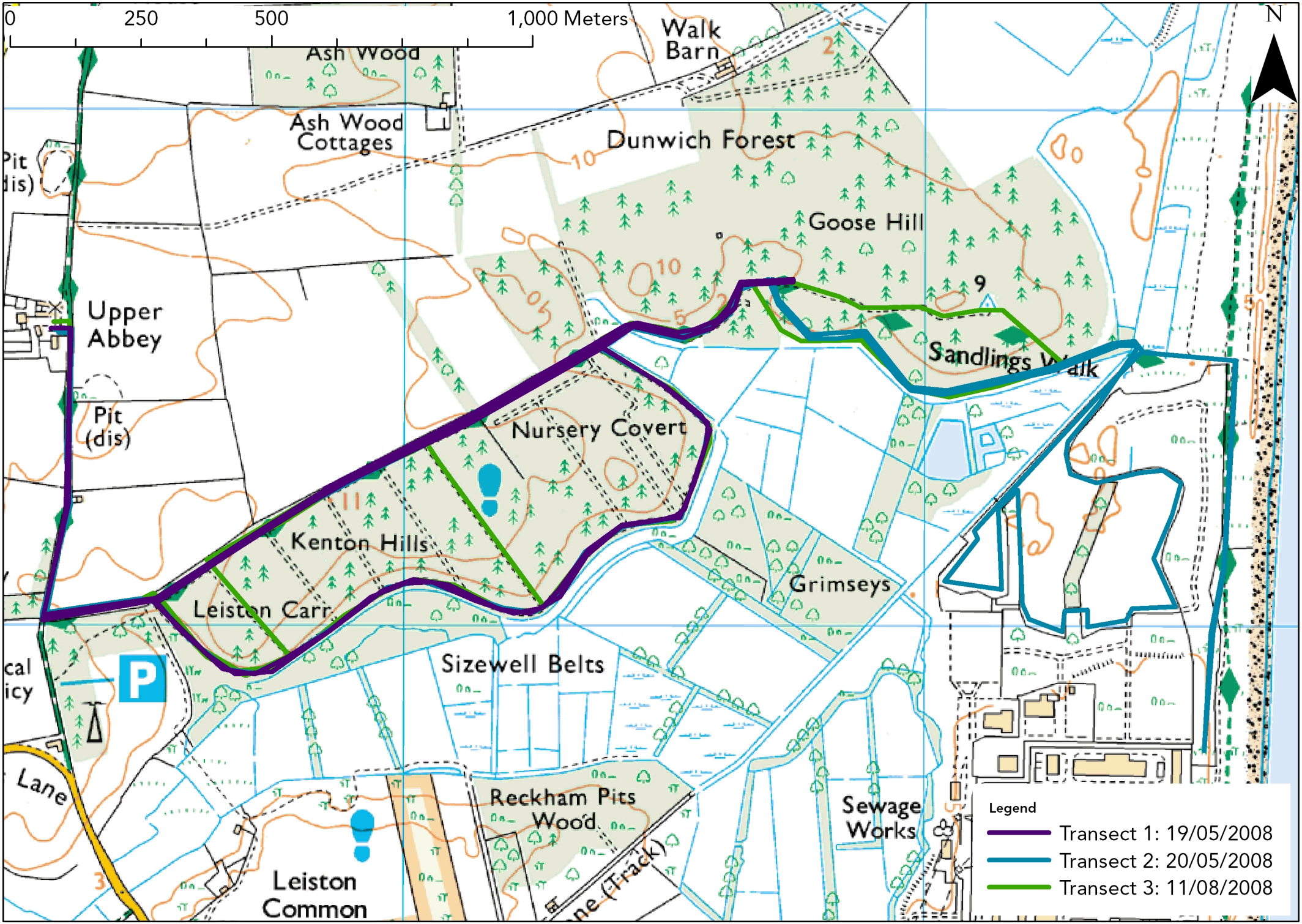
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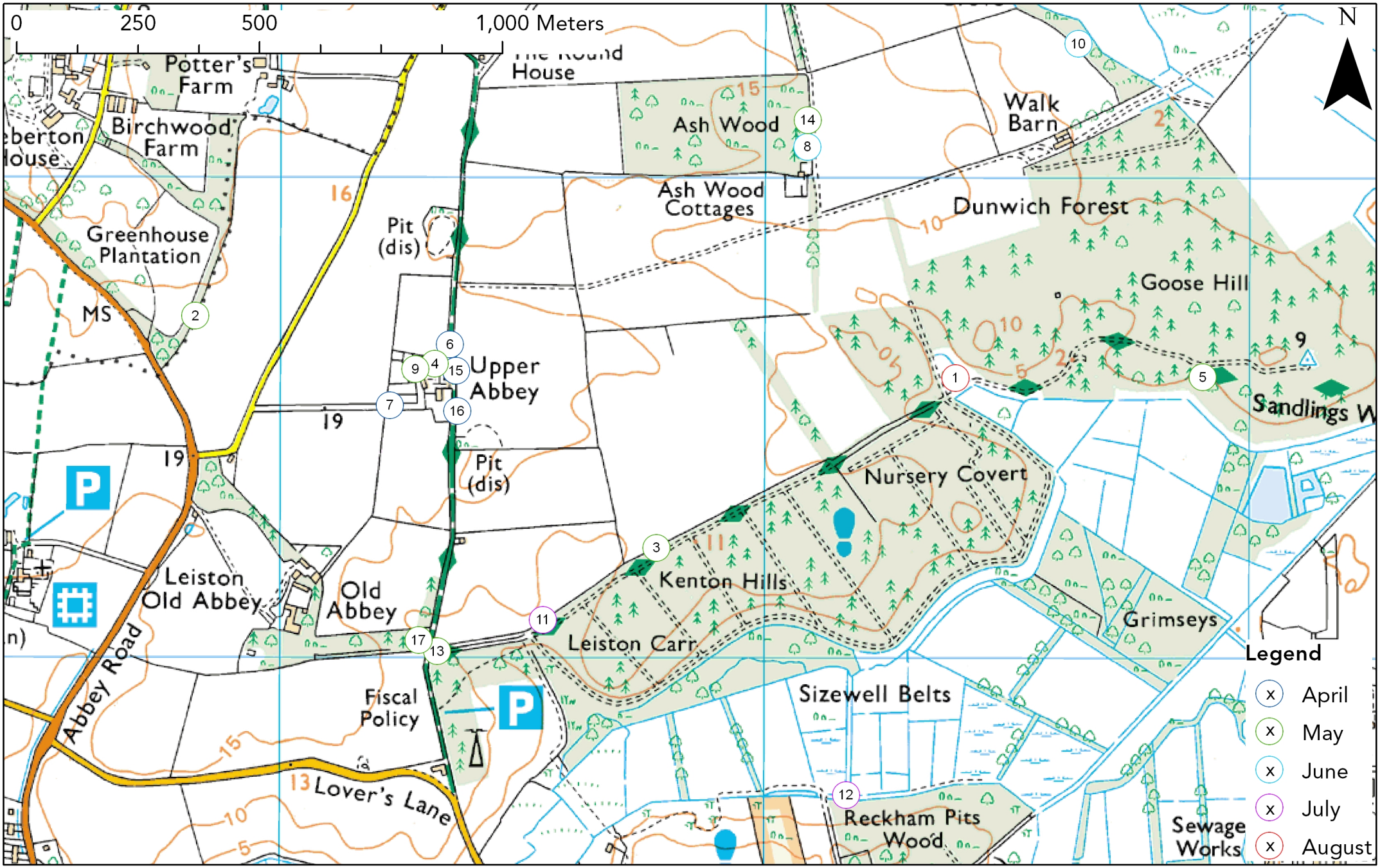

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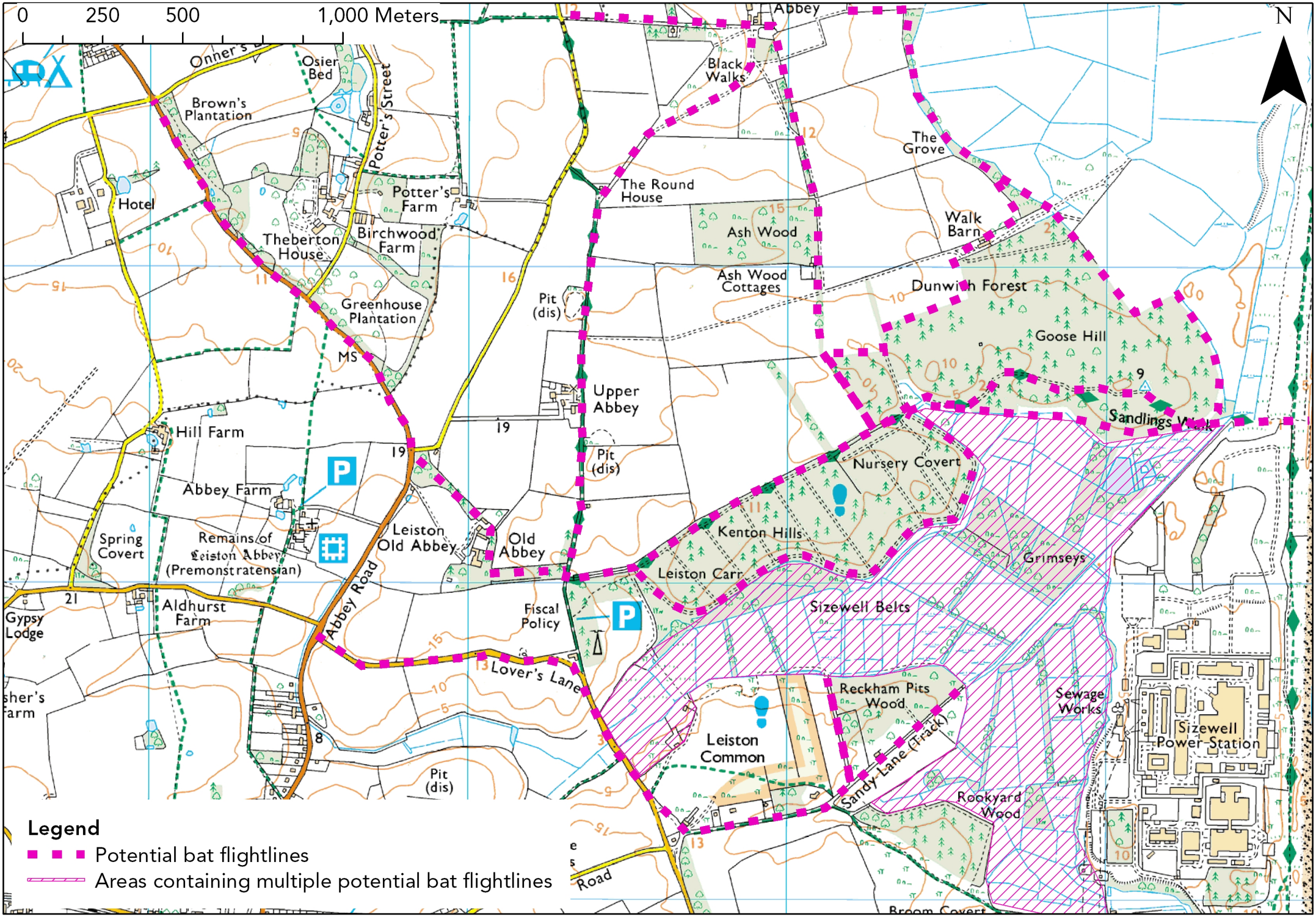
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Potter's Farm
Theberton House
Birchwood Farm
Greenhouse Plantation
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Hill Farm
Abbey Farm
Spring Covert
Remains of Leiston Abbey (Premonstratensian)
Leiston Old Abbey
Old Abbey
Abbey Road
Gypsy Lodge
Aldhurst Farm
Fiscal Policy
Lover's Lane
Pit (dis)
Upper Abbey
The Round House
Black Walks
Abbey
The Grove
Walk Barn
Ash Wood
Ash Wood Cottages
Dunwich Forest
Goose Hill
Sandlings Walk
Nursery Covert
Kenton Hills
Leiston Carr
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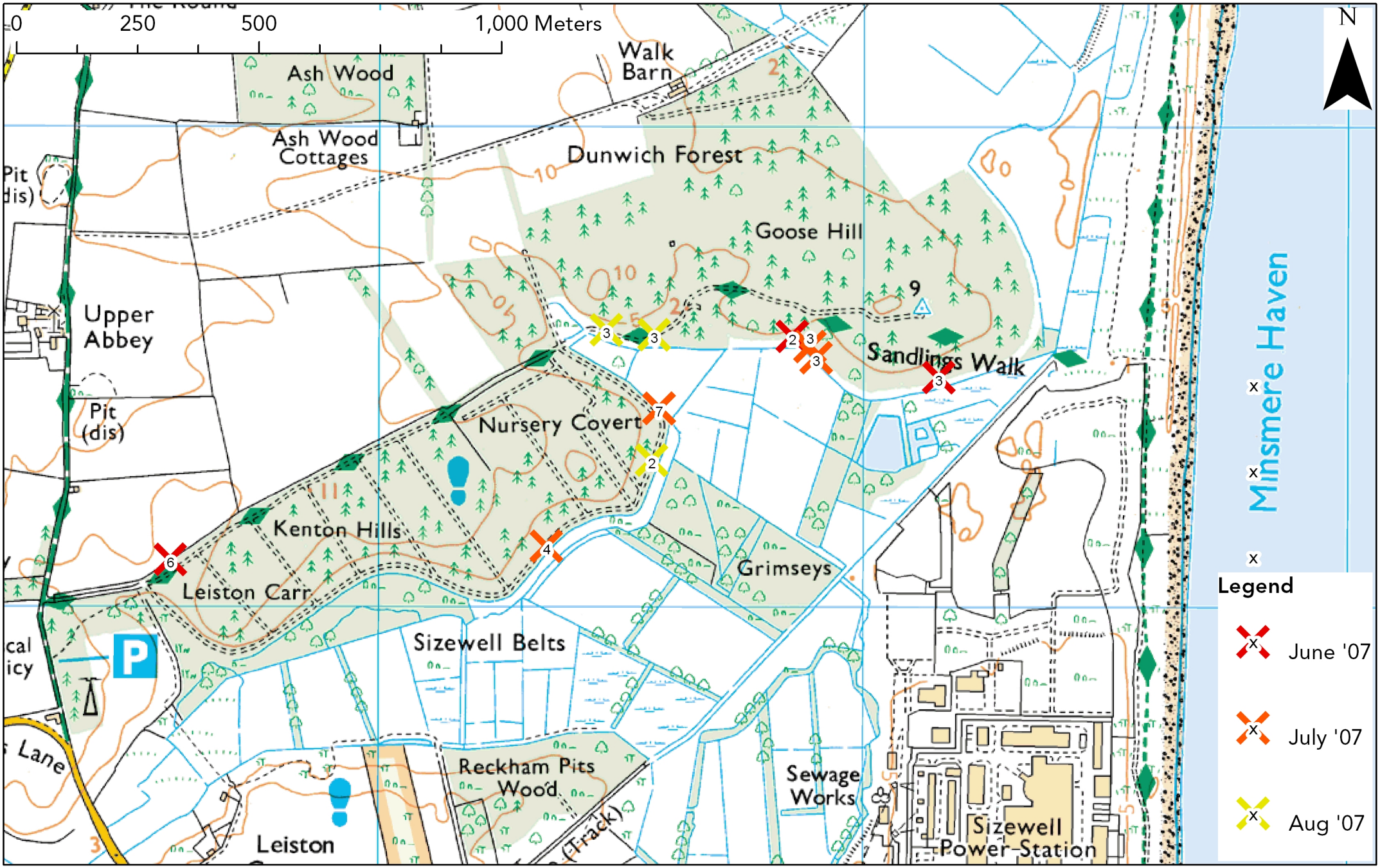

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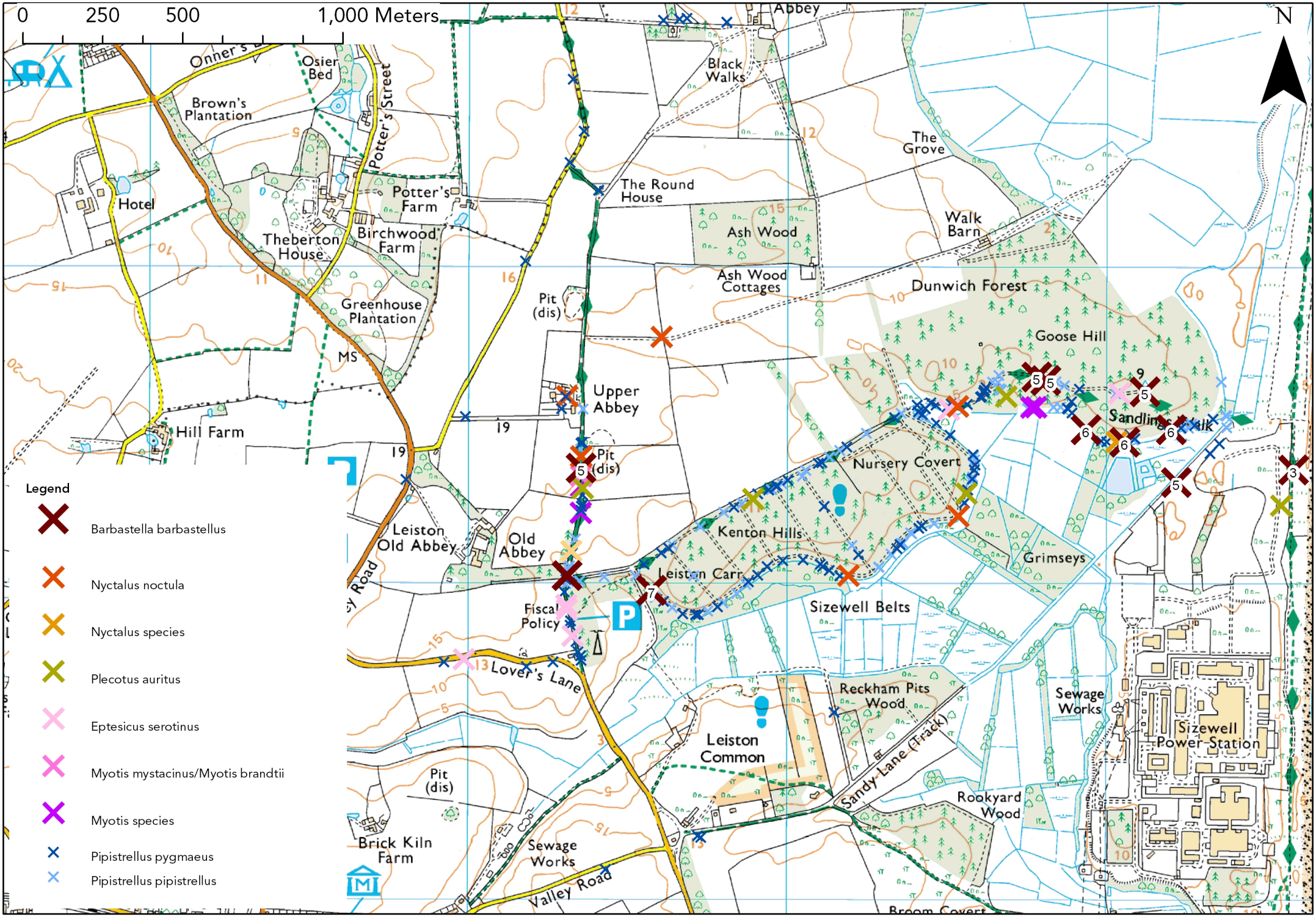
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Myotis species
Pipistrellus pygmaeus
Pipistrellus pipistrellus
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Brown's Plantation
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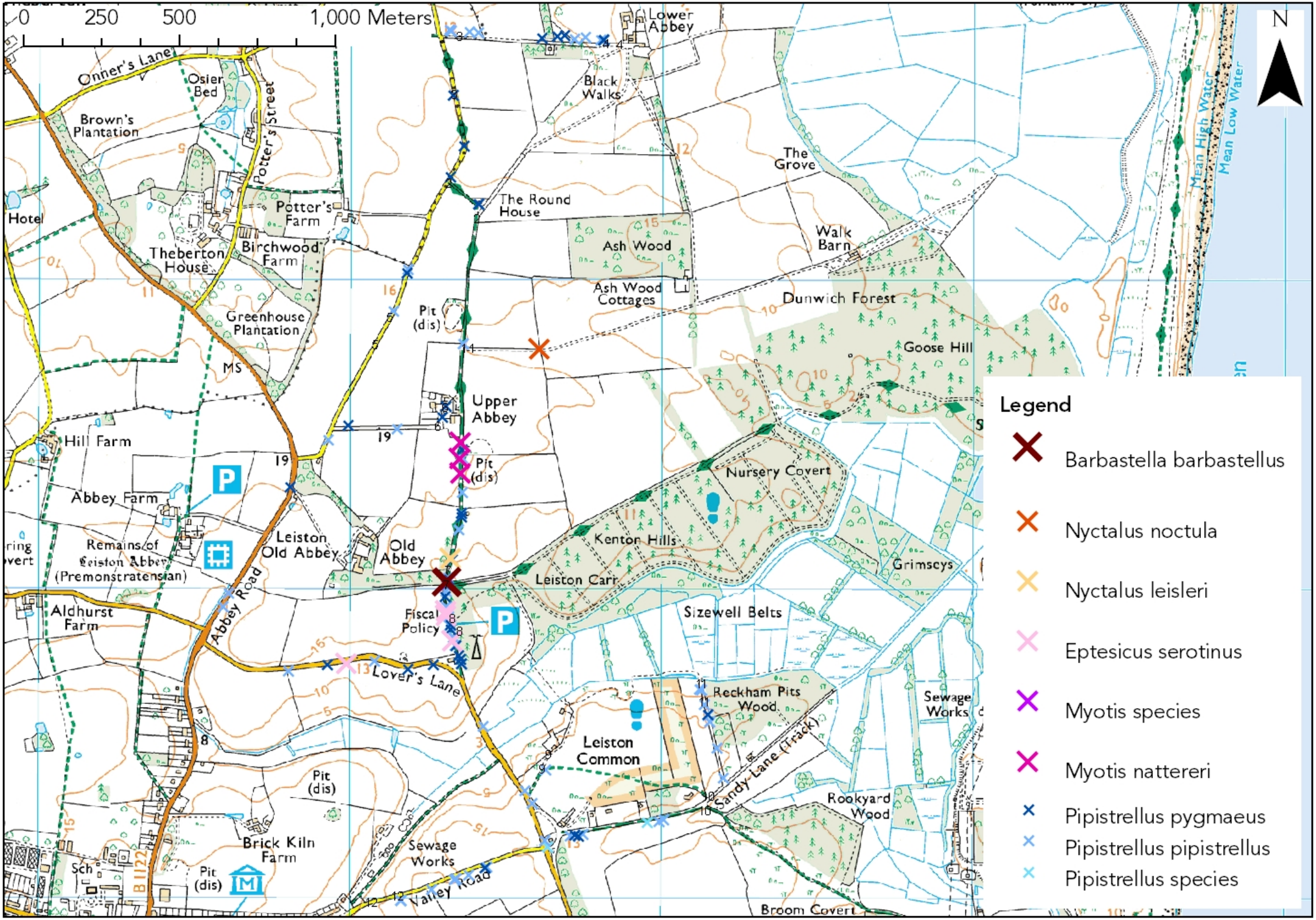
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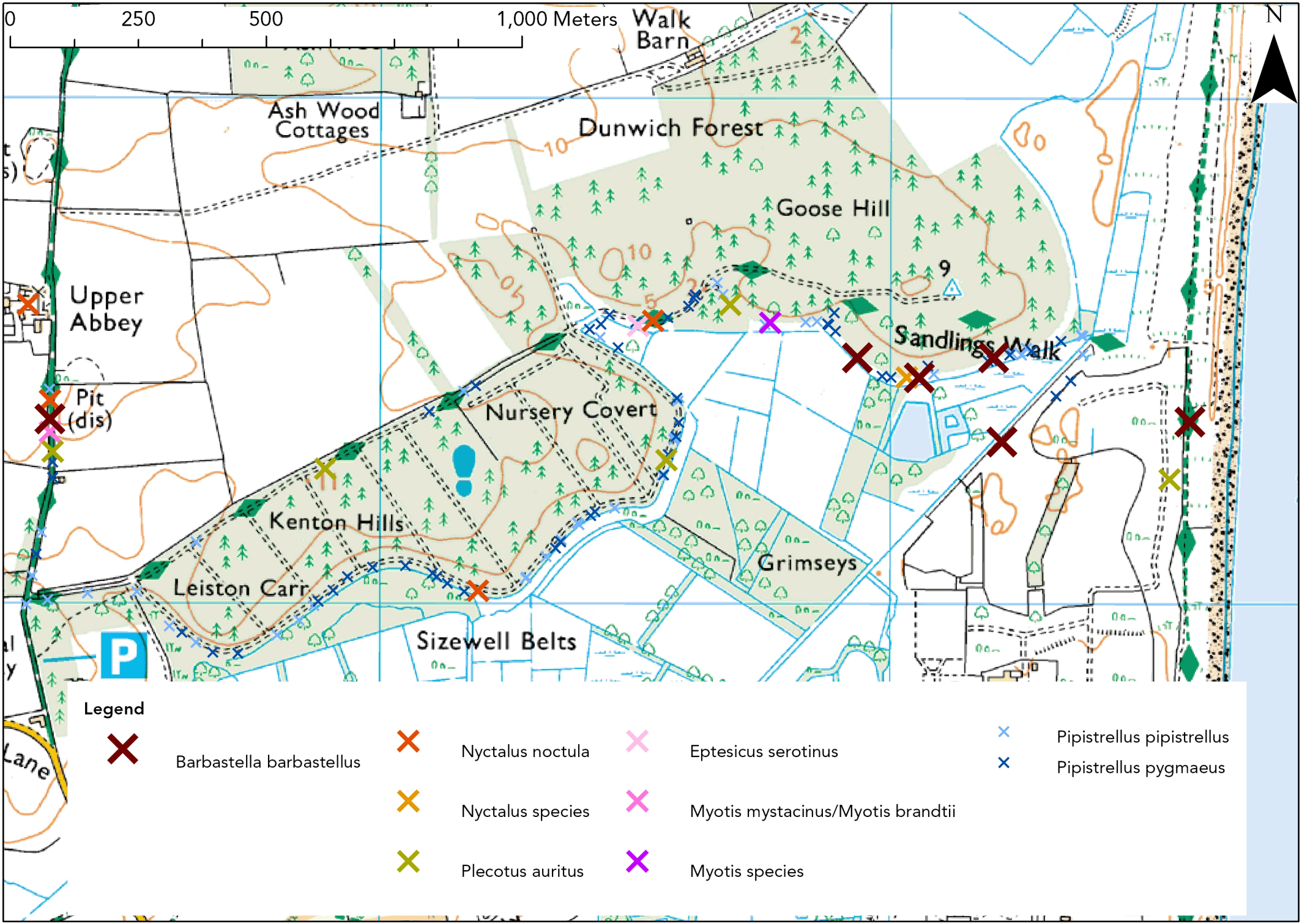
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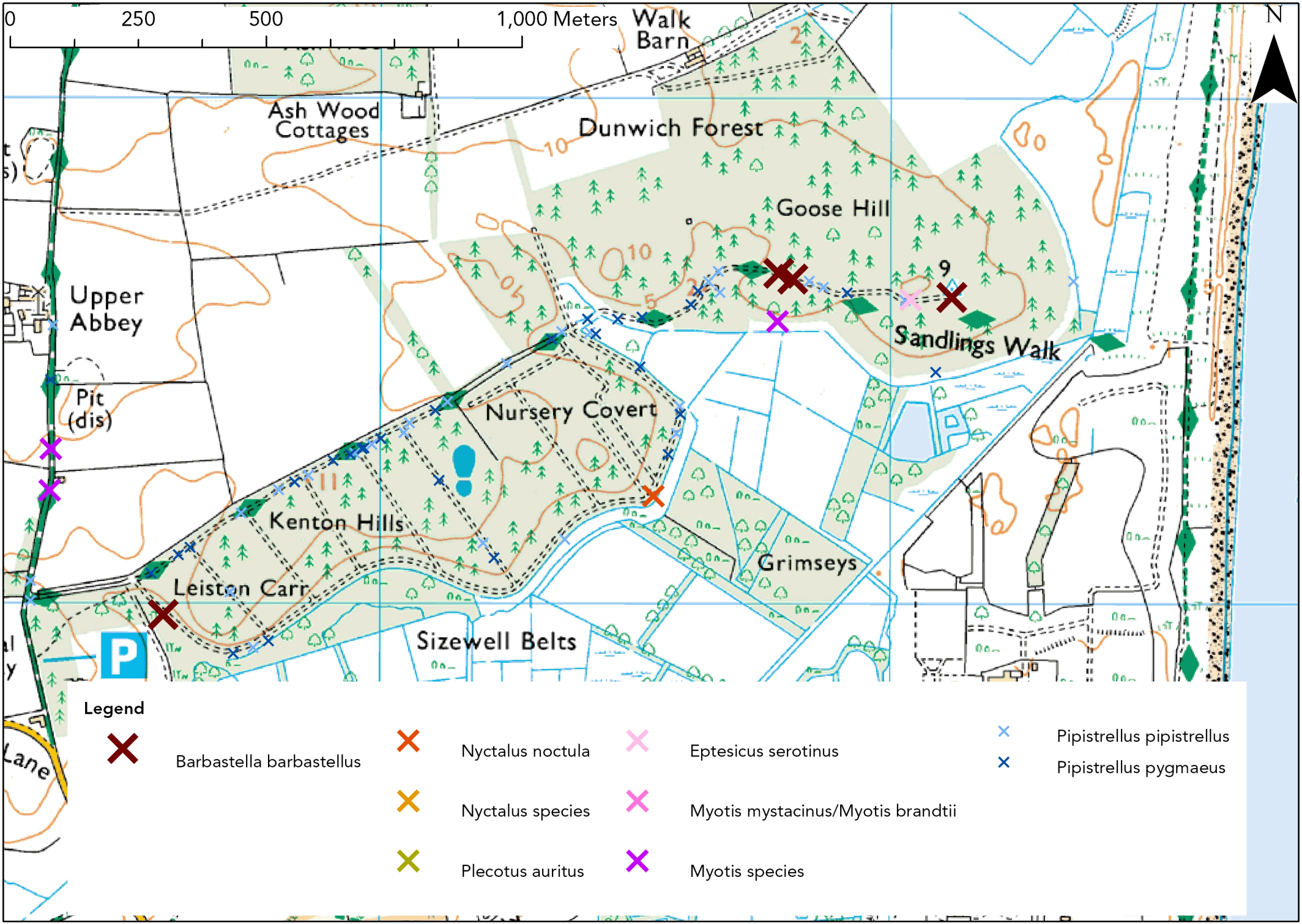
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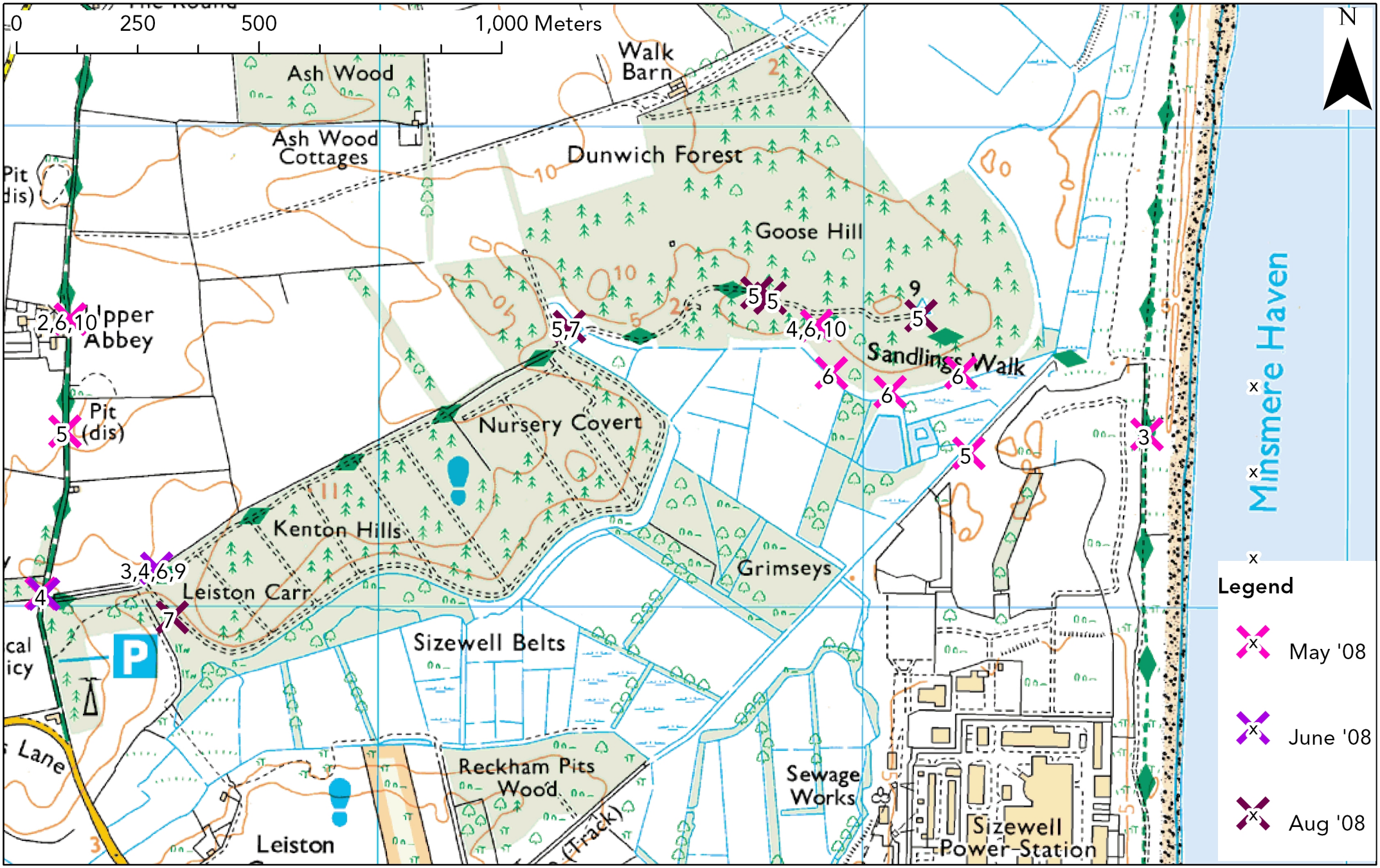

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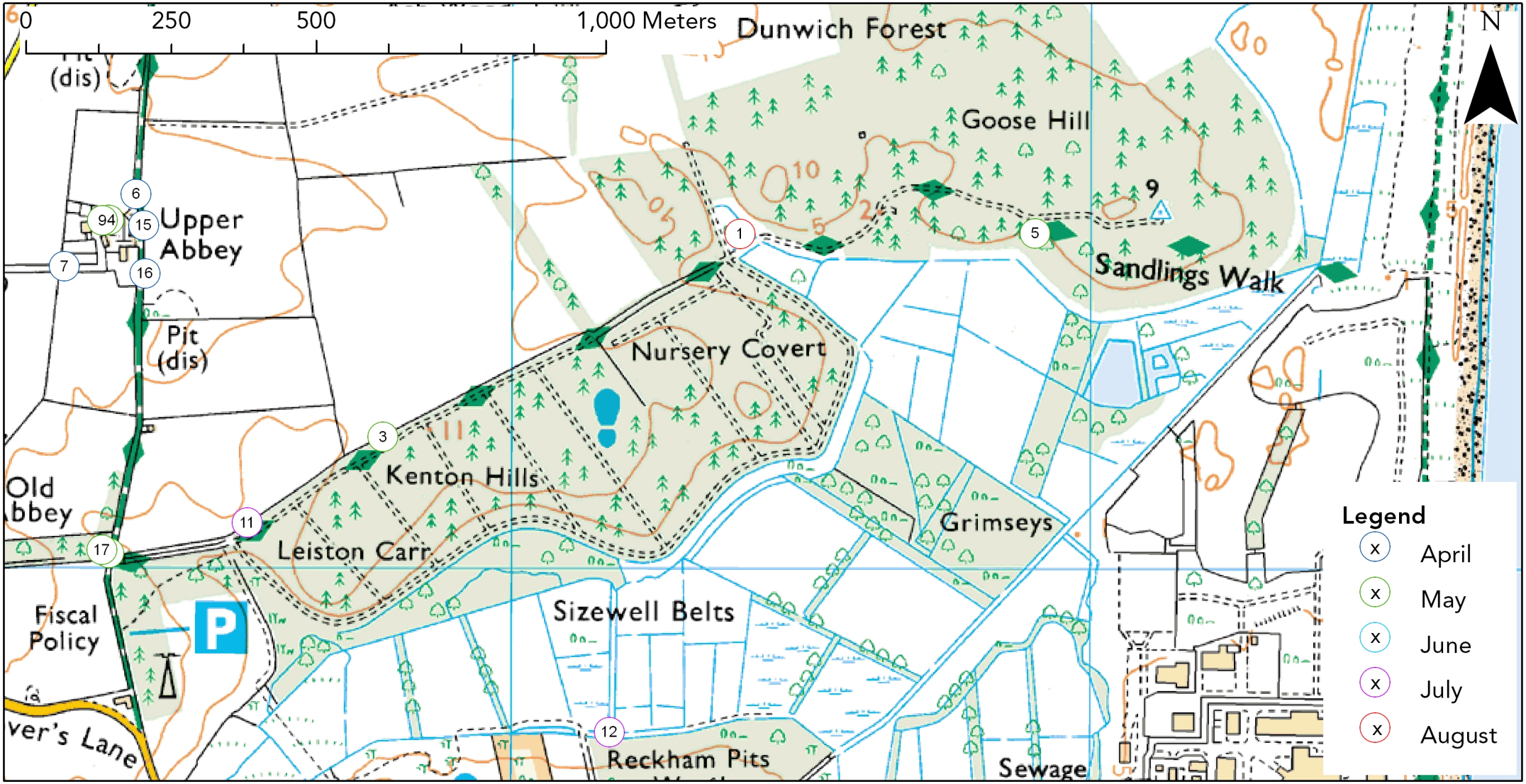
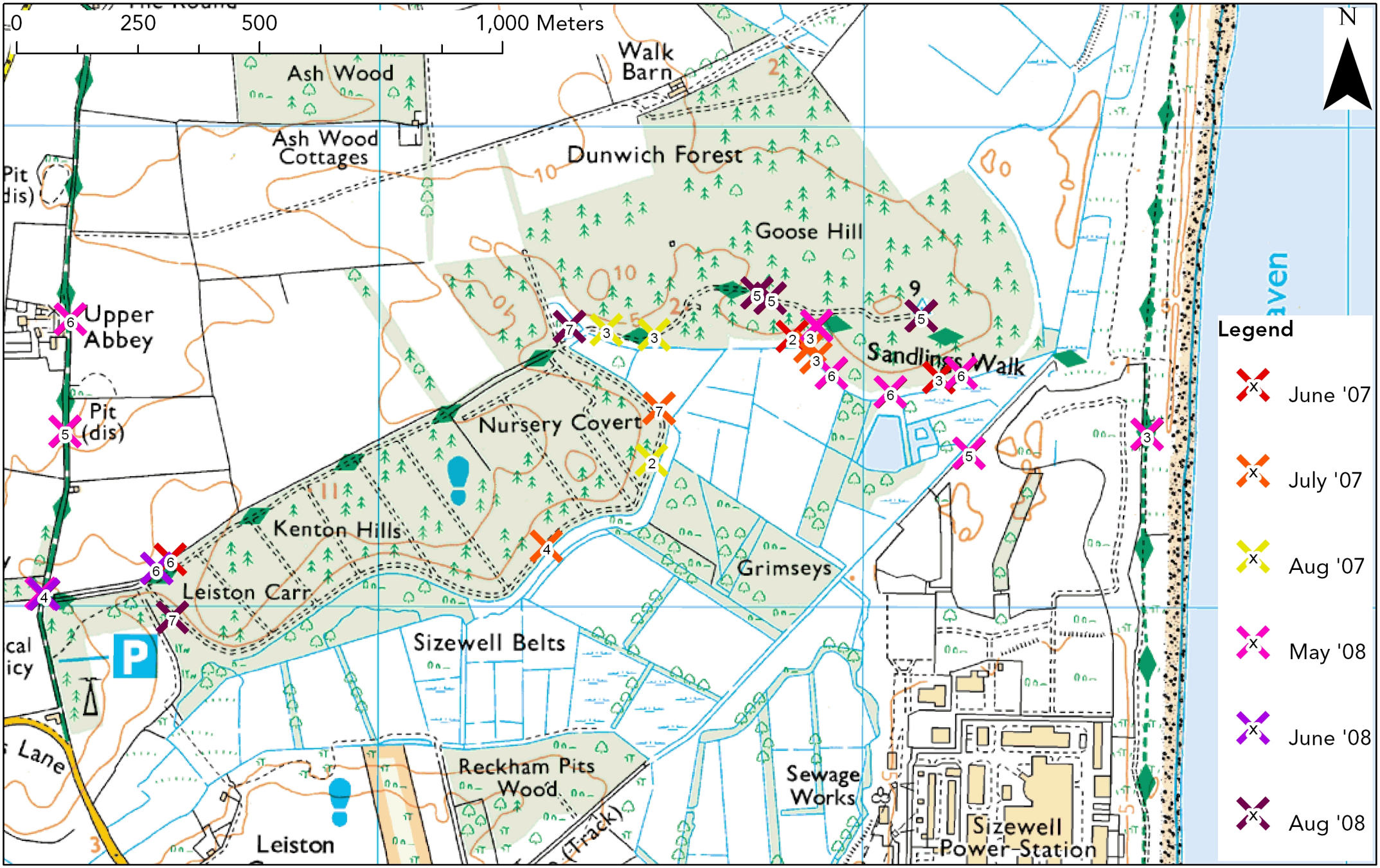
Minutes after sunset	Before sunset	1-20	21-40	41-60	61-80	81-100	101-120	121-140	141-160	161-180	181+



Static No.	No. of Nights	Month	*Barbastella barbastellus*	*Eptesicus serotinus*	*Myotis mystacinus/Myotis brandtii*	*Myotis* species	*Nyctalus leisleri*	*Nyctalus noctula*	*Pipistrellus pipistrellus*	*Pipistrellus pygmaeus*	*Pipistrellus* species	*Plecotus auritus*	Unidentified
6	2	April						3				1	
7	1	April		3		7		3	13	115		2	
15	13	April	3		1	14		1	1998	90	69	36	4
16	2	April											
3	1	May						1	5			1	1
4	1	May				2		3	85	23	36	1	1
5	1	May	2		1	4			113	50	11	3	1
2	1	May						1	5	10	1	1	
9	9	May				3			226	19	22	5	1
13	19	May	1	1	7	7		3	629	825	78	3	8
14	4	May							12	2	2	7	
18	1	May											
17	1	May											
8	3	June						7	1	3			4
10	7	June						22	78	22	3	1	17
11	10	July	3				9		96	93	1		7
12	8	July							55	41			
1	1	August	3			2		2	39	29	5	1	

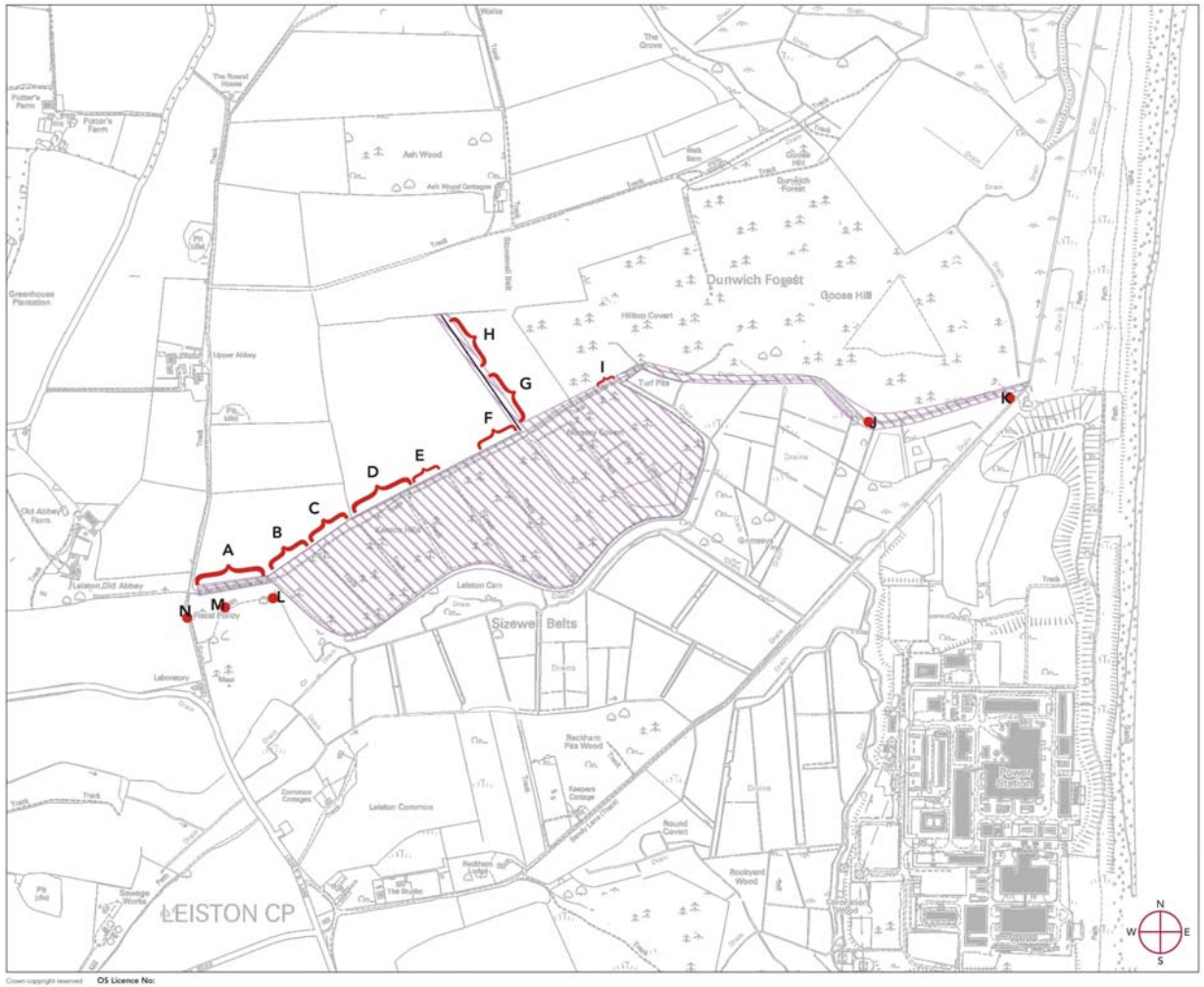


Sunset Code	0	1	2	3	4	5	6	7	8	9	10
Minutes after sunset	Before sunset	1-20	21-40	41-60	61-80	81-100	101-120	121-140	141-160	161-180	181+

Appendix A
Plan of Zones in the Plantation Woodland showing Locations of Trees Surveyed

1 Page

POWER STATIONS SURVEYS, SIZEWELL



Location of Surveyed Trees – 7th June 2007

Legend

A-N	Tree Blocks and Locations
	Survey Area
A	1-5 Tree Numbers
B	6-10 Tree Numbers
C	11-25 Tree Numbers
D	26-56 Tree Numbers
E	57-64 Tree Numbers
F	65-66 Tree Numbers
G	67-85 Tree Numbers
H	86-124 Tree Numbers
I	125-126 Tree Numbers
J	127-180 Tree Numbers
K	181-184 Tree Numbers
L	185-188 Tree Numbers
M	189-194 Tree Numbers
N	195-196 Tree Numbers

baker
shepherd
gillespie

ECOLOGICAL CONSULTANTS
Limited Liability Partnership

Office: Oxford
Tel: 01865 883833

Date	OCT'07	Checked	SS	Scale	NTS
Drawn	SW	Approved	SS	Job Ref	3040
Status	FINAL				

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Offices in: Bakewell, Oxford, Berwick-upon-Tweed & Monmouth Tel: 01629 815544 Fax: 01629 815577 Web: info@bsg-ecology.com

Appendix B
Bat Detector Results for the Walked and Driven Transect Surveys

18 Pages

Batbox Duet Results (Note: 45 kHz pip – common pipistrelle; 55 kHz pip – soprano pipistrelle, ble – long-eared bat.)

Sizewell	**28/04/2008**	**Sizewell_28Apr08_ walked**	**10306**	**152**	**55 kHz pip. Single pass**
				285 - 450	55 kHz pip. Numerous passes with some social calling
				520 - 546	45 kHz and 55 kHz pips present
				581 - 630	55 kHz pip only
				670	Pip sp.
				727	45 kHz pip
				781 - 830	45 kHz pip
				851 - 870	45 kHz and 55 kHz pips present
				993	Distant Pip sp.
				1079 - 1156	55 kHz pip. Numerous passes with feeding buzzes
				1242	Pip sp. single pass
				1315	Distant Pip sp.
				1451	45 kHz pip
				1519	55 kHz pip. Several passes
				1551	*55 pips feeding ?unclear?*
				1603	Myotis sp. or loud ble Single pass
				1622 - 1654	55 kHz pip
				1665	Myotis sp.
				1680	*Approaching Upper Abbey Farm. Myotis bat flying up and down track*
				1757	Pip sp. Single pass

Sizewell	**28/04/2008**	**Sizewell_28Apr08_ walked**	**10306**	**152**	**55 kHz pip. Single pass**
				1830	Myotis sp. or loud ble. Single pass
				1920	Myotis sp. or loud ble. Single pass
				1927	*Possibly the same bat or two bats feeding up and down the track*
				1964 -2103	Myotis sp. (probably Natterer's due to 90 kHz max). Multiple passes
				2174	*Just walking past upper Abbey Farm on the track*
				2772	Distant Pip sp.
				3261 - 3360	Pip sp. Several passes
				3505	Distant 55 kHz pip
				3806	Distant Pip sp.
				3826	*45 pip ?unclear?*
				4285	*Just joined the track just outside Lower Abbey*
				4328 - 4350	45 KHz pip
				4366 - 4555	55 kHz pip joined 45 kHz pip. Numerous passes of both
				4611	*?unclear? Plantation ?unclear?*
				4622 - 4710	45 kHz pip. Numerous passes
				4845 - 4877	Pip sp. Several passes
				5373 - 5550	45 kHz pip. Two bats at various point. Numerous passes
				5564	*All pip activity on the track to the round house*
				5800	45 kHz pip
				5995	55 kHz pip. Two passes
				6047	55 kHz pip

Sizewell	**28/04/2008**	**Sizewell_28Apr08_ walked**	**10306**	**152**	**55 kHz pip. Single pass**
				6086	55 kHz pip
				6144 - 6270	Pip sp. Several passes
				6549	*Approaching main road*
				6790	45 kHz pip. Several passes
				7135	Probable serotine or Leisler's using single frequency. Single pass
				7172	*Approaching lights at ?Leesden?*
				7255	Distant unidentified bat
				7277	Distant unidentified bat
				7319	Pip sp. Single pass
				7335	*On the road from ?Beasdon? to Sizewell*
				7486 - 7590	45 kHz pip. Several passes with feeding buzz. Joined by 55 kHz pip at 7537 secs
				7805 - 7830	45 kHz pip. Three passes
				7919 - 7960	55 kHz pip
				7999	Pip sp. Distant pass
				8027	*On track towards the car park*
				8309 - 8332	55 kHz pip
				8408	45 kHz pip
				8445 - 8674	Both 45 kHz and 55 kHz pips present
				8768	45 kHz pip
				8877	55kHz pip
				8912 - 9060	45 kHz pip. At least two 45 kHz pips for some of the time

Sizewell	**28/04/2008**	**Sizewell_28Apr08_ walked**	**10306**	**152**	**55 kHz pip. Single pass**
				9103	45 kHz pip
				9277	Pip sp.
				9338 - 9345	Both 45 kHz and 55 kHz pips present
				9406 - 9455	55 kHz pip. Two passes
				9463	Stop
Site	Date	Track no.	Duration (Sec)	Time (Sec)	Event
Sizewell	19/05/2008	Sizwell_19may08_walk ed	8771	0	Sizewell B walked transit on the 19th March. Time is 21:02. Been recording since 20:45 but no bat passes
				60	Pip sp. Single close pass using FM call
				1231	45 kHz pip. Single close pass
				1357	45 kHz pip. Single close pass
				1372	55 kHz pip Single pass
				1382	Interesting bat pass there
				1426 - 1435	Pip sp. (prob 45 kHz). Several more distant passes
				1475	Time is 21:26 and I'm back at the turf bits having walked up and down the access track
				1610	Distant pip
				1618	I'm now off the access track leading in to the woods from the turf bits
				1696 - 1740	55 kHz pip. Several passes
				1775 - 1785	55 kHz pip. Several passes
				1792	45 kHz pip. Single distant pass
				1805	21:31

Sizewell	**28/04/2008**	**Sizewell_28Apr08_ walked**	**10306**	**152**	**55 kHz pip. Single pass**
				1814	Pip sp. Single pass
				1860	Unknown quiet bat could be ble or barbastelle. Some indication of CF call. Some components at about 40 kHz
				1877	Probable 55 kHz pip with approach phase call
				1880	Still at location 21:31
				1922 - 2044	55 kHz pip using FM call and approach phase 55 kHz and Pip sp. at 2035 sec
				1966 -1993	45 kHz pip using FM call
				2050	21:35
				2067	55 kHz pip
				2085 - 2217	55 kHz pip with numerous feeding buzzes and brief contact with Pip sp.
				2160	45 kHz pip
				2220	45 kHz pip
				2225	55 pips flying down canopy of Corsican pines
				2390 - 2462	55 kHz pip. Several passes with approach phase
				2497	21:43
				2535	55 kHz pip. Two passes
				2763 - 2780	55 kHz pip. Three passes
				2834 - 2845	55 KHz pip. Three passes
				2847	Bats flying over the top of the access track shown on the plan at 21:48
				2870 - 2880	55 kHz pip. Several passes
				2920 - 2970	Pip sp. Numerous passes
				2972 - 2990	Pip sp joined by 45 kHz pip with social calling

Sizewell	**28/04/2008**	**Sizewell_28Apr08_ walked**	**10306**	**152**	**55 kHz pip. Single pass**
				3055 -3085	55 and 45 kHz pip briefly together followed by 45 alone
				3120	21:53
				3135 - 3155	45 kHz pip. Several passes
				3205	55 kHz pip. Several passes
				3239	45 kHz pip. Single pass
				3250	Unclear memo ??? 55
				3306	45 kHz pip. Single pass
				3342	Pip sp. Single pass
				3390	55 kHz pip. Single pass
				3396	21:58
				3401	45 kHz pip. Single pass
				3422 - 3480	55 kHz pip. Several passes
				3486	Feeding up and down track (unclear). Just approaching clear felled area
				3520	55 kHz pip. Two passes
				3649	Pip sp. Single pass
				3690 - 3735	55 kHz pip. Numerous passes
				3740	22:04
				3788	55 kHz pip. Distant passes
				3880	55 kHz pip. FM call
				3890	45 KHz pip. Quiet call
				3905	22:06

Sizewell	**28/04/2008**	**Sizewell_28Apr08_ walked**	**10306**	**152**	**55 kHz pip. Single pass**
				3920 - 3970	55 kHz pip. Several passes
				4020	Myotis sp. or less likely ble. Single pass
				4028	55 kHz pip. Single pass
				4076	Distant Pip sp.
				4130	45 kHz pip. CF call
				4160 - 4225	Pip sp. Numerous passes
				4232	22:12
				4280	55 kHz pip. Distant pass
				4305 - 4325	Pip sp. Several passes
				4403	45 kHz pip. Single pass
				4407 - 4440	55 kHz pip. Several passes
				4585	55 kHz pip. Single pass
				4790 - 4810	45 kHz pip. Two passes
				4815	Time is 22:22
				4853	45 kHz pip. Single pass
				5215	45 kHz pip. Single pass
				5237	22:29
				5307	Pip sp. Distant pass
				5325	45 kHz pip with feeding buzz
				5418 - 5436	55 kHz pip. Two passes
				5441	22:32

Sizewell	**28/04/2008**	**Sizewell_28Apr08_ walked**	**10306**	**152**	**55 kHz pip. Single pass**
				5455	Pip sp. Distant pass
				5535 - 5585	45 kHz pip. Several passes including feeding buzz
				5584	55 kHz pip. Possibly with serotine
				5600 - 5652	45 kHz pip. Several passes with feeding buzz
				5616	22:35
				5657 - 5747	55 kHz and 45 kHz pip present
				5860	Pip sp. One loud and several distant passes. Probable social calling
				5985 - 6145	Pip sp. Distant passes but probably including 45 kHz pips. Some social calling
				6405	45 kHz pip. Single pass
				6445	22:50
				6590	Pip sp.
				6879	22:56
				7008 - 7105	45 kHz pip. Several passes with approach phase
				7418	Pip sp. Single pass
				7480	55 kHz pip. Single pass
				7510	23:07. Back at the junction with the access track and the track to Upper Abbey Farm
				7550	45 kHz pip. Single pass
				7565	23:18. Standing at a fixed point having collected in the static Anabat
				7595	45 kHz pip. Single pass
				7719	Distant Pip sp.
				8307	End of transect. Time is 23:30 exactly

Anabat Results

Night	Time	Label	Number	
19/05/2008	20:53	Ppip	1	May19th roost watch and transect
19/05/2008	20:54	Ppip	2	May19th roost watch and transect
19/05/2008	21:09	Ppip	1	May19th roost watch and transect
19/05/2008	21:14	Ppip	1	May19th roost watch and transect
19/05/2008	21:16	Nnoc	1	May19th roost watch and transect
19/05/2008	21:17	Ppip	1	May19th roost watch and transect
19/05/2008	21:42	Pp	1	May19th roost watch and transect
19/05/2008	21:43	Pp	1	May19th roost watch and transect
19/05/2008	21:47	Ppip	1	May19th roost watch and transect
19/05/2008	21:48	Ppip	1	May19th roost watch and transect
19/05/2008	21:49	Pa	1	May19th roost watch and transect
19/05/2008	21:49	Ppyg	1	May19th roost watch and transect
19/05/2008	22:01	Ppip	1	May19th roost watch and transect
19/05/2008	22:04	Nnoc	1	May19th roost watch and transect
19/05/2008	22:04	Ppip	1	May19th roost watch and transect
19/05/2008	22:04	Ppyg	1	May19th roost watch and transect
19/05/2008	22:05	Ppip	2	May19th roost watch and transect
19/05/2008	22:09	Pp	1	May19th roost watch and transect
19/05/2008	22:20	Pa	1	May19th roost watch and transect
19/05/2008	22:21	Bb	1	May19th roost watch and transect
19/05/2008	22:21	Mmy/Mbr	1	May19th roost watch and transect
19/05/2008	22:21	Paur	1	May19th roost watch and transect
19/05/2008	22:21	Ppy	1	May19th roost watch and transect
19/05/2008	22:21	Ppyg	2	May19th roost watch and transect
19/05/2008	22:22	Ppyg	1	May19th roost watch and transect
19/05/2008	22:27	Ppip	1	May19th roost watch and transect
19/05/2008	22:29	Ppip	1	May19th roost watch and transect
19/05/2008	22:30	Ppip	1	May19th roost watch and transect
19/05/2008	22:31	Pp	1	May19th roost watch and transect
19/05/2008	22:34	Ppip	1	May19th roost watch and transect
19/05/2008	22:36	Pp	1	May19th roost watch and transect
19/05/2008	22:39	Ppip	3	May19th roost watch and transect

Night	Time	Label	Number	
19/05/2008	22:39	Ppyg	1	May19th roost watch and transect
19/05/2008	22:40	Pp	1	May19th roost watch and transect
19/05/2008	22:40	Ppyg	2	May19th roost watch and transect
19/05/2008	22:41	Ppyg	1	May19th roost watch and transect
19/05/2008	22:43	Pp	1	May19th roost watch and transect
19/05/2008	22:44	Ppip	1	May19th roost watch and transect
19/05/2008	22:45	Ppip	1	May19th roost watch and transect
19/05/2008	22:48	Ppy	1	May19th roost watch and transect
19/05/2008	22:48	Ppyg	1	May19th roost watch and transect
19/05/2008	22:49	Ppyg	1	May19th roost watch and transect
19/05/2008	22:50	Ppyg	2	May19th roost watch and transect
19/05/2008	22:51	Ppyg	1	May19th roost watch and transect
19/05/2008	22:52	Ppyg	3	May19th roost watch and transect
19/05/2008	22:53	Ppy	1	May19th roost watch and transect
19/05/2008	22:53	Ppyg	1	May19th roost watch and transect
19/05/2008	22:54	Ppyg	2	May19th roost watch and transect
19/05/2008	22:55	Ppip	2	May19th roost watch and transect
19/05/2008	22:56	Pp	1	May19th roost watch and transect
19/05/2008	22:56	Ppip	1	May19th roost watch and transect
19/05/2008	22:57	Ppip	2	May19th roost watch and transect
19/05/2008	22:57	Ppyg	1	May19th roost watch and transect
19/05/2008	22:58	Ppip	3	May19th roost watch and transect
19/05/2008	22:58	Ppyg	1	May19th roost watch and transect
19/05/2008	23:02	query	1	May19th roost watch and transect
19/05/2008	23:03	Pa	1	May19th roost watch and transect
19/05/2008	23:03	query	2	May19th roost watch and transect
19/05/2008	23:04	Ppip	2	May19th roost watch and transect
19/05/2008	23:04	Ppyg	1	May19th roost watch and transect
19/05/2008	23:06	Pp	1	May19th roost watch and transect
19/05/2008	23:14	Ppip	1	May19th roost watch and transect
19/05/2008	23:16	Pa	1	May19th roost watch and transect
19/05/2008	23:27	Pp	1	May19th roost watch and transect
20/05/2008	20:31	Nnoc	1	May20walked
20/05/2008	20:37	Nnoc	1	May20walked

Night	Time	Label	Number	
20/05/2008	20:37	Paur	1	May20walked
20/05/2008	20:37	Ppip	2	May20walked
20/05/2008	20:45	Pp	1	May20walked
20/05/2008	20:59	Pp	1	May20walked
20/05/2008	21:09	Ppyg	2	May20walked
20/05/2008	21:10	Ppyg	3	May20walked
20/05/2008	21:14	Es	1	May20walked
20/05/2008	21:14	Nnoc	2	May20walked
20/05/2008	21:15	Ppyg	1	May20walked
20/05/2008	21:16	Ppyg	2	May20walked
20/05/2008	21:17	Ppyg	2	May20walked
20/05/2008	21:18	Ppip	1	May20walked
20/05/2008	21:18	Psp	1	May20walked
20/05/2008	21:23	Pp	1	May20walked
20/05/2008	21:24	Ppip	1	May20walked
20/05/2008	21:25	Ppy	1	May20walked
20/05/2008	21:26	Ppyg	4	May20walked
20/05/2008	21:27	Ppyg	2	May20walked
20/05/2008	21:30	Ppyg	1	May20walked
20/05/2008	21:31	Ppyg	4	May20walked
20/05/2008	21:32	Ppyg	3	May20walked
20/05/2008	21:33	Ppip	1	May20walked
20/05/2008	21:33	Ppyg	1	May20walked
20/05/2008	21:47	Bb	1	May20walked
20/05/2008	21:56	Paur	1	May20walked
20/05/2008	22:21	Bb	1	May20walked
20/05/2008	22:37	Ppyg	2	May20walked
20/05/2008	22:38	Ppyg	3	May20walked
20/05/2008	22:39	Ppyg	2	May20walked
20/05/2008	22:40	Ppip	1	May20walked
20/05/2008	22:42	Ppip	3	May20walked
20/05/2008	22:43	Pp	1	May20walked
20/05/2008	22:43	Ppip	1	May20walked
20/05/2008	22:44	Bbarb	1	May20walked

Night	Time	Label	Number	
20/05/2008	22:44	Ppip	3	May20walked
20/05/2008	22:44	Ppyg	4	May20walked
20/05/2008	22:45	Ppip	2	May20walked
20/05/2008	22:45	Ppyg	3	May20walked
20/05/2008	22:46	Bb?	1	May20walked
20/05/2008	22:46	Pp	1	May20walked
20/05/2008	22:46	Ppip	1	May20walked
20/05/2008	22:46	Ppy	1	May20walked
20/05/2008	22:46	Ppyg	3	May20walked
20/05/2008	22:46	queryNsp	1	May20walked
20/05/2008	22:47	Ppyg	2	May20walked
20/05/2008	22:49	Ppyg	2	May20walked
20/05/2008	22:50	Bb	1	May20walked
20/05/2008	22:50	Ppyg	2	May20walked
20/05/2008	22:50	Psp	1	May20walked
20/05/2008	22:51	Myotis	1	May20walked
20/05/2008	22:52	Pp	1	May20walked
20/05/2008	22:52	Ppip	2	May20walked
20/05/2008	22:52	Psp	1	May20walked
20/05/2008	22:54	Pa	1	May20walked
20/05/2008	22:54	Psp	1	May20walked
20/05/2008	22:55	Pp	1	May20walked
20/05/2008	22:56	Ppyg	1	May20walked
20/05/2008	22:59	Ppip	1	May20walked
20/05/2008	22:59	Ppyg	1	May20walked
20/05/2008	23:00	Ppyg	1	May20walked
20/05/2008	23:01	Ppyg	1	May20walked
20/05/2008	23:05	Ppip	2	May20walked
20/05/2008	23:05	Ppyg	1	May20walked
20/05/2008	23:06	Ppip	1	May20walked
20/05/2008	23:07	Ppyg	2	May20walked
20/05/2008	23:07	Psp	1	May20walked
20/05/2008	23:08	Ppyg	2	May20walked
20/05/2008	23:09	Ppyg	4	May20walked

Night	Time	Label	Number	
20/05/2008	23:10	Ppip	1	May20walked
20/05/2008	23:10	Ppyg	4	May20walked
20/05/2008	23:11	Ppyg	4	May20walked
20/05/2008	23:12	Ppip	2	May20walked
20/05/2008	23:12	Psp	1	May20walked
20/05/2008	23:14	Ppip	1	May20walked
20/05/2008	23:14	Ppyg	2	May20walked
20/05/2008	23:15	Ppip	2	May20walked
20/05/2008	23:15	Ppyg	1	May20walked
20/05/2008	23:16	Ppyg	1	May20walked
20/05/2008	23:16	Psp	1	May20walked
20/05/2008	23:17	Ppip	1	May20walked
20/05/2008	23:18	Nnoc	1	May20walked
20/05/2008	23:18	Ppip	2	May20walked
20/05/2008	23:18	Ppyg	1	May20walked
20/05/2008	23:19	Psp	1	May20walked
20/05/2008	23:35	Ppyg	2	May20walked
18/06/2008	09:37	Noctule	1	18thJune_driven
18/06/2008	09:41	Pip45	1	18thJune_driven
18/06/2008	09:42	Pip45	1	18thJune_driven
18/06/2008	09:47	Pip55	1	18thJune_driven
18/06/2008	09:48	Pip55	1	18thJune_driven
18/06/2008	09:52	Pip55	2	18thJune_driven
18/06/2008	09:55	Pip45	1	18thJune_driven
18/06/2008	09:57	Pip45	1	18thJune_driven
18/06/2008	09:59	Pip55	1	18thJune_driven
18/06/2008	10:00	Pip55	3	18thJune_driven
18/06/2008	10:01	Pip45	3	18thJune_driven
18/06/2008	10:01	Pip55	1	18thJune_driven
18/06/2008	10:03	Pip45	1	18thJune_driven
18/06/2008	10:06	Pip55	1	18thJune_driven
18/06/2008	10:21	Pip55	1	18thJune_driven
18/06/2008	10:25	Leislers	1	18thJune_driven
18/06/2008	10:27	Myotis	1	18thJune_driven

Night	Time	Label	Number	
18/06/2008	10:31	Barb	1	18thJune_driven
18/06/2008	10:50	Pip55	1	18thJune_driven
18/06/2008	10:51	pip	1	18thJune_driven
18/06/2008	10:58	Pip45	1	18thJune_driven
18/06/2008	10:59	Pip45	1	18thJune_driven
18/06/2008	10:59	Pip55	1	18thJune_driven
18/06/2008	11:03	Pip45	1	18thJune_driven
18/06/2008	11:04	Pip45	2	18thJune_driven
18/06/2008	11:05	Pip45	1	18thJune_driven
18/06/2008	11:10	Pip45	1	18thJune_driven
18/06/2008	11:16	Pip45	1	18thJune_driven
18/06/2008	11:17	Pip45	2	18thJune_driven
18/06/2008	11:18	Pip45	1	18thJune_driven
18/06/2008	11:19	Pip45	1	18thJune_driven
18/06/2008	11:39	Pip	1	18thJune_driven
18/06/2008	11:39	Pip45	1	18thJune_driven
18/06/2008	11:43	Pip45	1	18thJune_driven
18/06/2008	11:46	Pip45	2	18thJune_driven
18/06/2008	11:47	Pip45	5	18thJune_driven
18/06/2008	11:48	Pip45	1	18thJune_driven
24/07/2008	21:25	Ppy	1	24July_driven
24/07/2008	21:30	Pp	2	24July_driven
24/07/2008	21:32	Pp	1	24July_driven
24/07/2008	21:34	Pp	1	24July_driven
24/07/2008	21:40	Pp	1	24July_driven
24/07/2008	21:41	Pp	2	24July_driven
24/07/2008	21:42	Pp	1	24July_driven
24/07/2008	21:45	Ppy	1	24July_driven
24/07/2008	21:46	Ppy	2	24July_driven
24/07/2008	21:51	Pp	1	24July_driven
24/07/2008	21:51	Ppy	1	24July_driven
24/07/2008	21:54	Pp	1	24July_driven
24/07/2008	22:01	Pp	1	24July_driven
24/07/2008	22:02	Ppy	1	24July_driven

Night	Time	Label	Number	
24/07/2008	22:03	Pp	1	24July_driven
24/07/2008	22:08	Pp	1	24July_driven
24/07/2008	22:09	Ppy	1	24July_driven
24/07/2008	22:11	Ppy	3	24July_driven
24/07/2008	22:12	Pp	1	24July_driven
24/07/2008	22:12	Ppy	3	24July_driven
24/07/2008	22:13	Pp	1	24July_driven
24/07/2008	22:13	Ppy	1	24July_driven
24/07/2008	22:14	Ppy	1	24July_driven
24/07/2008	22:18	Pp	1	24July_driven
24/07/2008	22:20	Pp	1	24July_driven
24/07/2008	22:21	Pp	2	24July_driven
24/07/2008	22:26	Ppy	1	24July_driven
24/07/2008	22:30	Pp	2	24July_driven
24/07/2008	22:36	Pp	1	24July_driven
24/07/2008	22:37	Pp	1	24July_driven
24/07/2008	22:38	Pp	1	24July_driven
24/07/2008	22:42	Pp	3	24July_driven
24/07/2008	22:45	Pp	1	24July_driven
24/07/2008	22:47	Pp	1	24July_driven
24/07/2008	22:52	Pp	1	24July_driven
24/07/2008	22:53	Pp	1	24July_driven
24/07/2008	22:54	Pp	2	24July_driven
24/07/2008	22:58	Pp	2	24July_driven
24/07/2008	22:58	Ppy	1	24July_driven
24/07/2008	23:01	Ppy	2	24July_driven
24/07/2008	23:07	Ppy	1	24July_driven
24/07/2008	23:09	Ppy	2	24July_driven
24/07/2008	23:10	Pp	1	24July_driven
24/07/2008	23:10	Ppy	1	24July_driven
24/07/2008	23:12	Pp	3	24July_driven
24/07/2008	23:12	Ppy	3	24July_driven
24/07/2008	23:13	Pp	1	24July_driven
24/07/2008	23:13	Ppy	3	24July_driven

Night	Time	Label	Number	
24/07/2008	23:14	Pp	3	24July_driven
24/07/2008	23:14	Ppy	3	24July_driven
24/07/2008	23:14	query	1	24July_driven
24/07/2008	23:15	Pp	1	24July_driven
24/07/2008	23:16	ES	1	24July_driven
24/07/2008	23:16	Es	1	24July_driven
24/07/2008	23:17	Pp	1	24July_driven
24/07/2008	23:17	Ppy	3	24July_driven
24/07/2008	23:18	Pp	1	24July_driven
24/07/2008	23:19	Es	1	24July_driven
24/07/2008	23:19	Pp	1	24July_driven
24/07/2008	23:20	Ppy	2	24July_driven
24/07/2008	23:21	Pp	1	24July_driven
24/07/2008	23:21	Ppy	1	24July_driven
24/07/2008	23:21	query	1	24July_driven
24/07/2008	23:22	Ppy	1	24July_driven
24/07/2008	23:23	Ppy	2	24July_driven
24/07/2008	23:24	Pp	1	24July_driven
24/07/2008	23:25	Es	1	24July_driven
24/07/2008	23:25	Ppy	1	24July_driven
24/07/2008	23:26	Pp	1	24July_driven
11/08/2008	21:01	Ppgy	1	11Aug_walked transect
11/08/2008	21:02	Ppgy	1	11Aug_walked transect
11/08/2008	21:09	Ppip	1	11Aug_walked transect
11/08/2008	21:10	Ppgy	1	11Aug_walked transect
11/08/2008	21:10	Ppip	1	11Aug_walked transect
11/08/2008	21:15	Ppgy	2	11Aug_walked transect
11/08/2008	21:16	Ppip	1	11Aug_walked transect
11/08/2008	21:17	Ppgy	1	11Aug_walked transect
11/08/2008	21:17	Ppip	3	11Aug_walked transect
11/08/2008	21:18	Ppgy	1	11Aug_walked transect
11/08/2008	21:18	Ppip	2	11Aug_walked transect
11/08/2008	21:19	Ppgy	2	11Aug_walked transect
11/08/2008	21:21	Ppip	3	11Aug_walked transect

Night	Time	Label	Number	
11/08/2008	21:22	Psp	1	11Aug_walked transect
11/08/2008	21:23	Ppip	3	11Aug_walked transect
11/08/2008	21:25	Ppgy	1	11Aug_walked transect
11/08/2008	21:25	Ppip	2	11Aug_walked transect
11/08/2008	21:26	Ppgy	5	11Aug_walked transect
11/08/2008	21:27	Ppgy	2	11Aug_walked transect
11/08/2008	21:28	Ppgy	4	11Aug_walked transect
11/08/2008	21:32	Ppgy	3	11Aug_walked transect
11/08/2008	21:34	Ppip	1	11Aug_walked transect
11/08/2008	21:37	Myotis	1	11Aug_walked transect
11/08/2008	21:45	Ppgy	1	11Aug_walked transect
11/08/2008	21:52	Ppip	1	11Aug_walked transect
11/08/2008	21:59	Bbarb	1	11Aug_walked transect
11/08/2008	22:02	Eser	1	11Aug_walked transect
11/08/2008	22:02	Ppip	2	11Aug_walked transect
11/08/2008	22:06	Ppgy	1	11Aug_walked transect
11/08/2008	22:07	Ppip	1	11Aug_walked transect
11/08/2008	22:07	Ppip	3	11Aug_walked transect
11/08/2008	22:08	Bbarb	1	11Aug_walked transect
11/08/2008	22:09	Bbarb	1	11Aug_walked transect
11/08/2008	22:10	Ppip	1	11Aug_walked transect
11/08/2008	22:11	Ppip	4	11Aug_walked transect
11/08/2008	22:11	Ppgy	2	11Aug_walked transect
11/08/2008	22:12	Ppip	1	11Aug_walked transect
11/08/2008	22:12	Ppgy	2	11Aug_walked transect
11/08/2008	22:12	Psp	1	11Aug_walked transect
11/08/2008	22:14	Ppgy	2	11Aug_walked transect
11/08/2008	22:15	Ppip	2	11Aug_walked transect
11/08/2008	22:15	Ppgy	2	11Aug_walked transect
11/08/2008	22:16	Ppip	1	11Aug_walked transect
11/08/2008	22:17	Ppgy	1	11Aug_walked transect
11/08/2008	22:19	Nnoc	1	11Aug_walked transect
11/08/2008	22:20	Ppip	1	11Aug_walked transect
11/08/2008	22:23	Ppgy	3	11Aug_walked transect

Night	Time	Label	Number	
11/08/2008	22:23	Ppip	1	11Aug_walked transect
11/08/2008	22:24	Ppgy	1	11Aug_walked transect
11/08/2008	22:26	Ppip	4	11Aug_walked transect
11/08/2008	22:27	Ppgy	2	11Aug_walked transect
11/08/2008	22:27	Ppgy	1	11Aug_walked transect
11/08/2008	22:29	Ppip	3	11Aug_walked transect
11/08/2008	22:30	Ppgy	1	11Aug_walked transect
11/08/2008	22:32	Ppip	1	11Aug_walked transect
11/08/2008	22:34	Ppgy	4	11Aug_walked transect
11/08/2008	22:35	Ppip	1	11Aug_walked transect
11/08/2008	22:35	Ppgy	1	11Aug_walked transect
11/08/2008	22:37	Bbarb	2	11Aug_walked transect
11/08/2008	22:43	Psp	1	11Aug_walked transect
11/08/2008	22:43	Ppip	3	11Aug_walked transect
11/08/2008	22:44	Ppip	4	11Aug_walked transect
11/08/2008	22:48	myotis	1	11Aug_walked transect
11/08/2008	22:49	myotis	1	11Aug_walked transect
11/08/2008	22:50	Psp	1	11Aug_walked transect
11/08/2008	22:50	Ppgy	1	11Aug_walked transect
11/08/2008	22:51	Psp	1	11Aug_walked transect
11/08/2008	22:51	Ppip	1	11Aug_walked transect

Appendix C
Results from the 2007 Bat Activity Surveys

Date	No. of sound files	No. of species	Common pipistrelle	Soprano pipistrelle	Noctule	Serotine	Leisler's bat	*Myotis* species	Whiskered/ Brandt's bat	Natterer's bat	Long-eared bat	Barbastelle
7 June 07	131	8	49	68	2	2	0	1	0	2	3	3
6 July 07*	187	8	45	79	2	13	0	5	0	5	7	7
16 Aug 07	203	7	74	110	2	4	1	1	0	0	1	0
28 Aug 07	174	7	76	74	1	8	0	1	2	0	0	3
12 Sept 07	120	5	43	56	3	7	0	1	0	0	0	0