



The Sizewell C Project

6.3 Volume 2 Main Development Site Chapter 14 Terrestrial Ecology and Ornithology Appendix 14A9 Terrestrial Mammals

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SIZEWELL C DEVELOPMENT – MAIN DEVELOPMENT SITE: VOLUME 2, CHAPTER 14: ANNEX 14A9 – TERRESTRIAL MAMMALS

Documents included within this Appendix are as follows:

- Appendix 14A9 Terrestrial Mammals
- Annex 14A9.1 Figures (provided separately)
- Annex 14A9.2 Desk Study
- Annex 14A9.3 Secondary Data
 - Annex 14A9.3 Phase 1 Consolidated Report
 - Annex 14A9.3 Consolidated Badger Report 2012 [CONFIDENTIAL, provided separately]
 - Annex 14A9.3 Otter Consolidated Report
 - Annex 14A9.3 Water Vole Report
 - Annex 14A9.3 Sizewell Water Vole Report
 - Annex 14A9.3 Aldhurst Farm Water Vole 2010
- Annex 14A9.4 Primary Data
 - Annex 14A9.4 Primary Data [CONFIDENTIAL, provided separately]
 - Annex 14A9.4 Sizewell C Sandpits Technical Note [CONFIDENTIAL, provided separately]
 - Annex14A9.4 Otter Survey Report Oct 2013
 - Annex14A9.4 Sizewell C Aldhurst Farm Water Vole Survey Report

NOTE:

Please note that the red line boundary used in figures within this document may have since been amended, and therefore does not reflect the boundaries in respect of which development consent has been sought in this application. However, the amendment to the red line boundary does not have any impact on the findings set out in this document and all other information remains correct.

VOLUME 2, CHAPTER 14: APPENDIX 14A9 – TERRESTRIAL MAMMALS

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Plates

None provided.

Figures

Note: The plans for this report have been produced at different times and may display older (superseded) versions of the construction site boundary. As other changes, may arise, all plans will be revised shortly prior to publication rather than individually.

Figure 14A9.1: **Restricted Data:** Locations of badger setts from Wood Group surveys (2007–2011).

Figure 14A9.2: Wood Group otter survey results (2007–2010).

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Executive Summary

This appendix assesses the baseline conditions for the following terrestrial mammal species: badger (*Meles meles*); otter (*Lutra lutra*); water vole (*Arvicola terrestris*); brown hare (*Lepus europaeus*); Western European hedgehog (hereafter referred to as hedgehog) (*Erinaceus europaeus*); harvest mouse (*Micromys minutus*); polecat (*Mustela putorius*); shrews; voles; mice; and deer species, within the Zone of Influence (ZOI) of the Sizewell C power station at the main development site (hereafter referred to as the “proposed development”). Bats are addressed separately in **Appendix 14A8** of this volume – Bats.

The majority of mammal species listed above receive protection under the various schedule of the Wildlife and Countryside Act (Ref. 1.1) and are listed within Section 41 of the Natural Environment and Rural Communities (NERC) Act (Ref. 1.2). In addition to this, badgers are protected under the Protection of Badgers Act (Ref. 1.3) and otter is a European Protected Species on Schedule 2 of the Conservation of Habitats and Species Regulations (Ref. 1.4).

Brown hare, harvest mouse, hedgehog, otter, polecat, water vole and water shrew (*Neomys fodiens*) are all Suffolk Biodiversity Action Plan (BAP) (Ref. 1.5) priority species.

Desk-study data from the Suffolk Biodiversity Information Service was obtained for notable species of conservation concern within 2 kilometre (km) of the proposed development site (hereafter referred to as the “site”). All terrestrial mammals discussed in this appendix were found within the site boundary.

Mammal surveys carried out by Suffolk Wildlife Trust (SWT), Wood Group (formerly Entec and Amec Foster Wheeler) and Arcadis Consulting (UK) Limited (formerly Hyder Consulting, and hereafter referred to as Arcadis) have identified a number of receptors. There are two badger social groups within the site boundary. Otter is present within Sizewell Marshes Site of Special Scientific Interest (SSSI), with a year-round presence, and has bred in the vicinity. Water vole is present in the Sizewell Marshes SSSI, and this forms one of 15 National Key Sites for water voles. A second National Key Site is present at Minsmere, and water voles potentially move between the two sites via the Leiston drain. Hedgehog, brown hare and harvest mouse have all been recorded on the EDF Energy Estate, along with seven other species of small mammal (vole, mice and shrew). A single polecat record exists for 2018. Red deer (*Cervus elaphus*) and muntjac (*Muntiacus reevesi*) are regularly seen across the EDF Energy Estate, with occasional sightings of Chinese water deer (*Hydropotes inermis*) and fallow deer (*Dama dama*).

To ensure a robust Ecological Impact Assessment (EclA) process, mammal populations within the ZOI of the proposed development have been assessed to determine whether or not they would qualify as Important Ecological Features (IEFs) as defined in Chartered Institute of Ecology and Environmental Management (CIEEM) guidelines on EclA (Ref. 1.6). In addition, the mammal populations have been assessed in accordance with the standard Environmental Impact Assessment (EIA) methodology used elsewhere within the **Environmental Statement (ES)** (Doc Ref. Book 6).

On the basis of this assessment, the populations of mammals within the ZOI of the proposed development have been identified as IEFs:

- water vole is considered to be an IEF at the national level under the CIEEM guidelines (Ref. 1.6); and of high importance following the EIA-specific assessment methodology;
- otter is considered to be an IEF at the county level under the CIEEM guidelines (Ref. 1.6); and of medium importance following the EIA-specific assessment methodology; and
- badger has been assessed as important only at the local level under the CIEEM guidelines (Ref. 1.6) and are of low importance following the EIA-specific assessment methodology; however, owing to the legal protection afforded to badgers and their setts, the badger population within the ZOI is nevertheless considered to be an IEF.

1. Terrestrial Mammals Baseline

1.1 Introduction

a) Purpose of this appendix

1.1.1 This is an appendix to the Sizewell C power station at the main development site (referred to throughout this volume as the “proposed development”) **Volume 2, Chapter 14** of the **ES** (Doc. Ref. 6.2). This appendix presents a description of the mammal baseline for the proposed development site (hereafter referred to as the “site”) and its ZOI. This excludes bat species, which are discussed separately in **Appendix 14A8** of this volume – Bats, and marine mammals (seals, whales and dolphins) which are considered within the **Volume 2, Chapter 22** of the **ES** - Marine Ecology.

b) Establishing Zone of Influence, study area and survey area

1.1.2 For terrestrial species, the ZOI and survey area are defined as the site boundary. The study area is defined as 2km from the site boundary.

1.1.3 The site supports a range of mammal species. For the purposes of this study, only those terrestrial mammal species that are legally protected or are of nature conservation concern are considered for assessment in this report. This includes: badger (*Meles meles*); otter (*Lutra lutra*); water vole (*Arvicola amphibius*); brown hare (*Lepus europaeus*); Western European hedgehog (hereafter referred to as hedgehog) (*Erinaceus europaeus*); harvest mouse (*Micromys minutus*); and polecat (*Mustela putorius*). Survey information regarding shrews, voles, mice and deer species are included for information only and they are not regarded as IEFs.

c) Structure of this appendix

1.1.4 This appendix has been set out as follows:

- **Section 1.2** of this chapter sets out the approach and methodology used for obtaining the desk-study data and secondary data, as well as the results of this data acquisition. The detail of the desk-study information acquired is presented in **Annex 14A9.2**, whilst the secondary data reports are presented in **Annex 14A9.3**.
- **Section 1.3** of this chapter first sets out the approach and methodology for obtaining the primary data, as well as the results of this survey work. The detailed data underpinning these results are presented in **Annex 14A9.4**.

- Finally, **section 1.4** of this chapter brings together all of this information into a detailed consideration of the baseline conditions for amphibians within the ZOI of the proposed development and identifies those IEFs (whether as individual species or assemblages) to be taken forward to be considered and assessed with the EclA.

1.1.5 Figures summarising the ecological baseline with regard to other mammals are presented in **Annex 14A9.1** – Figures.

1.2 Desk-study/secondary data

a) Approach and methodology

i. Desk-study

1.2.1 Records for terrestrial mammals were requested from Suffolk Biodiversity Information Service in 2014 and 2018 for protected or otherwise notable species of conservation concern within 2km of the site boundary. Citations for all designated sites within 2km of the site were reviewed to ascertain whether or not other mammals are cited as interest features. The BAP (Ref. 1.5), Suffolk’s Priority Species and Habitats list (Ref. 1.7), and the habitats and species of principal importance included on the Section 41 list of the NERC Act (Ref. 1.2), were also reviewed with reference to any other mammals present, or likely to be present, within the site and the wider study area.

ii. Secondary data

Wood Group

1.2.2 Wood Group (formerly Entec and Amec Foster Wheeler) carried out targeted surveys for terrestrial mammal species within the site. The detailed methodology, timings and results of these surveys are presented in the Wood Group reports as seen in **Annex 14A9.3**. Surveys were carried out for badger, otter and water vole, for which further detail is provided below.

Badger

1.2.3 A walkover survey of the site was undertaken in November 2007, and again in January 2008. A further walkover of the site specifically targeting evidence of badgers was undertaken in January 2011. During these surveys, any evidence of badgers (setts, hairs, footprints, evidence of foraging, latrines and paths) was recorded; full methodologies are given in Wood Group (2012) (Ref. 1.8).

- 1.2.4 Bait-marking, using the method recommended by Delahay *et al.* (Ref. 1.9), was undertaken in March 2011 to establish the extent of badger territories across the EDF Energy Estate, and the boundaries between different social groups.

Otter

- 1.2.5 A walkover survey of the site was undertaken on 4 and 5 October 2007. Suitable habitat was assessed for potential to support otter, and searched for field signs including spraints, footprints, feeding remains, potential holt sites, pathways and resting sites.

- 1.2.6 A more extensive survey programme (Wood Group, 2012) (Ref. 1.10) was undertaken during 2009 and 2010 to understand the presence of otters in the local area, within Sizewell Marshes SSSI, and the extent of habitat connectivity to the wider area. An initial reconnaissance survey was undertaken, which covered a significant proportion of all the drainage channels and water bodies within the 2007 survey area. This identified 33 potential spraint locations, which were then surveyed monthly between December 2009 and November 2010 for any sightings or field signs.

Water vole

- 1.2.7 A walkover survey of the site was undertaken in October 2007, in conjunction with the surveys for otter. Twenty potentially suitable ditches were surveyed. Suitable terrestrial and aquatic habitat along these ditches were assessed for potential to support water vole and searched for field signs including a search of the bankside vegetation (where conditions were suitable) for latrines/droppings, feeding stations, burrows and footprints.
- 1.2.8 Further water vole surveys of 16 ditches, using the same methodology as in 2007, were carried out in 2009, aimed at obtaining a better understanding of how water voles use the habitats across the EDF Energy Estate and to establish a generalised population assessment.
- 1.2.9 Additionally, five transects (approximately 500m in length) were surveyed within the reedbeds in the Sizewell Marshes SSSI. Artificial latrines were installed at a density of one every 10m; these were left in place undisturbed for two to three weeks prior to the surveys. Each reedbed transect was surveyed twice in 2009, between 20 to 21 August 2009, and again between 13 and 14 October 2009. Any field signs of water vole were recorded.
- 1.2.10 In 2010, Wood Group (Ref. 1.11) surveyed all watercourses at Aldhurst Farm, using five transects, to identify evidence of water vole activity using the same survey methodology.

Other secondary data

- 1.2.11 A number of surveys were carried out by SWT, for on behalf of NGL, and a summary provided within their annual Sizewell Land Management Reports (1996 - 2018) (Ref. 1.12).
- 1.2.12 Monitoring of badgers from 1996 onwards across the EDF Energy Estate has been carried out by SWT/Agricultural Development and Advisory Service, together with collation of incidental and anecdotal records, as recorded in the NGL Sizewell Land Management Reports. Badger surveys were also undertaken in 1991 by Bioscan (cited in Ref. 1.9). A field survey was also undertaken by Cresswell Associates in 2005 as part of the **ES** for the decommissioning of Sizewell A power station (cited in Ref. 1.9).
- 1.2.13 SWT have collected *ad hoc* records of otter sightings and field signs (spraint and footprints), as recorded in the NGL Sizewell Land Management Reports (Ref. 1.12). As part of monitoring surveys of Sizewell (a National Key Site for water voles as described in Bright and Carter (Ref. 1.13), see below) and the adjacent EDF Energy Estate by Royal Holloway College, incidental field signs of otters were also recorded. The Royal Society for the Protection of Birds (RSPB) staff at Minsmere also record incidental otter sightings/field signs.
- 1.2.14 As part of the National Key Sites Monitoring Programme initiative (Ref. 1.13), 12 transects within the EDF Energy Estate are monitored annually for water voles for the Sizewell National Key Site, and 24 transects are also monitored by the RSPB at the Minsmere National Key Site, to the north of the Sizewell Key Site. The Sizewell surveys were carried out in the spring and autumn up to 2009, in the autumn between 2010 and 2014 inclusively, and then from the spring from 2015 onwards. Positive sightings of water vole signs were recorded, and the results presented as the percent of the 12 or 24 transects surveyed each time that showed positive signs. The data is published in the NGL Sizewell Land Management Reports (Ref. 1.12). RSPB (*pers. comm.*) provided the Minsmere survey results.
- 1.2.15 SWT have recorded incidental sighting and signs of other mammals and carried out targeted surveys of the reedbeds for harvest mice in 2010 (Ref. 1.14).
- 1.2.16 Deer numbers are monitored on the EDF Energy Estate.

b) Results

i. Desk-study

- 1.2.17 No statutory sites were identified citing mammal species as qualifying features. The citation for a single non-statutory site, the Minsmere Valley (Eastbridge to Reckford) county wildlife site, identifies that otters use the Minsmere Valley. This county wildlife site has been incorporated into the Minsmere to Walberswick Heaths and Marshes SSSI. Full details on the sites present, and their reasons for designation, are provided in **Appendix 14A2** of this volume – Designated Sites.
- 1.2.18 The desk-study revealed a large number of mammal records within 2km of the site, dated from 1994 to 2017. Species recorded included badger, otter, hedgehog, brown hare, water vole, and harvest mouse. The full results of the desk-study presented in **Annex 14A9.2**.
- 1.2.19 The desk-study identified a single record for badger within the EDF Energy Estate, in the field to the north of Ash Wood. An additional twelve records of badger were identified within 2km of the EDF Energy Estate boundaries. Six of these records were to the north of the EDF Energy Estate (Theberton, between Theberton and Eastbridge, and three north of the Minsmere New Cut), three close to Leiston on the west side, and three to the south towards Thorpeness.
- 1.2.20 Five otter records were identified during the desk-study within the EDF Energy Estate. One of these records was situated on Leiston drain, east of Goose Hill (dated 2008), which is adjacent to the northern boundary of the site. One record was adjacent to the Sizewell B power station (dated 2012). One record was by Sandy Lane, and two records were by Lovers Lane. A further 27 records were identified within 2km of the EDF Energy Estate; at least 20 of these records were from the RSPB Minsmere Reserve.
- 1.2.21 Seventeen water vole records were identified from the desk-study within the EDF Energy Estate; all records were within the wetland habitat present within Sizewell Marshes SSSI. A further 19 records were identified within 2km of the EDF Energy Estate boundary. These were predominantly to the north of the EDF Energy Estate, with eight of these records being in the Minsmere and Eastbridge areas.
- 1.2.22 Nine records of brown hare were found within 2km of the site boundary. Two of these records were within Sizewell Marshes SSSI. The remaining records were to the north (Minsmere, Middleton and Lower Abbey Farm), and south (Thorpeness and south of Sizewell village) of the site boundary.

- 1.2.23 Eleven hedgehog records were identified from the desk-study as being within 2km of the EDF Energy Estate. A number of these were either within or in close proximity to the site boundary, including at Upper Abbey Farm (dated 1995), Sizewell Beach (dated 1996), Common Farm on Leiston Common (dated 1997), and a dead individual found on the Sizewell A and B power station access road in 2009.
- 1.2.24 Twelve records of harvest mouse were found within 2km of the site boundary. Three of these records were within the EDF Energy Estate, two on the Sizewell Marshes SSSI (dating from 1994 and 1996) and one within Reckham Pits Wood, near Leiston Common (1994). The remaining records were all north of the EDF Energy Estate, being in Theberton, Eastbridge and Minsmere (dating from 1998-2010).
- 1.2.25 The desk-study did not identify any hazel dormouse (*Muscardinus avellanarius*) or red squirrel (*Sciurus vulgaris*) records within 2km of the EDF Energy Estate.
- 1.2.26 Polecat was considered extinct in Suffolk for the last 100 or so years, until records from 2010 onwards indicated recolonization from the west and there was a record from the EDF Energy Estate in 2018 (D. West, *pers. comm.*).
- 1.2.27 The legal protection/conservation status of other mammals considered in this appendix are listed in **Table 14.1**. Deer are not protected under any of the instruments listed in **Table 14.1** but are discussed within this appendix as they are present within the site.

Table 14.1: Summary of protected status of terrestrial mammal species considered for assessment.

Mammal Species.	Protected Status in England.				Priority (Suffolk BAP) Species.
	CHSR 2010 ¹ .	W&CA 1981 ² .	NERC Act 2006 ³ .	Other.	
Badger	x	Schedule 6.	x	Protection of Badgers Act (1992).	x
Otter	√ Schedule 2.	Schedule 5 and Schedule 6.	√	x	√
Water vole.	x	Schedule 5.	√	x	√
Brown hare.	x	x	√	x	√
Hedgehog.	x	Schedule 6.	√	x	√
Harvest mouse.	x	x	√	x	√

NOT PROTECTIVELY MARKED

Mammal Species.	Protected Status in England.				Priority (Suffolk BAP) Species.
	CHSR 2010 ¹ .	W&CA 1981 ² .	NERC Act 2006 ³ .	Other.	
Polecat.	Schedule 4.	Schedule 6.	√		√
Shrews:		Schedule 6.			
Common shrew (<i>Sorex araneus</i>).	x		x	x	x
Pygmy shrew (<i>Sorex minutus</i>).	x		x	x	x
Water shrew (<i>Neomys fodiens</i>).	x		x	x	√

¹ Conservation of Habitats and Species Regulations 2017 (Ref. 1.4): Schedule 2 are European Protected Species (EPS); Schedule 4 relates to the prohibition of certain methods of capturing or killing wild animals.

² Wildlife and Countryside Act (W&CA) (Ref. 1.1). Schedule 5 lists species protected from intentional killing, injuring or taking. Schedule 6 lists species that are protected from being killed or taken by certain methods.

³ Natural Environment and Rural Communities Act (Ref. 1.2).

ii. Secondary data

Wood Group

Badger

1.2.28 In 2007 to 2008, badger activity was found within Ash Wood. A number of setts were identified, with a total of 17 active entrances found within Ash Wood. There was also evidence of badger foraging activity in the fields to the east and west of Ash Wood. The 2011 walkover surveys identified a total of six clusters of badger activity widespread across the site.

1.2.29 A more detailed bait-marking survey (Ref. 1.8), incorporating four of the six clusters of activity identified in 2011, revealed two active badger social groups on the EDF Energy Estate, these being the Ash Wood and Goose Hill groups. The Goose Hill group was considered to be a consolidation of the Grove Wood and Sandlings Walk groups, formerly thought to be separate. The status of a third group, the Upper Abbey group, was not clear as bait was not taken during the surveys and no latrines were found. The social groups studied occupied 11 setts within the survey area at the time of the survey. The mean territory size between the two active social groups was 65ha. Detailed findings of the bait-marking survey, along with locations of setts surveyed between 2007–2011, are summarised in **Table 14.2** and shown in **Figure 14A9.1**.

Table 14.2: Summary of badger social groups from bait-marking in the EDF Energy Estate (Ref.1.8).

Location of Badger Activity Clusters.	Description
Ash Wood.	Seven setts, comprising one main sett (AW/M1), one subsidiary (AW/S1) and five outlier setts (AW/01-05), within Ash Wood. A total of 23 holes were identified, ten of which were part of the main sett. The number and extent of setts within the woodland suggests that this is an established social group, which has expanded in number over time throughout the woodland and the wider area. The social group had a territory of 79ha.
Goose Hill.	Four recorded setts, consisting one main (GW/M1), one subsidiary (SW/M1) and one annexe sett (GW/A1); GW/01 is an outlier. Formerly thought to be the separate Grove Wood and Sandlings Walk groups. The setts are found in sandy banked disused borrow pits. The social group had a territory of 48ha.
Upper Abbey.	Three setts, comprising one main (UA/M1 and two outlier setts (UA/01 and UA/02)). These appeared to be inactive during the bait-marking study.
Reckham Pits Wood.	A well-used main sett (RP/M1), with seven entrance holes, and showing many signs of recent activity. Well-used runs recorded leading out of the woodland across Sandy Lane, and into pasture fields to the south of the wood. Not surveyed in the bait-marking study.
Coronation Wood.	Three recorded setts, including a main sett (CW/M1) with four holes, an annexe sett (CW/A1) with four holes, and a subsidiary/outlier sett (CW/O1) with a single hole. Well-used runs were recorded following the edge of the drainage ditch, crossing the ditch, and heading into the improved pasture fields to the west. Not surveyed in the bait-marking study.

Otter

1.2.30 The 2007 walkover survey found that otter signs were widely distributed across the survey area. The 2009 to 2010 surveys for field signs recorded spraint at 32 of the 33 monitored potential spraint locations, with various other field signs recorded across the survey area. These included couches (above-ground resting places) found in Sizewell Marshes SSSI, feeding remains, and a well-used slide close to the Minsmere Sluice. Three otter sightings were recorded during the course of these surveys: one within Sizewell Marshes SSSI of two otters on 25 May 2010 (thought to have been an adult female and an approximately one-year-old youngster); and a single large male otter on 9 March 2011 at the edge of Goodrums Fen. **Figure 14A9.2** summarises Wood Group otter sightings and survey results.

Water vole

1.2.31 Summary information on Wood Group water vole surveys is found in Wood Group (2012) (Ref. 1.15). **Figure 14A9.3** summarises Wood Group water vole sightings and survey results for the site.

- 1.2.32 Nineteen of the twenty ditches surveyed in 2007 were found to contain field evidence of water vole activity. Burrows were identified on three of the ditches; these were widely distributed across Sizewell Marshes SSSI. Evidence of water vole activity was found in 14 of 16 ditches surveyed in 2009. A high density of field signs were found in four of these ditches. Water vole field signs were found on all of the five reedbed transect routes surveyed in 2009. All field signs were found in close proximity to ditches or other areas of open water, indicating that water voles were not active within the drier areas of reedbed, but restricted to the wetter margins.
- 1.2.33 The average population size for the ditches surveyed in 2009 was estimated by Wood Group at 8.1 individual voles per 100m ditch, based on latrine counts within the breeding season. The density was, however, found to vary significantly, being dependent on the quality of the surrounding habitat. In the lowest quality habitat, with little aquatic or emergent vegetation, this was estimated at only 3.5 individuals per 100m ditch, rising to 17.1 individuals per 100m for optimal habitat. Jefferies (Ref. 1.16) suggest that only 36% of the calculated population represents breeding adults, which in the current sample of the EDF Energy Estate equates to an average adult density of 2.9 water voles per 100m of bank.
- 1.2.34 Four out of five sections of ditches surveyed at Aldhurst farm provided suitable aquatic habitat for water voles and yielded field signs for water voles (Ref. 1.17).

Other secondary data

- 1.2.35 Mammal sightings and survey data from the EDF Energy Estate from the NGL Sizewell Land Management Reports (Ref. **Error! Reference source not found.**) are summarised below and given in more detail in in **Annex 14A9.3 (vii)**.

Badger

- 1.2.36 SWT/Agricultural Development and Advisory Service surveys and a collation of incidental and anecdotal records have revealed the presence of badgers across on the EDF Energy Estate. A large, active sett was known to be present in Ash Wood. A second large sett was found on the north side of the central ride in Kenton Hills. These are likely to correspond to the Ash Wood and Goose Hill groups (see above). Cresswell Associates in 2005, as part of the **ES** for the decommissioning of Sizewell A power station, (cited in Ref. 1.8) identified two main setts to the south-west of the decommissioned Sizewell A power station, and two outlier setts to the western side of the Sizewell A power station.

Otter

- 1.2.37 Although not sighted on the EDF Energy Estate every year by SWT, otter field signs including spraint and footprints are regularly found, indicating a year-round presence. A 2001 sighting of an adult with cubs suggesting breeding in the vicinity. The Lower Abbey Farm Marshes had particularly high otter activity in 1997, with spraint and tracks found regularly all year round. Otter activity was also reported on Sizewell Marshes SSSI in 1997, 2000, and each year between 2006 to 2014. Otter field signs recorded during the water vole National Key Site monitoring surveys indicate that otter activity is focused within Sizewell Marshes SSSI. Otter are also common on the RSPB Minsmere Reserve to the north, with numerous recent sightings throughout 2019 and into 2020 (recent social media postings on Twitter via @RSPBMinsmere).

Water vole

- 1.2.38 Locations of survey transects for the National Key Sites Monitoring Programme are shown in **Figure 14A9.3**.
- 1.2.39 A review of the NGL Sizewell Land Management Reports from 2001-2018 (Ref. 1.12) demonstrated (from the National Key Sites Monitoring Programme survey data) that from the 12 Sizewell transects monitored annually there was an overall steady population which showed the typical level of cyclical population changes found in all vole species when in a stable environment with no American mink (*Neovison vison*) predation (see **Table 14.3** and **Figure 14A9.4**). The Sizewell survey area has been described as “one of the best sites in Suffolk for these animals” (Ref. 1.12).
- 1.2.40 Results for the 24 transects monitored at the Minsmere National Key Sites Monitoring Programme show that water vole are widely distributed across the Minsmere site. Survey results (RSPB, *pers. comm.*) for autumn transects are shown in **Table 14.3** and **Figure 14A9.4**.
- 1.2.41 The Sizewell Land Management Reports (Ref. 1.12) indicate that water vole activity was evident within Sizewell Marshes SSSI in all years and no change in status is indicated since earlier surveys.

Polecat

- 1.2.42 A polecat record was reported south-west of the EDF Energy Estate in 2018 (D. West, *pers. comm.*), adjacent to Lover’s Lane.

Brown hare

- 1.2.43 No regular monitoring of brown hare has been reported by SWT, but there were sightings throughout the year in 2008 when a minimum of two animals were recorded on all monthly farmland bird counts; and in 2012 and 2013 with hares recorded on all the monthly farmland bird counts. In 2014, only one individual was seen in the Retsom's Field area. None were seen on the EDF Energy Estate in 2015, although a small number were regularly observed on the main platform grassland (Ref.1.12). However, by 2018 brown hare were reported as “*pretty much lost from the bulk of the [EDF Energy] Estate lands*” (SWT, *pers. comm.*). Possible causes for this decline include land management changes and indiscriminate shooting (SWT, *pers. comm.*).

Other mammals

- 1.2.44 Although American mink have been found in the vicinity of the EDF Energy Estate, with reports in the 1999-2000 Sizewell Land Management Reports (Ref. 1.12), and an individual found killed on the road near the Sizewell A and B power station entrance in February 2004, they have failed to become established, largely owing to active mink control from SWT.
- 1.2.45 Water shrew (*Neomys fodiens*) are known to be present on the EDF Energy Estate, as both live animals and corpses have been found regularly (Ref. 1.13). Scat analysis from bait tubes carried out by Otley College students indicated a relationship between tall vegetation and water shrews and found this species to be present within Sizewell Marshes SSSI.
- 1.2.46 Harvest mice have been recorded and nests have been found occasionally within the reedbeds, with one found in 2009 and one in 2011. A survey of the reedbeds in 2010 failed to record any nests (Ref. 1.14).
- 1.2.47 Red deer (*Cervus elaphus*) and muntjac (*Muntiacus reevesi*) have been regularly seen across the EDF Energy Estate, with occasional sightings of Chinese water deer (*Hydropotes inermis*) and fallow deer (*Dama dama*). Red deer may have become residential (rather than seasonal visitors) from 2001 to 2002 (Ref. 1.18 and they are known to use multiple habitats, including the plantation woodland, Sizewell Marshes SSSI, and surrounding arable fields.
- 1.2.48 Red deer and muntjac were described as “*common*” on the EDF Energy Estate in 2007 (Ref. 1.18 and are frequently seen to 2019 at least.

Table 14.3: National Key Sites Monitoring Programme survey results (% +ve presence in transect) for the Sizewell and Minsmere site showing transect survey results for water voles for 2001 to 2014 (RSPB, pers. comm.).

Year	Sizewell National Key Sites Monitoring Programme.		Minsmere National Key Sites Monitoring Programme.	
	Spring	Autumn	Spring	Autumn
2001	75	67	-	83
2002	100	100	80	88
2003	67	67	-	96
2004	92	67	100	-
2005	100	100	100	96
2006	92	58	85	81
2007	83	50	80	70
2008	50	50	44	56
2009	67	75	85	78
2010	-	83	-	100
2011	-	67	-	95
2012	-	67	-	86
2013	-	67	-	91
2014	-	50	-	95
2015	50	-	-	-
2016	67	-	90	90
2017	75	-	100	-
2018	67	-	60	-
2019	58	-	90	-

1.3 Field surveys – primary data

a) Approach and methodology

1.3.1 Further surveys have been carried out by Arcadis Consulting (UK) Limited (formerly Hyder Consulting, and hereafter referred to as Arcadis) both to update any Wood Group data (where ecologically appropriate; for example, badger social group territories may change over time). Updated badger sett and bait-marking surveys were carried out on the EDF Energy Estate by Arcadis in 2015, and in Coronation Wood in 2019. Transect surveys within Aldhurst Farm and Sizewell Marshes SSSI were undertaken in 2013, looking for otter holts and lying-up sites, and any incidental observations of water vole signs. Water vole surveys were undertaken in 2019 of the ditches within 250m of the proposed Sizewell B relocated facilities site close to Coronation Wood. Small mammal surveys were conducted in 2015 as part of the Reptile Mitigation Plan (Ref. 1.19, to monitor reptile prey availability at the proposed reptile receptor sites and have been included here to inform the other mammal baseline. Incidental observations of other mammal species were recorded during other field surveys by Arcadis.

b) Methods

i. Badger surveys

Badger sett survey

1.3.2 Surveys were carried out in January and February 2015 of all habitats with potential to support a badger sett and of any habitat within the ZOI that might support badgers as seen in **Figure 14A9.5**. In addition, an area of woodland outside of the site boundary in Reckham Pits Wood was surveyed to confirm the status of a previously identified badger sett.

1.3.3 The study area was investigated for its use by badgers by searching for the characteristic signs of badger activity including setts, latrines, paths, footprints, hairs, and feeding signs.

1.3.4 A walkover of the proposed Sizewell B relocated facilities development site was conducted in March 2019 and again in July/August 2019, to determine the status of previously identified setts within and adjacent to Coronation Wood, and to confirm if any new badger setts had become established. This walkover also included a survey of a 30m buffer zone around the proposed Sizewell B relocated facilities development boundary, where access was possible, and use of trail cameras to monitor activity during July and early August 2019 at sett 1.

1.3.5 A walkover of two sandpits within the site boundary was undertaken in August 2019 to determine the status of a previously identified sett (Sett 4) and to confirm if any new badger setts had become established (Ref.1.20). This included surveying of a 30m buffer zone around the sandpits where access allowed.

Badger bait-marking

1.3.6 As a result of the 2015 surveys, five potential main or large subsidiary setts were identified as seen in **Figure 14A9.5**, and a bait-marking survey, following methodology described in Delahay *et al.*(Ref. 1.9), was carried out to confirm the status of these setts and to attempt to determine territorial boundaries.

1.3.7 The dates that bait was placed at each sett and the colour of pellets used in bait at each sett is summarised in **Table 14.4**.

Table 14.4: Bait placement at setts during 2015 survey.

Date Bait Put Out.	Colour of Bait Pellets.				
	Sett 1.	Sett 2.	Sett 3.	Sett 4.	Sett 5.
24/02/2015	Orange	White	Green	Red	--
25/02/2015	Orange	White	Green	Red	--
03/03/2015	Orange	White	Green	Red	Blue
04/03/2015	Orange	White	Green	Red	Blue
09/03/2015	Orange	White	Green	Red	Blue
10/03/2015	Orange	White	Green	Red	Blue
25/03/2015	Orange	White	Green	Red	Blue
26/03/2015	Orange	White	--	Red	Blue
30/03/2015	Orange	White	Green	Red	Blue
31/03/2015	Orange	White	Green	Red	Blue
14/04/2015	Orange	White	Green	Red	Blue
15/04/2015	Orange	White	Green	Red	Blue

1.3.8 Any dung pits or latrines associated with the five marked setts, and any latrines identified during the initial badger survey, were systematically searched for the presence of coloured marker pellets on the day following bait placement, between 3 March and 3 June 2015.

NOT PROTECTIVELY MARKED

ii. Otter and water vole surveys

1.3.9 Transect surveys of the reedbeds and ditches within Goodrums Fen and a 200m radius, and within Aldhurst Farm, were undertaken between 9 and 11 October 2013, looking for otter holts and lying-up sites, and any incidental observations of water vole signs (Ref. 1.21 following standard methodologies (Ref. 1.22)).

1.3.10 Five ditches at Aldhurst Farm were surveyed in April 2014 for all evidence of water vole activity.

1.3.11 In 2019, six watercourses to the south of Coronation Wood were assessed for their suitability for water voles, and surveys were carried out in July and September for signs of water vole activity.

iii. Small mammals

1.3.12 As part of the studies for reptile prey availability, Longworth traps were placed at a number of locations within the EDF Energy Estate.

iv. Other mammals

1.3.13 Incidental observations of other mammal species were recorded during other field surveys by Arcadis.

c) Results

i. Otter and water vole surveys

1.3.14 No otter holts or field signs were recorded during the surveys of Goodrums Fen or Aldhurst Farm.

1.3.15 No incidental observations of water vole signs were recorded during the surveys of Goodrums Fen. Three ditches at Aldhurst Farm showed signs of water vole activity and were found to have good habitat suitability for water voles.

1.3.16 In 2019, only one of the six watercourses south of Coronation Wood was considered suitable for water voles. No burrows were identified within 100m of the site boundary, and only one water vole latrine was identified. This was recorded approximately 57m west of the site boundary, on the same watercourse (11) where Wood Group carried out surveys in 2009 as seen in **Figure 14A9.3**.

ii. Badger surveys

Badger sett survey

- 1.3.17 Fourteen active badger setts were identified in 2015 within the survey area as seen in **Figure 14A9.5** and **Table 14.5**. Definitions for sett types follow Natural England (Ref. 1.23). A further 21 inactive or long-disused setts were identified during the survey; these entrances showed no evidence of current or recent use by badgers, and as such are not currently considered to represent a licensable constraint.
- 1.3.18 In 2019, a total of 18 badger setts were confirmed (including the 14 identified in 2015) as seen in **Figure 14A9.5** and **Table 14.5**.
- 1.3.19 Full survey results are presented in and **Annex 14A9.4**.

Table 14.5: 2015 and 2019 badger sett survey results.

Target Note.	Sett Type.	Description of Sett.	Equivalent Wood Group Sett from Wood Group (Ref. 1.8).
1	Subsidiary	Subsidiary badger sett comprising six entrances, located on the lower edge of a wooded slope. This was a well-established and active sett, comprising three well-used and three disused entrances, with a number of partially collapsed and long-disused entrances in the immediate vicinity. Several of the entrances had very large spoil heaps indicating that the sett could have an extensive tunnel system. High levels of badger activity were observed at this sett, including fresh spoil and prints, and a clear bedding trail leading down the slope to the sett. Several individual dung pits and a large latrine comprising six to eight dung pits were identified in the immediate vicinity of this sett. In August 2019, this had one well-used, three partially-used and two disused entrances. Trail camera results 2019 confirmed this was a subsidiary sett, with less evidence of activity than observed in 2015.	CW/M1
2	Subsidiary	Large subsidiary sett complex, comprising at least 12 well-used and 13 partially-used entrances located around the rim of, and within a large pit (50m+ diameter.. Evidence of current and recent badger activity, including fresh spoil, prints and bedding, was identified at two clusters of entrances within this sett complex, but the majority of the entrances showed no evidence of use by badgers and were occupied by foxes or rabbits only. These entrances are distributed in a number of small clusters or setts within the wood, but are likely to function as a single sett complex.	AW/M1
3	Main	Main sett, comprising seven well-used and two partially-used entrances, extending for approximately 30m around the upper edge of a large borrow pit on the southern edge of a large block of mature conifer plantation. The majority of the entrances had very large sandy spoil heaps, indicating that the sett could have an extensive tunnel system. High levels of badger activity were identified at this sett, including fresh spoil, prints and bedding. A number of small dung pits were identified within the immediate vicinity of this sett.	SW/M1

NOT PROTECTIVELY MARKED

Target Note.	Sett Type.	Description of Sett.	Equivalent Wood Group Sett from Wood Group (Ref. 1.8).
4	Main	<p>During the 2015 survey a main sett, comprising nine well-used entrances, ten partially-used entrances and one disused entrance, extending for approximately 20m around the north-eastern edge of a large borrow-pit was recorded. The majority of the entrances had very large and historic spoil heaps, indicating that the tunnel system could extend some distance, and one of the well-used entrances was located 2m out into the adjacent field. Evidence of current and recent badger activity was identified, including fresh spoil, prints and bedding.</p> <p>The 2019 survey confirmed that the sett was still an active main sett, comprising 20 well used entrances, one partially used entrance and one disused entrance. Evidence of current and recent badger activity was recorded including, fresh spoil, prints, bedding and paths.</p>	UA/M1
5	Subsidiary	<p>Large subsidiary sett, comprising seven well-used entrances, two partially-used entrances, four disused entrances and a day nest beneath the root plate of a fallen tree. The entrances are scattered around the edge of a large borrow pit within an area of woodland, and extend over a distance of approximately 75m. The majority of the entrances showed little or no evidence of use, but evidence of current and recent badger activity was identified at three entrances, including fresh spoil, prints and badger hair.</p>	RP/M1
6	Outlier	<p>Outlier sett comprising three well-used entrances, extending for approximately 15m along the eastern edge of a hedge bank. Two of the sett entrances were close together with a third located 15m to the north. The entrances showed evidence of current or recent badger activity, including fresh spoil and badger prints, but evidence of use by foxes was also identified. Subsequent monitoring has shown badger activity at this sett to be sporadic at most.</p>	na
7	Outlier	<p>Outlier sett comprising a single well-used entrance within hedge bank. The entrance showed evidence of current or recent use including badger prints in the spoil, and a well-worn badger path was identified adjacent to this entrance</p>	na
8	Outlier	<p>Outlier sett comprising a single well-used entrance with a medium-sized spoil heap, located within hedge bank. The entrance showed evidence of current or recent use including bedding, and a well-worn badger path was identified adjacent to this entrance</p>	na
9	Outlier	<p>Outlier sett comprising two partially-used entrances located on edge of conifer plantation. Both entrances were partially obscured with twigs and pine cones and showed little evidence of current or recent use by badgers; however, a badger latrine comprising four to five dung pits was identified within several metres of this sett.</p>	GW/A1

NOT PROTECTIVELY MARKED

NOT PROTECTIVELY MARKED

Target Note.	Sett Type.	Description of Sett.	Equivalent Wood Group Sett from Wood Group (Ref. 1.8).
10	Outlier	Outlier sett comprising a single well-used and a single partially-used entrance, located approximately 12m apart at the upper edge of a borrow pit on the southern edge of a large block of mature conifer plantation. Both entrances showed evidence of current or recent use, including badger hair in the partially-used entrance and fresh bedding in the tunnel of the well-used entrance.	na
11	Outlier	Outlier sett comprising a single partially-used entrance located on the southern edge of a large block of mature conifer plantation. The entrance showed evidence of current or recent use, including fresh spoil and badger hair.	na
12	Outlier	Outlier sett comprising a single well-used entrance with a small spoil heap, potentially leading to a larger void beneath a buried concrete slab. An additional opening beneath the slab could be used as an access point by badgers, but showed no evidence of use. This sett is located on the edge of a dense block of conifer thicket within the conifer plantation.	na
13	Outlier	Outlier sett comprising a single well-used entrance located just below the top edge of a steep west-facing embankment. The entrance had a very large sandy spoil heap, containing faint but identifiable badger prints, but appeared to be occupied by rabbits. There was also some evidence of use by fox (fox smell in tunnel)	na
14	Outlier	Outlier sett, comprising a single well-used entrance, located within an area of dense bracken. The entrance had a very large spoil heap (approximately 2.5m diameter), and evidence of current or recent badger activity was identified, including badger hair in the spoil. Evidence of current use by foxes was also identified, including fresh fox prints in the spoil, and a fox was flushed from the bracken within 15m of this sett. In 2019 this outlier sett had two well-used entrances.	CW/A1 / CW/O1
15	Outlier	Outlier sett, with one partially-used entrance with no signs of current occupancy by badgers in August 2019.	na
16	Outlier	Outlier sett with one partially-used entrance with no signs of current occupancy by badgers in August 2019.	na
18	Subsidiary	Subsidiary sett with one well-used, three partially-used and two disused sett entrances in March 2019. Fresh spoil was identified outside the well-used entrance. There was also a latrine located close to the sett with fresh dung.	na

Badger bait marking

1.3.20 The 2015 bait-marking survey suggests that there are two badger social groups within the survey area as seen in **Figure 14A9.6** and **Table 14.6**. This is consistent with results of previous Wood Group surveys carried out in 2011 (Ref. 1.8).

Table 14.6: Bait-marking survey results 2015.

Date Found.	Location	Colour of Pellet Identified.
10/03/2015	Large latrine in ride, east of Ash Wood Cottages.	White/Red/Green.
10/03/2015	Dung pit on edge of track, north of Reckham Pits Wood.	Blue
11/03/2015	Latrine in north-east corner Ash Wood.	Red/White.
25/03/2015	Dung pit at Sett 3, Goose Hill.	Orange
25/03/2015	Dung pit at Sett 2, Ash Wood.	Red
25/03/2015	Dung pit in south-east corner of Ash Wood.	White
30/03/2015	Dung pit near outlier sett in hedge, south-west Ash Wood.	Red
15/04/2015	Small latrine near Sett 5, Reckham Pits Wood.	Blue/Green.
02/06/2015	Small latrine near Sett 5, Reckham Pits Wood.	Green/Orange.
14/04/2015	Latrine near outlier sett, east of walk barn.	Green
02/06/2015	Dung pit in scrub near track, Goose hill.	Green
02/06/2015	Small latrine by track, Leiston Carr.	Orange
03/06/2015	Dung pit by hedge, north of Kenton hills.	White

1.3.21 In 2015, the Upper Abbey/Ash Wood social group occupied Sett 4, located in the disused borrow pit to the south-east of Upper Abbey Farm, as the main sett, as evidenced by the presence of badger cubs recorded on monitoring equipment (SWT, *pers. comm.*), while the Sett 2 complex in Ash Wood functioned as a subsidiary sett. This social group also sporadically occupied a number of small outlier setts within hedge banks between these two setts.

1.3.22 The Goose Hill/Coronation Wood/Reckham Pits Wood social group occupied Sett 3 (Goose Hill) as the main sett, while using Sett 1 (Coronation Wood), and Sett 5 (Reckham Pits Wood) as subsidiary setts. From the levels of badger activity identified during repeat visits, Sett 3 (Goose Hill) and Sett 1 (Coronation Wood) were more important or more heavily-used than Sett 5 (Reckham Pits Wood), but the latter sett was clearly in regular use by the resident badgers.

iii. Small mammals

1.3.23 During the reptile prey study, seven species of small mammal were caught in the traps at the nine survey sites, namely wood mouse (*Apodemus sylvaticus*), yellow-necked mouse (*Apodemus flavicollis*), field vole (*Microtus agrestis*), bank vole (*Myodes glareolus*), common shrew (*Sorex araneus*), pygmy shrew (*Neomys fodiens*) and water shrew (*Neomys fodiens*). Full survey results are presented in Arcadis (2015) (Ref. 1.19) and **Annex 14A9.4**.

iv. Other mammals

1.3.24 Brown hares were regularly seen across the EDF Energy Estate, including on the main platform, with a maximum of five individuals being recorded on any one occasion.

1.3.25 Red deer and muntjac have been observed across the EDF Energy Estate; field signs, including footprints and droppings, have been regularly seen.

1.4 Baseline conditions – other mammals and their importance

a) Introduction

1.4.1 This section describes the terrestrial mammal baseline and assigns an ecological value to each of the mammals identified. This assessment is then used, in conjunction with a description of the extent and magnitude of the predicted impacts of the scheme, to carry out the detailed EclA presented in **Volume 2, Chapter 14** of the **ES**.

1.4.2 To comply with both the CIEEM Guidelines for EclA (Ref. 1.6) and with the standard EIA methodology used elsewhere within the **ES**, both methodologies have been used to assess the other mammals within the ZOI. Full details of both assessment methodologies are presented in **Volume 1, Chapter 6** and **Appendix 14A1** of the **ES**– Introduction to the Ecological Baseline.

b) Description and assessment of ecological features

i. Feature: badger

Description

1.4.3 The 2015 bait-marking survey by Arcadis was consistent with earlier survey work and confirmed that there are two badger social groups resident within the site and wider study area: the Upper Abbey/Ash Wood social group and the Goose Hill/Coronation Wood/Reckham Pits social group. This is consistent with results of previous surveys carried out by Wood Group in 2011, and suggest the social groups are stable.

1.4.4 Although there is some cattle-grazed pasture, this is typically wet pasture which may reduce earthworm density (earthworms are the main prey items of badgers). The arable fields, conifer plantation and wet woodland is also considered as sub-optimal habitat for badgers.

1.4.5 Territory sizes for badger range from ~30ha to greater than 150ha, and densities in East Anglia are likely to be between 0.3 to 1.2 per km² (Ref. 1.24). Badger is found in lower densities in the Midlands and East Anglia compared to South West England, due to the large wet fenland areas and intensively-managed agricultural land (Ref. 1.25). Due to the arable nature of much of Suffolk’s farming landscape, a high proportion of setts are found in hedge lines and scrub. In woodland they are often found in old pits or banks (Ref. 1.26).

1.4.6 Judge *et al.* (Ref. 1.27) surveyed badger setts across England and Wales between 2011 and 2013, and concluded there had been a 103% increase in social groups over the last 25 years; this increase seems likely to be the result of species protection and changes in habitat quality. There has also been an increase in Suffolk’s badger population since the 1980s (Ref. 1.26).

1.4.7 Badgers and their setts are protected under Schedule 6 of the Wildlife and Countryside Act, and the Protection of Badgers Act.

Assessment

1.4.8 Given that:

- badger setts are legally protected;
- badger populations are increasing both in Suffolk and nationally;
- there are two social groups within the EDF Energy Estate, where habitat is sub-optimal; and

- this species would be directly impacted by the proposed development;

then the population of badger within the ZOI would be:

- an IEF at the local level under the CIEEM guidelines (Ref. 1.6) (owing to their legal protection rather than their status); and
- of low importance following the EIA-specific assessment methodology.

However, badgers have been scoped out of the detailed assessment process as **no significant** effects are expected.

ii. **Feature: otter**

Description

- 1.4.9 Desk-study and survey data indicate that otter is widely distributed across the survey area in the Sizewell Marshes SSSI, Lower Abbey Farm Marshes and Minsmere South Levels areas (part of the Minsmere to Walberswick Heaths and Marshes SSSI) and are present in the wider landscape. Sightings from SWT indicate a year-round presence.
- 1.4.10 The 2001 sighting of an adult with cubs and the 2010 sighting of an adult with a one year old, within Sizewell Marshes SSSI, suggests that otter breed in the vicinity.
- 1.4.11 Otter live along rivers, lakes and occasionally estuaries and coasts. They can use a variety of habitats found within the river floodplain such as reedbeds, fen and woodland (Ref. 1.24). Sizewell Marshes SSSI, together with neighbouring wetland habitat within Minsmere, comprises a sizeable area of suitable habitat.
- 1.4.12 Five national otter surveys (from 1977 to 2010) reveal the recovery of otter from virtual extinction in most of England during the early 1970s. Positive site records increased from 5.8% in 1977-79 to 58.8% in 2009 to 2010 (Ref. 1.28). Matthews *et al.* (Ref. 1.29) consider there to have been a 49% increase in the population size from reviews carried out in 1995 and 2018. Otter populations in Suffolk are also considered to be increasing (Ref. 1.26).

1.4.13 The Environment Agency (Ref. 1.28) state that recovery has been in response to a ban on pesticides, legal protection and the significant improvement in water quality in previously fishless rivers. Since 2000–2002, there has been a major link-up across several river catchments, and there is now a link between populations in East Anglia, the River Trent catchment, Yorkshire and the traditional Northumbria stronghold. Otter was considered almost extinct in Suffolk in the 1970s (Ref. 1.30) but, following a number of re-introductions in the 1980s in East Anglia, there has been a major increase in otter numbers. Although populations are recovering, they are considered still to be vulnerable (Ref. 1.31), threatened by various factors including: lack of safe and suitable habitat along rivers; poor water quality and pollution; and road traffic accidents. **Table 14.7** summarises the increase in numbers from the five national surveys in the East Suffolk catchments.

Table 14.7: Increase in otter numbers in East Suffolk from national otter survey results (Ref.1.28).

East Suffolk (66) Main Survey.	1977–79	1984–86	1991–94	2000–02	2009–10
Positive sites/total.	1/60	2/60	10/60	24/60	36/60

1.4.14 A review of the Suffolk’s Priority Species and Habitats list identified otter as a priority species for conservation action in the county. Otter is protected under Schedule 5 and 6 of the Wildlife and Countryside Act, Schedule 2 of the Conservation of Habitats and Species Regulations, and are listed under Section 41 of the NERC Act.

Assessment

- 1.4.15 Given that otter:
- is legally protected;
 - is on Suffolk’s Priority Species and Habitats list and Section 41 of the NERC Act;
 - has a population that is increasing both in England and Suffolk specifically from virtual extinction during the early 1970s, but is still considered to be vulnerable, threatened by: lack of safe and suitable habitat along rivers; poor water quality and pollution; and road traffic accidents;
 - has a sizeable area of suitable habitat in the Sizewell Marshes SSSI, together with neighbouring wetland habitat at Minsmere;

- is widely distributed across the EDF Energy Estate, breeds within the local vicinity and has good quality habitat within the EDF Energy Estate; however,
- could be directly and indirectly affected by the proposed development;

then the population of otter within the ZOI would be:

- an IEF at the county level under the CIEEM guidelines; and
- of medium importance following the EIA-specific assessment methodology.

iii. Feature: water vole

Description

1.4.16 Desk-study and survey data indicate that water vole is present within Sizewell Marshes SSSI. Desk-study records beyond the EDF Energy Estate were predominantly to the north, particularly in the Minsmere and Eastbridge areas. Surveys by Wood Group found signs of water voles in between 88 to 100% of transects. The average population size for the ditches surveyed in 2009 within Sizewell Marshes SSSI was estimated at 8.1 individuals per 100m ditch. Estimated densities in England range from 2.4 to 14.0 per 100m of bank (Ref. 1.32), with a UK average of 6.1 individuals per 100m (Ref. 1.33).

1.4.17 Water vole prefer sites with wide swathes of riparian vegetation growing from the banks and water, which provide both food and shelter (Ref. 1.24). The EDF Energy Estate has a wide extent of good habitat and also of less-optimal quality habitat (with little aquatic or emergent vegetation). The combination of both good and less-optimal habitat is considered to be essential for the long-term persistence of the EDF Energy Estate water vole meta-populations.

- 1.4.18 The National Key Sites Monitoring Programme data (2001-2019) showed the typical level of cyclical population changes found in all vole species when in a stable environment with no mink predation. Similar trends were seen for the Minsmere National Key Sites Monitoring Programme surveys suggesting the two populations may have similar population dynamics or may be acting as a single meta-population. The two National Key Sites Monitoring Programme sites are adjacent, with connectivity between the two likely via the Leiston drain. Telfer *et al.* (Ref. 1.34) recorded average inter-population dispersal distances for lowland water vole to be between 1.0km and 1.5km for females and males, respectively. The collective populations will be important as part of a wider population present in coastal marsh habitat along the Suffolk coast, again with extensive reedbed habitat providing refuge from potential mink predation and control of mink numbers carried out by conservation organisations (SWT and RSPB).
- 1.4.19 Water vole populations have been considered to have a meta-population dynamics (Ref. 1.32; Ref. 1.35). Populations typically consist of small, discrete colonies comprising a few individuals and having a finite lifespan. Groups of colonies persist through dispersal and colonisation (Ref. 1.36), and genetic interchange is a feature in the successful survival of water vole meta-populations. Low quality, sink habitats may only be used intermittently but are a valuable aspect of the overall habitat used by the population, and should not be considered insignificant compared to high quality source habitats (Ref. 1.32). Bright & Carter (Ref. 1.13) showed that water voles thrived in large reedbeds sites, even where mink (water vole predators) had been present for many years; predation rates declined steeply the greater distance water voles nested from water channels, and the reedbeds provided a refuge from predation allowing recolonization to surrounding sites.
- 1.4.20 The National Key Sites Monitoring Programme recognises sites supporting water vole populations of national importance and considered as a priority for conservation of water voles at a national level. The Sizewell National Key Sites Monitoring Programme survey area was described as “*one of the best sites in Suffolk for these animals*” (Ref. 1.13). SWT recognise the coastal grazing marshes and associated dyke system as being nationally important for water voles (Ref. 1.26).

- 1.4.21 Strachan *et al.* (Ref. 1.32) reviewed published distribution data for water vole and demonstrated that the water vole population in Britain had suffered a long-term decline since 1900. The National Water Vole Survey (Ref. 1.37) estimated a 94% loss of water vole sites over the 20th Century. The National UK Water Vole Database and Mapping project (Ref. 1.38) recorded water vole in 874 10km squares across the UK in 2004-2008; mapping for 2007-2011, found water vole present in just 683 10km squares (a decline of 22%). However, reintroduction schemes, combined with mink control programmes and habitat management, suggest that population recovery may be possible, and that the decline may have been halted (Ref. 1.39).
- 1.4.22 The major threats to water voles (Ref. 1.32) include:
- predation by the introduced American mink, which has had a severe impact on water vole populations;
 - habitat loss and degradation (including fragmentation of habitat) following agricultural intensification since the Second World War;
 - fluctuations in water level; and
 - pollution/poor water quality (both directly through contamination of water bodies with pollutants and indirectly through eutrophication, which causes algal blooms and loss of their food plants).
- 1.4.23 For the EDF Energy Estate water vole population, SWT have monitored and controlled mink since 1992, and the Sizewell Marshes SSSI habitat has been managed proactively by SWT since 1992, so habitat degradation is not likely.
- 1.4.24 Very small populations of water vole are highly vulnerable and larger populations are much more robust (Ref. 1.40). As water vole populations dwindle, fragmentation of meta-populations results in the isolation of smaller colonies; when these are no longer connected to any wider population in the surrounding landscape, they can rapidly decline to extinction.

- 1.4.25 A survey in Suffolk (Ref. 1.41) in 1997, undertaken by SWT and the Environment Agency, showed that water vole were largely absent from the west and north of Suffolk, which could have been correlated with the presence of American mink in this area. Water vole were present in central and eastern areas of the county, including Sizewell Marshes SSSI. Between 2003 and 2005, SWT (Ref. 1.42) surveyed all Suffolk river catchments and reported further dramatic decline on all rivers. A survey of the Deben catchment in 2003 showed a reduction in positive sites from 75% in 1997 to 46% in 2003. These survey results prompted both further monitoring and a county-wide management strategy (involving mink control and habitat management). Surveys in 2005 indicated healthy water vole populations at key coastal sites, and surveys in 2007 and 2010 indicated water vole population recovery on the Alde and Blythe catchments, respectively.
- 1.4.26 A review of the Suffolk’s Priority Species and Habitats list identified water vole as a priority species for conservation action in the county. Water vole is protected under Schedule 5 of the Wildlife and Countryside Act and is listed under Section 41 of the NERC Act.

Assessment

- 1.4.27 Given that the water vole:
- is legally protected;
 - is on Suffolk’s Priority Species and Habitats list and Section 41 of the NERC Act;
 - is considered to be the one of most endangered mammal species in the UK, though with some limited evidence of halts in the population decline;
 - is present within the EDF Energy Estate, at densities higher than the national average for this species and has a sizeable area of suitable habitat in the Sizewell and adjacent Minsmere that have been recognised as National Key Sites;
 - has habitat within the EDF Energy Estate that has been managed proactively since 1992, and there is no evidence of persistent American mink within the ZOI; however,
 - could be directly and indirectly affected by the proposed development.

Then the population of this species located within the ZOI would be:

- an IEF at the national level under the CIEEM guidelines; and

- of high importance following the EIA-specific assessment methodology.

iv. Feature: brown hare

Description

- 1.4.28 The desk-study and ad-hoc sightings collated by SWT in their annual NGL Sizewell Land Management Reports indicate continued presence of brown hare from 1999 to 2012, but suggest a possible decline since 2014. By 2018, brown hare were reported as pretty much lost from the bulk of the EDF Energy Estate.
- 1.4.29 In Britain, brown hare is usually associated with lowland pasture and arable farmland, feeding mainly on grasses and herbs as well as agricultural crops (Ref. 1.43). Woods and hedgerows also provide day-time shelter, particularly in winter. This species requires a suitable sequence of food sources and cover types through-out the year, and, on farmland, are highly dependent on the agricultural cycle. Annual home ranges vary between 20 to 90ha though they may commute 1.7km between feeding and resting sites crops (Ref. 1.43). The arable fields and areas of grassland on the EDF Energy Estate provide suitable foraging habitat for brown hares, and the arable hedgerow margins and woodland provide sites for shelter.
- 1.4.30 Surveys in the 1990s showed that East Anglia is a reservoir for brown hare, at the time holding approximately 20% of the national population across the three counties (Cambridgeshire, Suffolk and Norfolk), despite only covering 5% of the area of the UK (Ref. 1.43). They were considered to be particularly numerous along the east coast and in the Brecks (Ref. 1.26). The Suffolk BAP for brown hare states that the species is “*widespread in Suffolk, with little evidence of any large decline in recent years, although numbers do fluctuate from year to year*” (Ref. 1.7).
- 1.4.31 Recent reports (2018) in the east of England suggest “*over the past month, landowners, farmers and members of the public [in Norfolk and Suffolk] have been in contact to report sightings of obviously sick and dead hares*” (Ref. 1.44).

1.4.32 The brown hare used to be common and widespread throughout lowland Britain, but they have become more patchily distributed and less abundant where they do occur (Ref. 1.43). The UK BAP species plan for brown hare (Ref. 1.45), stated that the current population was believed to be 20% of the 1880 total. The Tracking Mammals Partnership ten-year trend in 2011 (Ref. 1.46) indicated no change in the population. Numbers appeared to be recovering during the past two decades, according to the National Gamebag Census, commissioned by the Game and Wildlife Trust (Ref. 1.47); between 1984 and 2009 this annual count of individuals shot increased by 59%. However, the recent reports of dead hares described above supersede this assessment (Ref. 1.43).

1.4.33 Reasons for past declines in populations of brown hare are not fully understood but are likely to be primarily related to agricultural intensification, although other factors such as predation, disease and shooting may play a role. More recent increases in numbers may be attributed to introduction of agri-environmental and set-aside schemes in the 1980s (Ref. 1.46).

1.4.34 Hares have limited legal protection and are classified as a game species; however, a review of Suffolk’s Priority Species and Habitats list identified the brown hare as a priority species for conservation action in the county (Ref. 1.7). Brown hare is also listed under Section 41 of the NERC Act (Ref. 1.2).

Assessment

1.4.35 Given that the brown hare:

- has limited legal protection;
- is on Suffolk’s Priority Species and Habitats list (Ref. 1.7) and Section 41 of the NERC Act (Ref. 1.2);
- is considered to have a population that was considered stable, relatively widespread and common across East Anglia but may have recently declined; and
- is no longer considered to exist within the majority of the EDF Energy Estate despite the availability of suitable habitat in these areas;

then the population of brown hare within the ZOI would:

- not be an IEF under the CIEEM guidelines (Ref. 1.6), and
- be of very low importance following the EIA-specific assessment methodology.

v. Feature: hedgehog**Description**

- 1.4.36** Desk-study records reveal that hedgehogs are found within the site and wider study area. Hedgehogs occur in a wide variety of habitat types including grasslands, forests and suburban areas (Ref. 1.48). This species requires a secure winter site for nesting and this is a crucial factor in their distribution and habitat use; winter nests are typically built under a structure that lends support from above, for example piles of brushwood, sprawling brambles or tree stumps. The lack of materials to make such nests may explain why hedgehogs are rare or absent in conifer woodland, marshy areas, heathland and moorland, and open habitats such as arable fields. Males may travel 3km or more in a night and have a home range of 50ha or more in the summer; females normally travel about 1km per night with a home range of about 10ha (Ref. 1.48).
- 1.4.37** Within the EDF Energy Estate, much of the habitat under the construction footprint, such as the coniferous woodland of Goose Hill, the wet areas of the Sizewell Marshes SSSI and the arable fields, is sub-optimal. Hedgehogs may be present within hedgerows and field margins to the north of Kenton Hills, the broadleaved woodland areas (e.g. Rookyard Pits Wood, St James's Covert, broadleaved areas of Kenton Hills and Coronation Wood), and the open grassland/mixed woodland of the main platform.
- 1.4.38** Nationally, hedgehog was considered to be a declining species, subject to an approximately 20% decline over four years (2001 to 2005) (equivalent to a greater than 50% decline over 25 years, and so were added to the UK BAP species review in 2007 (Ref. 1.49). Population estimates indicated a population decline from around 30 million in the 1950s to 1.5 million in 1995 (Ref. 1.46) and road casualty counts carried out between 1990 and 2001 suggest they declined by as much as half in that decade alone. The Tracking Mammals Partnership ten-year trend in 2011 (Ref. 1.46) indicated no statistical decline in England but did note that populations of their main predator (badgers) continued to increase. The Britain's Mammals 2018 survey (Ref. 1.29) states that the species range may have remained stable between 1995 to 2018, but the population has substantially declined.
- 1.4.39** Nationally, threats to hedgehog include: habitat/population fragmentation; pesticides (especially slug pellets) which may affect hedgehogs directly and also reduce food availability; predation by badger; road traffic accidents; and other anthropogenic causes.

1.4.40 Hedgehog is distributed widely throughout Suffolk, although it is thought to be becoming scarcer (Ref. 1.26). A national survey in 2001 reported that the number of hedgehog found dead on the roads in East Anglia has fallen by 50% compared with a similar survey in 1991 (Ref. 1.26).

1.4.41 A review of Suffolk's Priority Species and Habitats list identified hedgehog as a priority species for conservation action in the county. Hedgehogs are also listed under Section 41 of the NERC Act.

Assessment

1.4.42 Given that the hedgehog:

- has limited legal protection;
- is on Suffolk's Priority Species and Habitats list and Section 41 of the NERC Act;
- exists within some habitats of the EDF Energy Estate, and has suitable habitat in these areas; and
- is considered to be distributed widely throughout Suffolk, although populations are becoming scarcer;

then the population of hedgehogs within the ZOI would:

- not be an IEF under the CIEEM guidelines, and
- be of low importance following the EIA-specific assessment methodology.

vi. Feature: harvest mouse

Description

1.4.43 Desk-studies and incidental observations by SWT show that harvest mouse is present within the EDF Energy Estate and wider study area, with nests found within reedbeds areas. Harvest mouse occupy a wide range of habitats, and are found in rough and tussocky grassland, ungrazed and uncut meadows, reedbeds and riparian margins, and the rank grassland associated with young plantations (Ref. 1.24); this species rarely occurs in cereal crops or mature woodland. The arable hedgerow margins on the EDF Energy Estate and the reedbeds of the Sizewell Marshes SSSI and Minsmere, are suitable habitat for harvest mouse.

- 1.4.44 Harvest mouse is established in Suffolk, having been found in 35% of 226 samples of owl pellets collated from across the county (80 sites); nest searches confirmed their presence at 85% of these locations (Ref. 1.26; Ref. 1.14). Harvest mouse is considered to be widespread within Suffolk and Essex.
- 1.4.45 Nationally, harvest mouse is considered to be a declining species, subject to an approximately 71% decline over the past 18 years, and so was added to the UK BAP species review in 2007 (Ref. 1.14). Changes in habitat management and agricultural methods are thought to be the main cause for the loss of populations from certain areas, although there have been no reliable studies to quantify this change.
- 1.4.46 A review of the Suffolk's Priority Species and Habitats list identified harvest mouse as a priority species for conservation action in the county. Harvest mouse is also listed under Section 41 of the NERC Act.

Assessment

- 1.4.47 Given that the harvest mouse:
- has limited legal protection;
 - is on Suffolk's Priority Species and Habitats list and Section 41 of the NERC Act;
 - exist within some habitats of the EDF Energy Estate, and has suitable habitat in these areas; and
 - is considered to be distributed widely throughout Suffolk, although populations are declining nationally;
- then the population of harvest mice within the ZOI would:
- not be an IEF under the CIEEM guidelines, and
 - be of low importance following the EIA-specific assessment methodology.

vii. Feature: polecat

Description

- 1.4.48 Nationally, the population size of polecat is considered to have increased by more than four times between reviews carried out in 1995 and 2018 as a result of range expansion (Ref. 1.27). Polecat was considered extinct in Suffolk for the last 100 or so years, until records from 2010 onwards indicated recolonization from the west. A single polecat record was reported in the south-west of the EDF Energy Estate in 2018 (D. West, *pers. Comm.*), on Lover's Lane.
- 1.4.49 A review of the Suffolk's Priority Species and Habitats list identified polecat as a priority species for conservation action in the county. The polecat is also listed Section 41 of the NERC Act.

Assessment

- 1.4.50 Given that the polecat:
- has limited legal protection;
 - is on Suffolk's Priority Species and Habitats list and Section 41 of the NERC Act; and
 - has not been recorded within the main EDF Energy Estate;
- then the population of polecat within the ZOI would:
- not be an IEF under the CIEEM guidelines, and
 - be of low importance following the EIA-specific assessment methodology.

viii. Feature: other small mammals

Description

- 1.4.51 Small mammal trapping in the spring and summer of 2015, as part of a study on the availability of potential snake prey, found seven species of small mammal to be present at nine survey sites within the site and wider study area: wood mouse, yellow-necked mouse, field vole, bank vole, common shrew, pygmy shrew and water shrew.
- 1.4.52 **Table 14.8** summarises information on small mammal distribution and status in Suffolk (Ref. 1.26).

Table 14.8: Small mammal distribution and status in Suffolk.

Species	Distribution	Population Status.
Wood mouse.	Widespread and common.	Stable
Yellow-necked mouse.	Widespread	Likely to be stable.
Bank vole.	Widely distributed and common.	Thought to be stable.
Field vole.	Common	Probably declining.
Common shrew.	Widespread	Likely to be stable.
Pygmy shrew.	Widespread	Likely to be stable.
Water shrew.	-	Likely to be declining.

1.4.53 The water shrew is listed under Suffolk’s Priority Species and Habitat list, considered locally important, but is not listed under Section 41 of the NERC Act, so is not identified as a species of principal importance for the purpose of conserving biodiversity in England.

Assessment

1.4.54 Given that the water shrew:

- has limited legal protection;
 - is listed under Suffolk’s Priority Species and Habitat list;
 - exist within some habitats of the EDF Energy Estate;
 - is considered to be declining in Suffolk;
- then the population of water shrew within the ZOI would:
- not be an IEF under the CIEEM guidelines, and
 - be of low importance following the EIA-specific assessment methodology.

1.4.55 The remaining small mammal species (pygmy and common shrews, wood and yellow-necked mice, bank and field voles) are also not considered to be IEFs within the ZOI of the proposed development under the CIEEM guidelines, and of very low importance following the EIA-specific assessment methodology.

ix. Feature: deer

Description

- 1.4.56 Red deer and muntjac are widespread and common across the EDF Energy Estate, with occasional sightings of fallow deer and Chinese water deer. Red deer on the EDF Energy Estate are part of a larger population which roam freely across the EDF Energy Estate, the RSPB Minsmere Reserve and wider areas. They are known to use multiple habitats, including the plantation woodland, Sizewell Marshes SSSI and surrounding arable fields.
- 1.4.57 All deer species are currently undergoing a period of substantial growth nationally, due to several factors, including: milder winters; changes to agriculture such as the planting of winter crops; increased woodland cover; escapes and releases from parks and farms; and greater connectivity between green spaces in urban areas (Ref. 1.18). This increase has been seen on the EDF Energy Estate.

Assessment

- 1.4.58 Red deer and muntjac are common on the EDF Energy Estate, deer populations are growing nationally, and so deer are not considered to be an IEF within the ZOI of the proposed development under the CIEEM guidelines, and of very low importance, following the EIA-specific assessment methodology. Deer populations generically may have an economic value, both negative (through their impact on forestry and arable crops) and positive (through any sale of venison as a result of hunting).

c) Summary of ecological features/receptors

- 1.4.59 Following a review of the known baseline within the ZOI, **Table 14.9** lists the ecological features/receptors and details which will be carried forward into the detailed assessment. Those carried forward are IEFs of sufficient conservation value or receive legal protection and that will be sufficiently affected by the proposed development to be a material consideration in the planning determination.

Table 14.9: Summary of terrestrial mammal IEFs to be taken forward for detailed assessment.

Feature/ Receptor.	Importance (CIEEM/ EIA Methodology).	Justification	Scope In/Out.
Badger	Local/low.	Two badger two social groups are found within the EDF Energy Estate, where habitat is considered to be sub-optimal. Badger is widespread across England and Wales, and populations are increasing both in England and Wales and in Suffolk. Badger has therefore been scoped out of the assessment. However, badgers are considered an IEF owing primarily to their legal protection rather than their conservation status on site; they are included as an IEF but have been scoped out of the detailed assessment. Appropriate mitigation that should be employed to safeguard badgers has been detailed within the ES .	Scoped out.
Otter	County/medium.	Otters are widely distributed across the EDF Energy Estate, breed within the local vicinity and have good quality habitat within the EDF Energy Estate. This species has a sizeable area of suitable habitat in the Sizewell Marshes SSSI, together with neighbouring wetland habitat at Minsmere South Levels. The population is increasing in Suffolk, but is still considered to be vulnerable, threatened by: lack of safe and suitable habitat along rivers; poor water quality and pollution; and road traffic accidents. With the loss of part of Sizewell Marshes SSSI and with works planned boarding Sizewell Marshes SSSI, this species would be directly and indirectly affected by the proposed development. Otter is protected under Schedule 5 and 6 of the Wildlife and Countryside Act, and Schedule 2 of the Conservation of Habitats and Species Regulations, and is listed under Suffolk’s Priority Species and Habitats list and Section 41 of the NERC Act. Otter has therefore been scoped into the detailed assessment.	Scoped in.
Water vole.	National/high.	Water vole is present within the EDF Energy Estate, at densities higher than the national average for this species. There is a sizeable area of suitable habitat in the EDF Energy Estate, including within the site, and also in the adjacent Minsmere. Both the EDF Energy Estate and Minsmere have been recognised as National Key Sites. While the habitat within the EDF Energy Estate is managed proactively and there is no evidence of American Mink within the ZOI, the water vole is considered one of the most endangered mammals in the UK. With the loss of part of Sizewell Marshes SSSI and with works planned boarding Sizewell Marshes SSSI, this species would be directly and indirectly affected by the proposed development. Water vole is protected under Schedule 5 of the Wildlife and Countryside Act and is listed under Suffolk’s Priority Species and Habitats list and Section 41 of the NERC Act. Water vole has therefore been scoped into the detailed assessment.	Scoped in.

NOT PROTECTIVELY MARKED

Feature/ Receptor.	Importance (CIEEM/ EIA Methodology).	Justification	Scope In/Out.
Brown hare.	Local/low.	The population of brown hare found within the site is not a significant contribution to the potential wider population within the ZOI, given the recent absence of records within the bulk of the EDF Energy Estate. The effects of the proposed development on this highly mobile species are unlikely to be significant and brown hare have therefore been scoped out. Brown hare is listed under Suffolk’s Priority Species and Habitats list and Section 41 of the NERC Act.	Scoped out.
Hedgehog	Local/low.	Hedgehog is found within the site and wider area, with suitable habitats present such as field margins, broadleaved woodland and open grassland/mixed woodland. This species is considered to be distributed widely throughout Suffolk and has therefore been scoped out of the detailed assessment. Hedgehog is listed under Suffolk’s Priority Species and Habitats list and Section 41 of the NERC Act.	Scoped out.
Harvest mouse.	Local/low.	Harvest mouse exist within some habitats of the EDF Energy Estate, and has suitable habitat such as rough and tussocky grassland, ungrazed grassland, reed bed and riparian margins. This species is considered to be distributed widely throughout Suffolk and has therefore been scoped out of the detailed assessment. Harvest mouse is listed under Suffolk’s Priority Species and Habitats list and Section 41 of the NERC Act.	Scoped out.
Polecat	Local/low.	This species has not been recorded within the majority of the EDF Energy Estate. As such, it has been scoped out of the detailed assessment. Polecat is listed under Suffolk’s Priority Species and Habitats list and Section 41 of the NERC Act.	Scoped out.
Small mammals.	Water shrew: local/low. All others: local/very low.	These species existing within some suitable habitat within the EDF Energy Estate; however, will largely be unaffected by the proposed development. These species have therefore been scoped out of the detailed assessment.	Scoped out.
Deer	Local/very low.	Deer species are widespread and common across the EDF Energy Estate. The deer assemblage has therefore been scoped out of the detailed assessment.	Scoped out.

NOT PROTECTIVELY MARKED

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SIZEWELL C DEVELOPMENT – MAIN DEVELOPMENT SITE: VOLUME 2, CHAPTER 14: ANNEX 14A9 – TERRESTRIAL MAMMALS

Documents included within this Appendix are as follows:

- Annex 14A9.1 Figures (provided separately)
- Annex 14A9.2 Desk Study
- Annex 14A9.3 Secondary Data
 - Annex 14A9.3 Phase 1 Consolidated Report
 - Annex 14A9.3 Consolidated Badger Report 2012 [CONFIDENTIAL, provided separately]
 - Annex 14A9.3 Otter Consolidated Report
 - Annex 14A9.3 Water Vole Report
 - Annex 14A9.3 Sizewell Water Vole Report
 - Annex 14A9.3 Aldhurst Farm Water Vole 2010
- Annex 14A9.4 Primary Data
 - Annex 14A9.4 Primary Data [CONFIDENTIAL, provided separately]
 - Annex 14A9.4 Sizewell C Sandpits Technical Note [CONFIDENTIAL, provided separately]
 - Annex14A9.4 Otter Survey Report Oct 2013
 - Annex14A9.4 Sizewell C Aldhurst Farm Water Vole Survey Report 2014



VOLUME 2, CHAPTER 14: APPENDIX 14A9 – TERRESTRIAL
MAMMALS: ANNEX 14A9.2 DESK-STUDY



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Plates

None provided.

Figures

None provided.

1 Annex 14A9.2 – Desk study

1.1 Desk-study results for terrestrial mammals

- 1.1.1 Records for terrestrial mammals were requested from Suffolk Biodiversity Information Service (SBIS) in 2014 and 2018 for protected or otherwise notable species of conservation concern within 2km of the Sizewell C power station at the main development site (referred to throughout this volume as the “proposed development”).
- 1.1.2 The locations of all designated sites (statutory and non-statutory) within 2km of the proposed development site were also obtained. Citations for these sites, which provide information on the reasons for their designation, were reviewed to ascertain if terrestrial mammals are cited as interest features of these sites.
- 1.1.3 Suffolk Biodiversity Action Plan (BAP) (Ref 1.1), Suffolk’s Priority Species and Habitats list (Ref 1.2), and the habitats and species of principal importance included on the Section 41 list of the Natural Environment and Communities (NERC) Act (Ref 1.3), were also reviewed with reference to the habitats and species present, or likely to be present, within the proposed development site and the wider study area.
- 1.1.4 The following table presents the desk-study results for terrestrial mammals.

Table 1.1: Desk-study results for terrestrial mammals

Species	Location	Site Detail	Grid Reference	Longitude	Latitude	Year	Abundance
Eurasian badger (<i>Meles meles</i>)	Leiston	Red House Lane, Leiston	TM4512461947	1.587598005	52.20074492	2015	
Eurasian badger	Minsmere B. R.	Scott's Hall Cottage, RSPB Minsmere	TM4767	1.618684587	52.24525069	2015	
Eurasian badger	Westleton		TM4559666898	1.598085168	52.24496356	2014	
Eurasian badger	Leiston	Leistoná	TM4343661649	1.56273049	52.19881853	2012	
Eurasian badger	Theberton	Pretty Road, Theberton	TM435659	1.566723647	52.2369387	2012	
Eurasian badger	Leiston	Leistoná	TM4420163295	1.57508967	52.21325133	2012	
Eurasian badger	Westleton		TM4495267036	1.588770421	52.24648887	2011	
Eurasian badger	Aldringham Common and Walks/Thorpeness Golf Course	Margaret Wood,Aldringham Walks	TM469607	1.612627031	52.18876249	2009	1 Count of present
Eurasian badger	Eastbridge		TM44666616	1.583867259	52.23875771	2008	
Eurasian badger	Aldringham-cum-Thorpe	Aldringham	TM46316069	1.604005438	52.18893652	2003	
Eurasian badger	Minsmere B. R.	Minsmere B. R.	TM46606703	1.612858899	52.24569923	2003	
Eurasian badger	Leiston	Leiston	TM459652	1.601294277	52.22959068	2003	
Eurasian badger	Aldringham Common and Walks/Thorpeness Golf Course	Alexander Wood	TM460608	1.599559044	52.19006197	2001	
European otter	Minsmere B. R.	Minsmere	TM4767	1.618684587	52.24525069	2017	



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Species	Location	Site Detail	Grid Reference	Longitude	Latitude	Year	Abundance
(<i>Lutra lutra</i>)							
European otter	Minsmere B. R.	Minsmere RSPB	TM4692766797	1.617469072	52.24346184	2017	
European otter	Minsmere B. R.	Minsmere	TM4632266896	1.608697088	52.24462124	2016	
European otter	Minsmere B. R.	Island Mere, Minsmere	TM46326686	1.608641609	52.24429909	2016	
European otter	Minsmere B. R.	Minsmere RSPB	TM4610466740	1.605396563	52.24331887	2016	
European otter	Minsmere B. R.	minsmeer reserve suffolk	TM451646	1.58916819	52.22456301	2015	
European otter	Sizewell		TM47466503	1.623967301	52.22736655	2015	1 Count of Male
European otter	Minsmere B. R.	Minsmere: Island Mere	TM463668	1.608305503	52.24376963	2015	
European otter	Minsmere B. R.	Island Mere Hide Minsmere	TM462667	1.606770793	52.242917	2015	
European otter	Minsmere B. R.	Minsmere	TM4510864607	1.589290162	52.22462227	2015	
European otter	Minsmere B. R.	Minsmere	TM46316686	1.608495421	52.24430356	2015	
European otter	Leiston		TM4433362037	1.576110425	52.20190367	2014	
European otter	Sizewell		TM4705063504	1.616861886	52.21385707	2012	
European otter	Minsmere B. R.	Minsmere (Island Mere)	TM463668	1.608305503	52.24376963	2012	1 Count
European otter	Minsmere B. R.	Minsmere beach opposite public hide	TM478665	1.630012954	52.24040451	2012	
European otter	Minsmere B. R.	Minsmere	TM474667	1.624312481	52.24237906	2008	

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Species	Location	Site Detail	Grid Reference	Longitude	Latitude	Year	Abundance
European otter	Eastbridge	Minsmere	TM452663	1.591862102	52.23977382	2008	
European otter	Sizewell	Leiston Beck	TM454634	1.592681786	52.213661	2008	
European otter	Aldringham-cum-Thorpe	Thorpness Hundred	TM446607	1.579045008	52.1897872	2008	
European otter	Minsmere B. R.	Island Mere	TM460672	1.604211132	52.24749319	2005	
European otter	Minsmere B. R.	Minsmere	TM452666	1.592079744	52.24246593	2005	1 Count of Male
European otter	Sizewell Marshes	Sizewell belts	TM4684963157	1.613672544	52.21083333	2005	
European otter	Minsmere B. R.	Minsmere The Sluice	TM477662	1.628331409	52.23775751	2004	
European otter	Minsmere B. R.	Minsmere Twopenny Arch	TM460663	1.603555988	52.23941698	2004	
European otter	Eastbridge	Eastbridge	TM453664	1.593396424	52.24062665	2004	
European otter	Minsmere B. R.	The Sluice, Minsmere	TM477661	1.628258139	52.23686017	2004	
European otter	Minsmere B. R.		TM467672	1.614444932	52.24717991	2003	
European otter	Theberton	Theberton	TM4365	1.558768339	52.22908295	2001	
European otter	Aldringham Churchyard	Aldringham Churchyard	TM452603	1.587516444	52.18593128	2001	
European otter	Sizewell Levels and Associated Areas	B1122 to Leiston, Sizewell Belts water course	TM456633	1.595531016	52.21267454	2001	
European otter	Sizewell	Belts	TM465635	1.608824186	52.21406745	1997	
European otter	Sizewell	Leiston ditch, Sixewell Belts	TM474645	1.622702943	52.2226376	1996	

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Species	Location	Site Detail	Grid Reference	Longitude	Latitude	Year	Abundance
European otter	Minsmere B. R.		TM463669	1.608378389	52.24466698	1994	
Western European hedgehog (<i>Erinaceus europaeus</i>)	Leiston	Leiston	TM4665862519	1.610417772	52.20519371	2016	1 Count
Western European hedgehog	Aldringham-cum-Thorpe	B1353, Leiston	TM4608560463	1.600555521	52.18699992	2016	3 Count
Western European hedgehog	Leiston	Aldringham Park	TM4545662442	1.592805447	52.20503923	2015	
Western European hedgehog	Leiston	B1122	TM4541762445	1.592237983	52.20508351	2015	
Western European hedgehog	Theberton	B1122 road at Theberton	TM436660	1.568257402	52.23779186	2013	1 Count of dead
Western European hedgehog	Sizewell	Halfway Cottages, Sizewell	TM467625	1.611017379	52.20500441	2009	1 Count
Western European hedgehog	Sizewell	Ness House, Sizewell	TM477613	1.624745696	52.1937879	2004	
Western European	Aldringham Common and Walks/Thorpeness Golf	Aldringham Common and	TM468608	1.611239784	52.1897046	1998	

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Species	Location	Site Detail	Grid Reference	Longitude	Latitude	Year	Abundance
hedgehog	Course	Walks/Thorpeness Golf Course					
Western European hedgehog	Leiston	Common Fm.	TM456633	1.595531016	52.21267454	1997	1 Count of dead
Western European hedgehog	Sizewell		TM475628	1.622921119	52.20733787	1996	
Western European hedgehog	Leiston		TM453645	1.592018189	52.22357662	1995	
Eurasian water shrew (<i>Neomys fodiens</i>)	Middleton	between Reckford Bridge and Eastbridge	TM4467	1.574826234	52.24658862	2011	
Eurasian water shrew	Minsmere B. R.		TM478665	1.630012954	52.24040451	2002	
Eurasian water shrew	Buckles Wood		TM433634	1.56200221	52.2145921	1995	
Eurasian water shrew	Sizewell		TM462638	1.604659732	52.21689364	1994	1 Count of dead
Brown hare (<i>Lepus europaeus</i>)	Minsmere B. R.	RSPB Minsmere	TM472664	1.621169489	52.23977688	2016	
Brown hare	Minsmere B. R.	RSPB Minsmere	TM470668	1.6185384	52.24345601	2016	
Brown hare	Minsmere B. R.	RSPB Minsmere	TM472669	1.621535201	52.24426358	2015	

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Species	Location	Site Detail	Grid Reference	Longitude	Latitude	Year	Abundance
Brown hare	Middleton		TM4367	1.560206023	52.24703098	2008	
Brown hare	Aldringham Common and Walks/Thorpeness Golf Course	Aldringham Common and Walks/Thorpeness Golf Course	TM460608	1.599559044	52.19006197	1998	
Brown hare	Leiston	Lower Abbey Farm	TM463662	1.607868269	52.23838551	1996	
Brown hare	Leiston Common	Sizewell Belts	TM466633	1.61013938	52.21222801	1996	1 Count of present
Brown hare	Sizewell	Sizewell Belts	TM465636	1.608897004	52.21496481	1996	2 Count of present
Brown hare	Sizewell	Ness House	TM476611	1.623139403	52.19203811	1995	2 Count of present
European water vole (<i>Arvicola amphibius</i>)	Sizewell		TM46606370	1.610430763	52.21581743	2017	
European water vole	Minsmere B. R.	Minsmere	TM47066628	1.619035392	52.23876291	2017	
European water vole	Dunwich		TM4767	1.618684587	52.24525069	2015	
European water vole	Middleton	back of garden on Rectory Road	TM4367	1.560206023	52.24703098	2013	
European water vole	Middleton	between Reckford Bridge and Eastbridge	TM4467	1.574826234	52.24658862	2012	
European water vole	Eastbridge	Eastbridge IDB drain	TM4468966255	1.584359929	52.23959733	2010	

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Species	Location	Site Detail	Grid Reference	Longitude	Latitude	Year	Abundance
European water vole	Eastbridge	Eastbridge IDB drain	TM4746765914	1.624716464	52.23529588	2010	
European water vole	Theberton	Old Minsmere River, Theberton Hall Farm	TM4454067240	1.5828947	52.2485027	2009	
European water vole	Theberton	Old Minsmere River, Theberton Hall Farm	TM4457066880	1.583072728	52.24525881	2009	
European water vole	Theberton	Old Minsmere River, Theberton Hall Farm	TM4462066790	1.583738547	52.24442896	2009	
European water vole	Theberton	Old Minsmere River, Theberton Hall Farm	TM4472066740	1.585164253	52.24393583	2009	
European water vole	Eastbridge Marshes	Eastbridge Marshes	TM4573066400	1.599682028	52.2404349	2008	
European water vole	Eastbridge	Eastbridge Farm, Eastbridge	TM454664	1.594858198	52.24058208	2005	
European water vole	Sizewell Marshes	Sizewell belts	TM4686264560	1.614885739	52.22341733	2005	
European water vole	Sizewell Marshes	Sizewell belts	TM4697462983	1.615371585	52.20921594	2005	
European water vole	Sizewell Marshes	Sizewell belts	TM4683364408	1.614351111	52.22206636	2005	
European water vole	Sizewell Marshes	Sizewell belts	TM4667663258	1.611218999	52.21181711	2005	
European water vole	Sizewell Marshes	Sizewell belts	TM4664763500	1.610971675	52.21400169	2005	

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Species	Location	Site Detail	Grid Reference	Longitude	Latitude	Year	Abundance
European water vole	Sizewell Marshes	Sizewell belts	TM4684963157	1.613672544	52.21083333	2005	
European water vole	Sizewell Marshes	Sizewell belts	TM4673263822	1.612448124	52.21685311	2005	
European water vole	Sizewell Marshes	Sizewell belts	TM4547063493	1.593771846	52.21446438	2005	
European water vole	Sizewell Marshes	Sizewell belts	TM4563063648	1.596221782	52.21578401	2005	
European water vole	Sizewell Marshes	Sizewell belts	TM4612163729	1.603453929	52.2162918	2005	
European water vole	Sizewell Marshes	Sizewell belts	TM4629963877	1.606162132	52.21754037	2005	
European water vole	Sizewell Marshes	Sizewell belts	TM4630563880	1.606251976	52.2175646	2005	
European water vole	Minsmere B. R.	Most wetland compartments	TM460672	1.604211132	52.24749319	2003	
European water vole	Aldringham-cum-Thorpe	Aldringham	TM445608	1.577657001	52.19072892	2000	
European water vole	Sizewell	Sizewell Belts	TM455635	1.594215197	52.21451383	2000	
European water vole	Minsmere B. R.		TM474665	1.624166082	52.24058439	1998	
European water vole	Aldringham-cum-Thorpe	B1122 over thorpness hundred	TM446607	1.579045008	52.1897872	1997	

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Species	Location	Site Detail	Grid Reference	Longitude	Latitude	Year	Abundance
European water vole	Sizewell	Belts	TM465635	1.608824186	52.21406745	1997	
European water vole	Eastbridge		TM453664	1.593396424	52.24062665	1997	
European water vole	Minsmere B. R.	Two Penny Bridge, Minsmere New Cut	TM460663	1.603555988	52.23941698	1996	
European water vole	Sizewell	Leiston ditch, Sixewell Belts	TM474645	1.622702943	52.2226376	1996	
European water vole	Leiston	Goose Hill marshes	TM465645	1.609552541	52.22304101	1996	1 Count of feeding
European water vole	Aldringham-cum-Thorpe	B1122, Thorpeness Hundred	TM446608	1.579117164	52.19068459	1996	
Harvest mouse (<i>Micromys minutus</i>)	Minsmere B. R.	RSPB Minsmere	TM477667	1.628697816	52.24224417	2015	
Harvest mouse	Minsmere B. R.	RSPB Minsmere	TM47706671	1.628705145	52.24233391	2015	
Harvest mouse	Theberton		TM4440066200	1.580095668	52.23923213	2010	
Harvest mouse	Theberton		TM4450066500	1.581774432	52.24187987	2010	
Harvest mouse	Theberton		TM4470066500	1.584698097	52.24179101	2009	
Harvest mouse	Eastbridge	Upper Abbey Farm, Eastbridge	TM4520064600	1.590629443	52.22451851	2009	
Harvest mouse	Eastbridge	Lower Abbey Farm, Eastbridge	TM4587365376	1.601027651	52.23118209	2009	



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Species	Location	Site Detail	Grid Reference	Longitude	Latitude	Year	Abundance
Harvest mouse	Theberton		TM4620066900	1.606916502	52.24471171	2008	
Harvest mouse	Minsmere B. R.	Minsmere B. R.	TM475665	1.625627806	52.24053945	1998	
Harvest mouse	Sizewell	Sizewell Belts	TM468636	1.613279714	52.21483054	1996	
Harvest mouse	Leiston Common		TM462636	1.60451426	52.21509892	1994	
Harvest mouse	Sizewell		TM465638	1.609042652	52.21675952	1994	

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- 1.1 Suffolk Biodiversity Partnership. 2012. Suffolk Local Biodiversity Action Plan. (Online) Available from: <http://www.suffolkbiodiversity.org/biodiversity-action-plans.aspx> (Accessed 01 March 2019).
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EDF Energy

**Sizewell C New Nuclear Power Station:
Terrestrial and Freshwater Ecology, and
Ornithology**

Draft Extended Phase 1 Habitat Survey Report 2007-2012

June 2012

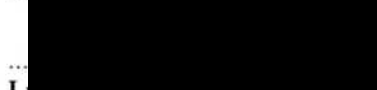
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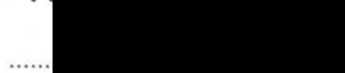
EDF Energy

Main Contributors

Alastair Miller

Issued by

Lynn Whitfield

Approved by

Lynn Whitfield

**AMEC Environment & Infrastructure
UK Limited**

17 Angel Gate, City Road, London EC1V 2SH,
United Kingdom
Tel +44 (0) 207 843 1400
Fax +44 (0) 207 843 1410

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June 2012

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Document Revisions

No.	Details	Date
	Draft report	June 2012

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1. Introduction

1.1 Purpose of this Report

An area of land directly north of Sizewell B Nuclear Power Station, which is located near Leiston in Suffolk, has been identified as having the potential to accommodate the proposed development of one or more new nuclear reactors. This proposed development is known as Sizewell C. The site of the proposed development has an approximate central National Grid Reference (NGR) of TM473640.

AMEC Environment & Infrastructure UK Ltd ('AMEC') was commissioned in 2007 to provide terrestrial and freshwater ecological, and ornithological services in relation to Sizewell C. The purpose of this report, which outlines the findings of the extended phase 1 habitat survey work undertaken in the period 2007-2012, is to inform the design of Sizewell C and the Environmental Statement for the scheme.

1.2 Survey Area and Scope

The survey area and methodologies used have been adopted following consultation with statutory and non-statutory consultees and other stakeholders, taking into account best practice guidelines, and site-specific and project-specific characteristics. The survey area adopted is precautionary in that it allows for the iterative development of the scheme design by covering a larger area than is likely to be affected by the proposals. Based on the information available at the time the survey was undertaken, it was assessed that the relevant Zones of Influence of the proposed development would be likely not to extend further than the defined study area.

2. Methods

2.1 2007 Survey

The survey was based on the phase 1 habitat ecological survey methodology (JNCC, 2003). Distinct habitats were identified and mapped, and any features of nature conservation interest were subject to a more detailed description in a target note. As the standard phase 1 habitat survey methodology is, in the main, concerned only with vegetation communities, the survey was extended (IEA, 1995) to allow for the provision of information on other important ecological features, particularly to identify the presence/potential presence of legally protected species, such as bats, badger (*Meles meles*), great crested newt (*Triturus cristatus*) and water vole (*Arvicola amphibius*).

2.2 2012 Survey

Extensions to the original survey area were surveyed and any change in on-site habitats or management was noted. Survey extension areas were located to the north and south of the EDF land holdings (see Figure 2.1), in order to cover the entire EDF Estate.

2.3 Personnel

In 2007, the site was surveyed on 27, 28 and 29 March by Emma Toovey, and in 2012 the extended area was surveyed by Alastair Miller on 3, 4 and 5 April 2012. Both are senior ecologists experienced in the phase 1 habitat survey methodology. Results

3. Results

3.1 Overview

The locations of the various habitats recorded during the surveys are shown on the phase 1 habitat map provided in Figure 3.1. The locations of the target notes are also shown on this figure.

The survey area can be separated into those habitats found on drier, sandier soils to the west and south of the Sizewell Estate and those in lower-lying areas across the estate, chiefly the Sizewell Belts, which are influenced by a high water table. Drier habitat areas are composed largely of agricultural farmland, primarily consisting of ploughed arable fields and hedgerow networks integrated with broad-leaved and coniferous plantation and semi-natural woodland habitats. Within and around these areas, dry grasslands comprising a mixture of improved, semi-improved swards (both acidic and neutral in nature) can be found, notably Leiston Common, Broom Covert and Retsoms Field. These areas also include some rural infrastructure including a number of farms and residential dwellings.

More regularly inundated habitats comprise a variety of well established and ecologically diverse wetland habitats, including extensive grazing marshes and lowland unimproved wet meadow, swamp and wet woodland (often including mosaics with dense and scattered scrub), as well as open water (freshwater and brackish) in the form of ditches and ponds. Furthermore, the proximity of the survey area to the coastline provides vegetated shingle and dune grassland habitats to the east of the proposed power station site.

3.2 Habitats

3.2.1 Dunes and Shingle

Vegetated shingle habitats lie parallel to the shoreline, beyond which a narrow dune system occurs. Bare shingle habitats are found along the beach that runs parallel to the eastern boundary of the power station site (TN1). Vegetation along the beach is limited with some occasional growth that generally includes yellow-horned poppy (*Glaucium flavum*), wood sage (*Teucrium scorodonia*) and sea kale (*Crambe maritima*).

Moving away from the sea, the habitats succeed into a poorly developed dune system (TN2) where dune grassland communities have been heavily disturbed as a result of regular use by the public. Marram grass (*Ammophila arenaria*) and bracken (*Pteridium aquilinum*) dominate these habitats with scattered patches of sea buckthorn (*Hippophae rhamnoides*), gorse (*Ulex europaeus*) and broom (*Cytisus scoparius*) locally abundant, particularly in the dune slacks where a variety of moss and lichen species also occur. On the dune system further inland, scrub and rank grassland habitats become more widespread and dominant. A thin strip of marram and wavy hair-grass (*Deschampsia flexuosa*) dominated grassland is present with common occurrences of sea couch (*Elytrigia atherica*), bramble (*Rubus fruticosus* agg.), dandelion (*Taraxacum officinale*) and sea spurge (*Euphorbia paralias*).

3.2.2 Grassland and Scrub

Grassland habitats across the survey area are generally semi-improved and acidic in nature (some areas have been re-instated and are currently grazed), with some smaller areas of semi-improved or poor semi-improved neutral grassland. Habitat enhancement in the form of acid grassland reversion from arable fields and coniferous woodland has also been undertaken, primarily as part of the ongoing reptile management plan. Grazing meadows/marshy grasslands are referred to in detail below under the Wetlands section.

Semi-improved neutral grassland

Land previously associated with the construction zone of Sizewell B power station is located to the west of the dune grassland habitats (TN3) and to the north of the existing nuclear facilities. The typical dune plant communities do not occur on this land as natural processes have been arrested and the hydrology and pedology of the area have been irreversibly altered. Habitats within this area include semi-improved tussocky rank grassland with planted native scrub species around the periphery of the disturbed area. The rank grassland is dominated by cock's-foot (*Dactylis glomerata*) and wavy hair grass with locally frequent occurrences of marram. Herb species including wild carrot (*Daucus carota*), curled dock (*Rumex crispus*), common couch (*Elytrigia repens*), creeping thistle (*Cirsium arvense*) and dandelion frequently occur. A relatively dense and even distribution of planted native scrub species occurs within the tussocky grassland around the periphery of the disturbed area and includes Corsican pine (*Pinus nigra* ssp. *laricio*), holly (*Ilex aquifolium*), gorse, alder (*Alnus glutinosa*), silver birch (*Betula pendula*), hornbeam (*Carpinus betulus*), blackthorn (*Prunus spinosa*) and hawthorn (*Crataegus mongyna*).

Immediately to the north of Sizewell B power station site there are three fields of poor semi-improved grassland (sheep grazed pasture) (TN4) that are maintained at a very low sward height during early spring but left ungrazed for the remainder of the year. Frequently occurring species include cocksfoot, white clover (*Trifolium repens*), dandelion, daisy (*Bellis perennis*), bristly oxtongue (*Picris echioides*) and ribwort plantain (*Plantago lanceolata*). These areas of pasture are fragmented by belts of semi-natural broad-leaved woodland that comprise silver birch, pedunculate oak (*Quercus robur*), hawthorn, blackthorn, hornbeam, alder and holly. A temporary gravel/shale construction track has been laid within these fields and connects the site to the foreshore.

Several other small fields or discrete areas of semi-improved or poor semi-improved neutral grassland are present within the EDF land holdings.

Mosaic of scattered scrub/neutral grassland and swamp/tall emergent vegetation

Habitats around the confluence of the two ditches draining out of the Sizewell Belts comprise a mosaic of neutral grassland (TN5) on drier soil, with the presence of tall emergent vegetation, notably common reed (*Phragmites australis*), hemp-agrimony (*Eupatorium cannabinum*) and bulrush (*Typha latifolia*) along the ditch edges. Open areas have been colonised predominantly by nettle (*Urtica dioica*), bramble, cow parsley (*Anthriscus sylvestris*), hogweed (*Heracleum sphondylium*) and bracken, while scrub has gradually invaded forming secondary woodland and becoming very dense in places. A small dense scrubby island has formed to the north of the footbridges, which is effectively surrounded by ditches on all four sides. This small island is dominated entirely by a dense scrub community, including willow (*Salix* spp.), alder and silver birch, with a ground flora comprising predominantly bracken, common reed and nettles.

To the south of the two footbridges, dense and scattered scrub occurs on damp neutral poor semi-improved grassland, which often tends to swamp (largely dominated by common reed). Also present in the ground layer are tussocks of hard rush (*Juncus inflexus*), cock's-foot and nettle.

Acid grassland

Leiston Common, Broom Covert and two fields adjacent to Sandy Lan, are all areas of semi-improved grazed acid grassland dominated by sheep's fescue (*Festuca ovina*) and an abundance of common bent (*Agrostis capillaris*), fine-leaved sheep's-fescue (*Festuca filiformis*) and sweet vernal grass (*Anthoxanthum odoratum*). Ribwort plantain, sand spurrey (*Spergularia rubra*), lady's bedstraw (*Galium verum*), creeping buttercup (*Ranunculus repens*), round-leaved crane's-bill (*Geranium rotundifolium*), dandelion and scentless mayweed (*Tripleurospermum inodorum*) are also locally apparent. Scattered gorse is particularly prominent across Broom Covert.

Around Leiston Common in particular, scattered silver birch is present to the east of the common, while discrete areas of oak and silver birch often form more of a wooded habitat. Evidence of extensive bracken encroachment and removal was also recorded. In addition to which, moderate localised heather coverage was apparent and some scattered gorse. The grassland at Black Walks is similar in species composition; however, gorse is more prominent and is scattered and dense in places in addition to blackthorn (*Prunus spinosa*) and elder (*Sambucus nigra*), while *Cladonia* sp. lichen, and biting stonecrop (*Sedum acre*) are more frequent and sand sedge (*Carex arenaria*) is often locally abundant. Many of these sites have a short sward height, due to heavy grazing by rabbits.

A further area of acid grassland has been re-instated on the previously arable Retsom's field to the north east of the survey area and exhibits a sward dominated again by sheep's-fescue and common bent and is regularly grazed by sheep and rabbits. A small area of regenerating heathland (TN6) has also been created within Retsom's field and is now dominated by heather (*Calluna vulgaris*), with occasional presence of *Cladonia* sp. lichen and localised patches of bracken.

Acid grassland (arable reversion)

Two large previously arable fields at Upper Abbey Farm (TN7) and the northern part of Rosery field (Sizewell Hall Farm) (TN7) are in the process of reversion to tussocky dry acid grassland with a range of mixed woody shrub areas. The fields have light sandy soils and were in continuous arable cultivation for a considerable time, growing field-scale vegetables and winter cereals; however, both sites have been ploughed, cultivated and rolled with a grass mixture drilled in 2010. The seed composition was collected from local dry acid grassland included sheep's fescue, sheep's sorrel (*Rumex acetosella*), common bent, wavy hair grass (*Deschampsia flexuosa*), tormentil (*Potentilla erecta*) and heath bedstraw (*Galium saxatile*). At the time of the 2012 survey the sward was sparse, suggesting that neither grassland area was yet fully established.

Acid grassland (coniferous plantation reversion)

Kenton Hills and Rookyard Wood (TN8) are two coniferous and mixed plantation woodlands with extensive areas of acid grassland reversion management under way. Habitat management in both areas has involved the creation of woodland rides and glades by felling trees and removing tree stumps. Acid grassland has been established by natural regeneration and in some

places by sowing. Species composition comprises predominantly common bent, sheep's fescue and sheep's sorrel.

3.2.3 Woodland

Semi-natural broad-leaved woodland

Wet woodland habitats are found on low-lying regularly inundated land at Grimseys (TN9) and extending northwards towards Sandlings Walk. Alder, ash (*Fraxinus excelsior*) and oak are all present in the canopy over most of the stand, with occasional downy birch (*Betula pubescens*) and poplar (*Populus nigra* agg.). The shrub layer most often comprises goat willow (*Salix cinerea*) as well as occasional saplings of the same broad-leaved species. Given the widespread inundation of this habitat, wetland species regularly comprise iris (*Iris pseudacorus*), hemp-agrimony, blackcurrant (*Ribes nigrum*), with rough meadow grass (*Poa trivialis*) and nettles constant, in addition to common reed, which is locally dominant. In places, climbing stems of honeysuckle (*Lonicera periclymenum*) are occasional on the trunks of some trees.

Distinct areas of deciduous woodland on drier ground also occur within the survey area. Reckham Pits (TN10) to the south of the Sizewell Belts is predominantly deciduous woodland dominated by silver birch with rare occurrences of Corsican pine. Holly and bramble occur frequently within the understorey with honeysuckle, bracken, common nettle, cleavers (*Galium aparine*), herb Robert (*Geranium robertianum*) and wood sorrel (*Oxalis acetosella*) also in abundance. Mistletoe (*Viscum album*) was apparent within some of the trees.

Ash Wood (TN11), located to the north of Ash Wood Cottages, is semi-natural broad-leaved woodland with dominant tree species including oak, ash and sweet chestnut. The ground flora is reasonably well established with dog violet, lords-and-ladies, common nettle, lesser celandine and fat-hen (*Chenopodium album*) in the marginal areas close to the arable fields. Bluebells (*Hyacinthoides non-scripta*) also occur occasionally along with large areas of creeping ivy. To the south-east of Ash Wood the woodland habitats have been extended, creating Great Mount Wood through the planting of Corsican pine with a deciduous woodland species edge that includes pedunculate oak, ash, sweet chestnut (*Castanea sativa*) and holly, linking up with a further belt of deciduous woodland to the west, referred to as The Grove.

Sandpytle and Dovehill Plantation woodlands (TN12) are plantation in origin but now comprise largely mature and established broad-leaved trees including oak, ash, alder and occasional Scots pine (*Pinus sylvestris*), but tending to alder carr within the damper, low-lying areas. The understorey comprises largely elder and younger alder trees, with evidence of some young plantation trees. Ground flora comprises bracken, bramble, honeysuckle, nettle, creeping soft grass (*Holcus mollis*), red campion (*Silene dioica*) and climbing corydalis (*Ceratocarpus claviculata*). Damper, more regularly inundated areas in both woodlands gave rise to more abundant common reed, yellow flag iris and nettles; within Dovehill Plantation, however, a variety of tall herbs are more frequent, including blackcurrant, common valerian (*Valeriana officinalis*) and meadowsweet (*Filipendula ulmaria*).

Between the Sizewell Belts grazing marshes and the power station complex, a long continuous strip of now established but previously plantation woodland (TN13) comprises a mix of oak, alder, ash and sycamore, with mature lines of alder bordering the ditch to the west of the woodland. Understorey species comprise bramble, hawthorn and elder, while the ground flora is dominated by nettle, ground ivy, cleavers and cock's-foot. This woodland was cleared for the installation of two large pylons, which has resulted in a ruderal/scrub mix of gorse, bramble,

elder and other scattered trees, with cock's-foot, rough meadow-grass, hemlock (*Conium maculatum*) and nettles dominating the ground flora.

Other pockets and belts of woodland across the survey area are often dominated by oak, beech (*Fagus sylvatica*), alder or silver birch, particularly along the southern edge of the Kenton Hills/nursery Covert plantation woodland, as well as the long strip of woodland to the east of Walk Barn (The Grove).

Plantation broad-leaved woodland

A strip of established plantation broad-leaved woodland borders the eastern edge of Kenton Hills (TN14) and include a mixture of beech, oak, silver birch, willow and alder. The understorey comprises scattered rhododendron or willow scrub, with a ground flora often dominated by bramble, nettle and bracken.

Plantation coniferous woodland

A large block of coniferous plantation (TN8) dominated by Corsican pine is located across the central part of the study area encompassing Leiston Carr, Kenton Hills, Nursery Covert, Dunwich Forest and Goose Hill. These woodlands are essentially coniferous although some felled areas have been planted with deciduous species including pedunculate oak, silver birch, alder, sweet chestnut, goat willow (*Salix caprea*) and holly.

The understorey comprises some deciduous species including honeysuckle-covered elder and holly, while bracken, bramble and common nettle heavily dominate the ground flora, in addition to spear thistle (*Cirsium vulgare*), locally frequent climbing corydalis and cleavers. Along the edges of the coniferous plantation, some areas of broad-leaved woodland species have been planted including pedunculate oak, goat willow, silver birch and alder, with areas of rhododendron (*Rhododendron ponticum*) and gorse. The plantation woodland is dissected by rides throughout with a composition as noted above with a limited understorey of holly, elder, hawthorn. Bracken, bramble and common nettle also heavily dominate the ground flora in these locations. Recently felled areas are also often planted with Corsican pine saplings and are commonly invaded by gorse.

Other smaller blocks or strips of coniferous woodland, generally comprising Corsican pine and/or Scots pine, are located across the survey area, particularly around the Greater Gabbard substation, as well as young plantation to the immediate north of Sizewell B power station.

Mixed plantation woodland

Several woodland blocks comprise mixed plantation woodland; these include Rookyard Wood, Sandlings Walk, Great Mount Wood and the Fiscal Policy woodland between Leiston Carr and Lover's Lane.

The fiscal policy woodland (TN15) comprises an even mix of Corsican pine, silver birch, sweet chestnut, pedunculate oak, sycamore (*Acer pseudoplatanus*) and common lime (*Tilia x europaea*). The understorey is well developed with frequent holly and elder (*Sambucus nigra*), often covered in honeysuckle, hawthorn and bramble with locally abundant gorse, particularly within the woodland margins. The ground flora at the time of the 2012 survey comprised lesser celandine (*Ranunculus ficaria*), wood speedwell (*Veronica montana*), cow parsley (*Anthriscus sylvestris*), dog violet (*Viola canina*), lords-and-ladies (*Arum maculatum*), snowdrop (*Galanthus nivalis*) and cleavers. Non-native rhododendron bushes are also locally abundant.

Rookyard Wood (TN8) comprises a similar mix of broad-leaved and coniferous species including oak, silver birch, sweet chestnut and Scots pine. The scrub layer is often dominated by hawthorn, elder, brambles, bracken and nettles in places; while the ground flora was sparse in most places, with frequent nettles and bluebells. Large areas have been felled and cleared however, and open grassland often corresponds with acid grassland conditions, with sheep's fescue, sheep sorrel and common bent. Several rides have been widened in order to provide habitat enhancement for reptiles.

Coronation Wood is predominantly medium-age and comprises Corsican pine with occasional mature European silver fir (*Abies alba*), beech and pedunculate oak, the latter particularly towards the southern end of the wood. A recently planted section (c. 30m x 20m) of oak and sweet chestnut occurs in the south eastern corner. The canopy is largely closed with little understorey other than occasional small open areas with patches of bracken and bramble, with the ground layer dominated by leaf litter, climbing corydalis and Yorkshire fog (*Holcus lanatus*). A dense 2m-wide band of scrub, mainly bramble with some gorse and hawthorn, occurs along the northern boundary.

3.2.4 Open water and wetland habitats

Open water and wetland habitats occur extensively across the survey area where the water table is high. The majority of the water bodies are man-made in the form of drainage channels (created historically for agricultural purposes), lagoons and pools, now managed for the benefit of biodiversity. The wetland habitats include grazing marshes (rush pasture and fen meadow), drainage ditches and swamp.

Marshy grassland and running water

An extensive dyke system occurs across a large proportion of the EDF Estate. Within the boundaries of the Sizewell Marshes SSSI, this area is also referred to as the Sizewell Belts. Marshy grassland (lowland unimproved wet meadow) (TN16) occurs between the dykes in lower-lying areas and is characterised by an abundance of plant species including sweet vernal grass (*Anthoxanthum odoratum*), crested dog's-tail (*Cynosurus cristatus*), rough-stalked meadow-grass and Yorkshire fog, with often rush-dominated stands comprising soft rush (*Juncus effusus*), blunt-flowered rush (*Juncus subnodulosus*) and jointed rush (*Juncus articulatus*). Frequent occurrences of bogbean (*Menyanthes trifoliata*), marsh pennywort (*Hydrocotyle vulgaris*), large bird's-foot-trefoil (*Lotus uliginosus*), ragged robin (*Lychnis flos-cuculi*), lesser yellow rattle (*Rhinanthus minor*), quaking grass (*Briza media*) and bog pimpernel (*Anagallis tenella*) were also noted during the survey.

The dykes are generally between 3 and 5m in width and the majority have a flow that varies in strength. They support a diverse aquatic flora including greater water parsnip (*Sium latifolium*), fool's watercress (*Apium nodiflorum*), floating sweet-grass (*Glyceria fluitans*) and whorled water-milfoil (*Myriophyllum verticillatum*). Bank habitats are generally well vegetated with a variety of sedge (*Carex spp.*) and rush (*Juncus spp.*) species in addition to yellow flag iris, watercress (*Nasturtium officinale*), fool's watercress (*Apium nodiflorum*), common reed and common reedmace; tubular water dropwort (*Oenanthe fistulosa*) and water plantain (*Alisma plantago-aquatica*) were also noted occasionally.

At the time of survey in 2012, a large, recently re-profiled area of open water was recorded within grazing marshes to the north of Sandlings Walk and to the east of Goose Hill plantation.

The northern extent of the EDF holdings incorporate a section of grazing marshes (TN17), crossed by a number of ditches. The species composition is similar to sections of the Sizewell Belts, which tend towards rush pasture, with an abundant mixture of soft rush and hard rush, Yorkshire fog, red fescue, rough meadow grass and frequent common reed; the network of freshwater ditches comprised similar species to those found in Sizewell Belts dykes. To the east of the BE landholding boundary, grazing fields are on slightly elevated ground and consequently drier; as such, rushes are less frequent and the sward is grassier in composition. In addition, gorse is more apparent, forming dense clumps within the fields.

Swamp and open water

Large areas dominated by common reed and reedmace also occur within the survey area, particularly south of Grimseys (TN18), as well as along the edge of the main Sizewell Belts dyke, which runs from Reckham Pits Wood in a north easterly direction, draining northwards to the Sluice at Minsmere. These swamp habitats are situated on an area of deep fen peat with a permanently high water table. These habitats are bordered by an extensive ditch system, which is prone to flooding. An area of open water (TN19) is situated within a reedbed and further surrounded by wet woodland. The shorelines of this open water body and along the edges of the dykes in this area are generally completely dominated by common reed and reedmace.

Large sections of the habitats to the south of Sandlings Walk comprise a mosaic (TN20) of swamp, scrub and established broad-leaved woodland. Areas can be divided into drier habitats, only inundated for part of the year and ground flora tending to neutral grassland, and damper swamp habitats inundated for most of the year, dominated by common reed. These areas show seral succession to dense scrub and also established woodland, where silver birch and alder have become established and attain heights of 10-15m.

Several small ponds were also recorded across the survey area, within plantation coniferous woodland, open arable farmland

3.2.5 Agricultural Land

Arable fields

As noted above, ploughed arable fields cover a large proportion of the EDF land holdings. The field margins vary in composition and diversity across the survey area. In the main, the margins are 2m in width, but in some places are wider (up to 6m), and support ruderal and herb species including broad-leaved dock (*Rumex obtusifolius*), red dead-nettle (*Lamium purpureum*), field speedwell (*Veronica persica*), common ragwort, common nettle, cocksfoot, false oat-grass (*Arrhenatherum elatius*), herb Robert, teasel (*Dipsacus fullonum*) and hoary plantain (*Plantago media*). Round-leaved crane's-bill (*Geranium rotundifolium*), lesser celandine and wood spurge (*Euphorbia amygdaloides*) also frequently occur with scattered encroaching scrub species such as lesser burdock (*Arctium minus*), blackthorn and bramble in abundance. Common reed also occurs in the margins where wetter soil conditions exist.

Field margins

The fields have well established although narrow margins comprising false oat-grass, common ragwort (*Senecio jacobaea*), common nettle, red dead-nettle, broad-leaved dock and herb Robert. Belts of deciduous woodland often dissect the arable fields and comprise pedunculate oak, silver birch, alder, white willow (*Salix alba*) and sycamore.

As noted previously, the arable fields within the survey area comprised ploughed fields at the time of the survey and have been planted with, amongst other crops, wheat, barley, onion, potatoes and beet. The margins are well-established in places with false oat-grass, common ragwort, common nettle, red dead-nettle, broad-leaved dock, bracken and herb Robert commonly present. Several narrow belts of deciduous woodland dissect the arable fields immediately to the north of Nursery Covert.

Hedgerows

More than 50 hedgerows occur within the survey area, generally adjacent to and dissecting arable or improved fields. The hedgerow network is a mixture of often tree-lined, intact and defunct hedgerows, and is most extensive and well connected around the agricultural land of Upper Abbey farm.

Intact species-poor hedgerows are dominated largely by just one or two species including hawthorn, blackthorn or hornbeam with occasional elder and pedunculate oak trees. They commonly occur on the agricultural land and are often heavily managed, particularly when adjacent to roads.

Although classified as species-poor, given the paucity of wooded species within their vicinity, the parallel hedgerows running north to south along the Upper Abbey farm track (TN21) to beyond the Round House do in places exhibit a comparatively species-rich understorey, which may include lords-and-ladies, dog's mercury (*Mercurialis perennis*), hart's tongue (*Asplenium scolopendrium*), cleavers, cocksfoot, false oat-grass, common nettle, ramsons (*Allium ursinum*), dog violet, hairy brome (*Bromus ramosus*), herb Robert and wood avens (*Geum urbanum*). Bluebell and wood spurge also occasionally occur along with climbers including hop (*Humulus lupulus*) and black bryony (*Tamus communis*).

3.2.6 Built-Up, Hardstanding and Amenity Land

The power station site itself contains little in the way of natural or semi-natural habitats, consisting of largely built-up (power station buildings of Sizewell B) or hard-standing ground (walkways, footpaths, roads and car parks).

To the north and west of Coronation Wood, areas/strips of short amenity grassland were noted, comprising predominantly mosses, common bent and annual meadow-grass (*Poa annua*) with frequent common forbs including daisy (*Bellis perennis*), early forget-me-not (*Myosotis ramosissima*), yarrow (*Achillea millefolium*), spear thistle (*Cirsium vulgare*), dovesfoot cranesbill (*Geranium molle*) and common storksbill (*Erodium cicutarium*). Verges had been planted with cultivated daffodils. Occasional patches of spring beauty (*Claytonia perfoliata*) and bugloss (*Anchusa arvensis*) were also noted along the southern part of verge. These areas also contained frequent ragwort (*Senecio sp.*) and patches of dense scrub, predominantly gorse.

Young ornamental trees and shrubs were recorded bordering these hardstanding areas, with woodland to the west and a high concrete wall covered in dense climbers to the east.

3.3 Fauna

The potential for each conservation-notable species or group of species to occur within the survey area, based on the habitats present, is discussed below.

3.3.1 Badger

The landscape within and around the survey area comprises well connected stretches of woodland, including Ash Wood, Grove Wood, Reckham Pits and Coronation Wood (broad-leaved, mixed and coniferous), with wooded or scrubby corridors or hedgerows connecting the landscape along many field boundaries, all of which offer secure and sheltered sett-building and commuting habitat for badgers.

Given the low-lying nature of the Sizewell Belts (most of these habitats are below the water table), the lack of effective soil drainage leaves much of this habitat largely unsuitable for sett-building; however, the largely cattle managed wet meadows within the Belts do offer high quality foraging for badgers' favoured prey item, earthworms (*Lumbricus terrestris*). The area surrounding the Sizewell Belts is generally very flat with land use on the sandy/gravel soils dominated by arable farming, particularly for root crops, such as potatoes, carrots, onions, peas and sugar beet, and to a lesser extent cereals such as sweet corn. These crops provide good alternative seasonal foraging for badgers.

3.3.2 Bats

The survey area comprises a mosaic of wetland habitats, woodland, hedgerows, grassland and scrub. This range of habitats provides optimal foraging and commuting habitat for many of the native bat species in the UK. Additionally, areas of mature woodland, farm buildings and residential dwellings within the estate are suitable to support roosting bats.

3.3.3 Otter

The wetlands present within the survey area provide extensive habitat conditions and foraging resources. Within the Sizewell Belts in particular, there is extensive cover for use by commuting and sheltering otters, including dense emergent vegetation (comprising reeds, greater pond sedge, nettles etc.), large stands of reed beds, tree-lined ditches and extensive areas of wet woodland. There is likely to be a reliable source of fish prey as well as a seasonal foraging resource in the form of frogs and toads. There is also good habitat connectivity to the north with a sizeable additional foraging resource in the extensive reed beds of the Minsmere Levels and wider Minsmere/Yox River catchment. In addition, there are low levels of disturbance to waterways and wetland areas across much of the Sizewell Belts.

3.3.4 Water Vole

Wetland habitats including the ditch network, swamp and marshy grassland within the survey area include large areas of optimal habitat for water voles. In addition, ditches within the survey area provide an important ecological link between Sizewell and Minsmere to the north. These water courses are likely to form an important dispersal route for water voles, linking populations at Sizewell with those found in Suffolk's coastal marshes to the north.

3.3.5 Birds

The range of wetland, woodland, coastal and farmland habitats present have the potential to support a range of breeding, foraging and wintering birds, potentially including conservation-notable species such as bittern (*Botaurus stellaris*) and marsh harrier (*Circus aeruginosus*).

3.3.6 Reptiles

The mosaic and extent of habitats present within the survey area are suitable to support the four common native reptile species most notably common lizard, (*Zootoca vivipara*) adder (*Vipera berus*), grass snake (*Natrix natrix*) and slow worm (*Anguis fragilis*).

3.3.7 Amphibians

The water bodies and ditches across the survey area are judged to be sub-optimal to support breeding great crested newt due to the high fish populations, brackish conditions in areas, strong flows and the presence of wildfowl. However, this species is known to be present further afield and terrestrial habitats within the survey area are suitable to support this species.

As part of a re-introduction project funded by the Herpetological Conservation Trust (HCT) and the Beckwith Trust, two ponds were created on Retsoms Field in 2004 specifically for natterjack toad (*Bufo calamita*), in line the aims of the UK Biodiversity Action Plan for the species (ADAS/Suffolk Wildlife Trust, 2005).

3.3.8 Invertebrates

The mosaic of wetland, aquatic and terrestrial habitats present within the wider survey area provides environmental conditions that are likely to support notable and scarce assemblages of invertebrate species.

4. Summary

The Extended Phase 1 Habitat Survey has characterised the habitats within the survey areas, comprising the entirety of EDF's Sizewell Estate.

The land within the survey area comprises an extensive mosaic of agricultural farmland primarily consisting of ploughed arable fields and hedgerow networks integrated with deciduous and coniferous plantation and semi-natural woodland habitats, semi-improved and improved neutral and acid grassland swards, dense and scattered scrub and general rural infrastructure including a number of farms and residential dwellings. Due to the high water table in areas across the Sizewell Estate, a variety of well-established and ecologically diverse wetland habitats are present including open water (freshwater and brackish) in the form of ditches and ponds, marshland, fen and lowland unimproved wet meadow. Coastal areas to the east of the survey area consist of vegetated shingle and dune grassland habitats. In addition to a number of acid grassland fields across the survey area, a small area displaying reversion to heath is present within an acid grassland field to the north east of the survey area.

The wider survey area is known to be of considerable botanical interest, particularly within the grazing meadows and dykes of Sizewell Belts, and in turn, the associated assemblages of invertebrates are also of particular note.

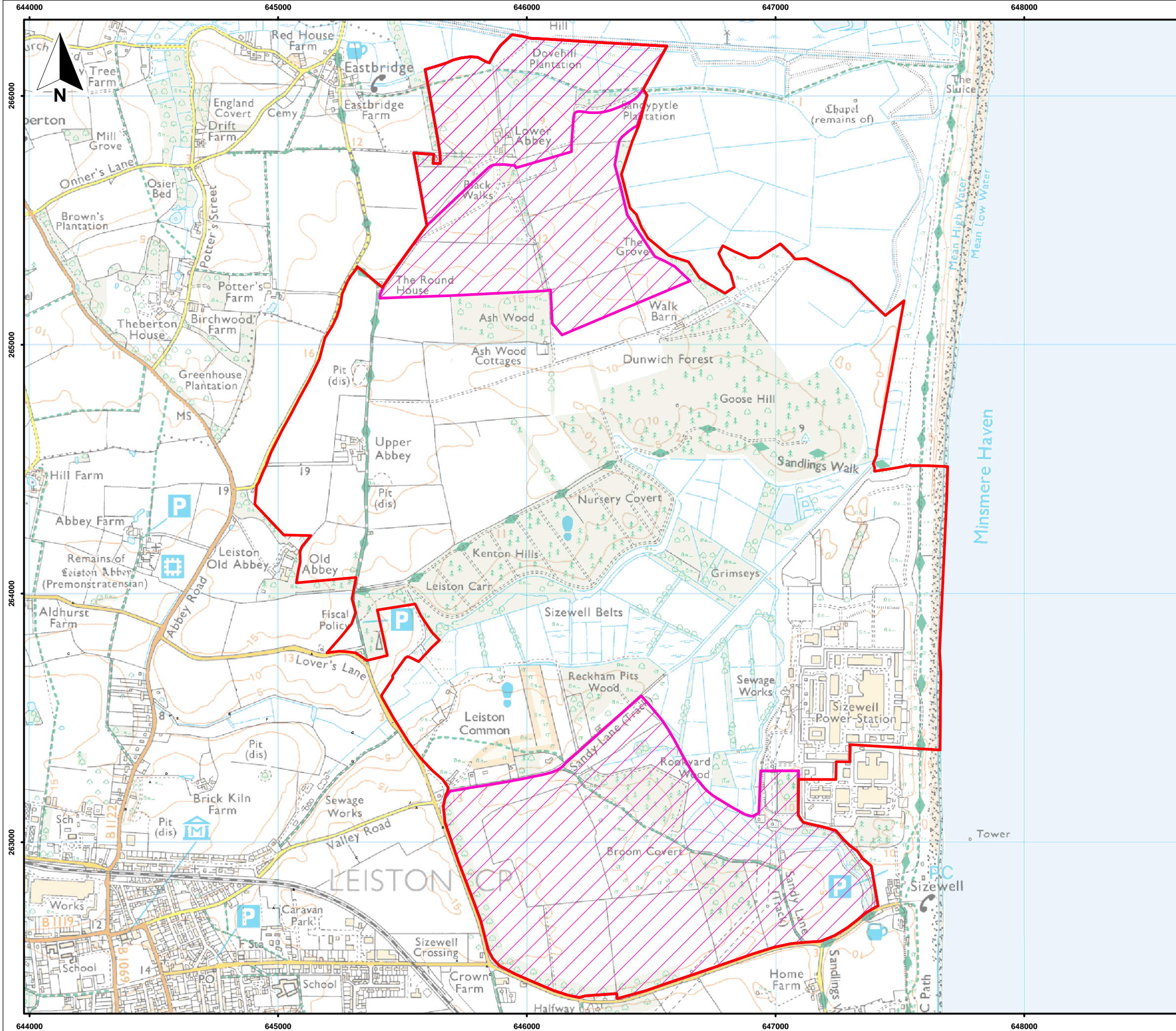
The survey area offers excellent potential to support badger foraging and sett-building; foraging, commuting and roosting bats and native reptile species within the grassland and scrub habitats and woodland edges; and foraging, dwelling places and cover habitat for water voles and otter. Natterjack toads are known to be present within this mosaic of habitats, and there is some potential for the area to support great crested newts, given the widespread occurrence of ditches and several discrete pools within the survey area.

5. References

ADAS/Suffolk Wildlife Trust (2008). Sizewell Land Management Annual Review 2007-2008.

Institute of Environmental Assessment (1995). *Guidelines for Baseline Ecological Assessment*. E & FN Spon, London.

Joint Nature Conservation Committee (2007). *Handbook for Phase 1 Habitat Survey – A Technique for Environmental Audit*. JNCC, Peterborough.



Key:
 Survey area boundary
 Additional area surveyed 2012

0 375 750
 Metres

Scale: 1:15,000 @ A3

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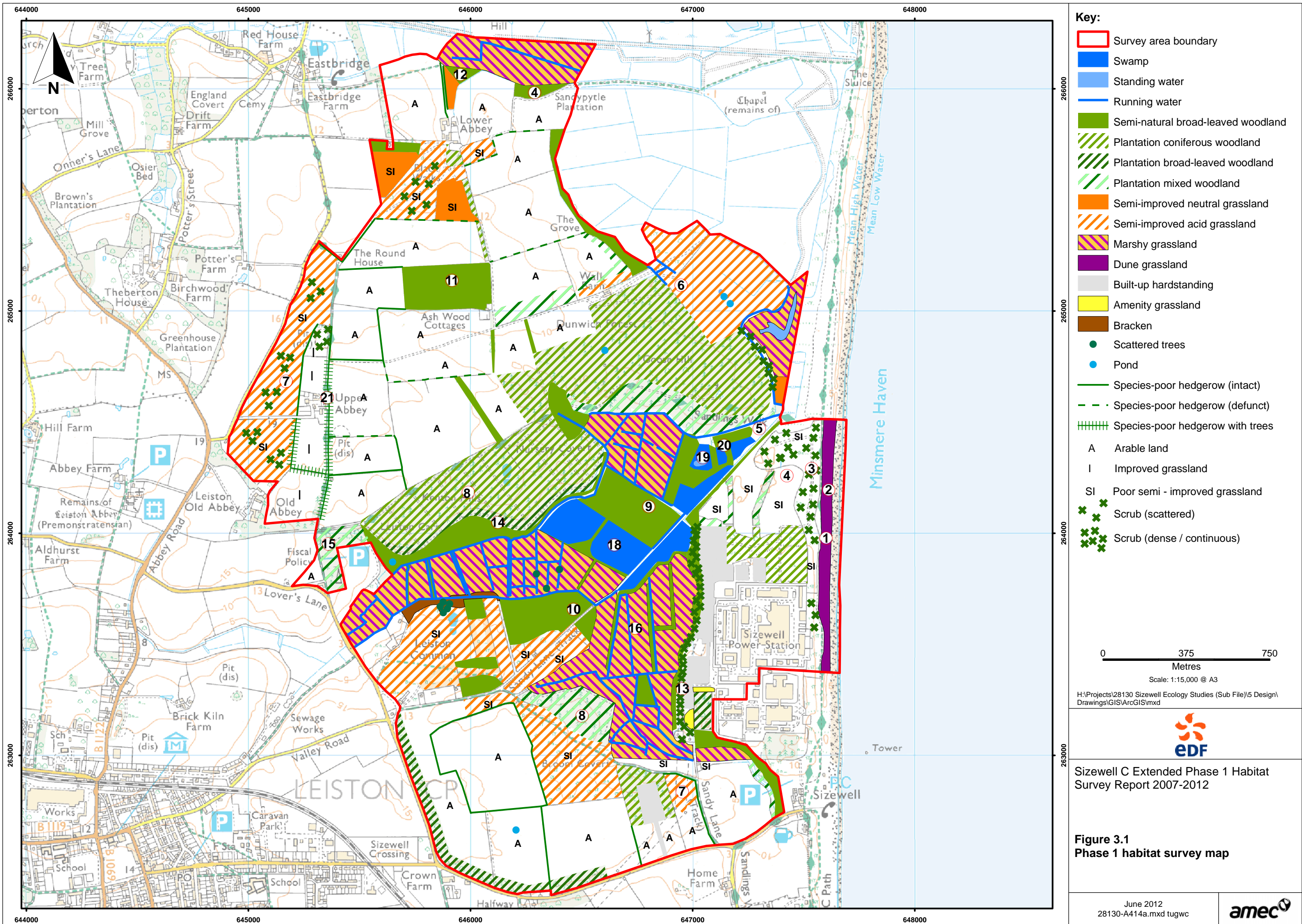


Sizewell C Extended Phase 1 Habitat Survey Report 2007-2012

Figure 2.1
 Survey area

June 2012
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**SIZEWELL C DEVELOPMENT – MAIN DEVELOPMENT SITE:
VOLUME 2, CHAPTER 14: APPENDIX 14A9 – TERRESTRIAL
MAMMALS: ANNEX 14A9.3 CONSOLIDATED BADGER
REPORT [CONFIDENTIAL]**

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EDF Energy

**Sizewell C New Nuclear Power Station:
Terrestrial and Freshwater Ecology, and
Ornithology**

Draft Otter Survey Report 2007-2010

June 2012

AMEC Environment & Infrastructure UK Limited

Report for
EDF Energy

Main Contributors

Katheryn Leggat
Alastair Miller
Emma Toovey
Richard Knightbridge

Issued by

.....
Lyn [REDACTED]

Approved by

.....
Lynn Whitfield [REDACTED]

**AMEC Environment & Infrastructure
UK Limited**

17 Angel Gate, City Road, London EC1V 2SH,
United Kingdom
Tel +44 (0) 207 843 1400
Fax +44 (0) 207 843 1410

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1. Introduction

1.1 Purpose of this Report

An area of land directly north of Sizewell B Nuclear Power Station, which is located near Leiston in Suffolk, has been identified as having the potential to accommodate the proposed development of one or more new nuclear reactors. This proposed development is known as Sizewell C. The site of the proposed development has an approximate central National Grid Reference (NGR) of TM473640.

AMEC Environment & Infrastructure UK Ltd ('AMEC') was commissioned in 2007 to provide terrestrial and freshwater ecological, and ornithological services in relation to Sizewell C. The purpose of this report, which outlines the findings of survey work undertaken for otter (*Lutra lutra*) in the period 2007-2010, is to inform the design of Sizewell C and the Environmental Statement for the scheme.

1.2 Survey Area and Scope

The survey area and methodologies used have been adopted following consultation with statutory and non-statutory consultees and other stakeholders, taking into account best practice guidelines, and site-specific and project-specific characteristics. The survey area adopted is precautionary in that it allows for the iterative development of the scheme design by covering a larger area than is likely to be affected by the proposals. Based on the information available at the time the survey was undertaken, it was assessed that the relevant Zones of Influence of the proposed development would be likely not to extend further than the defined study area.

2. Methods

2.1 Desk Study

A considerable amount of baseline ecological survey work has been conducted on the BE Estate at Sizewell during the past 25 years. This has been undertaken by a range of organisations including Suffolk Wildlife Trust (SWT), ecological consultants (commissioned by Nuclear Electric and latterly by BE), the Environment Agency, universities and colleges, special interest groups and individuals. This information was made available to AMEC by British Energy to assist the design of the ecological survey programme. Additional data from survey work commissioned by Magnox in association with the decommissioning of Sizewell 'A,' and species records held by the Suffolk Biological Records Centre (SBRC) were also used to inform the work. Royal Holloway University (RHU) and RSPB have conducted biannual water vole (*Arvicola terrestris*) monitoring as part of the Water Vole National Key Sites scheme since 2001 within the BE Estate and at Minsmere respectively. They were therefore also approached for information relating to otters that they may have recorded during the course of these surveys.

2.2 Field Surveys

2.2.1 2007 Survey

On the 4 and 5 October 2007, the Sizewell Estate was visited by two ecologists with the aim of surveying and assessing suitable habitat within the then current preliminary works area and a perimeter zone of 500m around it, for its potential to support otter.

Due to the extensive system of water bodies present across the survey area, and health and safety issues due to the heavily vegetated nature of some and the inaccessibility of others, it was not feasible to include every water body within the scope of the survey. A representative sample of the ditches within the survey area were therefore identified and surveyed for signs of otter presence. The water bodies surveyed were chosen based on ease of access, and were evenly and widely distributed in order that all parts of the study area were sampled. During the survey the following signs, indicating the presence of otter, were searched for in the vicinity of the watercourses:

- Spraints (faeces) – which are often located on prominent features within the channel or on the bank (including weirs, bridges, rocks, tree roots, confluences of streams etc); and
- Footprints – located in soft mud, silt, or sand banks.

Additional evidence of otter presence was also searched for, such as the remains of dead fish/ fish remains, potential holt sites, pathways from the water into dense cover or around bank-side trees, 'slides' down banks, or resting up places (often characterised by areas of flattened vegetation). These signs, when interpreted in conjunction with spraints and footprints, can provide data to support an assessment of otter activity on a site. They cannot however be used in isolation to definitively indicate otter presence/ absence.

Figure 2.1 indicates the location of the 20 transects surveyed.

2.2.2 2009/ 2010 Survey

Following an initial reconnaissance survey, which covered a high percentage of all drainage channels and other water bodies within the survey area, a total of 33 potential spraint locations were identified (see Figure 2.2). These points were surveyed monthly between December 2009 and November 2010 in order to provide information regarding the extent and seasonality of otter presence and habitat utilisation across the survey area.

In combination with the monthly spraint point surveys, all other signs of the presence of otter were recorded, such as those stated for the 2007 survey.

2.3 Personnel

The survey teams were led by Katheryn Leggat in 2007 and Emma Toovey in 2009-2010; all members of the teams were suitably experienced surveyors.

3. Results

3.1 Desk Study

Detailed desk study data are provided in Appendix A: these include records collected up to 2007.

3.1.1 Suffolk Wildlife Trust

The Sizewell Land Management Annual Reviews since 1996 have referred to regular signs of otter activity across the site, including a number of sightings of adult male and female otters, and of cubs. Two of the reports (1996-97, and 1997-98) refer to the Lower Abbey Marshes¹ as a regular crossing point with fresh otter signs found almost daily.

3.1.2 Royal Holloway University

12 transects within the BE Estate at Sizewell are monitored by RHU twice annually for water voles as part of the National Key Sites initiative. During the course of these surveys, field signs of otter and mink (*Mustela vison*) are also recorded. RHU provided data for these transects, for the period between September 2001 and May 2007. Figure 2.1 illustrates the location of each transect, and **Table A1** (Appendix A) summarises the otter data collected.

The RHU transects are all situated within the Sizewell Marshes. Otter field signs were recorded from three of the transects, indicating otter activity focussed in the south of the survey area (Transects 3 and 4) from May 2004 to September 2006. Otter activity was also identified in a more central location in the Sizewell Belts (Transect 7); however this record was made in September 2003, with no further activity noted since.

3.1.3 RSPB

24 transects on the Minsmere site are monitored on a twice annual basis for water voles as part of the National Key Sites initiative. The location of the transects is shown in Figure 2.1. Evidence of otter activity is not generally recorded during these surveys, but anecdotal evidence suggests that the species is common on the reserve as there are numerous signs of otter and regular sightings (R. Harvey [RSPB], pers comm.).

3.1.4 SBRC and Other Data

SBRC provided a number of records of otter from the Sizewell Marshes SSSI and the surrounding area for a 10km radius. These records are presented in **Table A2**, and indicate that the species has occurred in the area for more than 10 years. No recent (since 2005) records of otter activity were returned from SBRC, but this is unlikely to indicate any changes in local distribution or abundance.

¹ These marshes are approximately 1km to the north of the indicative construction compounds, being adjacent to the northern edge of Sandpytle Plantation.

The Environmental Statement (ES) produced in association with the decommissioning of Sizewell A included two historical records of otter activity. One of these was from outside the survey area, to the south of Reckham Pits Wood, whilst the other was located at the point where the proposed access road route crosses two water courses at its eastern extent (British Nuclear Group, 2005).

3.2 2007 Field Survey

3.2.1 Habitats

The ditches surveyed all generally comprised slow-flowing or still water over 1m deep with wide swathes of riparian vegetation and earth banks (see Table 3.1). Bordering land use was predominantly marshy grassland, which in many cases was grazed by cattle and/or sheep. Other land uses bordering survey transects included reedbeds and arable fields. Several of the transects had woodland dominating one bank and therefore were somewhat shaded by overhanging trees. Riparian vegetation was abundant at varying levels with some ditches providing a wide margin of reeds and sedges, and others dominated by patches of scrub with only a narrow strip of reeds.

Table 3.1 Descriptions of the ditches surveyed

Transect	Bordering Land Uses	Bank Profile ²	Depth (m)	Width (m)	Dominant Bankside Vegetation
A	Marshy grassland	Shallow-steep	1.5+	1-2	Reeds
A	Marshy grassland	Shallow-steep	1.5+	1-2	Reeds
B	Broad-leaved woodland, marshy grassland	Shallow-steep	1.5+	1-2	Trees
C	Marshy grassland, semi-improved grassland	Shallow	1-1.5	1	Trees/scrub
D	Marshy grassland, semi-improved grassland	Steep	0.5-1	1-2	Trees, scrub
E	Marshy grassland, mixed woodland	Steep	1.5+	2-5	Reeds, trees
F	Marshy grassland	Shallow	1.5+	1-2	Reeds
G	Conifer plantation, marshy grassland	Steep	1.5+	1-2	Trees, tall grass
A	Marshy grassland	Shallow-steep	1.5+	1-2	Reeds
H	Reedbed, broad-leaved woodland	Shallow	1.5+	2-5	Reeds, trees
I	Reedbed, broad-leaved woodland	Shallow	1.5+	2-5	Reeds, trees
J	Reedbed, broad-leaved woodland	Shallow	1.5+	2-5	Reeds, trees
K	Reedbed, broad-leaved woodland	Flat	1.5+	2-5	Reeds, trees

² Bank profile: flat <10°, shallow <45°, steep >45°, vertical/undercut.

Table 3.1 (continued) Descriptions of the ditches surveyed

Transect	Bordering Land Uses	Bank Profile³	Depth (m)	Width (m)	Dominant Bankside Vegetation
L	Reedbed, broad-leaved woodland	Flat	1.5+	2-5	Reeds
M	Marshy grassland	Shallow	1.5+	1-2	Reeds
N	Marshy grassland	Shallow	1.5+	1-2	Submerged weed
O	Marshy grassland, broad-leaved woodland	Shallow	1.5+	2-5	Trees, submerged weed
P	Marshy grassland, broad-leaved woodland	Shallow	1.5+	1-2	Trees, reeds
Q	Broad-leaved woodland, marshy grassland	Shallow	1.5+	1-2	Trees, submerged weed
R	Semi-improved grassland	Steep	1.5+	2-5	Scrub
S	Arable land	Steep	1.5+	1-2	Submerged weed, short grass
T	Marshy grassland	Shallow	1.5+	1-2	Reeds

3.2.2 Otter Signs

The otter field signs identified by the 2007 survey are summarised in Table 3.2.

Table 3.2 Otter field signs identified (* indicates no signs found)

Transect	Otter Signs Found		
	Spraint	Footprints	Other Notes
A	×	×	
B	On dead tree fallen across watercourse	×	
C	×	×	Evidence of large runs through, and areas of flattened vegetation, no other evidence to indicate this was caused by otters.
D	×	×	Large hole adjacent to watercourse, close to mature tree roots, no evidence in the vicinity to indicate the species that created this

³ Bank profile: flat <10°, shallow <45°, steep >45°, vertical/undercut.

Table 3.2 (continued) Otter Field signs identified (* indicates no signs found)

Transect	Otter Signs Found		
	Sprint	Footprints	Other Notes
E	*	*	
F	*	*	
G	*	*	
H	*	*	Woodland appears to offer numerous opportunities for potential holt sites, but no otter signs found.
I	*	*	
J	*	*	
K	On land bridge through watercourse	*	Dead fish found on tree stump, no other otter signs found in the vicinity.
L	On tree stump adjacent to watercourse	*	
M	*	*	
N	*	*	
O	*	In soft mud adjacent to watercourse	
P	*	*	
Q	*	*	
R	*	*	
S	*	*	
T	*	*	

Evidence of fresh otter activity, including three characteristic sprints and one clear footprint, was identified during the field survey. These field signs were widely distributed across the survey area, and indicate that otter occurs across suitable habitat on the BE Estate. A number of other signs indicative of otter activity were recorded, but in the absence of sprints or clear footprints in proximity to these, it was not possible to confirm that these were not made by other mammals.

3.3 2009-2010 Field Survey

Otter sprint was recorded at all but one of the 33 monthly monitored potential sprint locations across the survey area (see Appendix B). Data from both the 33 monitored sprint locations and other locations are presented in Table 3.3. These data indicate seasonality in the level of sprinting recorded across the survey area, with peak sprinting levels during the winter months (December 2009 and November 2010) and lowest during the summer (June–August 2010). This pattern of seasonal variation is typical of European otters and should not be taken as an indication of seasonal variation in intensity of use of the survey area (see Kruuk, 2006, for a

discussion of the factors underlying this seasonal variation in sprinting behaviour). Whatever the reasons, the extensive distribution of sprinting activity over much of the year and across the whole site indicate communication between several individual otters that are likely to be present during the year.

Table 3.3 Recorded sprint activity between december 2009 and november 2010

	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Formal sprint monitoring points	18	11	15	17	22	16	4	6	8	15	9	17
Additional sprints	9	11	9	8	6	6	3	3	4	7	9	18
Total sprints	27	22	24	25	28	22	7	9	12	22	18	35

All recorded otter activity within the survey area (including sightings, sprint locations, couches, potential couches, prints and carcasses etc.) is presented in Table 3.4 and Figure 3.1.

Table 3.4 Otter activity recorded within the survey area

Features of Importance	OS Grid Ref.	Description
Sightings		
S1: Two otters	TM 47028 64433	Two otters (likely to be an adult female and a 1 year old youngster) were seen by an AMEC ecologist on 25/05/10 (c.22:30) in a wide drainage ditch running along the southern extent of Goose Hill
S2: Two otters	TM 46719 63536	Two otters (likely to be an adult female and a 1 year old youngster) were recorded along the ditch network within the vicinity of Rookyard Wood earlier in 2010 by an SWT worker (pers. comm. Carl Powell).
S3: Single otter	TM 47313 64445	Single large dog otter (assumed to be male based on size) recorded on 09/03/11 (c. 10.20am) by AMEC ecologist Lynn Whitfield and Carl Powell (SWT) in a watercourse. Once disturbed, it left the ditch and headed west into the woods.
Dwelling places		
Couch	TM 47395 64572	The couch/covered den is situated on what amounts to an island, bordered on either side by drainage channels, and appears to be a well used above ground temporary dwelling place, with several potential laying-up areas. The den is situated within willow carr and beneath dense bracken, with a well worn run leading from the bank edge (with intact sprints) into the den area and several compacted earth runs and flattened bracken.
Couch	TM 46547 63893	The couch is situated along the edge of a woodland strip, adjacent to a drainage channel. The structure comprises a large fallen bough and branches, with flattened earth beneath. An intact sprint was recorded on dead wood near the entrance. Two small runs indicate movement between the drainage channel and the couch.

Table 3.4 (continued) Otter activity recorded within the survey area

Features of Importance	OS Grid Ref.	Description
Couch	TM 46158 63865	Similar to Sizewell Belts couch A, the couch is situated along the edge of a woodland strip, adjacent to a drainage channel. The structure comprises a large fallen bough with flattened earth beneath. An intact spraint was recorded on a log near the entrance. A single run indicates movement between the drainage channel and the couch.
Potential couch	TM 45936 63919	Lay-up space in the bowl of a tree with fallen branches and flattened leaves, adjacent to a watercourse. No definitive evidence of otter usage other than flattened vegetation.
Other activity		
Multiple spraint stations	TM 47703 66129	Regularly recorded multiple spraints deposited at strategic or prominent positions e.g. close to a foraging resource or crossroads location, where other otters are likely to visit.
	TM 47443 65128	
	TM 47375 64523	
Feeding remains	TM 46707 64331	Frog carcass
	TM 47043 64164	Fish carcass
	TM 46801 63014	Frog carcass
	TM 46788 63041	Fish carcass
	TM 46771 64479	Frog carcass
Slide	TM 46761 64280	Frog carcass
	TM 47721 66110	Well used slide down banking close to the sluice at Minsmere.

4. Summary

This report outlines the findings of survey work undertaken for otters in the period 2007-2010.

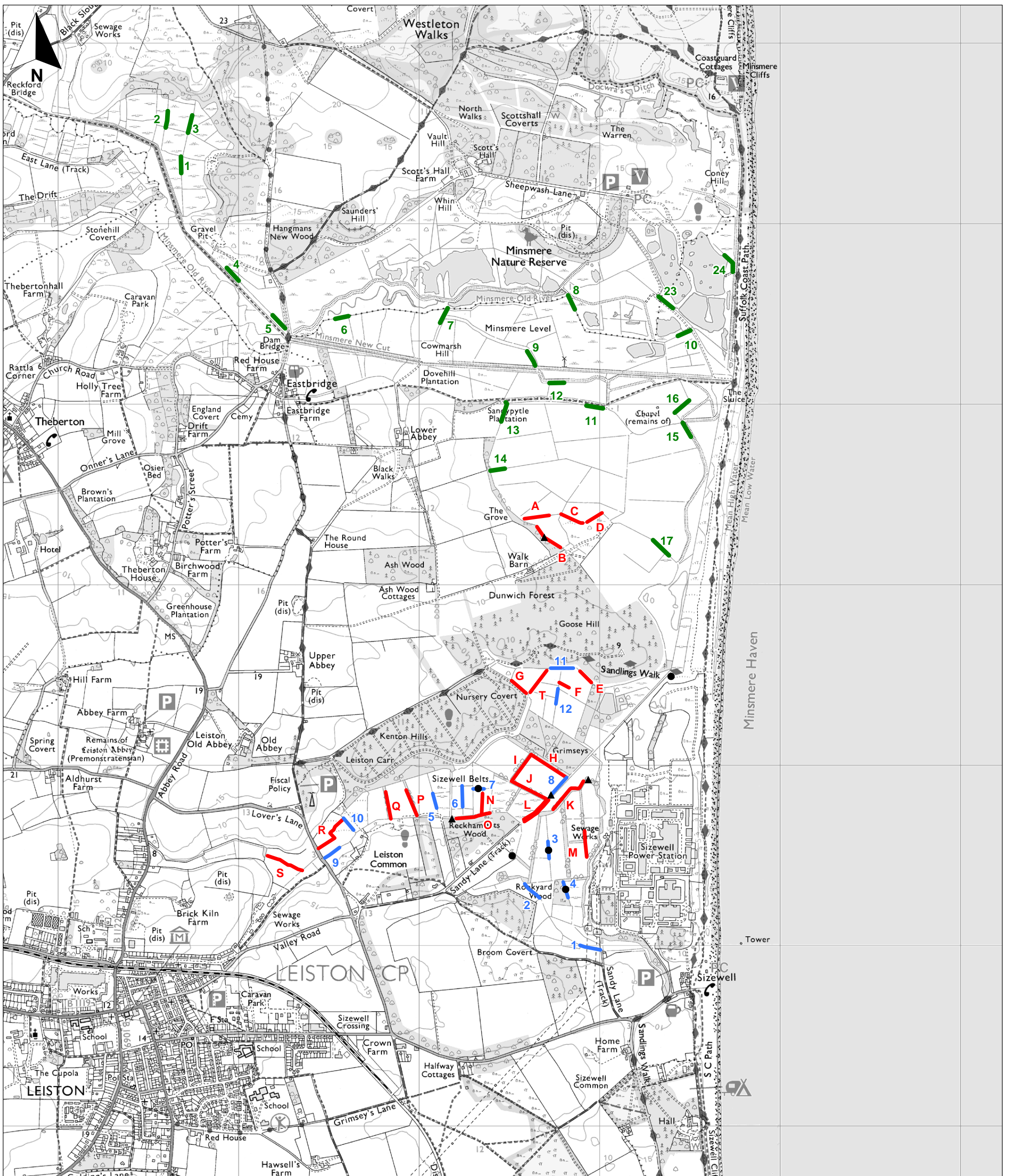
Evidence of fresh otter activity, including three characteristic spraints and one clear footprint, was identified during the 2007 field survey. These field signs were widely distributed across the survey area. A number of other signs indicative of otter activity were recorded, but in the absence of spraints or clear footprints in proximity to these, it was not possible to confirm that these were not made by other mammals.

During 2009/10 otter spraint was recorded at all but one of the 33 monthly monitored potential spraint locations across the survey area. A wide variety of other otter signs were also recorded across the survey area. These results indicate that the survey area is a well-used resource throughout the year. In addition, the evidence suggests that the site is also likely to be of significance with regard to breeding otters.

5. References

Kruuk, H. (2006). *Otters – Ecology, behaviour and conservation*. Oxford University Press. Oxford.

Figures



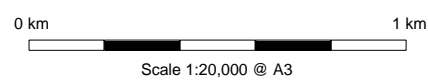
Key:

- AMEC 2007 survey transects (A-T)
- Royal Holloway University survey transects (1-12)
- RSPB survey transects (1-24)
- Otter signs recorded during AMEC 2007 survey
- Otter signs recorded historically



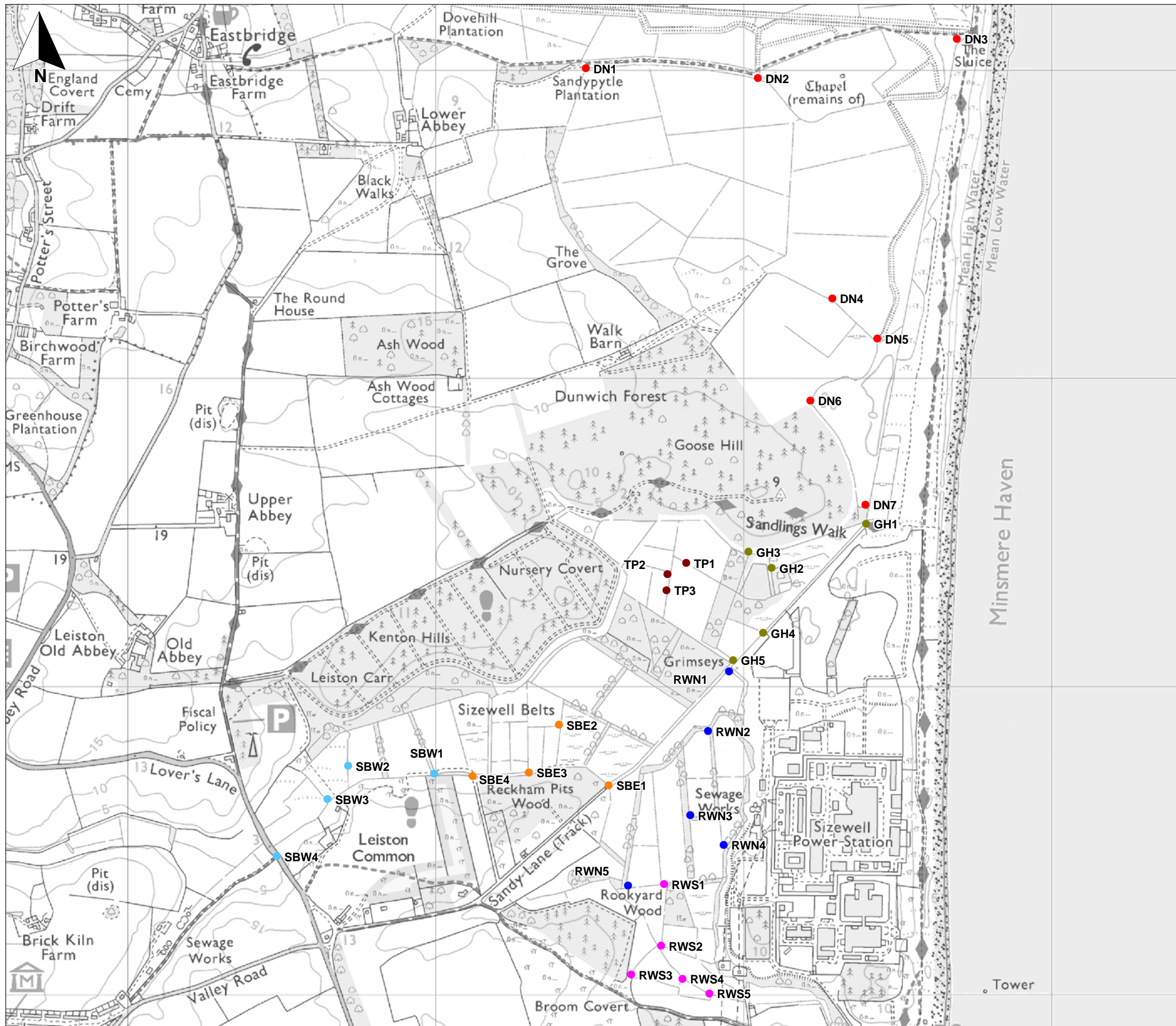
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Figure 2.1
Otter survey transects,
AMEC 2007 and RHU / RSPB to 2007



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- Key**
- Dunwich: DN (1-7)
 - Goose Hill South: GH (1-5)
 - Rookyard Wood North: RWN (1-5)
 - Rookyard South: RWS (1-5)
 - Sizewell Belts East: SBE (1-4)
 - Sizewell Belts West: SBW (1-4)
 - Turf Pits: TP (1-3)

0 m 500 m
Scale 1:12000 @ A3

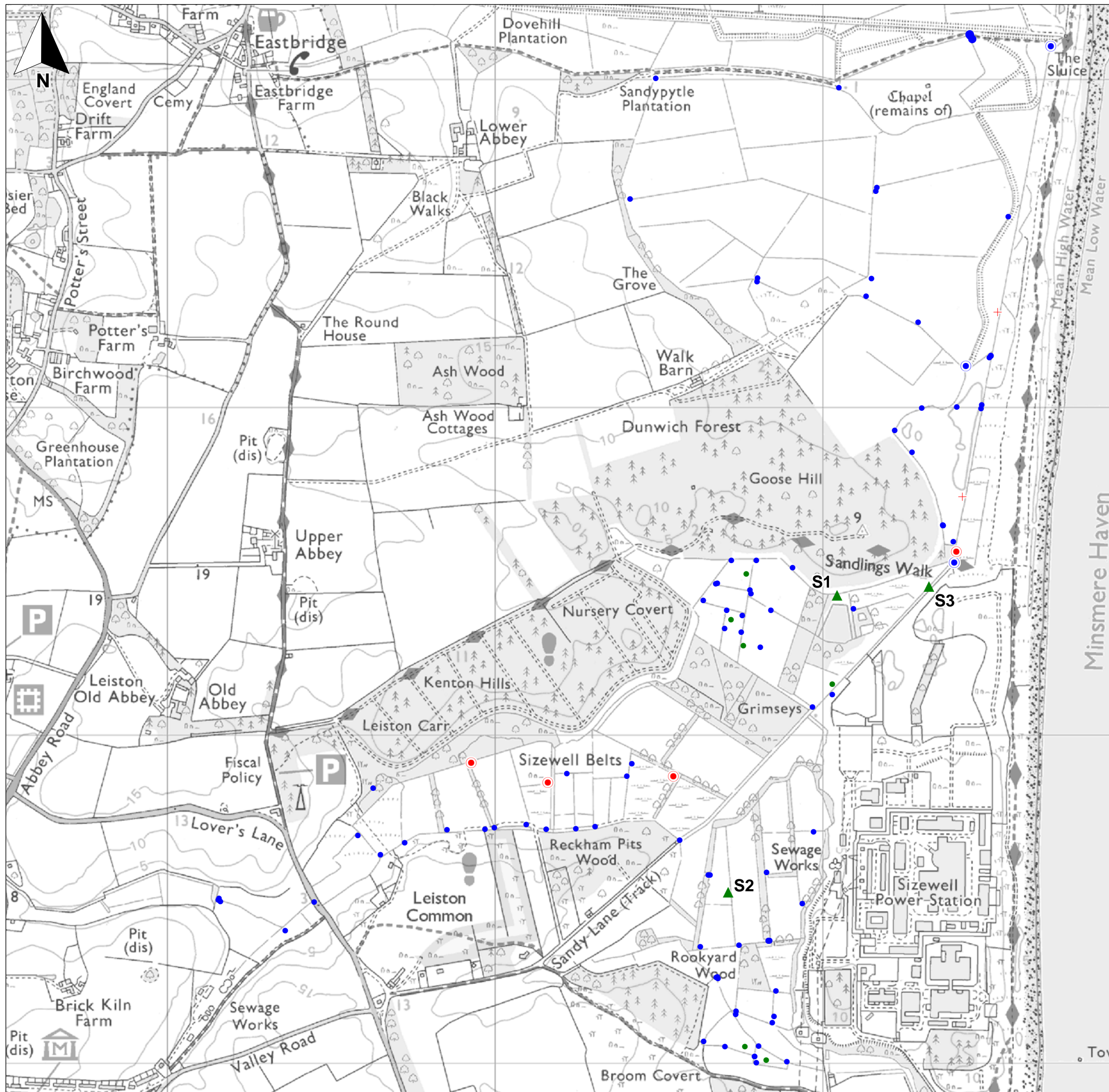


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Figure 2.2
Otter spraint point location map

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- Key**
- ▲ Otter sighting (S1, S2, S3)
 - Spraint locations
 - Couch/den
 - Spraint stations (regular multiple spraints)
 - Carcasses (fish or amphibian)
 - ✚ Mink scat

0 m 500 m
Scale 1:12,000 @ A3



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Figure 3.1
Otter survey 2009/2010:
Otter activity map

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Appendix A Data Responses

6 Pages

Table A1 Otter and mink presence recorded by RHU

Transect	Sep-01	May-02	Sep-02	May-03	Sep-03	May-04	Sep-04	May-05	Sep-05	May-06	Sep-06	May-07	Sep-07
1	x	x	x	x	x	x	x	x	x	x	x	x	x
2	x	x	x	x	x	x	x	x	x	x	x	x	x
3	x	x	x	x	x	otter	x	x	x	otter	x	x	x
4	x	x	x	x	x	x	otter	x	x	x	x	x	x
5	x	x	x	x	x	x	x	x	x	x	x	x	x
6	x	x	x	x	x	x	x	x	x	x	x	x	x
7	x	x	x	x	otter	x	x	x	x	x	x	x	x
8	x	x	x	x	x	x	x	x	x	x	x	x	x
9	x	x	x	x	x	x	x	x	x	x	x	x	x
10	x	x	x	x	x	x	x	x	x	x	x	x	x
11	x	x	x	x	x	x	x	x	x	x	x	x	x
12	x	x	x	x	x	x	x	x	x	x	x	x	x

Table A2 Otter records from SBRC

OS grid ref.	Location	Date
TM460672	Minsmere B. R.	2005
TM460672	Minsmere B. R.	2005
TM460672	Minsmere B. R.	2005
TM460672	Minsmere B. R.	2005
TM460672	Minsmere B. R.	2005
TM460672	Minsmere B. R.	2005
TM460672	Minsmere B. R.	2005
TM460672	Minsmere B. R.	2005
TM460672	Minsmere B. R.	2005
TM460672	Minsmere B. R.	2005
TM460672	Minsmere B. R.	2005
TM460672	Minsmere B. R.	2005
TM460672	Minsmere B. R.	2005
TM460672	Minsmere B. R.	2005
TM460672	Minsmere B. R.	2005
TM4684963157	Sizewell Marshes	2005
TM477719	Dingle Marshes	2005
TM460672	Minsmere B. R.	2005
TM460672	Minsmere B. R.	2005
TM460672	Minsmere B. R.	2005
TM460672	Minsmere B. R.	2005
TM460672	Minsmere B. R.	2005
TM460672	Minsmere B. R.	2005
TM460672	Minsmere B. R.	2005
TM460672	Minsmere B. R.	2005
TM460672	Minsmere B. R.	2005
TM460672	Minsmere B. R.	2005
TM460672	Minsmere B. R.	2005
TM460672	Minsmere B. R.	2005
TM460672	Minsmere B. R.	2005
TM460672	Minsmere B. R.	2005
TM460672	Minsmere B. R.	2005

Table A2 (continued) Otter records from SBRC

Grid Reference	Location	Date
TM39956890	Yoxford	2004
TM452663	Eastbridge	2004
TM436677	Middleton	2004
TM399689	Yoxford	2004
TM399690	Yoxford	2004
TM477661	Minsmere B. R.	2004
TM391576	Snape Maltings	2004
TM462596	Thorpeness Meare	2004
TM466581	North Warren	2004
TM443555	Sudbourne	2004
TM4749470770	Dunwich	2004
TM437677	Middleton	2004
TM460663	Minsmere B. R.	2004
TM400691	Yoxford	2004
TM477662	Minsmere B. R.	2004
TM453664	Eastbridge	2004
TM462596	Thorpeness Meare	2004
TM462596	North Warren	2004
TM465595	North Warren	2004
TM4559	North Warren	2004
TM471672	Minsmere B. R.	2004
TM4659	North Warren	2003
TM4659	North Warren	2003
TM4659	North Warren	2003
TM4659	North Warren	2003
TM4659	North Warren	2003
TM4659	North Warren	2003
TM4659	North Warren	2003
TM467672	Minsmere B. R.	2003
TM4658	North Warren	2003
TM470727	Dingle Marshes	2003

TableA2 (continued) Otter records from SBRC

Grid Reference	Location	Date
TM470727	Dingle Marshes	2003
TM4658	North Warren	2003
TM467672	Minsmere B. R.	2003
TM467672	Minsmere B. R.	2003
TM467672	Minsmere B. R.	2003
TM4658	North Warren	2003
TM4658	North Warren	2003
TM467672	Minsmere B. R.	2003
TM467672	Minsmere B. R.	2003
TM467672	Minsmere B. R.	2003
TM467672	Minsmere B. R.	2003
TM467672	Minsmere B. R.	2003
TM467672	Minsmere B. R.	2003
TM467672	Minsmere B. R.	2003
TM467672	Minsmere B. R.	2003
TM467672	Minsmere B. R.	2003
TM467672	Minsmere B. R.	2003
TM4659	North Warren	2003
TM4659	North Warren	2003
TM4659	North Warren	2003
TM393577	Snape Maltings	2003
TM4659	North Warren	2003
TM484726	Dingle Marshes	2003
TM467672	Minsmere B. R.	2003
TM471672	Minsmere B. R.	2003
TM471672	Minsmere B. R.	2003
TM460672	Minsmere B. R.	2002
TM455587	North Warren	2002
TM383589	Gromford Meadow	2001

Table A2 (continued) Otter records from SBRC

Grid Reference	Location	Date
TM456633	Sizewell Levels and Associated Areas	2001
TM455587	North Warren	2001
TM382598	Snape	2001
TM448601	Aldringham Churchyard	2001
TM4365	Theberton	2001
TM420694	Darsham	2000
TM400691	Yoxford	2000
TM383599	Farnham	2000
TM386610	Sternfield	2000
TM462596	Thorpeness Meare	2000
TM436676	Middleton	2000
TM392576	Snape	2000
TM455587	North Warren	1998
TM455587	North Warren	1998
TM453664	Minsmere B. R.	1997
TM431679	Minsmere Valley : Westleton	1997
TM436678	Middleton	1997
TM462596	North Warren and Thorpeness Mere	1997
TM43696772	Westleton	1997
TM460663	Minsmere B. R.	1997
TM465635	Sizewell	1997
TM391695	Yoxford	1997
TM455587	North Warren	1997
TM432680	Middleton	1997
TM437678	Middleton	1997
TM453664	Eastbridge	1997
TM460663	Minsmere B. R.	1996
TM474645	Sizewell	1996
TM462596	North Warren	1996

TableA2 (continued) Otter records from SBRC

Grid Reference	Location	Date
TM437677	Middleton	1996
TM451730	Newdelight Walks	1996
TM436677	Middleton	1996
TM4458	Aldeburgh	1996
TM455587	North Warren	1996
TM4659	North Warren	1995
TM4656	Aldeburgh	1995
TM463669	Minsmere B. R.	1994
TM455587	North Warren	1994
TM455587	North Warren	1993
TM3762	Stratford St Andrew	1993
TM465635	Sizewell	1993
TM4659	North Warren	1992
TM465595	Thorpeness Meare	1992
TM438678	Minsmere Valley : Reckford Bridge to Beveriche Manor Farm	1992
TM462598	Thorpeness	1992
TM463666	Minsmere B. R.	1992
TM465635	Sizewell	1992
TM467668	Minsmere B. R.	1991
TM4666	Minsmere B. R.	1991
TM4666	Minsmere B. R.	1990
TM435558	Iken	1990
TM437678	Middleton	1990
TM4667	Minsmere B. R.	1989
TM424685	Darsham Marshes	1986



Appendix B Spraint Point Activity, December 2009-November 2010




2 Pages



	Spraint Location (NGR)	Dec	Jan	Feb	Mar	April	May	Jun	Jul	Aug	Sep	Oct	Nov
DN1	TM 46490 66009	F/I	D/I	D/I	D/I	F/I	D/I	D/I	D/I	F/I	F/I	D/I	F/I
DN2	TM 47049 65978	F/I	F/I	F/I	D/I	D/I	D/I			F/I	F/I		F/I
DN3	TM 47696 66106	F/I	D/I	D/I	D/I	F/I			F/I		D/I	F/I	F/I
DN4	TM 47291 65262	F/I	F/I	F/I		D/I	D/I						
DN5	TM 47437 65131	F/I	F/I	F/I	F/I	F/I	D/I				F/I	F/I	F/I
DN6	TM 47220 64931	F/I	D/I	D/I		F/I	F/I			F/I			F/I
DN7	TM 47399 64592	F/I			D/I	F/I							
GHS1	TM 47401 64530	D/I	F/I	D/I	D/I	F/I	D/I	D/I	F/I	D/I	F/I	D/I	F/I
GHS2	TM 47094 64387					D/Fra	D/Fra						
GHS3	TM 46986 64313					F/I							
GHS4	TM 47029 64125					F/I	F/I				D/I	D/I	F/I
GHS5	TM 46969 64087					F/I	D/I						
TP1	TM 46781 64432			F/I	D/I	F/I	D/I	D/I	F/I	F/I	F/I	F/I	F/I
TP2	TM 46755 64366			D/I	F/I	F/I	D/I				D/I		
TP3	TM 46752 64315			F/I	F/I							F/I	F/I
SBW1	TM 45997 63719	F/I	D/I	D/I		F/I	F/I						
SBW2	TM 45853 63712	F/I	D/I		D/I				F/I		F/I		F/I
SBW3	TM 45650 63635	F/I			D/I						D/I		F/I
SBW4	TM 45448 63492					D/I							
SBE1	TM 46564 63680					F/I							
SBE2	TM 46395 63737										D/I		F/I
SBE3	TM 46402 63876					F/I	D/I						F/I



	Spraint Location (NGR)	Dec	Jan	Feb	Mar	April	May	Jun	Jul	Aug	Sep	Oct	Nov
SBE4	TM 46305 63722	F/I											
RW1	TM 46955 64050												
RW2	TM 46887 63856										D/I		
RW3	TM 46829 63583					F/I			D/I				
RW4	TM 46938 63487	F/I			F/I		D/I			F/I			
RW5	TM 46627 63355					F/I							
RW1	TM 46744 63359	F/I		D/I	D/I	F/I	F/I	F/I		F/I	F/I	D/I	F/I
RW2	TM 46735 63159	F/I	D/I		D/I	F/I				F/I	D/I	F/I	D/I
RW3	TM 46637 63065	F/I		F/I	D/I						F/I		
RW4	TM 46804 63052	F/I	D/I	F/I	D/I								F/I
RW5	TM 46891 63004	F/I		F/I	D/I		D/I						F/I

Presence  **Absence**  **Not surveyed** 
Spraint condition **Fresh = F** **Intact = I** **Dry = D** **Fragmented = Fra**

EDF Energy

**Sizewell C New Nuclear Power Station:
Terrestrial and Freshwater Ecology, and
Ornithology**

Draft Water Vole Survey Report 2007-2009

June 2012

AMEC Environment & Infrastructure UK Limited

Report for
EDF Energy

Main Contributors
Katheryn Leggat

Issued by

.....
Lynn Whitfield

Approved by

.....
Lynn Whitfield

**AMEC Environment & Infrastructure
UK Limited**

17 Angel Gate, City Road, London EC1V 2SH,
United Kingdom
Tel +44 (0) 207 843 1400
Fax +44 (0) 207 843 1410

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1	Draft Report	June 2012

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1. Introduction

1.1 Purpose of this Report

An area of land directly north of Sizewell B Nuclear Power Station, which is located near Leiston in Suffolk, has been identified as having the potential to accommodate the proposed development of one or more new nuclear reactors. This proposed development is known as Sizewell C. The site of the proposed development has an approximate central National Grid Reference (NGR) of TM473640.

AMEC Environment & Infrastructure UK Ltd ('AMEC') was commissioned in 2007 to provide terrestrial and freshwater ecological, and ornithological services in relation to Sizewell C. The purpose of this report, which outlines the findings of survey work undertaken for water vole (*Arvicola amphibius*) in the period 2007-2009, is to inform the design of Sizewell C and the Environmental Statement for the scheme.

1.2 Water Voles on the Sizewell Estate

The wetland habitats at Sizewell, and separately the Minsmere site, have been recognised as being of national importance to water voles, and the two sites have therefore been designated as National Key Sites for the species. The National Key Sites scheme recognises sites supporting water vole populations of national importance, and that are considered by the UKBAP Water Vole Steering Group (lead by the Environment Agency (EA)) as a priority for the conservation of resources at a national level. The selection of sites for this designation is based on the following criteria:

- The presence of a large water vole population, with habitat of optimal quality for the species, or where a minor adjustment in management would make it so;
- A site that provides a known and probably sustainable refuge from the introduced American mink (*Mustela vison*);
- A site that is most likely to be a major source of recolonist animals for a wider area; and
- A site where land tenure and habitat management is assured in the long term.

Landowners and managers of National Key Sites agree to adopt habitat management plans to ensure the importance of the site for water voles is maintained, and biannual monitoring is carried out following a standardised protocol to monitor the populations and allow comparisons to be made between sites (Bright & Carter, 2000, Strachan & Moorhouse 2006). British Energy (which became part of EDF Energy in 2009) developed a Species Action Plan (SAP) for water voles on land within their ownership, including the Sizewell estate (British Energy Group PLC 2007). This outlines the following actions:

- Maintain regular monitoring of the populations and diversity of the species on EDF Energy sites;

- Develop an information management system which records and manages data associated with the key performance indicators for water voles;
- Safeguard any existing populations on EDF Energy sites by appropriate and sympathetic management of bankside vegetation and riparian maintenance work. However, strike a balance between clearing ditches to promote water flow and providing adequate aquatic vegetation cover for small mammals such as water voles;
- Minimise the risk to water voles of any necessary pest control procedures;
- Safeguard water vole populations against mink predation by installing mink monitoring rafts and traps where necessary.

1.3 Survey Area and Scope

The survey areas and methodologies used have been adopted following consultation with statutory and non-statutory consultees and other stakeholders, taking into account best practice guidelines, and site-specific and project-specific characteristics. The survey area adopted is precautionary in that it allows for the iterative development of the scheme design by covering a larger area than is likely to be affected by the proposals. Based on the information available at the time the survey was undertaken, it was assessed that the relevant Zones of Influence of the proposed development would be likely not to extend further than the defined study area.

2. Methods

2.1 Desk Study

Existing information regarding water voles within the study area and surrounding land was obtained from the following sources:

- EDF Energy (and British Energy, which became part of EDF Energy in 2009) which has conducted a wide range of ecological surveys of its land holding and employs a conservation warden at Sizewell to help manage its land and undertake biological recording;
- Royal Holloway University (RHU) and RSPB, who conduct water vole monitoring as part of the National Key Sites scheme within the Sizewell Estate and at Minsmere respectively;
- Suffolk Biological Records Centre (SBRC);
- Suffolk Wildlife Trust (SWT); and
- The Environment Agency (EA).

The records included in this report were most recently requested in 2007.

2.2 Field Surveys

2.2.1 Ditch Surveys

An initial survey of 20 transects along ditches (see Figure 2.1 for locations) was carried out on 4 and 5 October 2007. Due to the extensive system of water bodies present across the survey area, and health and safety issues due to the heavily vegetated nature of some and the inaccessibility of others, it was not feasible to include every water body within the scope of the survey. A representative sample of the ditches within the survey area were therefore identified and surveyed to obtain basic presence/ absence data for water voles. The water bodies surveyed were chosen based on both ease of access in the field, and were widely distributed in order to sample all parts of the site. Once distinctive water vole signs were recorded in a ditch, presence had been established and no further searches of that water body were carried out.

On 28 and 29 July, and 15 October 2009, a sample of 16 sections of ditches (Figure 2.2) within the area of land directly north of the Sizewell B Power Station was surveyed in more detail to identify all evidence of water vole activity present (as far as safe access allowed). The aims of this further study were:

- To obtain a better understanding of how water voles use the habitats across the Sizewell Estate, not only in ditches and other clearly defined water bodies, but also in reedbeds (see Section 2.2.2); and

- To make more detailed assessments of a sample of ditches, in order to make population assessments that allow extrapolation for a generalised population assessment for the entire Estate.

The surveys were carried out based on methods recommended by Strachan & Moorhouse (2006). This involved searching bankside vegetation for:

- Latrines/ droppings – water vole droppings are often concentrated in discrete latrine sites near the nest, at range boundaries and places where they regularly enter and exit the water. While most droppings will be deposited in latrines, some may be found scattered along runways in vegetation;
- Feeding stations – feeding remains in the form of neat piles of chewed lengths of vegetation, are often found in runways and at haul-out platforms;
- Burrows - these are typically found along the water's edge and on top of the bank up to 5m from the water's edge. Holes on top of the banks often have grazed 'lawns' surrounding them;
- Nests – Where vegetation cover is dense and the water table is high (limiting opportunities for burrowing), water vole nests may be found woven into the base of rushes, sedges or grass tussocks; and
- Footprints – these may be identified in soft mud or silt.

Also recorded at each ditch was the depth, speed of water flow (estimated visually), the waterway width, bank side vegetation type and abundance, and surrounding land use, all of these being factors that may determine the suitability of habitat for supporting water voles.

The surveys were undertaken at an appropriate time of year for detecting water vole presence, i.e. between late April and early October, when water voles actively mark their breeding territories with latrines

2.2.2 Reedbed Survey

Marshland areas, where there are no distinct banks on which to search for water vole field signs, were also surveyed during 2009 via five transects, each measuring approximately 500m in length, designed to zig-zag through the reedbeds. Figure 2.3 shows the locations of the transects. Sheets of plywood measuring approximately 20cm by 30cm were then placed at a density of around one every 10m to create artificial latrine sites and lightly tethered to adjacent reeds. The artificial latrine sites were left in place, undisturbed, for 2-3 weeks prior to the survey taking place to allow enough time for water voles to explore and begin using them. Each of the transects was surveyed twice, once between 20 and 21 August, and once between 13 and 14 October.

During each survey the following signs of water vole activity were recorded:

- Latrines/ droppings – these may be found on the artificial latrine sites that have been specifically placed along the transect route, or in other suitable locations above the water level;
- Feeding signs – evidence of feeding in reedbed habitat is likely to be most noticeable where new shoots of vegetation have had the tips eaten; and

- Nests – above water level woven into large tussocks of vegetation.

2.3 Population Assessment

The data collected from the ditches during the 2009 survey were used to make population estimates using recommended methodologies¹ (Woodroffe *et al.*, 1990; amended by Morris *et al.*, 1998). This involves using the mean number of latrines per 100m of ditch to calculate the approximate water vole population density per 100m during the breeding season. Where access restrictions prevented both banks from being surveyed, the bank length was halved for the purpose of this equation. In all cases where this was undertaken, habitats on both banks of the ditch were considered to be of similar quality.

Given the variation in habitat types surveyed, in addition to the overall mean population estimate, mean estimates were calculated for the most optimal habitat and the habitat with very low suitability for water vole. This was in order to provide an indication of the variation between habitat types.

It should be noted that these are crude estimates, being based on a small sample size. In addition, the population assessment is based on latrine counts within the breeding season and therefore indicates the size of the breeding population. As such, it includes adult males, adult females and many independent juveniles, but not dependent young in the nests.

2.4 Personnel

The teams of suitably experienced surveyors were led by Katheryn Leggat.

¹ $y = 1.48 + 0.683x$, where y = number of water voles and x = number of latrines.

3. Results

3.1 Desk Study

3.1.1 SWT and EA

A countywide water vole survey was undertaken in Suffolk in 1997 by SWT and the EA. This demonstrated that water voles were largely absent from the west and north of Suffolk, but present in central and eastern parts of the county. Overall, signs of water vole were found at a third of sites surveyed. During this survey, the River Deben was found to have water voles present in three quarters of the sections surveyed. Whilst a follow-up countywide survey has not yet been completed, a survey of the River Deben catchment in 2003 showed a reduction in sites with water vole signs present from 75% in 1997 to 46% in 2003 (Suffolk Biodiversity Partnership, 2003).

The Sizewell Land Management Annual Review has regularly referred to the importance of Sizewell for water vole conservation and the high populations supported since the 1997-98 report. The 2006-07 report suggests that Sizewell is one of the best sites for the species in Suffolk. Liaison with Penny Hemphill (Suffolk Wildlife Trust, 2008), indicated that the population present at Sizewell is important only as part of a wider population throughout coastal marsh habitat along the Suffolk coast. She also explained that whilst mink have been discovered in this part of the county, they have not yet become established. Mink control is in place at Sizewell, without which the water vole population may face the threat of serious decline.

3.1.2 RHU and RSPB

12 transects within the Sizewell Estate are monitored twice annually as part of the National Key Sites initiative. RHU provided data for these transects, for the period between September 2001 and May 2007. Figure 2.1 illustrates the location of each transect, and Table A1 (Appendix A) provides the presence/ absence data for each of these since September 2001. The transects are distributed across the majority of the survey area, although none are located in the northernmost part. There was no evidence of water vole activity on two of the 12 transects in May 2007, but both of these have had water vole signs recorded within the past two years.

24 transects on the Minsmere site are monitored twice a year as part of the National Key Sites initiative. RSPB have been able to provide the presence/ absence data for these transects for the period between autumn 2001 and autumn 2007. Figure 2.1 illustrates the location of each of these transects too, while Table A2 presents the outcome of these surveys since the beginning of the monitoring programme (2001). These transects are distributed across an area to the north of the current study site. Water vole presence was confirmed in 16 of the 23 surveyed transects in autumn 2007, although those transects in which water voles were not recorded during this survey have all supported water voles within the previous two years. Transects in which water vole presence was confirmed in autumn 2007 are widely distributed across the Minsmere site.

3.1.3 SBRC and Other Data

The SBRC provided a number of records of water vole activity throughout the Sizewell Marshes and the surrounding area up to a distance of 3km. These data are presented in Table A3, and clearly indicate that the species has been present in the survey area for at least the last 10 years.

The Environmental Statement (ES) produced in association with the decommissioning of the existing nuclear facility indicated four historical records of water vole activity in the ditches at Turf Pits, to the south of the study area. Surveys carried out to inform the ES also confirmed the presence of the species in a watercourse that runs to the west of the existing power station.

3.2 Field Surveys

3.2.1 Habitat Assessment

Ditches Surveyed in 2007

All ditches surveyed in 2007 provided suitable aquatic habitat for water voles, comprising slow-flowing or still water over 1m deep with wide swathes of riparian vegetation and earth banks. Bordering land use is predominantly marshy grassland, which in many cases is grazed by cattle and/or sheep. Other land uses bordering survey transects included reedbeds and arable fields. Several of the transects had woodland dominating one bank and therefore were somewhat shaded by overhanging trees. Bank profiles ranged from shallow to steep, but all provided some suitable burrowing habitat for water voles, the only exception being Transect R, which had a very flat bank that merged with the adjacent wet grassland. This does not however preclude the possibility of water voles occupying the habitat, as the species will build nests in the base of sedge and reeds, particularly in wetlands with a high water table such as those found on the Sizewell Estate (Strachan & Moorhouse, 2006). At each transect the riparian vegetation required for foraging and sheltering water voles was abundant at varying levels. Some ditches provided a wide margin of reeds and sedges, whilst others were dominated by patches of scrub with only a narrow strip of reeds.

Table 3.1 Description of the Ditches Surveyed in 2007

Transect (Figure 2.1)	Bordering Land Uses	Bank Profile²	Depth (m)	Width (m)	Dominant Bankside Vegetation
A	Marshy grassland	Shallow- steep	1.5+	1-2	Reeds
B	Broad-leaved woodland, marshy grassland	Shallow- steep	1.5+	1-2	Trees
C	Marshy grassland, semi-improved grassland	Shallow	1-1.5	1	Trees/scrub
D	Marshy grassland, semi-improved grassland	Steep	0.5-1	1-2	Trees, scrub
E	Marshy grassland, mixed woodland	Steep	1.5+	2-5	Reeds, trees
F	Marshy grassland	Shallow	1.5+	1-2	Reeds
G	Conifer plantation, marshy grassland	Steep	1.5+	1-2	Trees, tall grass
H	Reedbed, broad-leaved woodland	Shallow	1.5+	2-5	Reeds, trees
I	Reedbed, broad-leaved woodland	Shallow	1.5+	2-5	Reeds, trees
J	Reedbed, broad-leaved woodland	Shallow	1.5+	2-5	Reeds, trees
K	Reedbed, broad-leaved woodland	Flat	1.5+	2-5	Reeds, trees
L	Reedbed, broad-leaved woodland	Flat	1.5+	2-5	Reeds
M	Marshy grassland	Shallow	1.5+	1-2	Reeds
N	Marshy grassland	Shallow	1.5+	1-2	Submerged weed
O	Marshy grassland, broad-leaved woodland	Shallow	1.5+	2-5	Trees, submerged weed
P	Marshy grassland, broad-leaved woodland	Shallow	1.5+	1-2	Trees, reeds
Q	Broad-leaved woodland, marshy grassland	Shallow	1.5+	1-2	Trees, submerged weed
R	Semi-improved grassland	Steep	1.5+	2-5	Scrub
S	Arable land	Steep	1.5+	1-2	Submerged weed, short grass
T	Marshy grassland	Shallow	1.5+	1-2	Reeds

Ditches Surveyed in 2009

Of the ditches surveyed in 2009, six were considered to offer relatively poor habitat for water voles. This was predominantly due to two key main factors:

- Heavy over-shading by adjacent woodland limiting the growth of aquatic vegetation and resulting in a deep layer of decaying leaf litter dominating the channel (ditches 3b, 8, 9b, 12 and 13); and/or

² Bank profile: flat <10°, shallow <45°, steep >45°, vertical/undercut.

- Very heavy poaching of the banks by cattle reducing bankside vegetation and restricting opportunities for burrowing water voles (ditches 9a, 12 and 13).

A further six of the ditches surveyed (ditches 3a, 4, 5, 6, 7 and 11) were considered to offer very good habitat for water voles, comprising water over 1m deep with wide swathes of riparian vegetation dominated by common reed (*Phragmites australis*), and earth banks. The other four ditches offer good habitat for water voles, although the value is limited to just one bank due to over-shading trees (ditch 2), and/or reduced by cattle poaching (ditches 1, 2, 10a and 10b).

Bordering land use is predominantly marshy grassland with cattle grazing, but also includes semi-natural broad-leaved woodland, mixed and conifer plantation, marshland (reedbed), and some semi-improved and improved grassland. Bank profiles are predominantly shallow, with only a few steep banks, limiting water vole burrowing opportunities; although most of the ditches do provide some burrowing habitat. The riparian vegetation required for foraging and sheltering water voles was present at varying levels with some ditches providing a dense reed bed, and others almost bare. Table 3.2 outlines the habitat variables recorded at each ditch.

Table 3.2 Description of the Ditches Surveyed in 2009

Ditch Reference (Figure 2.2)	Bordering Land Uses	Bank Profile ²	Depth (m)	Width (m)	Dominant Bankside Vegetation
1	Marshy grassland, mixed plantation woodland, cattle grazing	Shallow	0.5-1	1-5	Tall grass
2	Marshy grassland, mixed plantation woodland, semi-natural broad-leaved woodland, cattle grazing	Shallow	0.5-1	1-5	Bankside trees and short grass
3a	Semi-improved grassland, conifer plantation woodland	Shallow	1-2+	2-5	Reeds/sedges
3b	Semi-improved grassland, conifer plantation woodland, cattle grazing	Shallow	1-2+	1-5	Bankside trees and scrub
4	Marshy grassland, mixed plantation woodland	Shallow	1-2	2-5	Reeds/sedges
5	Marshy grassland, semi-natural broad-leaved woodland, cattle grazing	Shallow	1-2+	2-5	Reeds/sedges
6	Marshland, semi-natural broad-leaved woodland	Flat-shallow	1-2	2-5	Reeds/sedges
7	Marshland, semi-natural broad-leaved woodland	Flat-vertical/undercut	1-2	2-5	Reeds/sedges
8	Marshland, semi-natural broad-leaved woodland	Flat	0.5-2	2-5	Bankside trees
9a	Marshy grassland, semi-natural broad-leaved woodland, cattle grazing	Shallow	1-2	2-5	Bankside trees and short grass
9b	Improved grassland, semi-natural broad-leaved woodland	Shallow	0.5-1	1-2	Bankside trees

Table 3.2 (continued) Description of the Ditches Surveyed in 2009

Ditch Reference (Figure 2.2)	Bordering Land Uses	Bank Profile ²	Depth (m)	Width (m)	Dominant Bankside Vegetation
10a	Marshy grassland, cattle grazing	Shallow	>2	1-2	Tall grass
10b	Marshy grassland, semi-natural broad-leaved woodland, cattle grazing	Shallow-steep	1-2	1-2	Tall grass
11	Marshy grassland, cattle grazing	Shallow	>2	2-5	Reeds/sedges
12	Marshy grassland, semi-natural broad-leaved woodland, cattle grazing	Flat-shallow	0.5-2	1-2	Bankside trees
13	Marshy grassland, semi-natural broad-leaved woodland, cattle grazing	Flat-shallow	0.5-1	1-2	Bankside trees and tall grass/rushes

Reedbeds Surveyed in 2009

Reedbed habitat to the north of the Sizewell Estate is largely restricted to wide linear swathes that follow ditch lines, and therefore Transects 1 and 2 also followed these water bodies (Figure 2.3). The ditches have high water levels and predominantly flat banks that merge with adjacent marshy grassland.

Transects 3, 4 and 5 zig zag through dense reedbed habitat (Figure 2.3) which support several shallow and deep ditches. At the time of surveying water levels were low, with much of the reedbeds dry and the only water found in a few small wet patches of reedbed that occur close to the ditches, and within the ditches themselves. Parts of the reedbeds at all three transects were starting to be colonised by terrestrial species including common nettle (*Urtica dioica*), common cleavers (*Galium aparine*), bramble (*Rubus fruticosus* agg.) and lesser bindweed (*Convolvulus arvensis*).

The artificial latrine sites were not only sited through the reedbed occasionally crossing ditches, but sections of the transects also followed ditch lines where the extent of the reedbed was limited (transect 5) and passed through small sections of wet woodland (transect 3).

3.2.2 Water Vole Activity Surveys

Ditches Surveyed in 2007

A summary of the water vole field signs identified in 2007 is presented in Table 3.3, and the completed field survey forms are presented in Appendix B). Evidence of water vole activity, in the form of latrines and/or feeding remains, was found on the banks of all ditches surveyed with the exception of Transect T, and several water vole burrows were also identified.

Table 3.3 Water Vole Field Signs identified during the 2007 Survey

Transect (Figure 2.1)	Signs		
	Latrine/ Droppings	Feeding Station	Burrow
A	✓	✓	
B	✓	✓	
C	✓	✓	✓
D	✓		
E	✓	✓	
F	✓	✓	
G	✓		✓
H	✓		
I	✓	✓	
J	✓	✓	
K	✓	✓	
L	✓	✓	
M	✓	✓	
N	✓		
O		✓	
P	✓	✓	
Q	✓	✓	
R	✓		
S	✓		✓
T			

Ditches Surveyed in 2009

The water vole field signs identified during the 2009 ditch survey are summarised in Table 3.4. Evidence of water vole activity in the form of latrines, feeding remains, and/or burrows was found on the banks of all surveyed ditches, with the exception of ditches 2 and 9b. The latter of these was considered to offer poor habitat for water voles. All of the other ditches considered to offer poor water vole habitat supported some, limited signs of activity (ditches 3b, 8, 9a, 12 and 13).

A high density of different field signs was recorded from four of the ditches (3a, 4, 7 and 11) considered to provide very good water vole habitat. Although ditch 5 also offers very good water vole habitat, access to this ditch was restricted by deep sediment and dense bankside vegetation. A high density of feeding remains found along the banks of ditch 6 indicated a significant level of water vole activity, although few other signs were recorded. This is likely to be due to the flat banks of this ditch, which limit the number of suitable locations for latrines, as well as reducing potential for burrowing.

Table 3.4 Water Vole Field Signs identified during the 2009 Ditch Survey

Ditch Reference (Figure 2.2)	Transect Length (m)	Signs			
		Latrine/Droppings	Feeding Station	Burrow	Other
1	230	0	3	0	
2	190	0	0	0	
3a	50	26	25	9	
3b	100	0	2	0	1 dead water vole
4	160	22	51	31	
5 ³	150	2	0	0	
6	100	1	34	1	
7	200	12	34	3	
8	100	3	1	0	
9a ⁴	100	1	2	1	
9b ⁴	80	0	0	0	
10a	120	5	8	2	
10b	90	9	15	4	Water vole nest in rushes
11 ⁴	110	23	29	3	
12	160	4	0	0	
13 ⁴	60	3	2	1	

Reedbeds Surveyed in 2009

Water vole field signs, including latrines, were recorded on all of the transect routes surveyed. Throughout the length of transects 1 and 2, where natural latrine sites are restricted by high water levels, the artificial latrine sites were widely used for territorial marking. Of the 50 artificial latrine sites set out at transect 1, more than half held latrines during the second survey visit; while 18 of those along transect 2 held latrines during the same survey visit.

Within transects 3, 4 and 5 however, use of the artificial latrine sites was limited to the few that were placed within or adjacent to ditches and nearby wet areas. A maximum of 4 artificial latrine sites were used at transect 3, this was during the first survey visit. No more than 1 artificial latrine site was used at each of transects 4 and 5. Similarly, all other water vole field signs identified were recorded along the banks of ditches and in wet pockets. No evidence of water vole activity was recorded throughout most of the length of the transects, where they passed through dry reedbed habitats.

³ Access for survey limited due to very deep water and dense vegetation, as well as the presence of nesting reed warblers, therefore this ditch has not been included in the population estimate calculation.

⁴ Only one bank surveyed due to access difficulties. The bank length used for the population assessment was therefore taken to be half this distance.

Table 3.5 Water Vole Field Signs identified during the 2009 Reedbed Survey

Transect (Figure 2.3)	Survey Visit 1		Survey Visit 2	
	Signs	Details (e.g. Habitat Type/ Location of Record)	Signs	Details (e.g. Habitat Type/ Location of Record)
1	19 latrines	On artificial latrine sites	26 latrines	On artificial latrine sites
	1 feeding station	On an artificial latrine site	1 feeding station	On the banks of a ditch
			1 burrow	In the bank of a ditch
2	17 latrines	On artificial latrine sites	18 latrines	On artificial latrine sites
	2 feeding stations	On artificial latrine sites		
3	30 feeding stations	On the banks of ditches	13 feeding stations	On the banks of ditches
	1 feeding station	Within a wet area of the reedbed	2 latrines	On the banks of ditches
	1 patch of reeds with tops eaten	Within a wet area of the reedbed	1 latrine	On an artificial latrine site adjacent to a ditch
	19 latrines	On artificial latrine sites	26 latrines	On artificial latrine sites
	1 feeding station	On an artificial latrine site	1 feeding station	On the banks of a ditch
4			1 burrow	In the bank of a ditch
	17 latrines	On artificial latrine sites	18 latrines	On artificial latrine sites
	2 feeding stations	On artificial latrine sites		
	30 feeding stations	On the banks of ditches	13 feeding stations	On the banks of ditches
	1 feeding station	Within a wet area of the reedbed	2 latrines	On the banks of ditches
5	1 patch of reeds with tops eaten	Within a wet area of the reedbed	1 latrine	On an artificial latrine site adjacent to a ditch
	19 latrines	On artificial latrine sites	26 latrines	On artificial latrine sites
	1 feeding station	On an artificial latrine site	1 feeding station	On the banks of a ditch
		1 burrow	In the bank of a ditch	

3.3 Population Assessment

The results of the population assessment based on the 2009 ditch survey data are shown in Table 3.6. The average population size for all the ditches surveyed is estimated at 8.14 water voles per 100m. Assessments made based on habitat suitability, however, indicate the wide variation between ditches, with the most optimal habitats supporting an average of 17.13 water voles per 100m, and the poorest habitats supporting as few as 3.47 individuals per 100m.

Table 3.6 Water Vole Population Assessment 2009

Ditch Reference	Bank Length (m) ⁵	Latrine Count	No. of Latrines per 100m
1	230	0	0
2	190	0	0
3a*	50	26	52
3b†	100	0	0
4*	160	22	13.75
6*	100	1	1
7*	200	12	6
8†	100	3	3
9a†	50	1	2
9b†	40	0	0
10a	120	5	4.17
10b	90	9	10
11*	55	23	41.82
12†	160	4	2.5
13†	30	3	10
No. of water voles per 100m (from mean of 9.75 latrines per 100m) ¹ – entire sample:			8.14
No. of water voles per 100m (from mean of 22.91 latrines per 100m) ¹ - most optimal habitat only *):			17.13
No. of water voles per 100m (from mean of 2.92 latrines per 100m) ¹ - least suitable habitat only (†):			3.47

⁵ As noted in Section 2.3, where access restrictions prevented both banks from being surveyed, the bank length was halved for the purpose of this equation.

4. Summary

Surveys at Sizewell during 2007 and 2009 demonstrated that water voles occur throughout the ditch network within the survey area, with most of the Sizewell Estate providing areas of optimal habitat for water voles. Water vole activity was found to be limited in the less frequent areas of poorer habitat quality such as dry reedbeds.

A population assessment has been made based on the number of latrines recorded per 100m of ditch surveyed in 2009; however, these provide only a crude estimate and are based on a small sample size. The population assessment is based on latrine counts within the breeding season and therefore indicates the size of the breeding population, and does not allow for seasonal fluctuations. In addition, it includes adult males, adult females and many independent juveniles, but not dependent young in the nests. The population estimate for the study area was 8.14 water voles per 100m of ditch.

There is high variation in habitat quality within the study sample, therefore population assessments of the most optimal habitats, and separately of the poorest quality habitats, have also been made. These are based on a very small sample size and are used only to indicate the likely variation in water vole numbers between habitat types. The results equate to an average of 17.13 adult water voles per 100m in optimal water vole habitat, compared to an average of just 3.47 adult water voles per 100m in poor quality habitat.

The results of transect surveys through the reedbeds indicate that water voles are rarely active within the reedbed habitats at any distance from the ditches, with no evidence of such found. Ditches and nearby wet areas within the reedbeds are readily used, with clear evidence of water vole occupation present at all those surveyed.

5. References

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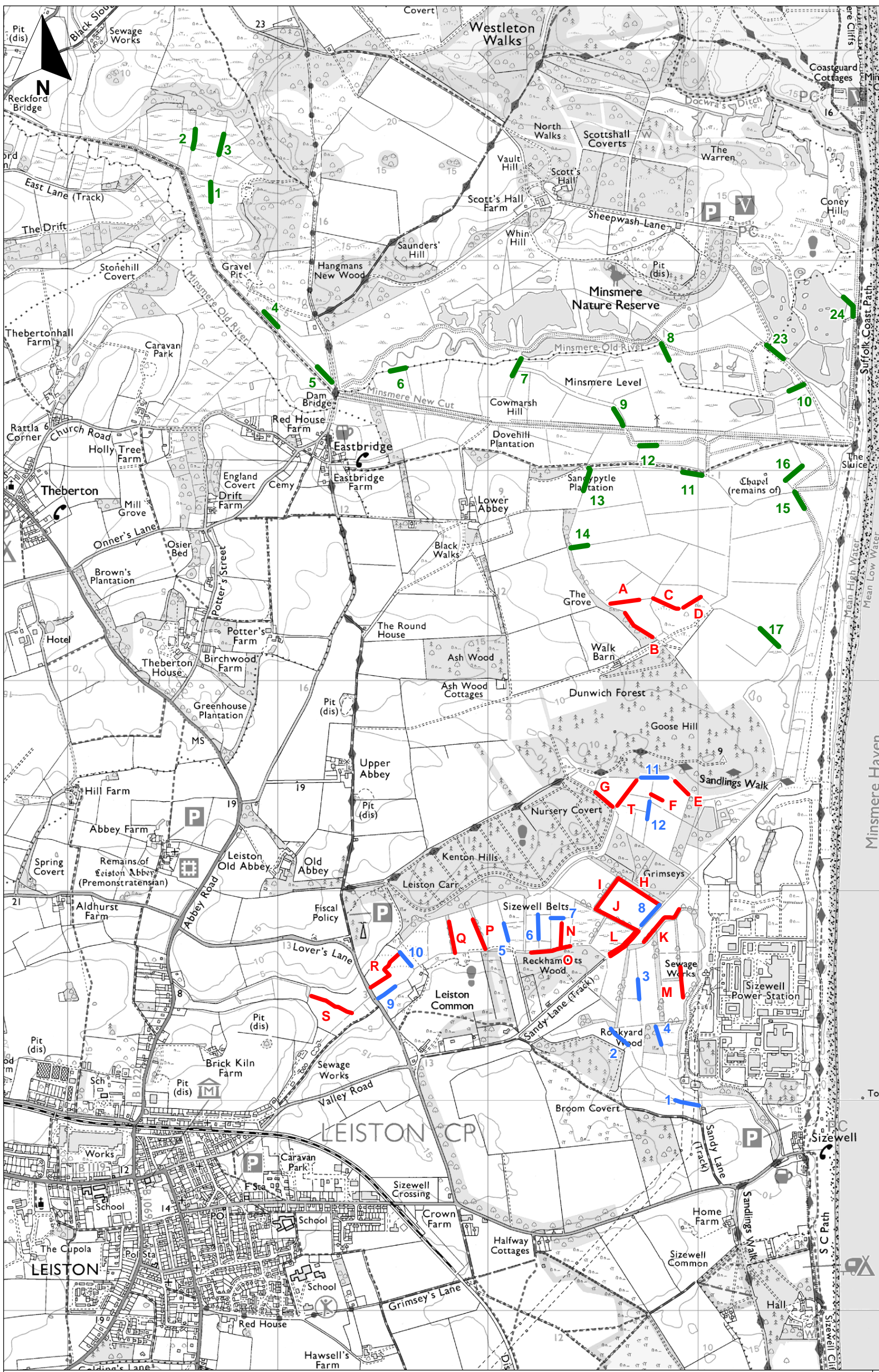
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Figures

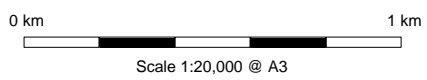


- Key:**
- AMEC 2007 survey transects (A-T)
 - Royal Holloway University survey transects (1-12)
 - RSPB survey transects (1-24)



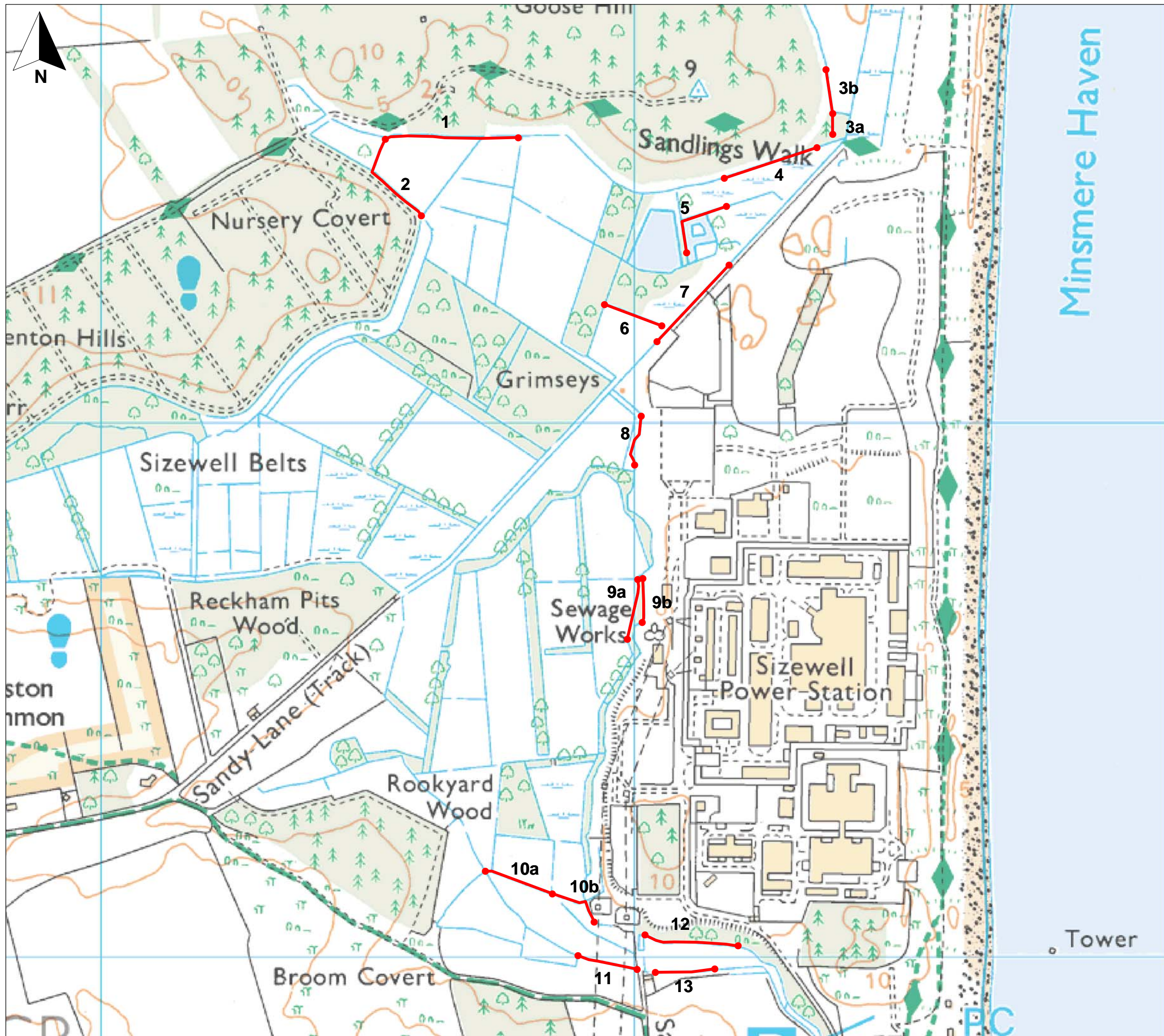
Sizewell Water Vole
Survey Report 2007-2009

Figure 2.1
Water Vole survey transects,
AMEC 2007 and RHU / RSPB to 2007



June 2012
28130-A420.wor tugwc





Key
 Ditch transect

0 m 250 m
 Scale 1:7000 @ A3



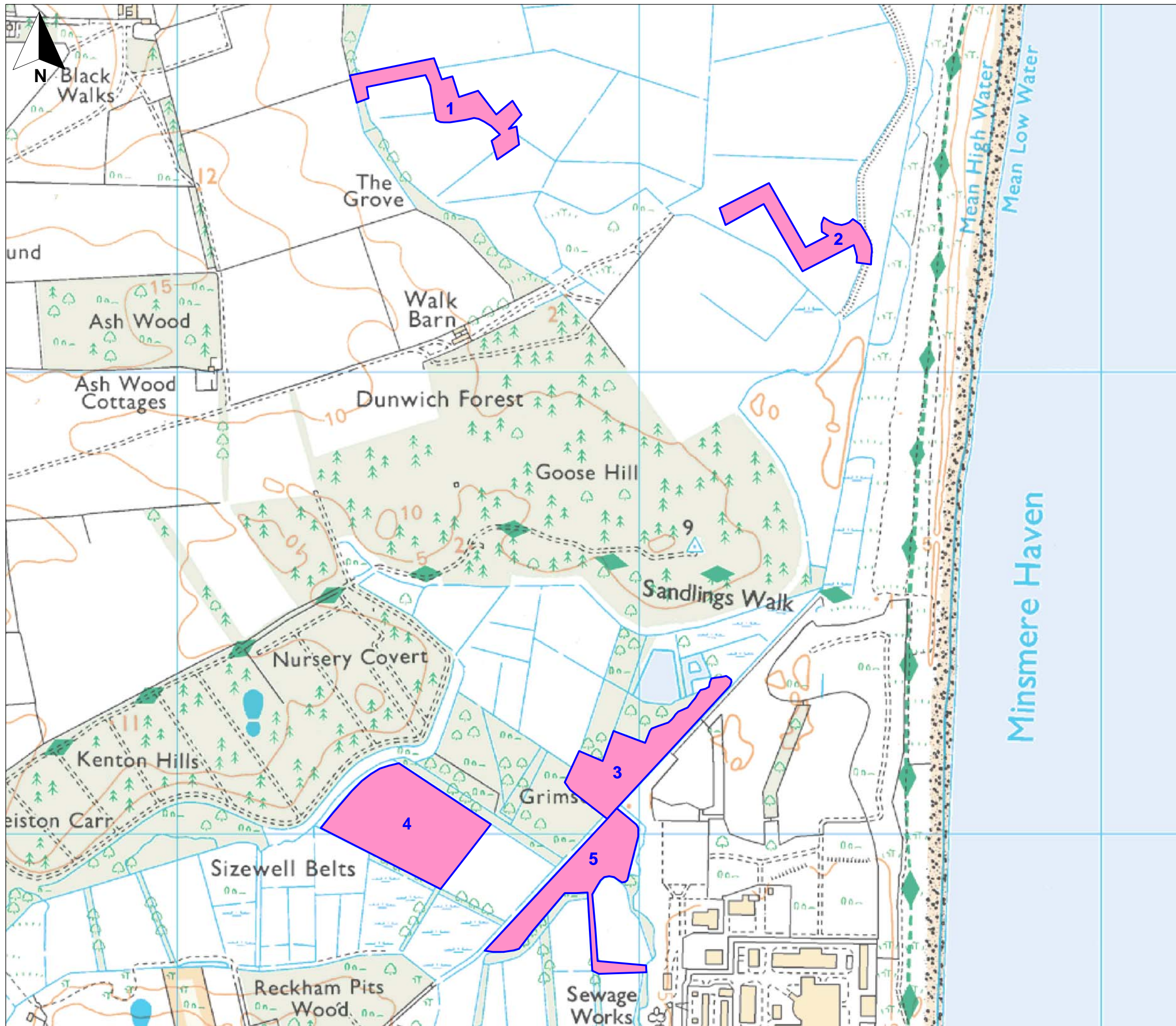
Sizewell Water Vole
 Survey Report 2007-2009


Figure 2.2
 Location of 2009 ditch survey transects

June 2012
 28132-A421.wor tugwc



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Key
 Reedbed survey transects

0 m 250 m
 Scale 1:8000 @ A3



Sizewell Water Vole
 Survey Report 2007-2009

Figure 2.3
Approximate locations of 2009 reedbed survey transects

June 2012
 28132-A422.wor tugwc



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Appendix A Data Responses

3 Pages

Table A1 RHU Survey Transects at Sizewell

Transect (Figure 2.1)	May 07	Sept 06	May 06	Sept 05	May 05	Sept 04	May 04	Sept 03	May 03	Sept 02	May 02	Sept 01
1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗
2	✓	✗	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓
3	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗
4	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✗
5	✗	✗	✗	✓	✓	✗	✓	✗	✗	✓	✓	✓
6	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓
7	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
8	✗	✓	✓	✓	✓	✗	✓	✓	✗	✓	✓	✓
9	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓
10	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
11	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
12	✓	✗	✓	✓	✓	✗	✓	✓	✓	✓	✓	✗

✓ indicates water vole signs recorded, ✗ indicates no water vole signs recorded.

Table A2 RSPB Survey Transects at Minsmere

Transect (Figure 2.1)	Aut 07	Spr 07	Aut 06	Spr 06	Aut 05	Spr 05	Aut 04	Spr 04	Aut 03	Spr 03	Aut 02	Spr 02	Aut 01
1	✓	✗	✗	✓	✓	✓	·	✓	✓	·	✗	✓	✓
2	✗	✗	✓	✗	✓	✓	·	✓	✓	·	✓	✓	✓
3	✓	✓	✓	✓	✓	✓	·	✓	✓	·	✓	✓	✓
4	✗	✓	✗	·	✗	✓	·	✓	✓	·	✗	✗	✗
5	✓	✓	✓	·	✓	✓	·	✓	✓	·	✗	✗	✗
6	✓	·	✓	·	✓	✓	·	·	✓	·	✓	·	✓
7	✗	·	✗	·	✓	·	·	·	✓	·	✓	·	✓
8	✗	·	✓	·	✓	·	·	·	✓	·	✓	·	✓
9	✓	·	✓	·	✓	·	·	·	✓	·	✓	·	✗
10	✓	✓	✓	✓	✓	·	·	·	✓	·	✓	✓	✓
11	✓	✓	✓	✓	✓	✓	·	✓	✓	·	✓	✓	✓
12	✗	✓	✓	✓	✓	✓	·	✓	✓	·	✓	✓	✓
13	✓	✗	✗	✓	✓	✓	·	✓	✓	·	✓	✓	✓
14	·	✓	✓	✓	✓	✓	·	✓	✓	·	✓	✓	✓
15	✓	✓	✓	✓	✓	✓	·	✓	✗	·	✗	✗	✗
16	✓	✓	✓	N	✓	✓	·	✓	✓	·	✓	✓	✓
17	✓	✓	✓	Y	✓	✓	·	✓	✓	·	✓	✓	✓
18	✓	·	✓	·	✓	·	·	·	✓	·	✓	·	✓
19	✓	·	✓	·	✓	·	·	·	✓	·	✓	·	✓
20	✗	·	✓	·	✓	·	·	·	✓	·	✓	·	✓
21	✗	·	✓	·	✓	·	·	·	✓	·	✓	·	✓
23	✓	·	✓	·	✓	·	·	·	✓	·	✓	·	✓
24	✓	✓	✓	✓	✓	✓	·	✓	✓	·	✓	✓	✓

✓ indicates water vole signs recorded, ✗ indicates no water vole signs recorded, · indicates surveys not completed.

Table A3 **Water Vole Records from SBRC**

Location	Grid Reference	Date
Eastbridge	TM4466	1991
Minsmere Valley: Reckford Bridge to Beveriche Manor Farm	TM453664	1997
Sizewell Belts	TM4547063493	2005
Sizewell Belts	TM4629963877	2005
Sizewell Belts	TM4630563880	2005
Sizewell Belts	TM465635	1997
Goose Hill marshes, Leiston	TM465645	1996
Sizewell Belts	TM4664763500	2005
Sizewell Belts	TM4667663258	2005
Sizewell Belts	TM4673263822	2005
Sizewell	TM467644	1993
Sizewell Belts	TM4683364408	2005
Sizewell Belts	TM4684963157	2005
Sizewell Belts	TM4686264560	2005
Sizewell Belts	TM4697462983	2005
Leiston ditch, Sizewell Belts	TM474645	1996
Minsmere B. R.	TM474665	1998
Minsmere B. R.	TM475671	1992
Sizewell Belts	TM455635	2000
Sizewell Belts	TM4563063648	2005
btw. Eastbridge and Hangmans	TM4566	1982
Two Penny Bridge, Minsmere New Cut	TM460663	1996
Minsmere B. R.	TM460672	2003
Sizewell Belts	TM4612163729	2005



Appendix B Field Survey Forms

36 Pages

WATER VOLE SURVEY FORM

BACKGROUND INFORMATION

Site name/river

Site number 10km square Grid ref

County Water Authority

Recorder Date

HABITAT INFORMATION (mark features on map)

Survey distance

Habitat

Ditch

Dyke

Gravel pit

Pond

Lowland lake

Upland loch

Reservoir

Running water

Marsh/bog

Canal

Shore/bank

Boulders

Stones

Gravel

Sand

Silt

Earth

Rock cliffs

Earth cliffs

Canalized

Poached

Reinforced (man-made)

Bordering land use

Upland grass

Permanent/temporary grass

Mixed broadleaf woodland

Conifer wood

Peat bog

Arable crop

Salt marsh

Urban/industrial

Park/garden

Heath

Fen

Cattle/grazing

Bank fenced?

Vegetation (DAFORN)

N Bankside trees

R Bushes

O Herbs

F Submerged weed

D Reeds/sedges

O Tall grass

A Short grass

Disturbance:

Bank profile

Flat < 10°

Shallow < 45° *2nd half*

Steep > 45° *1st half*

Vertical/undercut

Depth

< 0.5m

0.5-1m

1-2m

> 2m

Width

1m 1-2m 2-5m

5-10m 10-20m 20-40m > 40m

Current

Slow Rapid Fast

Sluggish Static

WILDLIFE INFORMATION

Water voles

Sightings (count)

Latrines (count)

Burrows (count)

Footprints

Pathway in vegetation

Feeding remains

Cropped grass around tunnel entrance

Rat

Sightings

Droppings

Footprints/runs

Otter

Sightings

Droppings

Footprints/runs

Mink

Sightings

Droppings

Footprints/runs

Other wildlife

Kingfisher Heron Coot Moorhen

Waterfowl Dipper

Identified plants from feeding remains:

SKETCH OF SITE – vole activity indicated (if any)

KEY TO SYMBOLS (mark route surveyed and direction of flow)		ADJACENT LAND-USE CODES	
Mature trees		Erosion/land slip BW	
Over-hanging branches		Cattle grazing CP	
Fallen tree		Wood and heath MH	
Exposed roots		Rough pasture RP	
Pollarded tree		Wetland WL	
Sapling		Improved grass IG	
Scrub		Tilled land (crop) TL	
Hedgerow		Suburban/urban devel. (inc gardens) URB	
Fence		Marshy grassland MG	
Reed/sedge bed		OTHER FEATURES	
Flood bank		Roadbridge	
Artificial bank		Footbridge	
Earth cliff		Weir	
		Culvert	
	Ford		
	Outfall		
	Dredgings/spoil		
	Silt bars		
	Islands mark position and size		
<p>ADDITIONAL COMMENTS:</p> <p>water level management signs of drying out flood debris position evidence of pollution</p> <p style="margin-left: 20px;">F - Water vole feeding remains L - Water vole latrine</p>			

WATER VOLE SURVEY FORM

BACKGROUND INFORMATION

Site name/river

Site number 10km square Grid ref

County Water Authority

Recorder Date

HABITAT INFORMATION (mark features on map)

Survey distance m

Habitat

Ditch

Dyke

Gravel pit

Pond

Lowland lake

Upland loch

Reservoir

Running water

Marsh/bog

Canal

Shore/bank

Boulders

Stones

Gravel

Sand

Silt

Earth ^{1st} half

Rock cliffs

Earth cliffs ^{2nd} half

Canalized

Poached

Reinforced (man-made)

Bordering land use

Upland grass

Permanent/temporary grass

Mixed broadleaf woodland

Conifer wood

Peat bog

Arable crop

Salt marsh

Urban/industrial

Park/garden

Heath

Fen

Cattle/grazing

Bank fenced?

Vegetation (DAFORN)

A Bankside trees

N Bushes

O Herbs

O Submerged weed

F Reeds/sedges

O Tall grass

O Short grass

Bank profile

Flat < 10°

Shallow < 45° ^{1st} half

Steep > 45° ^{2nd} half

Vertical/undercut

Depth

< 0.5m

0.5-1m

1-2m

> 2m

Width

1m 5-10m 1-2m 10-20m 2-5m 20-40m > 40m

Current

Slow Rapid Sluggish Fast Static

Disturbance:

WILDLIFE INFORMATION

Water voles

Sightings (count)

Latrines (count)

Burrows (count)

Footprints

Pathway in vegetation

Feeding remains

Cropped grass around tunnel entrance

Rat

Sightings

Droppings

Footprints/runs

Otter

Sightings

Droppings

Footprints/runs

Mink

Sightings

Droppings

Footprints/runs

Other wildlife

Kingfisher Heron Coot Waterfowl Moorhen Dipper

Identified plants from feeding remains:

SKETCH OF SITE – vole activity indicated (if any)

KEY TO SYMBOLS (mark route surveyed and direction of flow)		ADJACENT LAND-USE CODES	
Mature trees		Enclosed Area	BW
Over-hanging branches		Open pasture	CP
Fallen tree		Wood and near	MH
Exposed roots		Rough pasture	RP
Pollarded tree		Wetland	WL
Sapling		Improved grass	IG
Scrub		Tilled land (crop)	TL
Hedgerow		Suburban/urban devel. (inc gardens)	URB
Fence		Musky grass	MG
Reed/sedge bed		OTHER FEATURES	
Flood bank		Roadbridge	
Artificial bank		Footbridge	
Earth cliff		Weir	
		Culvert	
		Ford	
		Outfall	
		Dredgings/spoil	
		Silt bars	
		Islands	mark position and size

ADDITIONAL COMMENTS:

water level management

signs of drying out

flood debris position

evidence of pollution

FR - Watervole feeding remains

L - Watervole latrine

S - Otter spraint

BW

Overhanging trees throughout length, this bank only.

S

FR

MG
(Sheep & cattle grazed)

WATER VOLE SURVEY FORM

BACKGROUND INFORMATION

Site name/river SIZEWELL

Site number C 10km square Grid ref TM 468 653

County SUFFOLK Water Authority

Recorder SB & KL Date 04/10/07

HABITAT INFORMATION (mark features on map)

Survey distance

 115 m

Habitat

- Ditch
- Dyke
- Gravel pit
- Pond
- Lowland lake
- Upland loch
- Reservoir
- Running water
- Marsh/bog
- Canal

Shore/bank

- Boulders
- Stones
- Gravel
- Sand
- Silt
- Earth
- Rock cliffs
- Earth cliffs
- Canalized
- Poached
- Reinforced (man-made)

Bordering land use

- Upland grass
- Permanent/temporary grass
- Mixed broadleaf woodland
- Conifer wood
- Peat bog
- Arable crop
- Salt marsh
- Urban/industrial
- Park/garden
- Heath
- Fen
- Cattle/grazing
- Bank fenced?

Vegetation (DAFORN)

- A Bankside trees
- D Bushes
- R Herbs
- N Submerged weed
- N Reeds/sedges
- R Tall grass
- R Short grass

Disturbance:

Bank profile

- Flat < 10°
- Shallow < 45°
- Steep > 45°
- Vertical/undercut

Depth

- < 0.5m
- 0.5-1m
- 1-2m
- > 2m

Width

- 1m
- 1-2m
- 2-5m
- 5-10m
- 10-20m
- 20-40m
- > 40m

Current

- Slow
- Rapid
- Sluggish
- Fast
- Static

WILDLIFE INFORMATION

Water voles

- Sightings (count)
- Latrines (count)
- Burrows (count)
- Footprints
- Pathway in vegetation
- Feeding remains
- Cropped grass around tunnel entrance

Rat

- Sightings
- Droppings
- Footprints/runs

Otter

- Sightings
- Droppings
- ? Footprints/runs

Mink

- Sightings
- Droppings
- Footprints/runs

Other wildlife

- Kingfisher
- Heron
- Coot
- Waterfowl
- Moorhen
- Dipper

Identified plants from feeding remains:

SKETCH OF SITE – vole activity indicated (if any)

KEY TO SYMBOLS (mark route surveyed and direction of flow)		ADJACENT LAND-USE CODES	
Mature trees		Enclosed area BW	
Over-hanging branches		Common pasture CP	
Fallen tree		Wood and heath MH	
Exposed roots		Rough pasture RP	
Pollarded tree		Wetland WL	
Sapling		Improved grass IG	Semi improved grass SIG
Scrub		Tilled land (crop) TL	
Hedgerow		Suburban/urban devel. (inc gardens) URB	Mowing grass MG
Fence		OTHER FEATURES	
Reed/sedge bed		Roadbridge	
Flood bank		Footbridge	
Artificial bank		Weir	
Earth cliff		Culvert	
		Ford	
		Outfall	
	Dredgings/spoil		
	Silt bars		
	Islands mark position and size		

ADDITIONAL COMMENTS:

water level management

signs of drying out

flood debris position

evidence of pollution

F - water vole feeding remains

L - water vole latrine

B - water vole burrow

* Area with good otter potential, various unconfirmed field signs present.

WATER VOLE SURVEY FORM

BACKGROUND INFORMATION

Site name/river

Site number 10km square Grid ref

County Water Authority

Recorder Date

HABITAT INFORMATION (mark features on map)

Survey distance

m

Habitat

- Ditch
- Dyke
- Gravel pit
- Pond
- Lowland lake
- Upland loch
- Reservoir
- Running water
- Marsh/bog
- Canal

Shore/bank

- Boulders
- Stones
- Gravel
- Sand
- Silt
- Earth
- Rock cliffs
- Earth cliffs
- Canalized
- Poached
- Reinforced (man-made)

Bordering land use

- Upland grass
- Permanent/temporary grass
- Mixed broadleaf woodland
- Conifer wood
- Peat bog
- Arable crop
- Salt marsh
- Urban/industrial
- Park/garden
- Heath
- Fen
- Cattle/grazing
- Bank fenced?

Vegetation (DAFORN)

- A Bankside trees
- A Bushes
- R Herbs
- N Submerged weed
- N Reeds/sedges
- R Tall grass
- N Short grass

Disturbance:

Bank profile

- Flat < 10°
- Shallow < 45°
- Steep > 45°
- Vertical/undercut

Depth

- < 0.5m
- 0.5-1m
- 1-2m
- > 2m

Width

- 1m
- 1-2m
- 2-5m
- 5-10m
- 10-20m
- 20-40m
- > 40m

Current

- Slow
- Rapid
- Sluggish
- Static

WILDLIFE INFORMATION

Water voles

- Sightings (count)
- Latrines (count)
- Burrows (count)
- Footprints
- Pathway in vegetation
- Feeding remains
- Cropped grass around tunnel entrance

Rat

- Sightings
- Droppings
- Footprints/runs

Otter

- Sightings
- Droppings
- Footprints/runs

Mink

- Sightings
- Droppings
- Footprints/runs

Other wildlife

- Kingfisher
- Heron
- Coot
- Waterfowl
- Moorhen
- Dipper

Identified plants from feeding remains:

SKETCH OF SITE – vole activity indicated (if any)

KEY TO SYMBOLS (mark route surveyed and direction of flow)		ADJACENT LAND-USE CODES
Mature trees		Brushwood
Over-hanging branches		BW
Fallen tree		CP
Exposed roots		Wood and near
Pollarded tree		MH
Sapling		RP
Scrub		Wetland
Hedgerow		Improved grass
Fence		IG
Reed/sedge bed		TL
Flood bank		Suburban/urban devel. inc. gardens
Artificial bank		URB
Earth cliff		Marshy grass
		MC
		SIG
		TL
		OTHER FEATURES
		Roadbridge
		Footbridge
		Weir
		Culvert
		Ford
		Outfall
		Dredgings/spoil
		Silt bars
		Islands
		mark position and size

ADDITIONAL COMMENTS:

water level management
 signs of drying out
 flood debris position
 evidence of pollution

L Water vole latrine

X Possible other signs - large runs in bank, flattened vegetation, unconfirmed prints. Possible hole?

WATER VOLE SURVEY FORM

BACKGROUND INFORMATION

Site name/river SIZEWELL

Site number E 10km square Grid ref Tm 468 645

County SUFFOLK Water Authority

Recorder SB + KL Date 05/10/07

HABITAT INFORMATION (mark features on map)

Survey distance

120 m

Habitat

- Ditch
- Dyke
- Gravel pit
- Pond
- Lowland lake
- Upland loch
- Reservoir
- Running water
- Marsh/bog
- Canal

Shore/bank

- Boulders
- Stones
- Gravel
- Sand
- Silt
- Earth
- Rock cliffs
- Earth cliffs
- Canalized
- Poached
- Reinforced (man-made)

Bordering land use

- Upland grass
- Permanent/temporary grass
- Mixed broadleaf woodland
- Conifer wood
- Peat bog
- Arable crop
- Salt marsh
- Urban/industrial
- Park/garden
- Heath
- Fen
- Cattle/grazing
- Bank fenced?

Vegetation (DAFORN)

- A Bankside trees
- N Bushes
- R Herbs
- F Submerged weed
- A Reeds/sedges
- N Tall grass
- O Short grass

Disturbance:

Bank profile

- Flat < 10°
- Shallow < 45°
- Steep > 45°
- Vertical/undercut

Depth

- < 0.5m
- 0.5-1m
- 1-2m
- > 2m

Width

- 1m
- 1-2m
- 2-5m
- 5-10m
- 10-20m
- 20-40m
- > 40m

Current

- Slow
- Rapid
- Sluggish
- Fast
- Static

WILDLIFE INFORMATION

Water voles

- Sightings (count)
- Latrines (count)
- Burrows (count)
- Footprints
- Pathway in vegetation
- Feeding remains
- Cropped grass around tunnel entrance

Rat

- Sightings
- Droppings
- Footprints/runs

Otter

- Sightings
- Droppings
- Footprints/runs

Mink


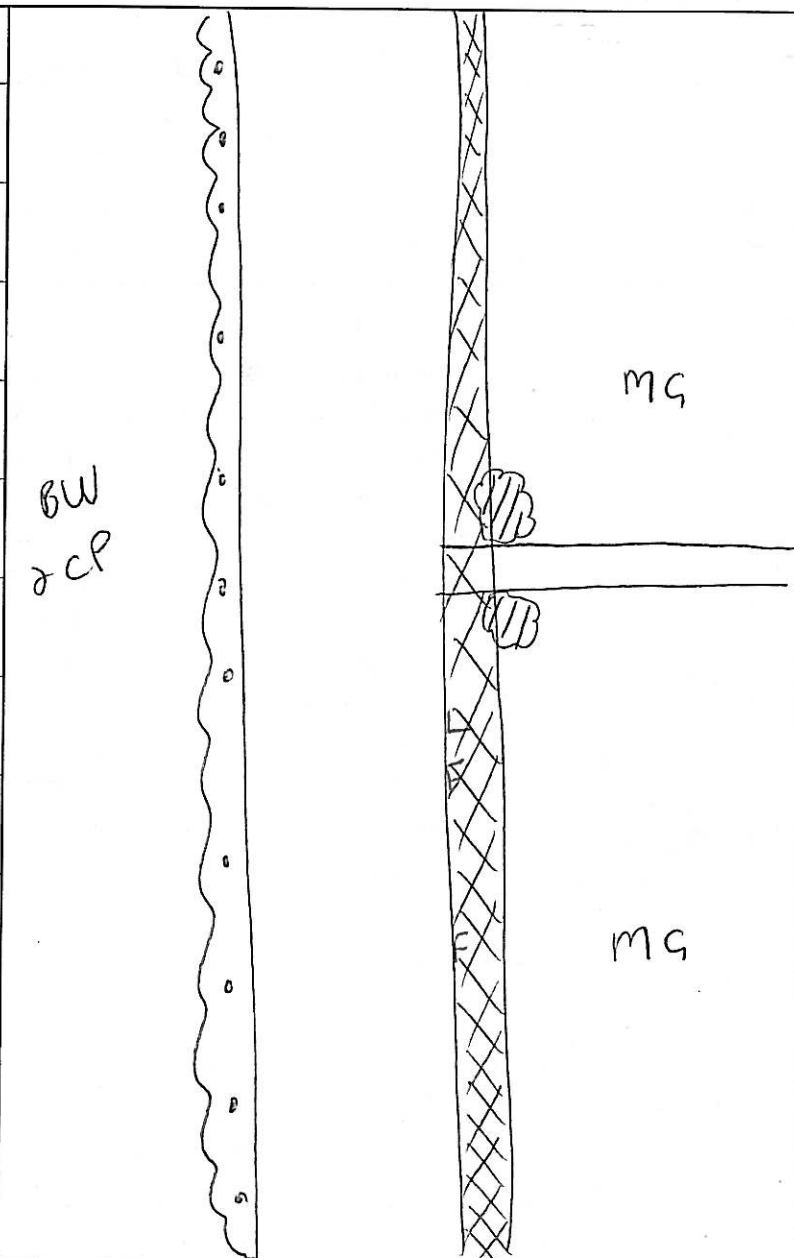






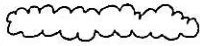
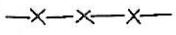






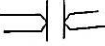



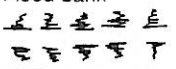

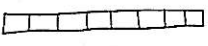

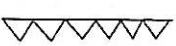

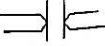



- Sightings
- Droppings
- Footprints/runs

Other wildlife

- Kingfisher
- Heron
- Coot
- Waterfowl
- Moorhen
- Dipper

Identified plants from feeding remains:

SKETCH OF SITE – vole activity indicated (if any)

KEY TO SYMBOLS (mark route surveyed and direction of flow)		ADJACENT LAND-USE CODES		
Mature trees 		Enclosed wood BW	Marshy grass MG	
Over-hanging branches 		Conifer plantation CP		
Fallen tree 		Moor and heath MH		
Exposed roots 		Rough pasture RP		
Pollarded tree 		Wetland WL		
Sapling 		Improved grass IG		
Scrub 		Tilled land (crop) TL		
Hedgerow 		Suburban/urban devel. (inc. gardens) URB		
Fence 		OTHER FEATURES		
Reed/sedge bed 		Roadbridge 		Roadbridge  Footbridge  Weir  Culvert  Ford  Outfall  Dredgings/spoil  Silt bars  Islands mark position and size
Flood bank 		Footbridge 		
Artificial bank 		Weir 		
Earth cliff 		Culvert 		
		Ford 		
	Outfall 			
	Dredgings/spoil 			
	Silt bars 			
	Islands mark position and size			
ADDITIONAL COMMENTS:				
water level management signs of drying out flood debris position evidence of pollution				
L Water vole latrine F Water vole feeding remains				

WATER VOLE SURVEY FORM

BACKGROUND INFORMATION

Site name/river

Site number 10km square Grid ref

County Water Authority

Recorder Date

HABITAT INFORMATION (mark features on map)

Survey distance

Habitat

- Ditch
- Dyke
- Gravel pit
- Pond
- Lowland lake
- Upland loch
- Reservoir
- Running water
- Marsh/bog
- Canal

Shore/bank

- Boulders
- Stones
- Gravel
- Sand
- Silt
- Earth
- Rock cliffs
- Earth cliffs
- Canalized
- Poached
- Reinforced (man-made)

Bordering land use

- Upland grass
- Permanent/temporary grass
- Mixed broadleaf woodland
- Conifer wood
- Peat bog
- Arable crop
- Salt marsh
- Urban/industrial
- Park/garden
- Heath
- Fen
- Cattle/grazing
- Bank fenced?

Vegetation (DAFORN)

- N Bankside trees
- N Bushes
- R Herbs
- R Submerged weed
- A Reeds/sedges
- R Tall grass
- O Short grass

Disturbance:

Bank profile

- Flat < 10°
- Shallow < 45°
- Steep > 45°
- Vertical/undercut

Depth

- < 0.5m
- 0.5-1m
- 1-2m
- > 2m

Width

- 1m
- 1-2m
- 2-5m
- 5-10m
- 10-20m
- 20-40m
- > 40m

Current

- Slow
- Rapid
- Sluggish
- Static

WILDLIFE INFORMATION

Water voles

- Sightings (count)
- Latrines (count)
- Burrows (count)
- Footprints
- Pathway in vegetation
- Feeding remains
- Cropped grass around tunnel entrance

Rat

- Sightings
- Droppings
- Footprints/runs

Otter

- Sightings
- Droppings
- Footprints/runs

Mink

- Sightings
- Droppings
- Footprints/runs

Other wildlife

- Kingfisher
- Heron
- Coot
- Waterfowl
- Moorhen
- Dipper

Identified plants from feeding remains:

SKETCH OF SITE – vole activity indicated (if any)

KEY TO SYMBOLS (mark route surveyed and direction of flow)		ADJACENT LAND-USE CODES		
Mature trees		Broad leaved wood	BW	
Over-hanging branches		Conifer plantation	CP	
Fallen tree		Moor and heath	MH	
Exposed roots		Rough pasture	RP	
Pollarded tree		Wetland	WL	
Sapling		Improved grass	IG	
Scrub		Tilled land (crop)	TL	
Hedgerow		Suburban/urban devel. (inc. gardens)	URB	Marshy grass MG
Fence		OTHER FEATURES		
Reed/sedge bed		Roadbridge		
Flood bank		Footbridge		
Artificial bank		Weir		
Earth cliff		Culvert		
		Ford		
	Outfall			
	Dredgings/spoil			
	Silt bars			
	Islands mark position and size			
ADDITIONAL COMMENTS: water level management signs of drying out flood debris position evidence of pollution L Water vole latrine F Water vole feeding remains				

WATER VOLE SURVEY FORM

BACKGROUND INFORMATION

Site name/river

Site number 10km square Grid ref

County Water Authority

Recorder Date

HABITAT INFORMATION (mark features on map)

Survey distance

m

Habitat

- Ditch
- Dyke
- Gravel pit
- Pond
- Lowland lake
- Upland loch
- Reservoir
- Running water
- Marsh/bog
- Canal

Shore/bank

- Boulders
- Stones
- Gravel
- Sand
- Silt
- Earth
- Rock cliffs
- Earth cliffs
- Canalized
- Poached
- Reinforced (man-made)

Bordering land use

- Upland grass
- Permanent/temporary grass
- Mixed broadleaf woodland
- Conifer wood
- Peat bog
- Arable crop
- Salt marsh
- Urban/industrial
- Park/garden
- Heath
- Fen
- Cattle/grazing
- Bank fenced?

Vegetation (DAFORN)

- A Bankside trees
- R Bushes
- O Herbs
- R Submerged weed
- O Reeds/sedges
- A Tall grass
- R Short grass

Disturbance:

Bank profile

- Flat < 10°
- Shallow < 45°
- Steep > 45°
- Vertical/undercut

Depth

- < 0.5m
- 0.5-1m
- 1-2m
- > 2m

Width

- 1m
- 1-2m
- 2-5m
- 5-10m
- 10-20m
- 20-40m
- > 40m

Current

- Rapid
- Sluggish
- Fast
- Static

WILDLIFE INFORMATION

Water voles

- Sightings (count)
- Latrines (count)
- Burrows (count)
- Footprints
- Pathway in vegetation
- Feeding remains
- Cropped grass around tunnel entrance

Rat

- Sightings
- Droppings
- Footprints/runs

Otter

- Sightings
- Droppings
- Footprints/runs

Mink


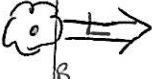

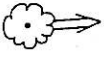




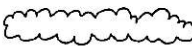
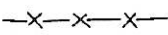


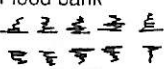

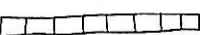

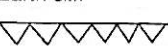




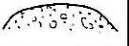
- Sightings
- Droppings
- Footprints/runs

Other wildlife

- Kingfisher
- Heron
- Coot
- Waterfowl
- Moorhen
- Dipper

Identified plants from feeding remains:

SKETCH OF SITE – vole activity indicated (if any)

KEY TO SYMBOLS (mark route surveyed and direction of flow)		ADJACENT LAND-USE CODES	
Mature trees 	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">CP</div> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">Overhanging trees all along this bank.</div> <div style="text-align: center;">MG</div> </div> <div style="text-align: center; margin-top: 20px;">  <p>B</p> </div>	Enclosed area BW	
Over-hanging branches 		Open pasture CP	
Fallen tree 		Wood and near MH	
Exposed roots 		Rough pasture RP	
Pollarded tree 		Wetland WL	
Sapling 		Improved grass IG	
Scrub 		Tilled land (crop) TL	
Hedgerow 		Suburban/urban devel. (inc. gardens) URB	marshy grass MG
Fence 		OTHER FEATURES	
Reed/sedge bed 		Roadbridge 	
Flood bank 		Footbridge 	
Artificial bank 		Weir 	
Earth cliff 		Culvert 	
	Ford 		
	Outfall 		
	Dredgings/spoil 		
	Silt bars 		
	Islands mark position and size		
ADDITIONAL COMMENTS: water level management signs of drying out flood debris position evidence of pollution <div style="margin-left: 200px;"> L water vole latrine B water vole burrow </div>			

WATER VOLE SURVEY FORM

BACKGROUND INFORMATION

Site name/river

Site number 10km square Grid ref

County Water Authority

Recorder Date

HABITAT INFORMATION (mark features on map)

Survey distance

km

Habitat

- Ditch
- Dyke
- Gravel pit
- Pond
- Lowland lake
- Upland loch
- Reservoir
- Running water
- Marsh/bog
- Canal

Shore/bank

- Boulders
- Stones
- Gravel
- Sand
- Silt
- Earth
- Rock cliffs
- Earth cliffs
- Canalized
- Poached
- Reinforced (man-made)

Bordering land use

- Upland grass
- Permanent/temporary grass
- Mixed broadleaf woodland
- Conifer wood
- Peat bog
- Arable crop
- Salt marsh
- Urban/industrial
- Park/garden
- Heath
- Fen
- Cattle/grazing
- Bank fenced?

Vegetation (DAFORN)

- D Bankside trees
- N Bushes
- R Herbs
- O Submerged weed
- D Reeds/sedges
- N Tall grass
- N Short grass

Disturbance:

Bank profile

- Flat < 10°
- Shallow < 45°
- Steep > 45°
- Vertical/undercut

Depth

- < 0.5m
- 0.5-1m
- 1-2m
- > 2m

Width

- 1m
- 1-2m
- 2-5m
- 5-10m
- 10-20m
- 20-40m
- > 40m

Current

- Slow
- Rapid
- Sluggish
- Fast
- Static

WILDLIFE INFORMATION

Water voles

- Sightings (count)
- Latrines (count)
- Burrows (count)
- Footprints
- Pathway in vegetation
- Feeding remains
- Cropped grass around tunnel entrance

Rat

- Sightings
- Droppings
- Footprints/runs

Otter

- Sightings
- Droppings
- Footprints/runs

Mink








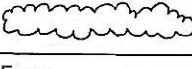
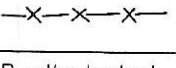
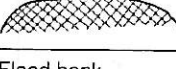

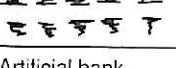

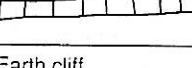

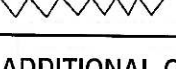

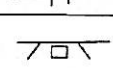


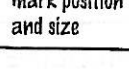
- Sightings
- Droppings
- Footprints/runs

Other wildlife

- Kingfisher
- Heron
- Coot
- Waterfowl
- Moorhen
- Dipper

Identified plants from feeding remains:

SKETCH OF SITE – vole activity indicated (if any)

KEY TO SYMBOLS (mark route surveyed and direction of flow)		ADJACENT LAND-USE CODES	
Mature trees 		Enclosed area BW	
Over-hanging branches 		Common pasture CP	
Fallen tree 		Moor and heath MH	
Exposed roots 		Rough pasture RP	
Pollarded tree 		Wetland WL	
Sapling 		Improved grass IG	
Scrub 		Tilled land (crop) TL	
Hedgerow 		Suburban/urban devel. (inc gardens) URB	
Fence 		OTHER FEATURES	
Reed/sedge bed 		Roadbridge 	
Flood bank 		Footbridge 	
Artificial bank 		Weir 	
Earth cliff 		Culvert 	
	Ford 		
	Outfall 		
	Dredgings/spoil 		
	Silt bars 		
	Islands mark position and size		
ADDITIONAL COMMENTS: water level management signs of drying out flood debris position evidence of pollution <i>L - water vole latrines</i>			

WATER VOLE SURVEY FORM

BACKGROUND INFORMATION

Site name/river SIZEWELL

Site number J 10km square Grid ref TM 466 638

County SUFFOLK Water Authority

Recorder SB+KL Date 05/10/07

HABITAT INFORMATION (mark features on map)

Survey distance

200 km

Habitat

- Ditch
- Dyke
- Gravel pit
- Pond
- Lowland lake
- Upland loch
- Reservoir
- Running water
- Marsh/bog
- Canal

Shore/bank

- Boulders
- Stones
- Gravel
- Sand
- Silt
- Earth
- Rock cliffs
- Earth cliffs
- Canalized
- Poached
- Reinforced (man-made)

Bordering land use

- Upland grass
- Permanent/temporary grass
- Mixed broadleaf woodland
- Conifer wood
- Peat bog
- Arable crop
- Salt marsh
- Urban/industrial
- Park/garden
- Heath
- Fen
- Cattle/grazing
- Bank fenced?

Vegetation (DAFORN)

- Bankside trees
- Bushes
- Herbs
- Submerged weed
- Reeds/sedges
- Tall grass
- Short grass

Disturbance:

Bank profile

- Flat < 10°
- Shallow < 45°
- Steep > 45°
- Vertical/undercut

Depth

- < 0.5m
- 0.5-1m
- 1-2m
- > 2m

Width

- 1m
- 1-2m
- 2-5m
- > 40m
- 5-10m
- 10-20m
- 20-40m

Current

- Slow
- Rapid
- Sluggish
- Fast
- Static

WILDLIFE INFORMATION

Water voles

- Sightings (count)
- Latrines (count)
- Burrows (count)
- Footprints
- Pathway in vegetation
- Feeding remains
- Cropped grass around tunnel entrance

Rat

- Sightings
- Droppings
- Footprints/runs

Otter

- Sightings
- Droppings
- Footprints/runs

Mink

- Sightings
- Droppings
- Footprints/runs

Other wildlife

- Kingfisher
- Heron
- Coot
- Moorhen
- Waterfowl
- Dipper

Identified plants from feeding remains:

SKETCH OF SITE – vole activity indicated (if any)

KEY TO SYMBOLS (mark route surveyed and direction of flow)		ADJACENT LAND-USE CODES	
Mature trees		Enclosed wood BW	
Over-hanging branches		Domestic garden CP	
Fallen tree		Moorland heath MH	
Exposed roots		Rough pasture RP	
Pollarded tree		Wetland WL	
Sapling		Improved grass IG	
Scrub		Tilled land (crop) TL	
Hedgerow		Suburban/urban devel. (inc gardens) URB	
Fence		OTHER FEATURES	
Reed/sedge bed		Roadbridge	
Flood bank		Footbridge	
Artificial bank		Weir	
Earth cliff		Culvert	
	Ford		
	Outfall		
	Dredgings/spoil		
	Silt bars		
	Islands mark position and size		
ADDITIONAL COMMENTS: water level management signs of drying out flood debris position evidence of pollution L - Water vole latrine F - Water vole feeding remains.			

WATER VOLE SURVEY FORM

BACKGROUND INFORMATION

Site name/river SIZEWELL

Site number K 10km square Grid ref TM 468 638

County SUFFOLK Water Authority

Recorder SB+KL Date 05/10/07

HABITAT INFORMATION (mark features on map)

Survey distance

250 km

Habitat

- Ditch
- Dyke
- Gravel pit
- Pond
- Lowland lake
- Upland loch
- Reservoir
- Running water
- Marsh/bog
- Canal

Shore/bank

- Boulders
- Stones
- Gravel
- Sand
- Silt
- Earth
- Rock cliffs
- Earth cliffs
- Canalized
- Poached
- Reinforced (man-made)

Bordering land use

- Upland grass
- Permanent/temporary grass
- Mixed broadleaf woodland
- Conifer wood
- Peat bog
- Arable crop
- Salt marsh
- Urban/industrial
- Park/garden
- Heath
- Fen
- Cattle/grazing
- Bank fenced?

Vegetation (DAFORN)

- Bankside trees
- Bushes
- Herbs
- Submerged weed
- Reeds/sedges
- Tall grass
- Short grass

Disturbance:

Bank profile

- Flat < 10°
- Shallow < 45°
- Steep > 45°
- Vertical/undercut

Depth

- < 0.5m
- 0.5-1m
- 1-2m
- > 2m

Width

- 1m
- 1-2m
- 2-5m
- 5-10m
- 10-20m
- 20-40m
- > 40m

Current

- Slow
- Rapid
- Sluggish
- Fast
- Static

WILDLIFE INFORMATION

Water voles

- Sightings (count)
- Latrines (count)
- Burrows (count)
- Footprints
- Pathway in vegetation
- Feeding remains
- Cropped grass around tunnel entrance

Rat

- Sightings
- Droppings
- Footprints/runs

Otter

- Sightings
- Droppings
- Footprints/runs

Mink






















- Sightings
- Droppings
- Footprints/runs

Other wildlife

- Kingfisher
- Heron
- Coot
- Waterfowl
- Moorhen
- Dipper

Identified plants from feeding remains:

SKETCH OF SITE – vole activity indicated (if any)

KEY TO SYMBOLS (mark route surveyed and direction of flow)		ADJACENT LAND-USE CODES
Mature trees 		Enclosed wood BW
Over-hanging branches 		Open garden CP
Fallen tree 		Woodland near MH
Exposed roots 		Rough pasture RP
Pollarded tree 		Wetland WL
Sapling 		Improved grass IG
Scrub 		Tilled land (crop) TL
Hedgerow 		Suburban/urban devel. (inc gardens) URB
Fence 		OTHER FEATURES
Reed/sedge bed 		Roadbridge 
Flood bank 		Footbridge 
Artificial bank 		Weir 
Earth cliff 		Culvert 
	Ford 	
	Outfall 	
	Dredgings/spoil 	
	Silt bars 	
	Islands mark position and size	
ADDITIONAL COMMENTS:		
water level management signs of drying out flood debris position evidence of pollution		

WATER VOLE SURVEY FORM

BACKGROUND INFORMATION

Site name/river

Site number 10km square Grid ref

County Water Authority

Recorder Date

HABITAT INFORMATION (mark features on map)

Survey distance

Habitat

- Ditch
- Dyke
- Gravel pit
- Pond
- Lowland lake
- Upland loch
- Reservoir
- Running water
- Marsh/bog
- Canal

Shore/bank

- Boulders
- Stones
- Gravel
- Sand
- Silt
- Earth
- Rock cliffs
- Earth cliffs
- Canalized
- Poached
- Reinforced (man-made)

Bordering land use

- Upland grass
- Permanent/temporary grass
- Mixed broadleaf woodland
- Conifer wood
- Peat bog
- Arable crop
- Salt marsh
- Urban/industrial
- Park/garden
- Heath
- Fen
- Cattle/grazing
- Bank fenced?

Vegetation (DAFORN)

- F Bankside trees
- R Bushes
- A Herbs
- F Submerged weed
- D Reeds/sedges
- O Tall grass
- R Short grass

Disturbance:

Bank profile

- Flat < 10°
- Shallow < 45°
- Steep > 45°
- Vertical/undercut

Depth

- < 0.5m
- 0.5-1m
- 1-2m
- > 2m

Width

- 1m
- 1-2m
- 2-5m
- 5-10m
- 10-20m
- 20-40m
- > 40m

Current

- Slow
- Rapid
- Sluggish
- Fast
- Static

WILDLIFE INFORMATION

Water voles

- Sightings (count)
- Latrines (count)
- Burrows (count)
- Footprints
- Pathway in vegetation
- Feeding remains
- Cropped grass around tunnel entrance

Rat

- Sightings
- Droppings
- Footprints/runs

Otter

- Sightings
- Droppings
- Footprints/runs

Mink

- Sightings
- Droppings
- Footprints/runs

Other wildlife

- Kingfisher
- Heron
- Coot
- Waterfowl
- Moorhen
- Dipper

Identified plants from feeding remains:

SKETCH OF SITE – vole activity indicated (if any)

KEY TO SYMBOLS (mark route surveyed and direction of flow)		ADJACENT LAND-USE CODES
Mature trees		Broadleaved Wood BW
Over-hanging branches		Open pasture OP
Fallen tree		Moorland heath MH
Exposed roots		Rough pasture RP
Pollarded tree		Wetland WL
Sapling		Improved grass IG
Scrub		Tilled land (crop) TL
Hedgerow		Suburban/urban devel. (inc. gardens) URB
Fence		OTHER FEATURES
Reed/sedge bed		Roadbridge
Flood bank		Footbridge
Artificial bank		Weir
Earth cliff		Culvert
	Ford	
	Outfall	
	Dredgings/spoil	
	Silt bars	
	Islands mark position and size	
	herbs	
ADDITIONAL COMMENTS: water level management signs of drying out flood debris position evidence of pollution L Water vole latrine F Water vole feeding remains S Otter spraint		

WATER VOLE SURVEY FORM

BACKGROUND INFORMATION

Site name/river SIZEWELL

Site number M 10km square Grid ref Tm 469 636

County SUFFOLK Water Authority

Recorder SB + KL Date 05/10/07

HABITAT INFORMATION (mark features on map)

Survey distance

200 km

Habitat

- Ditch
- Dyke
- Gravel pit
- Pond
- Lowland lake
- Upland loch
- Reservoir
- Running water
- Marsh/bog
- Canal

Shore/bank

- Boulders
- Stones
- Gravel
- Sand
- Silt
- Earth
- Rock cliffs
- Earth cliffs
- Canalized
- Poached
- Reinforced (man-made)

Bordering land use

- Upland grass
- Permanent/temporary grass
- Mixed broadleaf woodland
- Conifer wood
- Peat bog
- Arable crop
- Salt marsh
- Urban/industrial
- Park/garden
- Heath
- Fen
- Cattle/grazing
- Bank fenced?

Vegetation (DAFORN)

- Bankside trees
- Bushes
- Herbs
- Submerged weed
- Reeds/sedges
- Tall grass
- Short grass

Disturbance:

Bank profile

- Flat < 10°
- Shallow < 45°
- Steep > 45°
- Vertical/undercut

Depth

- < 0.5m
- 0.5-1m
- 1-2m
- > 2m

Width

- 1m
- 1-2m
- 2-5m
- 5-10m
- 10-20m
- 20-40m
- > 40m

Current

- Rapid
- Sluggish
- Fast
- Static

WILDLIFE INFORMATION

Water voles

- Sightings (count)
- Latrines (count)
- Burrows (count)
- Footprints
- Pathway in vegetation
- Feeding remains
- Cropped grass around tunnel entrance

Rat

- Sightings
- Droppings
- Footprints/runs

Otter

- Sightings
- Droppings
- Footprints/runs

Mink

- Sightings
- Droppings
- Footprints/runs

Other wildlife

- Kingfisher
- Heron
- Coot
- Waterfowl
- Moorhen
- Dipper

Identified plants from feeding remains:

SKETCH OF SITE – vole activity indicated (if any)

KEY TO SYMBOLS (mark route surveyed and direction of flow)					
Mature trees		ADJACENT LAND-USE CODES			
Over-hanging branches		Enclosed area BW			
Fallen tree		Cottier CP			
Exposed roots		Moor and heath MH			
Pollarded tree		Rough pasture RP			
Sapling		Wetland WL			
Scrub		Improved grass IG			
Hedgerow		Tilled land (crop) TL			
Fence		Suburban/urban devel. (inc gardens) URB	<i>Marshy grass MG</i>		
Reed/sedge bed		OTHER FEATURES			
Flood bank		Roadbridge			
Artificial bank		Footbridge			
Earth cliff		Weir			
		Culvert			
		Ford			
	Outfall				
	Dredgings/spoil				
	Silt bars				
	Islands mark position and size				
<p>ADDITIONAL COMMENTS:</p> <p>water level management signs of drying out flood debris position evidence of pollution</p> <p style="margin-left: 20px;"><i>L - water vole latrine</i></p> <p style="margin-left: 20px;"><i>F - feeding remains</i></p>					

WATER VOLE SURVEY FORM

BACKGROUND INFORMATION

Site name/river

Site number 10km square Grid ref

County Water Authority

Recorder Date

HABITAT INFORMATION (mark features on map)

Survey distance

Habitat

Ditch

Dyke

Gravel pit

Pond

Lowland lake

Upland loch

Reservoir

Running water

Marsh/bog

Canal

Shore/bank

Boulders

Stones

Gravel

Sand

Silt

Earth

Rock cliffs

Earth cliffs

Canalized

Poached

Reinforced (man-made)

Bordering land use

Upland grass

Permanent/temporary grass

Mixed broadleaf woodland

Conifer wood

Peat bog

Arable crop

Salt marsh

Urban/industrial

Park/garden

Heath

Fen

Cattle/grazing

Bank fenced?

Vegetation (DAFORN)

Bankside trees

Bushes

Herbs

Submerged weed

Reeds/sedges

Tall grass

Short grass

Disturbance:

Bank profile

Flat < 10°

Shallow < 45°

Steep > 45°

Vertical/undercut

Depth

< 0.5m

0.5-1m

1-2m

> 2m

Width

1m 1-2m 2-5m

5-10m 10-20m 20-40m > 40m

Current

Slow Rapid Fast

Sluggish Static

WILDLIFE INFORMATION

Water voles

Sightings (count)

Latrines (count)

Burrows (count)

Footprints

Pathway in vegetation

Feeding remains

Cropped grass around tunnel entrance

Rat

Sightings

Droppings

Footprints/runs

Otter

Sightings

Droppings

Footprints/runs

Mink

Sightings

Droppings

Footprints/runs


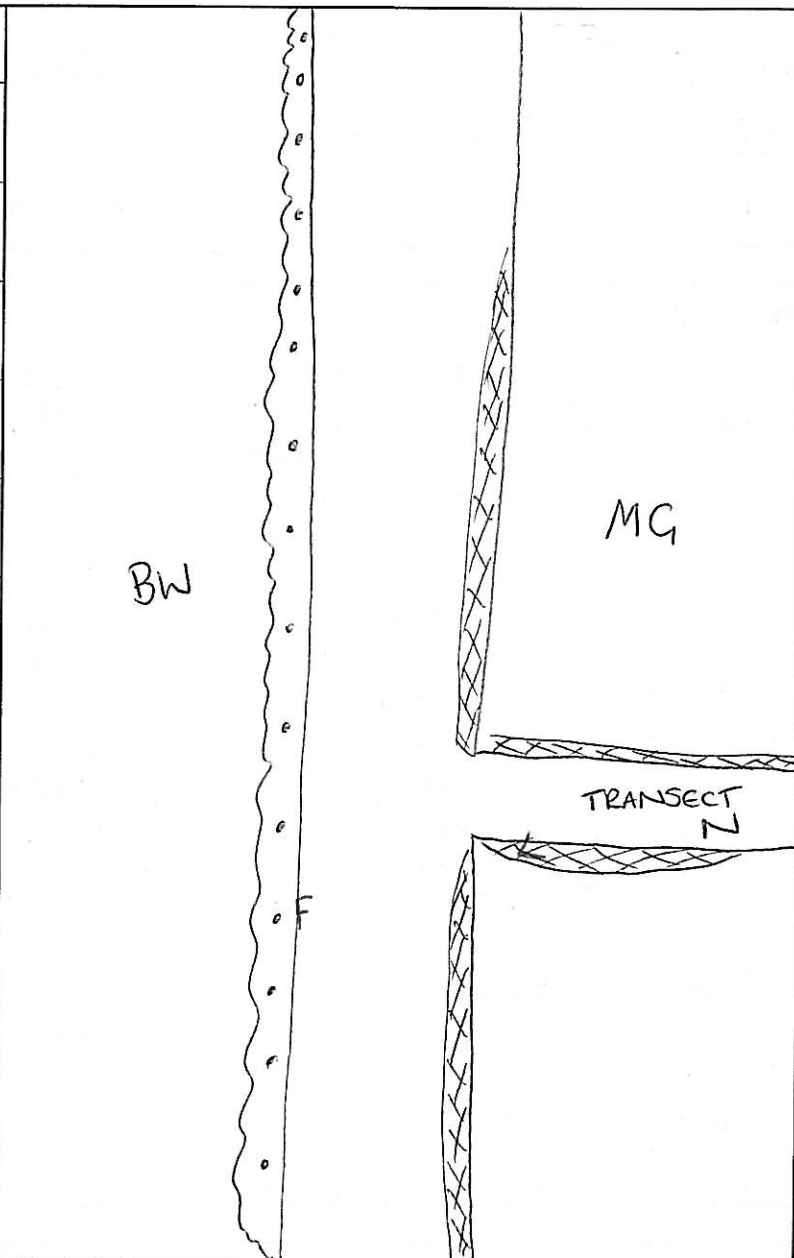






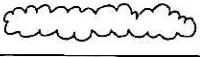
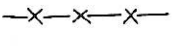


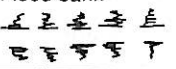

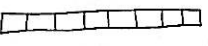



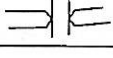


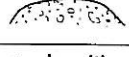
Other wildlife

Kingfisher Heron Coot Moorhen

Waterfowl Dipper

Identified plants from feeding remains:

SKETCH OF SITE – vole activity indicated (if any)

KEY TO SYMBOLS (mark route surveyed and direction of flow)		ADJACENT LAND-USE CODES	
Mature trees 		Enclosed Area BW	
Over-hanging branches 		Open pasture OP	
Fallen tree 		Moor and heath MH	
Exposed roots 		Rough pasture RP	
Pollarded tree 		Wetland WL	
Sapling 		Improved grass IG	
Scrub 		Tilled land (crop) TL	
Hedgerow 		Suburban/urban devel. (inc. gardens) URB	Mixing grass MG
Fence 		OTHER FEATURES	
Reed/sedge bed 		Roadbridge 	
Flood bank 		Footbridge 	
Artificial bank 		Weir 	
Earth cliff 		Culvert 	
		Ford 	
	Outfall 		
	Dredgings/spoil 		
	Silt bars 		
	Islands mark position and size		
ADDITIONAL COMMENTS: water level management signs of drying out flood debris position evidence of pollution L - Watervole latrine F - Water vole feeding remains			

WATER VOLE SURVEY FORM

BACKGROUND INFORMATION

Site name/river

Site number 10km square Grid ref

County Water Authority

Recorder Date

HABITAT INFORMATION (mark features on map)

Survey distance

Habitat

- Ditch
- Dyke
- Gravel pit
- Pond
- Lowland lake
- Upland loch
- Reservoir
- Running water
- Marsh/bog
- Canal

Shore/bank

- Boulders
- Stones
- Gravel
- Sand
- Silt
- Earth
- Rock cliffs
- Earth cliffs
- Canalized
- Poached
- Reinforced (man-made)

Bordering land use

- Upland grass
- Permanent/temporary grass
- Mixed broadleaf woodland
- Conifer wood
- Peat bog
- Arable crop
- Salt marsh
- Urban/industrial
- Park/garden
- Heath
- Fen
- Cattle/grazing
- Bank fenced?

Vegetation (DAFORN)

- A Bankside trees
- R Bushes
- F Herbs
- F Submerged weed
- A Reeds/sedges
- N Tall grass
- O Short grass

Disturbance:

Bank profile

- Flat < 10°
- Shallow < 45°
- Steep > 45°
- Vertical/undercut

Depth

- < 0.5m
- 0.5-1m
- 1-2m
- > 2m

Width

- 1m
- 1-2m
- 2-5m
- 5-10m
- 10-20m
- 20-40m
- > 40m

Current

- Slow
- Rapid
- Sluggish
- Fast
- Static

WILDLIFE INFORMATION

Water voles

- Sightings (count)
- Latrines (count)
- Burrows (count)
- Footprints
- Pathway in vegetation
- Feeding remains
- Cropped grass around tunnel entrance

Rat

- Sightings
- Droppings
- Footprints/runs

Otter

- Sightings
- Droppings
- Footprints/runs

Mink

- Sightings
- Droppings
- Footprints/runs

Other wildlife

- Kingfisher
- Heron
- Coot
- Waterfowl
- Moorhen
- Dipper

Identified plants from feeding remains:

SKETCH OF SITE – vole activity indicated (if any)

KEY TO SYMBOLS (mark route surveyed and direction of flow)		ADJACENT LAND-USE CODES	
Mature trees		Encroached wood BW	
Over-hanging branches		Common pasture CP	
Fallen tree		Woodland heath MH	
Exposed roots		Rough pasture RP	
Pollarded tree		Wetland WL	
Sapling		Improved grass IG	
Scrub		Tilled land (crop) TL	
Hedgerow		Suburban/urban devel. (inc gardens) URB	Marshy grass MG
Fence		OTHER FEATURES	
Reed/sedge bed		Roadbridge	
Flood bank		Footbridge	
Artificial bank		Weir	
Earth cliff		Culvert	
		Ford	
	Outfall		
	Dredgings/spoil		
	Silt bars		
	Islands mark position and size		
ADDITIONAL COMMENTS: water level management signs of drying out flood debris position evidence of pollution L - Water vole latrine F - Water vole feeding remains			

WATER VOLE SURVEY FORM

BACKGROUND INFORMATION

Site name/river

Site number 10km square Grid ref

County Water Authority

Recorder Date

HABITAT INFORMATION (mark features on map)

Survey distance

m

Habitat

Ditch

Dyke

Gravel pit

Pond

Lowland lake

Upland loch

Reservoir

Running water

Marsh/bog

Canal

Shore/bank

Boulders

Stones

Gravel

Sand

Silt

Earth

Rock cliffs

Earth cliffs

Canalized

Poached

Reinforced (man-made)

Bordering land use

Upland grass

Permanent/temporary grass

Mixed broadleaf woodland

Conifer wood

Peat bog

Arable crop

Salt marsh

Urban/industrial

Park/garden

Heath

Fen

Cattle/grazing

Bank fenced?

Vegetation (DAFORN)

D Bankside trees

R Bushes

R Herbs

D Submerged weed

F Reeds/sedges

A Tall grass

R Short grass

Disturbance:

Bank profile

Flat < 10°

Shallow < 45°

Steep > 45°

Vertical/undercut

Depth

< 0.5m

0.5-1m

1-2m

> 2m

Width

1m 1-2m 2-5m

5-10m 10-20m 20-40m > 40m

Current

Slow Rapid Sluggish Fast Static

WILDLIFE INFORMATION

Water voles

Sightings (count)

Latrines (count)

Burrows (count)

Footprints

Pathway in vegetation

Feeding remains

Cropped grass around tunnel entrance

Rat

Sightings

Droppings

Footprints/runs

Otter

Sightings

Droppings

Footprints/runs

Mink

Sightings

Droppings

Footprints/runs

Other wildlife

Kingfisher Heron Coot Waterfowl Moorhen Dipper

Identified plants from feeding remains:

SKETCH OF SITE – vole activity indicated (if any)

KEY TO SYMBOLS (mark route surveyed and direction of flow)		ADJACENT LAND-USE CODES
Mature trees		Bracken BW
Over-hanging branches		Common CP
Fallen tree		Wood and heath MH
Exposed roots		Rough pasture RP
Pollarded tree		Wetland WL
Sapling		Improved grass IG
Scrub		Tilled land (crop) TL
Hedgerow		Suburban/ urban devel. (inc. gardens) URB
Fence		Murshy grass MG
Reed/sedge bed		OTHER FEATURES
Flood bank		Roadbridge
Artificial bank		Footbridge
Earth cliff		Weir
	Culvert	
	Ford	
	Outfall	
	Dredgings/ spoil	
	Silt bars	
	Islands mark position and size	
ADDITIONAL COMMENTS: water level management signs of drying out flood debris position evidence of pollution L Water vole latrine F Water vole feeding remains		

WATER VOLE SURVEY FORM

BACKGROUND INFORMATION

Site name/river

Site number 10km square Grid ref

County Water Authority

Recorder Date

HABITAT INFORMATION (mark features on map)

Survey distance

m

Habitat

Ditch

Dyke

Gravel pit

Pond

Lowland lake

Upland loch

Reservoir

Running water

Marsh/bog

Canal

Shore/bank

Boulders

Stones

Gravel

Sand

Silt

Earth

Rock cliffs

Earth cliffs

Canalized

Poached

Reinforced (man-made)

Bordering land use

Upland grass

Permanent/temporary grass

Mixed broadleaf woodland

Conifer wood

Peat bog

Arable crop

Salt marsh

Urban/industrial

Park/garden

Heath

Fen

Cattle/grazing

Bank fenced?

Vegetation (DAFORN)

Bankside trees

Bushes

Herbs

Submerged weed

Reeds/sedges

Tall grass

Short grass

Disturbance:

Bank profile

Flat < 10°

Shallow < 45°

Steep > 45°

Vertical/undercut

Depth

< 0.5m

0.5-1m

1-2m

> 2m

Width

1m 1-2m 2-5m

5-10m 10-20m 20-40m > 40m

Current

Slow Rapid Fast

Sluggish Static

WILDLIFE INFORMATION

Water voles

Sightings (count)

Latrines (count)

Burrows (count)

Footprints

Pathway in vegetation

Feeding remains

Cropped grass around tunnel entrance

Rat

Sightings

Droppings

Footprints/runs

Otter

Sightings

Droppings

Footprints/runs

Mink

Sightings

Droppings

Footprints/runs

Other wildlife

Kingfisher Heron Coot Moorhen

Waterfowl Dipper

Identified plants from feeding remains:

SKETCH OF SITE – vole activity indicated (if any)

KEY TO SYMBOLS (mark route surveyed and direction of flow)			ADJACENT LAND-USE CODES
Mature trees			Enclosed wood BW
Over-hanging branches		Dense pasture CP	
Fallen tree		Moorland heath MH	
Exposed roots		Rough pasture RP	
Pollarded tree		Wetland WL	
Sapling		Improved grass IG	
Scrub		Tilled land (crop) TL	
Hedgerow		Suburban/urban devel. (inc gardens) URB	
Fence		OTHER FEATURES	
Reed/sedge bed		Roadbridge	
Flood bank		Footbridge	
Artificial bank		Weir	
Earth cliff		Culvert	
		Ford	
		Outfall	
	Dredgings/spoil		
	Silt bars		
	Islands mark position and size		
ADDITIONAL COMMENTS:	☿ herbs	⊗ standing dead tree	
water level management	<i>L Water vole latrine</i>		
signs of drying out			
flood debris position			
evidence of pollution			

WATER VOLE SURVEY FORM

BACKGROUND INFORMATION

Site name/river

Site number 10km square Grid ref

County Water Authority

Recorder Date

HABITAT INFORMATION (mark features on map)

Survey distance

km

Habitat

- Ditch
- Dyke
- Gravel pit
- Pond
- Lowland lake
- Upland loch
- Reservoir
- Running water
- Marsh/bog
- Canal

Shore/bank

- Boulders
- Stones
- Gravel
- Sand
- Silt
- Earth
- Rock cliffs
- Earth cliffs
- Canalized
- Poached
- Reinforced (man-made)

Bordering land use

- Upland grass
- Permanent/temporary grass
- Mixed broadleaf woodland
- Conifer wood
- Peat bog
- Arable crop
- Salt marsh
- Urban/industrial
- Park/garden
- Heath
- Fen
- Cattle/grazing
- Bank fenced?

Vegetation (DAFORN)

- Bankside trees
- Bushes
- Herbs
- Submerged weed
- Reeds/sedges
- Tall grass
- Short grass

Disturbance:

Bank profile

- Flat < 10°
- Shallow < 45°
- Steep > 45°
- Vertical/undercut

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- 0.5-1m
- 1-2m
- > 2m

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- 10-20m
- 20-40m
- > 40m

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- Slow
- Rapid
- Sluggish
- Fast
- Static

WILDLIFE INFORMATION

Water voles

- Sightings (count)
- Latrines (count)
- Burrows (count)
- Footprints
- Pathway in vegetation
- Feeding remains
- Cropped grass around tunnel entrance

Rat

- Sightings
- Droppings
- Footprints/runs

Otter

- Sightings
- Droppings
- Footprints/runs

Mink

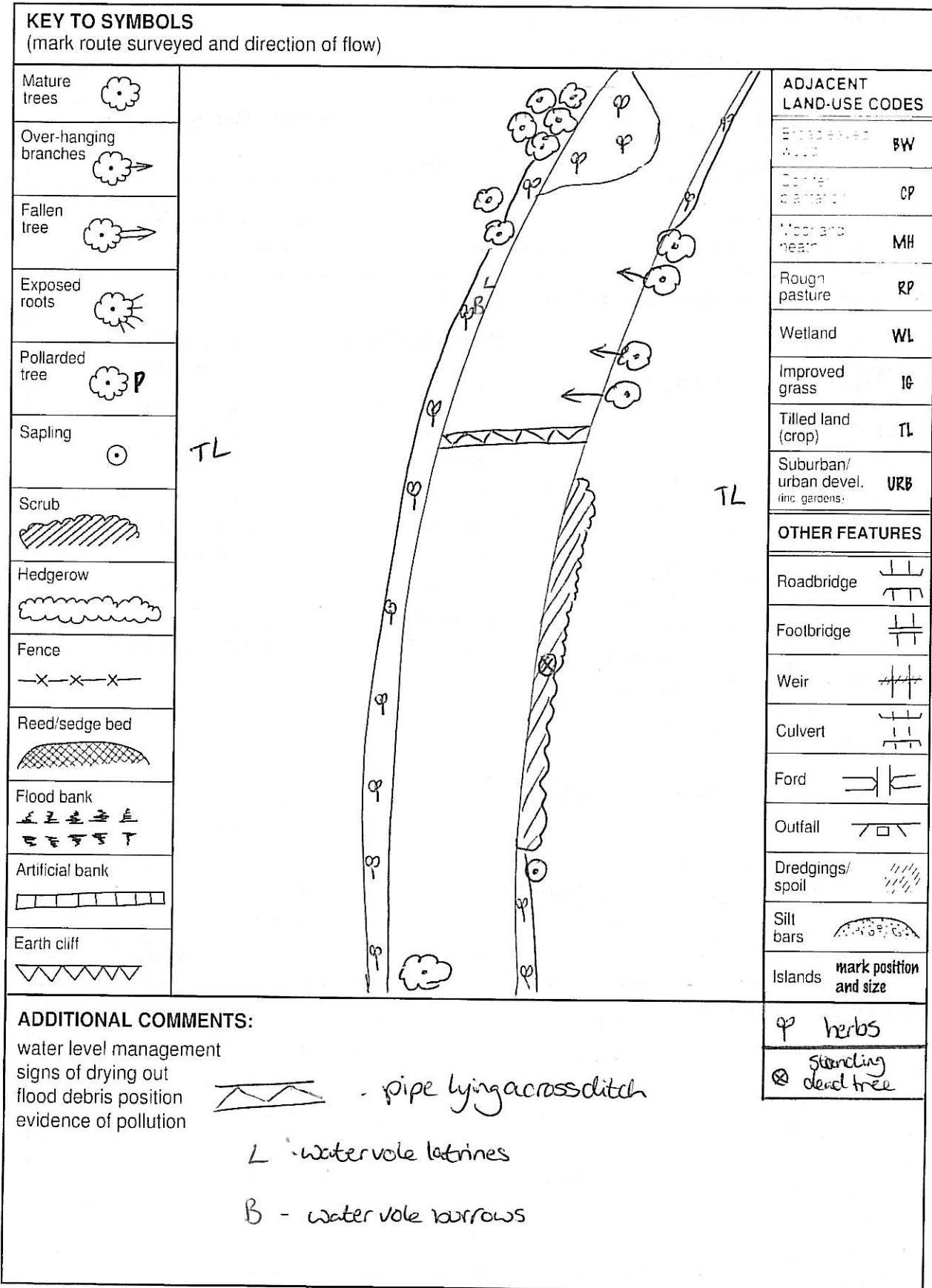
- Sightings
- Droppings
- Footprints/runs

Other wildlife

- Kingfisher
- Heron
- Coot
- Waterfowl
- Moorhen
- Dipper

Identified plants from feeding remains:

SKETCH OF SITE – vole activity indicated (if any)



WATER VOLE SURVEY FORM

BACKGROUND INFORMATION

Site name/river

Site number 10km square Grid ref

County Water Authority

Recorder Date

HABITAT INFORMATION (mark features on map)

Survey distance

Habitat

- Ditch
- Dyke
- Gravel pit
- Pond
- Lowland lake
- Upland loch
- Reservoir
- Running water
- Marsh/bog
- Canal

Shore/bank

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- Silt
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- Permanent/temporary grass
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- Peat bog
- Arable crop
- Salt marsh
- Urban/industrial
- Park/garden
- Heath
- Fen
- Cattle/grazing
- Bank fenced?

Vegetation (DAFORN)

- N Bankside trees
- N Bushes
- F Herbs
- A Submerged weed
- A Reeds/sedges
- O Tall grass
- O Short grass

Disturbance:

Bank profile

- Flat < 10°
- Shallow < 45°
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- 5-10m
- 10-20m
- 20-40m
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Current

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- Sluggish
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- Static

WILDLIFE INFORMATION

Water voles

- Sightings (count)
- Latrines (count)
- Burrows (count)
- Footprints
- Pathway in vegetation
- Feeding remains
- Cropped grass around tunnel entrance

Rat

- Sightings
- Droppings
- Footprints/runs

Otter

- Sightings
- Droppings
- Footprints/runs

Mink

- Sightings
- Droppings
- Footprints/runs


Other wildlife

- Kingfisher
- Heron
- Coot
- Waterfowl
- Moorhen
- Dipper

Identified plants from feeding remains:

SKETCH OF SITE – vole activity indicated (if any)

KEY TO SYMBOLS (mark route surveyed and direction of flow)				
Mature trees		ADJACENT LAND-USE CODES		
Over-hanging branches		Exposed water BW		
Fallen tree		Cattle pasture CP		
Exposed roots		Moor and heath MH		
Pollarded tree		Rough pasture RP		
Sapling		Wetland WL		
Scrub		Improved grass IG		
Hedgerow		Tilled land (crop) TL		
Fence		Suburban/urban devel. (inc gardens) URB	<i>Marshy grass</i> MG	
Reed/sedge bed		OTHER FEATURES		
Flood bank		Roadbridge		
Artificial bank		Footbridge		
Earth cliff		Weir		
		Culvert		
		Ford		
	Outfall			
	Dredgings/spoil			
	Silt bars			
	Islands mark position and size			
ADDITIONAL COMMENTS: water level management signs of drying out flood debris position evidence of pollution				

A	17/01/11	Katheryn Leggat	Emma Toovey	Draft	Draft Issue for EDF comment		Emma Toovey
Revision	Date	Prepared by	Checked by	Status	Reasons for revision		Approved by
EDF				N/A		N/A	
CIDEN							
DEVCO022-EDF\022 Report 01						SUPPLIER WBS CODE	
						N/A	
ENTEC							
CONTRACT KR1001			ITEM NUMBER		ELEMENTARY SYSTEM		BUILDING
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SCALE	NUCL/REP/EPR/UKEPR/					<input checked="" type="checkbox"/> IPS Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	
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NNB Generation Company Sizewell Water Vole Survey Report 2010

1. Introduction

1.1 Background

An area of land directly north of the Sizewell 'B' Power Station has been identified as having the potential to accommodate new nuclear plant. This area has an approximate central grid reference of TM473640 and is referred to in this document as the 'Strategic Site Area (SSA)'. The access road is likely to run in an easterly direction before linking into the wider road network at Lover's Lane, although its exact route has not yet been determined. In addition to these permanent development proposals there will also be a number of temporary construction activities and other associated developments but details of these areas are yet to be ascertained.

It was clear from early in the ecological desk study (which began in late 2006) that the Sizewell Estate supported a nationally important population of water voles (*Arvicola terrestris*). Survey work was undertaken in 2007 (report ref: 19081cr102) to establish the nature of use of the site by the water vole population present and following these studies, further survey work was proposed for 2009 to gain a better understanding of the size and distribution of the water vole population present. This additional data will be used to inform the Ecological Impact Assessment for the proposed scheme and to inform the design and implementation of any necessary mitigation strategy that may need to be adopted as part of the new build proposals.

This report outlines the findings of the 2009 survey work and complements the initial work from 2007.

1.2 Legislation and Policy Guidance

1.2.1 Biodiversity Action Plan

Water vole is on the list of priority species in the UK Biodiversity Action Plan (UK BAP), adopted by the Government in 2007. Species included on this list have been identified by the UK Government as needing special conservation effort 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. Water vole populations are at risk primarily from habitat loss and degradation, which has increased water vole vulnerability to predation, particularly from American mink. This has led to a major decline not only within Suffolk, but also nationally. This has led to populations becoming scarce and fragmented across many parts of their former range (Strachan & Moorhouse, 2006).

A clear understanding of the level and nature of use of a site by water voles 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 water vole habitat, and aim to maintain and enhance existing populations.

Most of the Species Action Plans (SAPs) in the Suffolk Biodiversity Action Plan are based on National Biodiversity Action Plans (Suffolk Biodiversity Partnership, 2003). The process of identifying BAP priorities in Suffolk began in 1997, and an initial plan (Tranche 1) was produced in 1998. Tranche 2, published in 2000 has been withdrawn and revised plans are in production. Water vole was included as a priority species on both Tranche 1 and Tranche 2.

1.2.2 Protective Legislation Relating to Water Vole

Water voles and their burrows are protected in the UK under Schedule 5 of the *Wildlife and Countryside Act 1981* (as amended). This makes it an offence, *inter alia*, to:

- Intentionally kill, injure or take a water vole;
- Intentionally or recklessly damage or destroy or obstruct access to any structure or place which water voles use for shelter or protection; or
- Intentionally or recklessly disturb water voles while they are using such a place.

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*”. Listed on the UK Biodiversity Action Plan (see Section 1.2.1), water vole is considered a Species of Principal Importance for the Conservation of Biodiversity under Section 41 of the NERC Act.

In paragraph 16 of Planning Policy Statement 9 (Office of the Deputy Prime Minister, 2005), 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 and their habitats are protected from adverse effects of development, where appropriate, by using planning conditions or obligations.

1.3 Summary of Previous Survey Work

The water vole surveys carried out in 2009 build upon the baseline survey work that was carried out in 2007. The Sizewell Water Vole Survey Report 2007 (Entec report reference 19081cr102) includes a detailed review of all available desktop data relating to water voles on and surrounding the Sizewell Estate. In addition, the report details survey work carried out with the specific aim of surveying and assessing suitable habitat within 500m of the preliminary works area for its potential to support water vole. A representative sample of the ditches within the survey area were identified and surveyed to obtain basic presence/absence data for water voles.

The findings of the desktop study and field survey in 2007 demonstrated that water voles occur throughout the ditch network of the Sizewell Estate, and are widespread in suitable habitat in the wider area. The population appears to be persistent and there is no evidence that it has been

affected by the national decline, with records dating back to 1982, and high water vole populations referred to by the Sizewell Land Management Annual Review Reports since 1997-98. The site has been recognised as a National Key Site for water voles since the scheme was set up in 2000.

It was concluded that the water voles present in the survey area likely formed part of a larger population inhabiting the wider ditch network. The 2007 survey was not designed to estimate population size, however due to the extensive signs discovered across the Sizewell area, and the wealth of desktop information available, it was assumed that the site supports a good population of the species.

1.4 Aims of 2009 Survey

The 2009 survey work was commissioned by British Energy (now EDF Developments Ltd) to address recommendations made in the 2007 Sizewell Water Vole Survey Report. The aims of the 2009 surveys were therefore:

- To obtain a better understanding of how water voles use the habitats across the Sizewell Estate not only in ditches and other clearly defined water bodies, but also in reedbeds;
- To make more detailed assessments of a sample of ditches, in order to make population assessments that allow extrapolation for a generalised population assessment for the entire Estate; and
- To use this additional data to make detailed assessments regarding the potential impacts of the development on the conservation status of water voles, as well as informing mitigation and enhancement strategies for the species.

2. Survey Methods

2.1 Ditch Surveys

On the 28 and 29 July, and 15 October 2009 a sample of 16 sections of ditches (**Figure 2.1**) within the Sizewell Estate, occurring close to and within the SSA boundaries were surveyed in detail to identify all evidence of water vole activity. Surveys were carried out based on methods recommended by Strachan & Moorhouse (2006). This involved searching bankside vegetation for:

- Latrines/droppings – water vole droppings are often concentrated in discreet latrine sites near the nest, at range boundaries and places where they regularly enter and exit the water. While most droppings will be deposited in latrines, some may be found scattered along runways in vegetation;
- Feeding stations – feeding remains in the form of neat piles of chewed lengths of vegetation, are often found in runways and at haul-out platforms;
- Burrows - these are typically found along the waters edge and on top of the bank up to 5m from the waters edge. Holes on top of the banks often have grazed 'lawns' around them;

- Nests – Where vegetation cover is dense and the water table is high (limiting opportunities for burrowing), water vole nests may be found woven into the base of rushes, sedges or grass tussocks; and
- Footprints – these may be identified in soft mud or silt.

Also recorded at each surveyed water body was the depth and speed of water flow¹, the waterway width, bank side vegetation and surrounding land use: all of these being factors that may determine the suitability of habitat for supporting water voles.

The survey was undertaken at an appropriate time of year for detecting water vole presence, with water voles actively marking their breeding territories with latrines between late April and early October (Strachan & Moorhouse, 2006).

2.1.1 Population Assessments

The data collected from those ditches was used to calculate a population estimate using recommended methodologies² (Woodroffe *et al.*, 1990; amended by Morris *et al.*, 1998). This involves using the mean number of latrines per 100m of ditch to calculate the approximate water vole population density per 100m during the breeding season. Where access restrictions prevented both banks from being surveyed, the bank length was halved for the purpose of this equation. In all cases where this was undertaken, habitats on both banks of the ditch were considered to be of similar quality.

Given the variation in habitat types surveyed, in addition to the overall mean population estimate mean estimates were calculated for the most optimal habitat and the habitat with very low suitability for water vole. This is to provide an indication of the variation between habitat types.

2.2 Reedbed Surveys

In marshland areas, where there are no distinct banks on which to search for water vole field signs, five transects, each measuring approximately 500m in length, were designed to zig-zag through the reedbeds (**Figure 2.2**). Sheets of plywood measuring approximately 20 by 30cm were then placed at a density of around one every 10m to create artificial latrine sites and lightly tethered to adjacent reeds. The artificial latrine sites were left in place, undisturbed for 2-3 weeks prior to the survey taking place so as to allow enough time for water voles to explore and begin using them.

Each transect was surveyed twice by Entec Ecologists³, once between 20 and 21 August, and once between 13 and 14 October. During each survey the following signs of water vole activity were recorded:

- Latrines/droppings – these may be found on the artificial latrine sites that have been specifically placed along the transect route, or in other suitable locations above the water level;

¹ Speed of flow was estimated during a visual assessment.

² $y = 1.48 + 0.683x$, where y = number of water voles and x = number of latrines.

³ Katheryn Leggat, Dyfrig Hubble, Alastair Miller, John Baker and Paige Alumbaugh.

- Feeding signs – evidence of feeding in reedbed habitat is likely to be most noticeable where new shoots of vegetation have had the tips eaten; and
- Nests – above water level woven into large tussocks of vegetation.

2.2.1 Survey Limitations

Due to deep water and/or silt, combined with dense bankside and in-channel vegetation, it was not feasible to search the entire banks of some of the ditches. Where banks were flat and water levels high, it is likely that the chance of finding field signs was reduced, due to the limited availability of dry banks on which such signs would usually be found.

The transect surveys had to be designed in the field taking into account the accessibility of some areas, as well as the suitability of habitats present. Furthermore the routes of both the ditch and transect surveys were adjusted in the field to avoid areas occupied by nesting birds, particularly sedge warblers (*Acrocephalus schoenobaenus*) and reed warblers (*Acrocephalus scirpaceus*). During the course of the survey work, approximately 10% of the artificial latrine sites were lost from each transect. This was due to them sinking in ditches, or becoming completely buried under dense dead vegetation after strong winds flattened areas of the reedbed habitat.

3. Results

3.1 Ditch Surveys

3.1.1 Habitat Suitability

Of the ditches surveyed, six were considered to offer relatively poor habitat for water voles. This was predominantly due to two key main factors:

- Heavy over-shading by adjacent woodland limiting the growth of aquatic vegetation and resulting in a deep layer of decaying leaf litter dominating the channel (ditches 3b, 8, 9b, 12 and 13); and/or
- Very heavy poaching of the banks by cattle reducing bankside vegetation and restricting opportunities for burrowing water voles (ditches 9a, 12 and 13).

A further six of the ditches surveyed (ditches 3a, 4, 5, 6, 7 and 11) were considered to offer very good habitat for water voles, comprising water over 1m deep with wide swathes of riparian vegetation dominated by common reed (*Phragmites australis*), and earth banks. The other four ditches offer good habitat for water voles, although the value is limited to just one bank due to over-shading trees (ditch 2), and/or reduced by cattle poaching (ditches 1, 2, 10a and 10b).

Bordering land use is predominantly marshy grassland with cattle grazing, but also includes semi-natural broad-leaved woodland, mixed and conifer plantation, marshland (reedbed), and some semi-improved and improved grassland. Bank profiles are predominantly shallow, with only a few steep banks, limiting water vole burrowing opportunities; although most of the ditches do provide some burrowing habitat. The riparian vegetation required for foraging and sheltering water voles was present at varying levels with some ditches providing a dense reed bed, and others almost bare.

Table 2.1 below outlines the habitat variables recorded at each ditch.

Table 2.1 Description of the Ditches Surveyed

Ditch reference	Bordering land uses	Bank profile ⁴	Depth (m)	Width (m)	Dominant bankside vegetation
1	Marshy grassland, mixed plantation woodland, cattle grazing	Shallow	0.5-1	1-5	Tall grass
2	Marshy grassland, mixed plantation woodland, semi-natural broad-leaved woodland, cattle grazing	Shallow	0.5-1	1-5	Bankside trees and short grass
3a	Semi-improved grassland, conifer plantation woodland	Shallow	1-2+	2-5	Reeds/sedges
3b	Semi-improved grassland, conifer plantation woodland, cattle grazing	Shallow	1-2+	1-5	Bankside trees and scrub
4	Marshy grassland, mixed plantation woodland	Shallow	1-2	2-5	Reeds/sedges
5	Marshy grassland, semi-natural broad-leaved woodland, cattle grazing	Shallow	1-2+	2-5	Reeds/sedges
6	Marshland, semi-natural broad-leaved woodland	Flat-shallow	1-2	2-5	Reeds/sedges
7	Marshland, semi-natural broad-leaved woodland	Flat-vertical/undercut	1-2	2-5	Reeds/sedges
8	Marshland, semi-natural broad-leaved woodland	Flat	0.5-2	2-5	Bankside trees
9a	Marshy grassland, semi-natural broad-leaved woodland, cattle grazing	Shallow	1-2	2-5	Bankside trees and short grass
9b	Improved grassland, semi-natural broad-leaved woodland	Shallow	0.5-1	1-2	Bankside trees
10a	Marshy grassland, cattle grazing	Shallow	>2	1-2	Tall grass
10b	Marshy grassland, semi-natural broad-leaved woodland, cattle grazing	Shallow-steep	1-2	1-2	Tall grass
11	Marshy grassland, cattle grazing	Shallow	>2	2-5	Reeds/sedges
12	Marshy grassland, semi-natural broad-leaved woodland, cattle grazing	Flat-shallow	0.5-2	1-2	Bankside trees
13	Marshy grassland, semi-natural broad-leaved woodland, cattle grazing	Flat-shallow	0.5-1	1-2	Bankside trees and tall grass/rushes

3.1.2 Water Vole Activity

The water vole field signs identified by the survey are summarised in **Table 2.2**. Evidence of water vole activity in the form of latrines, feeding remains, and/or burrows was found on the banks of most surveyed ditches, with the exception of ditches 2 and 9b. The latter of these was

⁴ Bank profile: flat <10°, shallow <45°, steep >45°, vertical/undercut.

considered to offer poor habitat for water voles. All of the other ditches considered to offer poor water vole habitat supported some, limited signs of activity (ditches 3b, 8, 9a, 12 and 13).

A high density of different field signs was recorded from four of the ditches (3a, 4, 7 and 11) considered to provide very good water vole habitat. Although ditch 5 also offers very good water vole habitat, access to this ditch was restricted by deep sediment and dense bankside vegetation. A high density of feeding remains found along the banks of ditch 6 indicated a significant level of water vole activity, although few other signs were recorded. This is likely to be due to the flat banks of this ditch, which limit the number of suitable locations for latrines, as well as reducing potential for burrowing.

Table 2.2 Water Vole Field Signs Identified

Ditch reference	Transect length (m)	Water Vole Signs Found			
		Latrines	Feeding Station	Burrow	Other
1	230	0	3	0	
2	190	0	0	0	
3a	50	26	25	9	
3b	100	0	2	0	1 dead water vole
4	160	22	51	31	
5 ⁵	150	2	0	0	
6	100	1	34	1	
7	200	12	34	3	
8	100	3	1	0	
9a ⁶	100	1	2	1	
9b ⁶	80	0	0	0	
10a	120	5	8	2	
10b	90	9	15	4	Water vole nest in rushes
11 ⁶	110	23	29	3	
12	160	4	0	0	
13 ⁶	60	3	2	1	

⁵ Access for survey limited due to very deep water and dense vegetation, as well as the presence of nesting reed warblers, therefore this ditch has not been included in the population estimate calculation.

⁶ Only one bank surveyed due to access difficulties. The bank length used for the population assessment was therefore taken to be half this distance (Table 2.3).

3.1.3 Population Assessment

The results of the population assessment based on the current survey data are shown in Table 2.3. The average population size for all the ditches surveyed can be estimated at 4.81 water voles per 100m. Assessments made based on habitat suitability however indicate the wide variation between ditches, with the most optimal habitats supporting an average of 9.31 water voles per 100m, and the poorest habitats supporting as few as 2.48 individuals per 100m.

Table 2.3 Water Vole Population Assessment

Ditch reference	Bank length (m)	Latrine count	No. of latrines per 100m
1	230	0	0
2	190	0	0
3a	50	26	52
3b	100	0	0
4	160	22	13.75
6	100	1	1
7	200	12	6
8	100	3	3
9a	50	1	2
9b	40	0	0
10a	120	5	4.17
10b	90	9	10
11	55	23	41.82
12	160	4	2.5
13	30	3	10
No. of water voles per 100m (from mean)² – entire sample:			8.34
No. of water voles per 100m (from mean)²- more optimal habitat only:			17.13
No. of water voles per 100m (from mean)²- least suitable habitat only:			3.47

3.2 Reedbed Surveys

3.2.1 Habitat Description

Reedbed habitat to the north of the Sizewell Estate is largely restricted to wide linear swathes that follow ditch lines, and therefore Transects 1 and 2 also followed these water bodies. The ditches have high water levels and predominantly flat banks that merge with adjacent marshy grassland.

Transects 3, 4 and 5 zig zag through dense reedbed habitat which support several shallow and deep ditches. At the time of surveying water levels were low, with much of the reedbeds dry and the only water found in a few small wet patches of reedbed that occur close to the ditches, and within the ditches themselves. Parts of the reedbeds at all three transects were starting to be colonised by terrestrial species including common nettle (*Urtica dioica*), common cleavers (*Galium aparine*), bramble (*Rubus fruticosus* agg.) and lesser bindweed (*Convolvulus arvensis*).

The artificial latrine sites were not only sited through the reedbed occasionally crossing ditches, but sections of the transects also followed ditch lines where the extent of the reedbed was limited (transect 5) and passed through small sections of wet woodland (transect 3).

3.2.2 Water Vole Activity

Water vole field signs, including latrines, were recorded on all of the transect routes surveyed. Throughout the length of transects 1 and 2, where natural latrine sites are restricted by high water levels, the artificial latrine sites were widely used for territorial marking. Of the 50 artificial latrine sites set out at transect 1, more than half held latrines during the second survey visit; while 18 of those along transect 2 held latrines during the same survey visit.

Within transects 3, 4 and 5 however, use of the artificial latrine sites was limited to the few that were placed within or adjacent to ditches and nearby wet areas. A maximum of 4 artificial latrine sites were used at transect 3, this was during the first survey visit. No more than 1 artificial latrine site was used at each of transects 4 and 5. Similarly, all other water vole field signs identified were recorded along the banks of ditches and in wet pockets. No evidence of water vole activity was recorded throughout most of the length of the transects, where they passed through dry reedbed habitats.

Table 2.4 Water Vole Field Signs Identified

Transect	Survey visit 1		Survey visit 2	
	Field signs	Details (e.g. habitat type/location of record)	Field signs	Details (e.g. habitat type/location of record)
1	19 latrines	On artificial latrine sites	26 latrines	On artificial latrine sites
	1 feeding station	On an artificial latrine site	1 feeding station	On the banks of a ditch
			1 burrow	In the bank of a ditch
2	17 latrines	On artificial latrine sites	18 latrines	On artificial latrine sites
	2 feeding stations	On artificial latrine sites		
3	30 feeding stations	On the banks of ditches	13 feeding stations	On the banks of ditches
	1 feeding station	Within a wet area of the reedbed	2 latrines	On the banks of ditches
	1 patch of reeds with tops eaten	Within a wet area of the reedbed	1 latrine	On an artificial latrine site adjacent to a ditch

Table 2.4 (continued) Water Vole Field Signs Identified

Transect	Survey visit 1		Survey visit 2	
	Field signs	Details (e.g. habitat type/location of record)	Field signs	Details (e.g. habitat type/location of record)
4	3 latrines	On an artificial latrine site adjacent to a ditch	1 latrine	On an artificial latrine site in a ditch
	1 latrine	On the banks of a ditch		
	1 latrine	On an artificial latrine site within a wet area of the reedbed		
	1 nest	Within dense reeds on the banks of a ditch		
	1 feeding station	On the banks of a ditch	1 latrine	On an artificial latrine site adjacent to a ditch
	1 latrine	On the banks of a ditch	1 latrine	On a log lying across a ditch
	1 latrine	On an artificial latrine site in a ditch		
5	1 burrow	Within the banks of a ditch		
	3 feeding stations	On the banks of ditches	2 feeding stations	On the banks of ditches
	1 latrine	On the banks of a ditch		
	1 latrine	On an artificial latrine site adjacent to a ditch		

4. Conclusions

- Water bodies occurring within and close to the SSA include both areas of optimal habitat for water voles, as well as areas of relatively poor habitat for the species. Within the wider Sizewell Estate it is considered that the poorer habitat occurs less frequently. This higher proportion of low quality habitat occurs within the sample due to the focus of the survey work along the existing Sizewell Power Station site boundary, which is followed by a linear woodland strip;
- In many areas within the SSA, and within the wider Sizewell site, relatively good water vole habitat is provided by the ditch network albeit that habitat quality has been degraded in some areas by poaching of the banks by cattle. Jefferies (2003) notes that livestock grazing on the banks of water courses is one of the key factors that has led to, and continues to contribute to, the decline of water voles in the UK. The degradation of habitats caused by livestock, not only by compacting soils and destroying burrows, but also by depletion of vegetative cover causes water voles to be significantly more susceptible to predation and increases mortality. In

some areas of the UK this single factor is thought to have resulted in a substantial reduction in water vole range;

- Both previous studies and the current field survey work have demonstrated that water voles occur in water bodies throughout the Sizewell Estate, including those that provide habitat perceived to be of relatively poor quality for the species. While survey work may fail to identify field signs on the banks of some ditches during any one visit, such surveys provide only a snapshot of activity, and cannot indicate the absence of the species from a water body. Water voles have a metapopulation dynamic, where lower quality habitats may only be used in intermittent years. These 'sink' habitats are however a very valuable aspect of the overall habitat used by the population, and should not be considered insignificant compared to the high quality 'source' habitats (Strachan & Moorhouse, 2006);
- A population assessment has been made based on the number of latrines recorded per 100m of ditch surveyed, however these provide only a crude estimate and are based on a small sample size. The population assessment is based on latrine counts within the breeding season and therefore indicates the size of the breeding population. As such, it includes adult males, adult females and many independent juveniles, but not dependent young in the nests. Jefferies (2003) suggests that only 36% of the calculated population represents breeding-aged adults, which in the current sample of the Sizewell site equates to an average of 3 adult water voles per 100m of bank. In addition, there are large seasonal fluctuations in water vole population size, and the overwintering population is likely to be considerably lower than that calculated here;
- Given the high variation in habitat quality within the study sample, population assessments of the most optimal habitats, and separately of the poorest quality habitats, have also been made. These are based on a very small sample size and are used only to indicate the likely variation in water vole numbers between habitat types. The results equate to an average of 6.17 adult water voles per 100m of bank in optimal water vole habitat, compared to an average of just 1.25 adult water voles per 100m of bank in poor quality habitat;
- As the current survey findings suggest, the size of the population supported by a water course is largely dependent on the habitat provided, and in particular the width of riparian vegetation along each bank (pers. comm. Rob Strachan, Environment Agency, 2008). It is however considered that the habitat within the surveyed ditches is not representative of the wider Sizewell Belts, consisting as it does of a disproportionately high sample of over-shaded and woodland ditches with limited riparian vegetation. The results of the population assessment cannot therefore be extrapolated to provide an estimate of population size for the entire Sizewell site. The current findings do however indicate that, even allowing for natural gaps in water vole distribution within optimal habitat, the population of the site is considerably higher than the mean estimate made for the entire Anglian region in 1993 (Strachan & Jefferies, 1993; amended by Morris *et al.*, 1998). This estimate suggested an average of 7.75 water voles per 100m, equating to 2.79 adult water voles per 100m of bank. This estimate was the second highest made of all regions in the UK during the study;

- The reedbeds that occur within the Sizewell Estate are generally very dry, and during the survey period water was predominantly restricted to the ditches that pass through the habitat. The frequent occurrence of terrestrial plant species within the reedbeds indicates that the 2009 survey period was not unusual in this respect, and communications with the Suffolk Wildlife Trust confirmed that the reedbeds remain dry in most years (pers. comm. Alan Miller, Suffolk Wildlife Trust, 2009);
- The results of transect surveys through the reedbeds suggested that water voles are rarely active within the reedbed habitats at any distance from the ditches, with no evidence of such found. Ditches and nearby wet areas within the reedbeds are readily used, with clear evidence of water vole occupation present at all those surveyed. Previous survey work during a period when water levels were higher (Entec report ref: 19081cr102), and reedbeds were wet, did however indicate that water voles occurred within the habitats at some distance from any defined channels. It is likely that water voles on the Sizewell Estate may leave water bodies to pass through the reedbeds occasionally, but only make regular use of such areas in years when water levels are high;
- It has been suggested that every 1m width of vegetation cover either side of a water course increases the chance of water vole survival (pers. comm. Rob Strachan, Environment Agency, 2008). Ditches situated entirely within the Sizewell reedbeds are therefore likely to be of particularly high value to the water vole population;
- In particular reedbeds have been proposed as crucial to the persistence of water vole populations in the UK, by providing a refuge from mustelid predators, specifically the non-native American mink (*Mustela vison*). This species has significantly contributed to the decline of water voles in the UK. While American mink will hunt around the edges of reedbeds, they are less likely to leave main channels, and research had shown that predation rates strongly decline with the distance water vole live from a main water channel (Bright & Carter, 2003);
- Expanding on this, Bright & Carter (2003) have suggested that reedbeds that contain dry islands, or ditches with earth banks above the water level, provide an overwintering refuge for water voles. Such refuges are particularly critical in reducing winter mortality in water voles, which is likely to be a major factor influencing the population viability. They conclude that reedbeds are likely to increase the viability of water vole metapopulations in surrounding landscapes;
- American mink do occur within the county of Suffolk, and it is thought that only a programme of trapping by the Suffolk Wildlife Trust has prevented them becoming established within the Sizewell Belts (pers. comm. Penny Hemphill, Suffolk Wildlife Trust, 2008). If the presence of this invasive species does increase in the Sizewell area, the reedbed habitats are likely to be vital in order to prevent major decline, and potentially extinction of the water vole population;
- A number of ditches occur within the SSA, most notably however the SSA includes an area of reedbed habitat (survey transect 3), and some ditches of high habitat quality supporting wide swathes of riparian vegetation (including survey ditches 3a, 4, 5, 6 and 7). In addition, the SSA includes two ditches that are

thought to provide an important ecological link between Sizewell and Minsmere to the north. These water courses are likely to form an important dispersal route for water voles, linking the Sizewell population with those found in Suffolk's coastal marshes.

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Author: Katheryn Leggat

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Reviewer: Emma Toovey

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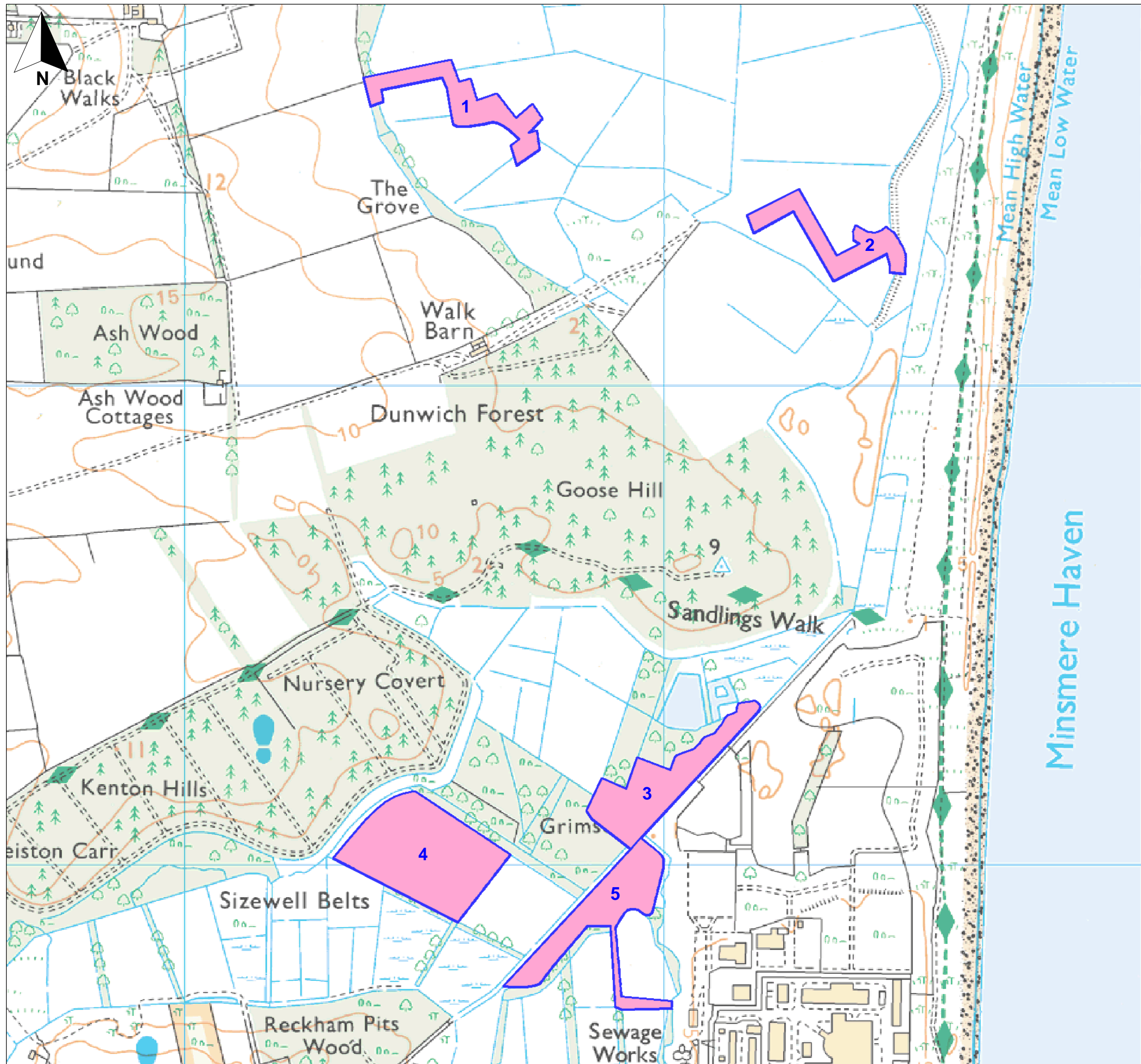
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Appendix A Figures

2 pages





Key
 Reedbed survey transects

0 m 250 m
 Scale 1:8,000 @ A3



Sizewell Water Vole Report 2010

Figure 2.2
Approximate locations of
reedbed survey transects

May 2010
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Aldhurst Farm, Sizewell Water Vole Survey Report 2010

1. Introduction

1.1 Background

It was clear from early in the ecological desk study (which began in late 2006) that the Sizewell Estate supported a nationally important population of water voles (*Arvicola terrestris*). Survey work was undertaken in 2007 (report ref: 19081cr102) to establish the nature of use of the site by the water vole population present and following these studies, further survey work was conducted in 2009 (report ref: 19081cr056) to gain a better understanding of the size and distribution of the water vole population present. The additional survey work at Aldhurst farm will be used to feed into the Ecological Impact Assessment for the proposed scheme and to inform the design and implementation of any necessary mitigation strategy that may need to be adopted as part of the new build proposals.

This report details the findings of the 2010 field survey work at Aldhurst farm and a summary of previous survey and desktop work conducted within on the main site in 2007 and 2009.

1.2 Legislation and policy guidance

1.2.1 Biodiversity Action Plan

Water vole is on the list of priority species in the UK Biodiversity Action Plan (UK BAP), adopted by the Government in 2007. Species included on this list have been identified by the UK Government as needing special conservation effort 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. Water vole populations are at risk primarily from habitat loss and degradation, which has increased water vole vulnerability to predation, particularly from American mink. This has led to a major decline not only within Suffolk, but also nationally. This has led to populations becoming scarce and fragmented across many parts of their former range (Strachan & Moorhouse, 2006).

A clear understanding of the level and nature of use of a site by water voles 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 water vole habitat, and aim to maintain and enhance existing populations.

Most of the Species Action Plans (SAPs) in the Suffolk Biodiversity Action Plan are based on National Biodiversity Action Plans (Suffolk Biodiversity Partnership, 2003). The process of identifying BAP priorities in Suffolk began in 1997, and an initial plan (Tranche 1) was

produced in 1998. Tranche 2, published in 2000 has been withdrawn and revised plans are in production. Water vole was included as a priority species on both Tranche 1 and Tranche 2.

1.2.2 Protective Legislation Relating to Water Vole

Water voles and their burrows are protected in the UK under Schedule 5 of the *Wildlife and Countryside Act 1981* (as amended). This makes it an offence, *inter alia*, to:

- intentionally kill, injure or take a water vole;
- intentionally or recklessly damage or destroy or obstruct access to any structure or place which water voles use for shelter or protection; or
- intentionally or recklessly disturb water voles while they are using such a place.

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”. Listed on the UK Biodiversity Action Plan (see Section 1.2.1), water vole is considered a Species of Principal Importance for the Conservation of Biodiversity under Section 41 of the NERC Act.

In paragraph 16 of Planning Policy Statement 9 (Office of the Deputy Prime Minister, 2005), 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 and their habitats are protected from adverse effects of development, where appropriate, by using planning conditions or obligations.

1.3 Summary of Previous Survey Work

The water vole surveys at Aldhurst farm carried out in 2010 built upon baseline information that existed for this part of the site from survey conducted in 2007 across the entire Sizewell estate. Water Vole Surveys conducted in 2007 and 2009 (Entec report reference 19081cr102 & 19801cr056) included detailed review of all available desktop data relating to water voles on and surrounding the Sizewell Estate. In addition, the reports detailed survey work carried out with the specific aim of surveying and assessing suitable habitat within 500m of the preliminary works area for its potential to support water vole. The 2009 surveys were aimed at gaining a better understanding of how water voles use the habitats across the Sizewell estate and from conducting detailed assessments from a number of sample ditches, to estimate the water vole population for the entire estate.

The findings of the desktop study and field survey in 2007 and 2009 demonstrated that water voles occur throughout the ditch network of the Sizewell Estate, and are widespread in suitable habitat in the wider area. The population appears to be persistent and there is no evidence that it has been affected by the national decline, with records dating back to 1982, and high water vole populations referred to by the Sizewell Land Management Annual Review Reports since 1997-

98. The site has been recognised as a National Key Site for water voles since the scheme was set up in 2000.

It was concluded that the water voles present in the Sizewell estate are likely to form part of a larger population inhabiting the wider ditch network. The 2009 surveys attempted to estimate the size of the water vole population within the Sizewell estate, however due to the range in the quality of the habitats across the site; it was not possible to extrapolate the finding from the sample ditches to estimate the pollution for the entire estate. Given the extensive signs of water voles discovered across the ditch network at Sizewell, and the wealth of desktop information available, it was assumed that the site supports a good population of the species.

1.4 Aims of 2009 Survey

The 2010 survey work at Aldhurst farm was commissioned by EDF Developments Ltd to access the sites potential as a receptor site for water voles. The aims of the surveys work are:

- To established the presence / absence of this species within the study area;
- To assess the quality of the habitats for water vole at Aldhurst farm and activity levels within them.

2. Survey Methods

2.1 Ditch surveys

On the 29th March 2010 all the water courses at Aldhurst farm were surveyed in detail to identify all evidence of water vole activity (**Figure 2.1**). Surveys were carried out based on methods recommended by Strachan & Moorhouse (2006). This involved searching bankside vegetation for:

- Latrines/droppings – water vole droppings are often concentrated in discreet latrine sites near the nest, at range boundaries and places where they regularly enter and exit the water. While most droppings will be deposited in latrines, some may be found scattered along runways in vegetation;
- Feeding stations – feeding remains in the form of neat piles of chewed lengths of vegetation, are often found in runways and at haul-out platforms;
- Burrows - these are typically found along the waters edge and on top of the bank up to 5m from the waters edge. Holes on top of the banks often have grazed 'lawns' around them;
- Nests – Where vegetation cover is dense and the water table is high (limiting opportunities for burrowing), water vole nests may be found woven into the base of rushes, sedges or grass tussocks; and
- Footprints – these may be identified in soft mud or silt.

Also recorded at each surveyed water body was the depth and speed of water flow¹, the waterway width, bank side vegetation and surrounding land use: all of these being factors that may determine the suitability of habitat for supporting water voles.

The survey was undertaken at an appropriate time of year for detecting water vole presence, with water voles actively marking their breeding territories with latrines between late April and early October (Strachan & Moorhouse, 2006).

2.1.1 Survey limitations

Due to deep water and/or silt, combined with dense bankside and in-channel vegetation, it was not feasible to search the entire banks of some of the ditches. Where banks were flat and water levels high, it is likely that the chance of finding field signs was reduced, due to the limited availability of dry banks on which such signs would usually be found.

A number of rat droppings were recorded within the section of the ditch near the sewage treatment works and a number of burrows within this area could not be positively identified

3. Results

3.1 Ditch Surveys

3.1.1 Habitat suitability

Figure 3.1 indicates the location of the 5 transects surveyed for evidence of water vole activity by Entec in March 2010, whilst **Appendix D** presents the completed field survey forms.

3.1.2 Habitats

Four of the five sections of ditch surveyed all generally provide suitable aquatic habitat for water voles (see **Table 3.1**), comprising slow-flowing or still water over <0.5m deep with wide swathes of riparian vegetation and earth banks. Bordering land use is exclusively arable. Other land uses bordering the ditches at Aldhurst farm included a small area of reed bed, a sewage works and main road. Two of the transects had one bank dominated by trees and scrub cover and were therefore somewhat shaded by vegetation. Bank profiles were general steep and provided suitable burrowing habitat for water voles. Within each of the survey ditches the riparian vegetation required for foraging and sheltering water voles was abundant at varying levels. Some ditches provided a wide margin of grasses, reeds and sedges, whilst others were dominated by patches of scrub with only a narrow strip of reeds.

Of the five sections of ditch surveyed, one was considered to offer relatively poor habitat for water voles. This was predominantly due to two key main factors:

- The strip of grassland separation the ditch from the arable field was very thin, less than 1m.
- Very little water within the ditch line, sections with less than 30cm of water and many dry sections.

Table 3.1 below outlines the habitat variables recorded at each ditch.

¹ Speed of flow was estimated during a visual assessment.

Table 3.1 Description of the ditches surveyed

Ditch reference	Bordering land uses	Bank profile ²	Depth (m)	Width (m)	Dominant bankside vegetation
1	Arable land	Steep	<0.5	2-5	Tall grass
2	Arable land	Steep	<0.5	2-5	Tall grass
3	Arable land	Steep	<0.5	2-5	Bankside trees with scrub, tall grass and area of reed bed
4	Arable land	Steep	<0.5	2-5	Bankside trees with scrub and tall grass
5	Arable land	Steep	<0.5	1	Short grass

3.1.3 Water vole activity

The water vole field signs identified by the survey are summarised in **Table 3.2**. Evidence of water vole activity in the form of footprints, latrines, feeding remains, and/or burrows was found on four of the five sections of ditch surveyed, with the exception of ditch 5. Ditch 5 was considered to offer poor habitat for water voles. Very few sign of water vole activity were identified within ditch 4 with only a single burrow and latrine. Parts of this ditch were shaded, with little bank side vegetation and parts of the water course were silted up. A medium to high density of different field signs was recorded from ditches 1, 2 and 3, and these are considered to provide good water vole habitat.

Table 3.2 Water vole field signs identified

Ditch reference	Transect length (m)	Water Vole Signs Found			
		Latrines	Feeding Station	Burrow	Other
1	250	1	0	4	1 Footprint
2	300	7	0	16	Rat dropping
3	500	6	3	4	1 Footprint
4	600	1	0	1	
5	200	0	0	0	

² Bank profile: flat <10°, shallow <45°, steep >45°, vertical/undercut.

4. Conclusions

- Both previous studies and the current field survey work have demonstrated that water voles occur in water bodies throughout the Sizewell Estate, including those that provide habitat perceived to be of relatively poor quality for the species. While survey work may fail to identify field signs on the banks of some ditches during any one visit, such surveys provide only a snapshot of activity, and cannot indicate the absence of the species from a water body. Water voles have a metapopulation dynamic, where lower quality habitats may only be used in intermittent years. These 'sink' habitats are however a very valuable aspect of the overall habitat used by the population, and should not be considered insignificant compared to the high quality 'source' habitats (Strachan & Moorhouse, 2006).
 - Expanding on this, Bright & Carter (2003) have suggested that reedbeds that contain dry islands, or ditches with earth banks above the water level, provide an overwintering refuge for water voles. Such refuges are particularly critical in reducing winter mortality in water voles, which is likely to be a major factor influencing the population viability. They conclude that reedbeds are likely to increase the viability of water vole metapopulations in surrounding landscapes.
- ☞ Desktop studies and field surveys have demonstrated that water voles occur throughout the ditch network of the Sizewell Estate and are widespread in suitable habitat in the wider area. The population appears to be persistent and there is no evidence that it has been affected by the national decline, with records from SBRC dating back to 1982, and high water vole populations referred to by the Sizewell Land Management Annual Review Reports since 1997-98. The site has been recognised as a National Key Site for water voles since the scheme was set up in 2000;
- ☞ No suitable aquatic water vole habitat occurs within the indicative power station footprint that forms the eastern part of the preliminary works area, although a watercourse does run adjacent to the western edge of the works boundary. The proposed access road crosses some ditches at its eastern end, and these are thought to provide an important ecological link between Sizewell and Minsmere to the north, thus providing a potentially important dispersal route for water voles. Records from the SBRC and previous survey work indicates the presence of water voles in ditches in these areas;
- ☞ Only one of the ditches (T) surveyed by Entec in 2007 did not appear to support evidence of water vole activity; however latrines, feeding stations and burrows were discovered in the adjacent ditches, and evidence from the long term studies by RHU and RSPB demonstrates how the absence of field signs during a single survey period is not necessarily indicative of long-term water vole absence;
- ☞ Apart from this one ditch (T), every ditch shown on Figure 3.1 as being surveyed for water voles by Entec, Royal Holloway or RSPB has had evidence of water vole activity in at least one of the years between 2005-07 inclusive, and should be regarded as supporting resident water voles.

5. Recommendations

- In the period leading to the commencement of construction works on the site, any additional data relating to water voles that is collected by third parties on or in the vicinity of the BE Estate should be obtained. This will include the biannual monitoring data generated for Sizewell and Minsmere as part of the National Key Sites initiative since 2007.
- During other studies conducted at Aldhurst Farm, it was observed that the water levels within the ditch system varied greatly. There is a need to ensure that water levels and flows are maintained at a suitable level during and post construction in order to avoid adverse effects on water voles within this area.
- In order to mitigate and compensate for any adverse effects upon the water vole population, provide enhancement and to ensure the long-term maintenance of the existing population, a detailed mitigation and management strategy will be required that is integrated with any other mitigation, compensation or enhancement measures that are proposed for the site. The nature of this strategy will be informed by the scheme design as noted above but additionally, will need to provide a long term management philosophy for the wider population to ensure their long term conservation in addition to compliance with the relevant legislation to which they are afforded. This strategy may also include the following management measures:
 - Maintenance of water depth to prevent drying out in ditches on site, and encouraging wider ditch edge habitat/riparian vegetation
 - The use of rat poison within the estate, especially on the ditches close to the power station and swage works, should be more closely monitored and managed. In particular, its use should be avoided within 5m of any water bodies;
 - Mink control and ongoing monitoring should be adopted within the estate and an integrated wider management strategy should be discussed with local landowners and stakeholders;
 - Maintain steep-sided earth banks within reedbeds to provide sites for winter burrows above likely flood levels. Ideally, networks of steep-sided islands should be created within otherwise wet reedbeds. Where possible, some reedbeds could be managed to allow the ground conditions to remain wet for longer periods throughout the year.

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Author: Dyfrig Hubble

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Reviewer: Emma Toovey

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February 2011

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VOLUME 2, CHAPTER 14: APPENDIX 14A9 - TERRESTRIAL MAMMALS: ANNEX 14A9.4 PRIMARY DATA

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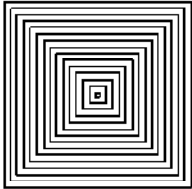


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Sizewell C Nuclear Project

Otter Survey Report – October 2013



Cresswell
(a Hyder Consulting group company)
The Mill
Brimscombe Port
Stroud
Gloucestershire GL5 2QG
United Kingdom
Tel: +44 (0)1453 423 100
Fax: +44 (0)1453 887 979
www.hydercresswell.com



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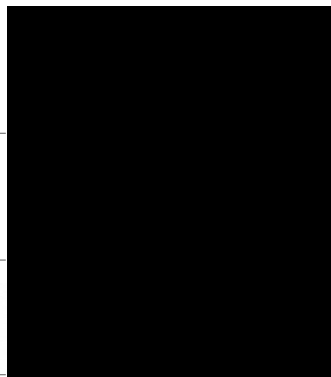
Sizewell C Nuclear Project

Otter Survey Report – October 2013

Author Will Trehella and Jon Davies

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Appendix A – Figures

Figure 1 – Aldhurst Farm Survey Area

Figure 2 – SSSI Triangle Survey Area

1 Introduction

EDF Energy/NNB GenCo (hereafter referred to as NNB) is to submit an application for a Development Consent Order (DCO) to construct and operate a new nuclear power station, Sizewell C, near the town of Leiston in Suffolk. The proposal site lies within an area of high landscape and ecological sensitivity, within an Area of Outstanding Natural Beauty (AONB) and adjacent to the Minsmere to Walberswick Heaths and Marshes Special Area of Conservation (SAC), the Sandlings Special Protection Area (SPA) and the Outer Thames Estuary SPA. A small part of the site also lies within the Sizewell Marshes Site of Special Scientific Interest (SSSI).

Following on from NNB's Stage 1 Pre-Application Consultation on its initial proposals and options for Sizewell C, which ended on 6th February 2013, NNB's priorities for 2013 have been to progress the conceptual engineering design and technical studies relating to the development, as well as to undertake essential environmental studies in order to inform this conceptual work and support the Stage 2 Consultation and ultimately to help underpin a robust DCO application in due course.

This report presents the results of an otter and water vole survey of the 'SSSI triangle' and Aldhurst Farm area of the proposal site (see Figures 1 and 2 in Appendix A), carried out in October 2013 to gain further information on the distribution of otters and water voles within these areas. Particular emphasis was placed on identifying the location of any actual or potential otter holts.

The main aim of the work was to inform both the impact assessment and the development of a mitigation strategy for otters, with incidental records of water vole activity also being recorded, given that the habitats being surveyed are suitable for both species.

2 Methodology

The survey work comprised the following activities:

1. Transect survey of the reed bed within the SSSI triangle and a 200m radius to identify potential otter holts and lying-up sites, and to record any incidental observations of signs of water voles.
2. Survey of the ditches within the SSSI triangle and a 200m radius to identify potential otter holts and lying-up sites, and to record any incidental observations of signs of water voles.
3. Survey of the ditches and other wetland habitats at Aldhurst Farm to identify potential otter holts and lying-up sites, and to record any incidental observations of signs of water voles.

The SSSI area was surveyed between 9th and 11th October 2013, and the Aldhurst Farm area on 10th October, by three qualified ecologists from Hyder Cresswell.

2.1 Aldhurst Farm

For the Aldhurst Farm area (see Figure 1), all drains, ditches and streams between Abbey Road and Lovers Lane were surveyed on both sides, where access was possible. The banks and area around the pond in the centre of the site was also surveyed. In addition, field boundaries were also surveyed in case they were being used by otters as lying-up sites. Two small areas of drain contained vegetation that was too dense to survey (see Figure 1). The arable fields

around the ditches and streams within a 200m radius, were not intensively surveyed, but were assessed for their suitability, or otherwise, for otters and water voles.

2.2 SSSI Triangle

The drains, ditches and streams within both the SSSI triangle and a small strip of land approximately 300m x 50m running south of it (see Figure 2), were also surveyed on both sides, where access was possible. Any signs or evidence of otter holts or lying-up sites identified were recorded on a hand-held GPS device.

Where accessible, potentially suitable features within a 200m strip of land to the north and east of the SSSI triangle were also surveyed. Where access was not possible (primarily due to dense reed beds or flooded land), and/or where the land was considered unsuitable, the area was not intensively surveyed, but was instead assessed for its suitability or otherwise for otters and water voles.

The large areas of reed bed within the SSSI triangle were surveyed by walking transects through the area. Owing to the height and density of the reed vegetation, a large bamboo pole with high visibility marker tape attached was used to mark the edge at the start of each transect; the three surveyors then walked in a line three-abreast (each 5m apart) across the reed bed. On reaching the other side of the reed bed, another bamboo pole was then used to mark the end of the transect. On each subsequent transect the bamboo poles were moved and used to mark the start and end of the next transect. This process was repeated until all of the reed bed had been surveyed.

3 Results

3.1 Aldhurst Farm

The Aldhurst Farm survey area consisted of a branching drain on the east side (Target Note 1, Figure 1), a dry ditch leading into a drain on the west side (Target Notes 2 and 3), a pond (Target Note 4), several tree- and hedge- lines, and surrounding arable fields (see Photograph 1, below). The drain was approximately 3m wide, with flowing water and dense vegetation on its banks. The dry ditch and drain were lined by trees and hedges.



Photograph 1: Drain and surrounding arable fields in Aldhurst Farm survey area
(see Figure 1 for location of photograph)

The branching drain, dry ditch and the drain it fed into, and the area around the pond, were all considered as areas potentially suitable for water voles and otters; however, no potential or actual otter holts, and no signs of water voles, were recorded. Similarly, no field signs were identified in the field boundaries also searched for potential otter holts/lying up sites (see Figure 1).

The arable fields (maize, cabbages and bare ground) were not considered to support suitable habitat for either species.

3.2 SSSI Triangle

The SSSI triangle was dominated by a large triangle of reed bed (see Photograph 2, below and Target Note 1 on Figure 2), bordered by ditches. Within the triangle there were also additional ditches and areas of open water along with isolated areas of tree-lines, providing a network of suitable wetland habitat for both otters and water voles.



Photograph 2: Reed beds in the SSSI area
(see Figure 2 for location of photograph).

The small strip of land to the south of the SSSI area (Target Note 2 on Figure 2) consisted of a ditch with low-lying wet pasture to the west and an area of woodland on a bank to the east, leading up the Sizewell B site. The pasture land to the west and south-west of the SSSI area were not intensively surveyed, but these areas were considered unsuitable for otter holts because of the high water table in these areas.

The SSSI area and the wooded ditch to the south were considered as areas potentially suitable for water voles and otters. One hole in a tree root plate in the SSSI area (Photograph 3, Target Note 3, at TM 47179 64459) was investigated but showed no evidence of use by otters. No other potential or actual holts were observed, and no signs of water voles were recorded.



Photograph 3: Hole in tree root plate that showed no signs of use by otters
(see Figure 2 for location of photograph)

To the north east of the SSSI area, an area of pasture (between two drains) and an area of reed bed to the east of this, were considered as areas potentially suitable for water voles and otters (Target Note 4); however, no potential or actual otter holts, and no signs of water voles, were recorded.

To the north of the SSSI area there was a ride, with a thick belt of bracken (Target Note 5, see Photograph 4, below) leading into coniferous plantation. This area was not considered to be suitable habitat for otters or water voles.



Photograph 4: Bracken and coniferous woodland to the north of the SSSI area
(see Figure 2 for location of photograph)

To the west of the SSSI triangle there was a large area of carr woodland (Target Note 6 on Figure 2; Photograph 5) with a high water table and areas of flooding. Because of the high water table, this area was not considered potentially suitable for otter holts.

To the south-west of the SSSI triangle, there were areas of reed bed and flooded land that were inaccessible. However, again the high water table in this area indicated that it was not suitable for otter holts.



Photograph 5: Flooded carr woodland south-west of the SSSI triangle

4 Conclusions

No potential or actual otter holts were found during the surveys of the Aldhurst Farm and SSSI areas, and as such there is currently no otter licensing constraint to the proposed works within the SSSI triangle nor the proposed wetland habitat creation at Aldhurst Farm.

Similarly, no incidental observations of water vole signs were recorded during the surveys in either location. It should be noted, however, that the primary aim of the survey was to search for otter resting places with a view to informing any subsequent licence application, if required. A more comprehensive survey for water voles will be required in the future, both to inform the licence application for mitigation works within the SSSI and to inform the proposed habitat creation work at Aldhurst Farm.

Although previous surveys by Amec (2012a, 2012b), and ongoing monitoring by Suffolk Wildlife Trust, have identified signs of both otters and water voles in these areas, no holts have been recorded previously in the areas that would be the subject of the proposed works. An otter 'couch/den' was, however, recorded during the 2009-2010 Amec surveys on a small 'island' outside of the proposed working area (TM 47395 64572 and identified by Target Note 7 on Figure 2). This area was inaccessible during the current survey, so the structure may need to be re-inspected at a time of year when the vegetation is lower. However, whilst there is the potential for disturbance effects, this habitat will not directly be affected by the proposed works so the holt would not need to be removed.

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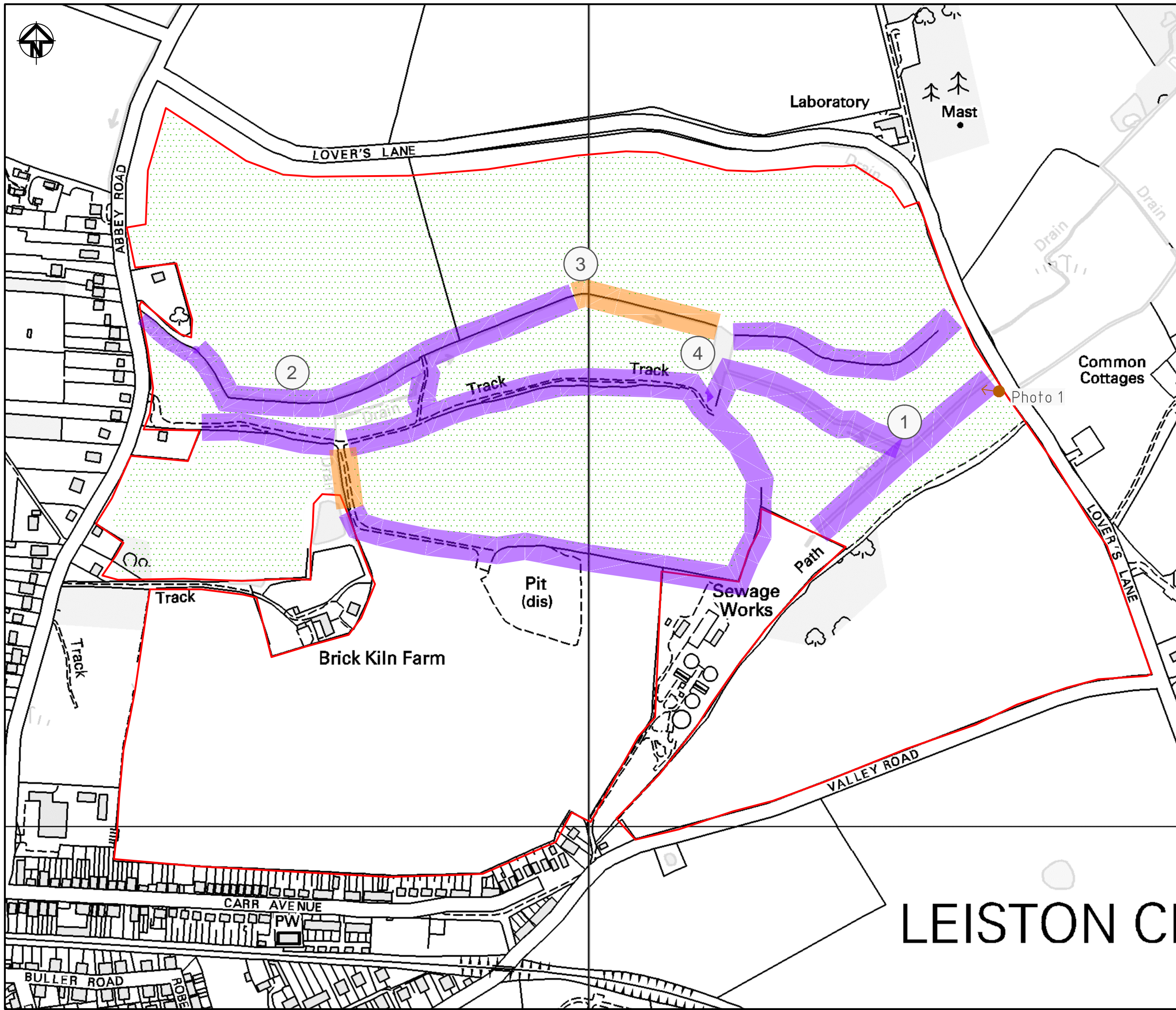
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Figure 1: Aldhurst Farm Survey Area



- Key
- Site Boundary
 - Drains, ditches, streams and boundaries intensively surveyed for otters and water voles
 - Area of ditch too dense to survey
 - Fields considered unsuitable for otters and water voles
 - ← Location and direction of photograph
 - ① Target Note

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EDF ENERGY



HYDER CONSULTING (UK) Limited
 The Mill, Brimscombe Port
 Brimscombe
 Stroud, England
 GL5 2QG
 Tel: +44 (0)1453 423100
 Fax: +44 (0)1453 887979

Project

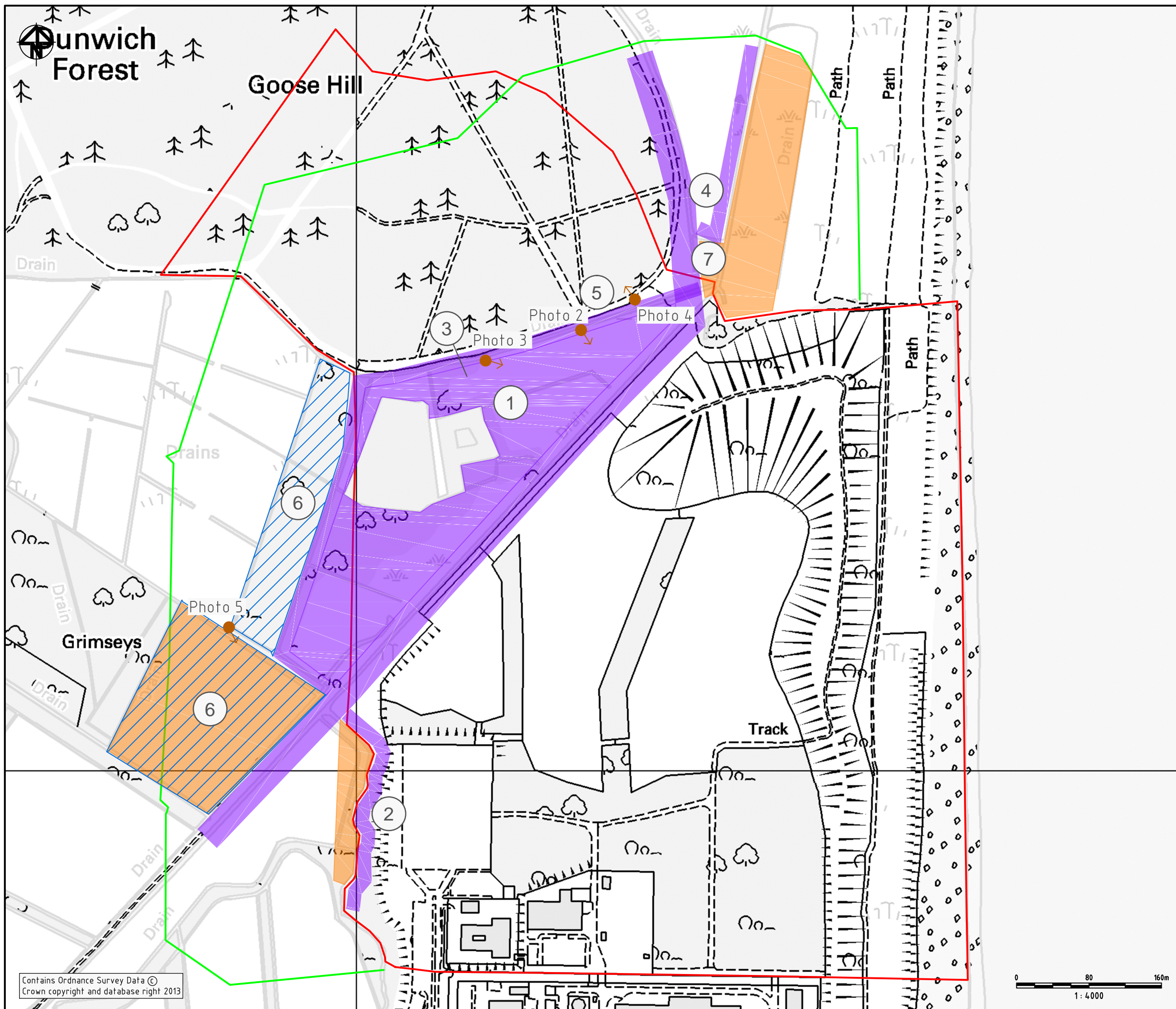
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FIGURE 1
ALDHURST FARM
SURVEY AREA

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Figure 2: SSSI Survey Area



- Key
- Site Boundary
 - Approximate 200m Survey Boundary
 - Areas intensively surveyed for otters and water voles
 - Inaccessible areas
 - Flooded carr
 - Location and direction of photograph
 - ① Target Note

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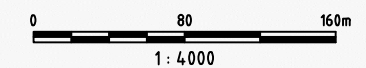
Hyder HYDER CONSULTING (UK) Limited
The Mill, Brimscombe Port
Brimscombe
Stroud, England
GL5 2QG
Tel: +44 (0)1453 423100
Fax: +44 (0)1453 887979

Project
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**FIGURE 2
SSSI
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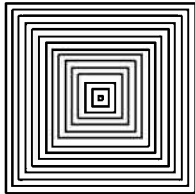
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REPORT

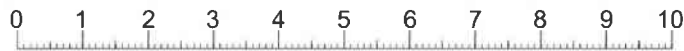
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EDF Energy/NNB GenCo
Sizewell C Ecological Support
Aldhurst Farm Water Vole Survey 2014



Hyder Consulting (UK) Limited

2212959
The Mill
Brimscombe Port
Stroud
Glos GL5 2QG
United Kingdom
Tel: +44 (0)1453 423 100
Fax: +44 (0)1453 887 979
www.hyderconsulting.com



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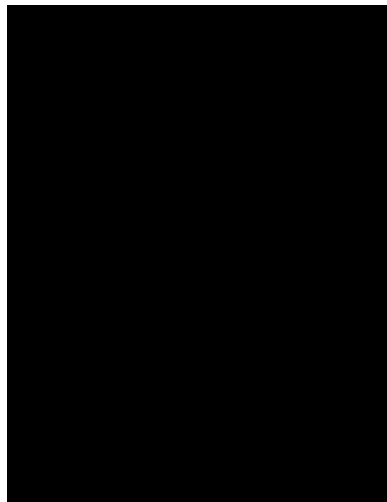
Sizewell C Ecological Support

Aldhurst Farm Water Vole Survey 2014

Author Will Trehella

Checker Mark Lang

Approver Mark Lang



BC No - - - -

Hyder Reference UA004506 S-EX073

Date 4 July 2014

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1 SUMMARY

This report presents the findings of an updated survey for water voles (*Arvicola terrestris*) and assessment of their habitat at Aldhurst Farm, Leiston, Suffolk, where new habitat creation is proposed to mitigate for the potential loss of habitat at the Sizewell Marshes Site of Special Scientific Interest (SSSI), as a result of proposed development of Sizewell C.

The survey work on 16 April 2014 comprised of searching the ditches and other wetland habitats at Aldhurst Farm to identify all evidence of water vole activity, following recognised survey methodologies. Three ditches (ditches 1, 2 and 3) indicated on Figure 1, showed signs of water vole activity, and were found to have good habitat suitability for water voles. These findings support those of previous water vole surveys and habitat assessments carried out at Aldhurst Farm in 2010 (AMEC 2010).

2 INTRODUCTION

EDF Energy/NNB GenCo (hereafter referred to as NNB) is to submit an application for a Development Consent Order (DCO) to construct and operate a new nuclear power station, Sizewell C, near the town of Leiston in Suffolk. The proposal site lies within an area of high landscape and ecological sensitivity, within an Area of Outstanding Natural Beauty (AONB) and adjacent to the Minsmere to Walberswick Heaths and Marshes Special Area of Conservation (SAC), the Sandlings Special Protection Area (SPA) and the Outer Thames Estuary SPA. A small part lies within the Sizewell Marshes Site of Special Scientific Interest (SSSI).

Following on from NNB's Stage 1 Pre-Application Consultation on its initial proposals and options for Sizewell C, which ended on 6th February 2013, NNB's priorities from 2013 have been to progress the conceptual engineering design and technical studies relating to the development, as well as to undertake essential environmental studies in order to inform this conceptual work and support a robust Stage 2 Consultation in due course. A considerable amount of ecological survey work has been carried out within and around the proposal site since 2007. Further detailed ecological surveys will be needed in support of Stage 2, most of which will be undertaken in 2014.

Previous surveys and habitat assessments of the Sizewell Estate for water voles show that it supports a nationally significant water vole population. A small part of the Sizewell C development site lies within the Sizewell Marshes SSSI, and is known to support a good population of water voles. This species has in recent years been afflicted by a UK wide decline in numbers, linked to a loss in habitat and predation by introduced mink (*Neovison vison*). Since 1998, the water vole has been included on Schedule 5 of the Wildlife & Countryside Act 1981, and it is an offence to destroy any place of shelter or protection for the species.

To mitigate for the loss of SSSI habitat, new habitat creation is proposed at Aldhurst Farm. Hyder Consulting (UK) Ltd were commissioned in 2014 by NNB to update previous water vole surveys at Aldhurst Farm. Aldhurst Farm is situated to the west of the Sizewell Marshes SSSI, and comprises approximately 69 hectares of mostly arable farmland. The site was identified as having potential for water vole during the estate-wide surveys in 2007 and 2009, with further site-specific surveys carried out in 2010.

The 2014 water vole survey at Aldhurst Farm (see Figure 1 for the survey area) had the specific purpose of updating and reassessing the potential of the site for supporting a population of water voles, and updating and reassessing the presence and distribution of water voles within the watercourses at Aldhurst Farm, so as to inform subsequent habitat creation proposals.

2.1 Previous water vole surveys

Water vole surveys conducted across the entire EDF Sizewell Estate between 2007 and 2010 (AMEC 2012, Entec 2010a) have provided baseline information which has been built upon by the later site specific surveys in 2010 at Aldhurst Farm (Entec 2010b). These earlier surveys aimed to assess all suitable habitats within 500 metres of the proposed development, for the potential of supporting water voles. These estate-wide surveys and the associated desk study indicated a large, widespread and stable water vole population across the EDF Sizewell Estate and the wider area, with no evidence of numbers being affected by the national decline. It was concluded that the water vole population on the EDF Sizewell Estate was likely to be a part of a single meta-population distributed across the wider ditch network.

Site specific surveys of Aldhurst Farm itself were carried out by Entec in March 2010. A network of ditches was identified on site, and divided into five sections (ditches 1-5) for ease of survey (see Figure 1). These were then assessed for potential for habitat suitability, and evidence of, water vole presence on site. Of the five sections of ditch surveyed during these 2010 surveys, four (ditches 1-4) were found suitable for habitation by water vole. Evidence of water vole activity was found on the site, with a medium to high density of field signs recorded alongside three of the ditches. A total of 15 latrines, 3 feeding stations, two footprints and 25 burrows were discovered adjacent to the four suitable ditches. This study, concluded that there was evidence of a resident population of water voles at the Aldhurst Farm site, with a medium to high density of different field signs recorded from ditches 1, 2 and 3, and these three ditches were considered to provide good water vole habitat.

The Aldhurst Farm ditches were also surveyed by Hyder in October 2013, primarily for evidence of otter (*Lutra lutra*) field signs but also with the intention of recording any with incidental records of water vole activity. The branching drain, dry ditch and the drain it fed into, and the area around the pond (these locations are indicated by Target Notes 1 to 4 in Figure 2) were all considered as areas potentially suitable for water voles. No signs of water voles were recorded; however, the main purpose of the survey was to identify signs of otter, and the ditches were not searched in detail for signs of water voles. Therefore a lack of field signs would not indicate that water voles were not present during 2013.

3 METHODOLOGY

The Aldhurst Farm area was resurveyed for signs of water voles and the habitat assessed for its potential to support water voles on 16 April 2014, by two experienced ecologists, following standard methodologies (Strachan & Moorhouse 2011). This is an appropriate time of year for detecting water vole presence, as water voles actively mark their breeding territories with latrines between February to November (Strachan & Moorhouse 2011).

Drains, ditches and streams in the Aldhurst Farm area between Abbey Road and Lovers Lane were surveyed on both sides, where access was possible. The ditches, drains and streams were divided into five sections (see Figure 3), following the survey divisions established by Entec in 2010. The banks and area around the pond in the centre of the site was also surveyed. The arable fields around the ditches and streams within a 200m radius, were not intensively surveyed, but were assessed for their suitability for water voles.

3.1 Water vole activity survey

The activity survey work comprised of searching the ditches and other wetland habitats at Aldhurst Farm (Figure 3) to identify all evidence of water vole activity. Surveys were carried out based on standard methods recommended in the water vole conservation handbook (Strachan & Moorhouse 2011). This involved searching bankside vegetation for:

- Latrines/droppings – water vole droppings are often concentrated in discreet latrine sites near the nest, at range boundaries and places where they regularly enter and exit the water. While most droppings will be deposited in latrines, some may be found scattered along runways in vegetation;
- Feeding stations – feeding remains in the form of neat piles of chewed lengths of vegetation, are often found in runways and at haul-out platforms;
- Burrows - these are typically found along the water's edge and on top of the bank up to 5m from the water's edge. Holes on top of the banks often have grazed 'lawns' around them;
- Nests – Where vegetation cover is dense and the water table is high (limiting opportunities for burrowing), water vole nests may be found woven into the base of rushes, sedges or grass tussocks; and
- Footprints – these may be identified in soft mud or silt.

Survey results were recorded on water vole survey forms.

3.2 Water vole habitat survey

For each water course surveyed, the following habitat data was recorded:

- Bank material;
- Bordering land use;
- Vegetation type present and frequency;
- Bank profile;
- Approximate depth and relative speed of water.

A sketch of each water course was made, with any features potentially determining the suitability of the ditch and surrounding area for supporting water vole recorded.

3.3 Survey Limitations

Due to deep silt, combined with steep banks and dense bankside and in-channel vegetation, it was not feasible to search the entire banks of some of the ditches, nor was it possible to enter the watercourse and conduct the survey by wading upstream.

4 RESULTS

4.1 Water vole activity

Evidence of recent water vole activity was found on the Aldhurst Farm site. Water vole field signs (in the form of burrows, runs, droppings/latrines and feeding remains) were found in ditch sections 1, 2 and 3, with no evidence of any activity on sections 4 and 5. The evidence of water vole activity found is summarised in Table 1. A single otter spraint was also found near ditch 3, but no obvious holt or lying up site was identified.

Table 1. Water vole field signs identified at Aldhurst Farm

Ditch reference	Transect length (m)	Water vole signs found				
		Burrow	Path in vegetation	Droppings / latrines	Cropped grass around tunnel	Feeding remains
1	250	17	1	1	2	3
2	300	10	2	0	0	1
3	500	5	3	0	0	0
4	600	0	0	0	0	0
5	200	0	0	0	0	0
Total	1,850	32	6	1	2	4

4.2 Habitat suitability

Ditch sections 1, 2 and 3 were found to have high habitat suitability for water vole presence. These water courses were all situated within arable fields, and comprised of moderately wide (minimum 1-2 metre) ditches with slow flowing water of up to 1 metre in depth. Abundant aquatic vegetation was often present, including a large body of emergent Watercress (*Nasturtium officinale*). All three ditches possessed steep earthen banks, providing suitable burrowing habitat for water vole. Although short grasses dominated, banks were occasionally highly vegetated with some tall grasses and ruderal vegetation, such as Common Nettle (*Urtica dioica*) and Great Willowherb (*Epilobium hirsutum*), as well as occasional bushes and regular patches of bankside willows (*Salix Sp.*). There is therefore significant opportunity for foraging and provision of shelter for water voles at the site. However, an upstream section of ditch 3 was identified as being less suitable for water vole, due to the presence of overhanging willows shading this section of the ditch, and a much shallower water depth.

Beyond 500 metres upstream of Lover's Lane (ditches 4-5), the water course was found to be heavily shaded with Bramble (*Rubus fruticosus agg.*) and shrubs and therefore the channel supported little emergent or aquatic vegetation. It was therefore deemed to be sub-optimal for supporting water voles.

5 CONCLUSIONS

In terms of habitat suitability, the 2014 surveys are in broad agreement with those of Entec in 2010 (Entec 2010) with ditches 1, 2 and 3 at Aldhurst Farm having good habitat suitability for water voles and ditches 4-5 being sub-optimal. There is no indication that the range of water voles increasing since 2010, with fields signs being located in the same areas as those recorded by AMEC.

For field surveys of water voles, latrines are considered to be the best index of population abundance (Strachan & Moorhouse 2011). Therefore the low number of latrines found (1), as opposed to other field signs, in 2014 compared to 2010 (15), could be indicative of a change in population status of water voles at Aldhurst Farm, with a caveat that it is known that water vole populations fluctuate seasonally and that the surveys were done four years apart. Possibilities for a change in population abundance include:

- A succession of wet weather since 2010, which could have flooded burrows and caused individuals to drown.
- The potential presence of mink at the site preying water voles.

We will consult with Suffolk Wildlife Trust about mink abundance; and suggest surveys using mink rafts (with a sand or clay plate to detect mink footprints) positioned along the ditches, to highlight if mink presence is the reason for the suspected population decline. We would also recommend that a second field survey is carried out in 2014; in early October when vegetation may be less dense.

6 REFERENCES

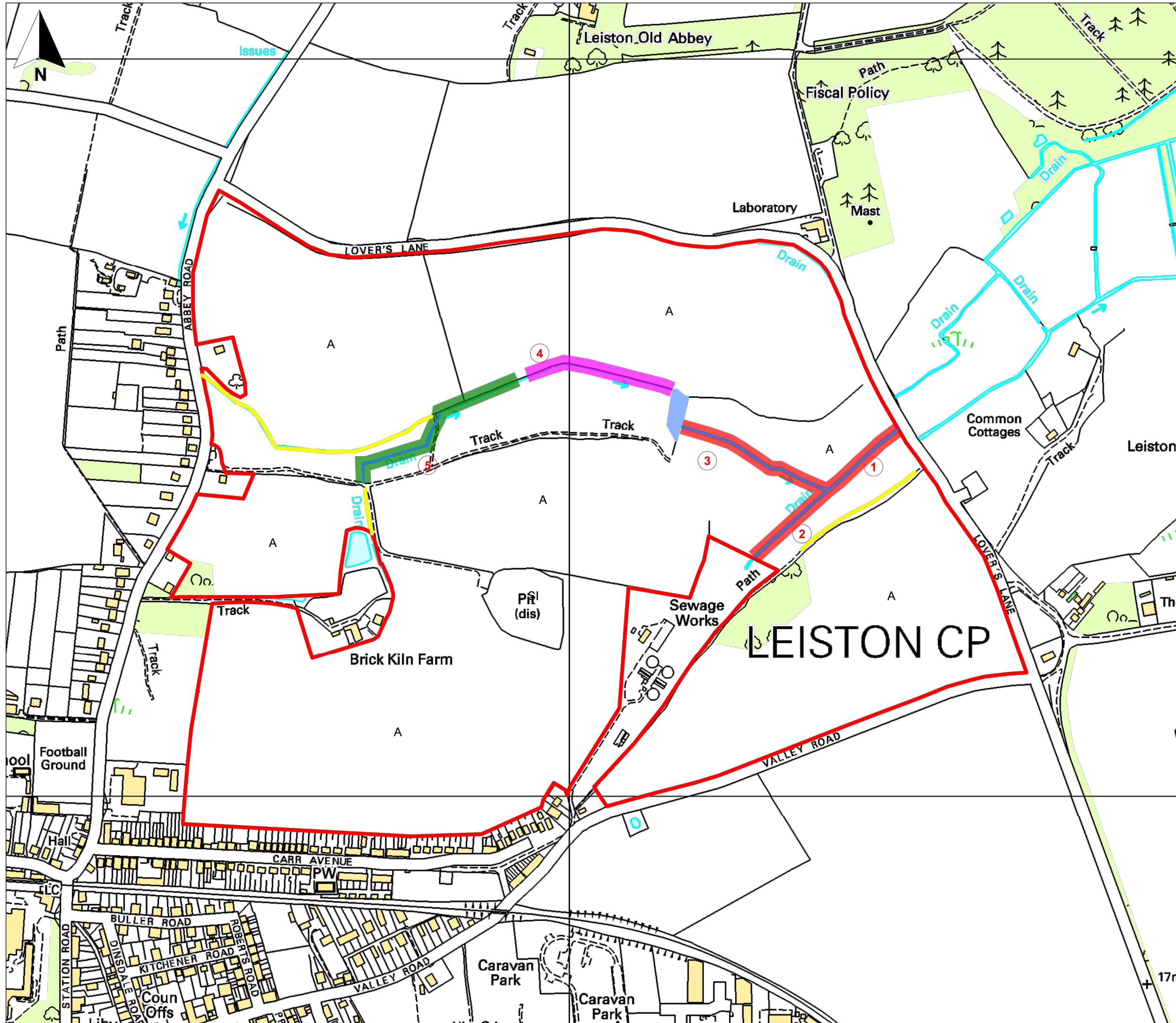
- AMEC (2012). *EDF Energy. Sizewell C New Nuclear Power Station: Terrestrial and Freshwater Ecology, and Ornithology. Draft Water Vole Survey report 2007-2009*. Unpublished report 2012.
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- Strachan, R & Moorhouse, T. (2011). *Water Vole Conservation Handbook. 3rd Edition*. Wildlife Conservation Research Unit, Oxford.

FIGURES

Figure 1: Site specific surveys of Aldhurst Farm itself were carried out by Entec in March 2010.

Figure 2: Aldhurst Farm otter and water vole survey area 2013.

Figure 3: Aldhurst Farm water vole survey area and results 2014.







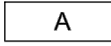




- Key**
-  Site boundary
 -  Transect reference
 -  Standing water
 -  Running water
 -  Arable
 -  Dry ditches
 -  High quality habitat
 -  Medium quality habitat
 -  Poor quality habitat

FIGURE 1
WATER VOLE SURVEY
RESULTS FROM ENTEC (2010)

0 m 250 m
 Scale 1:5,000 @ A3

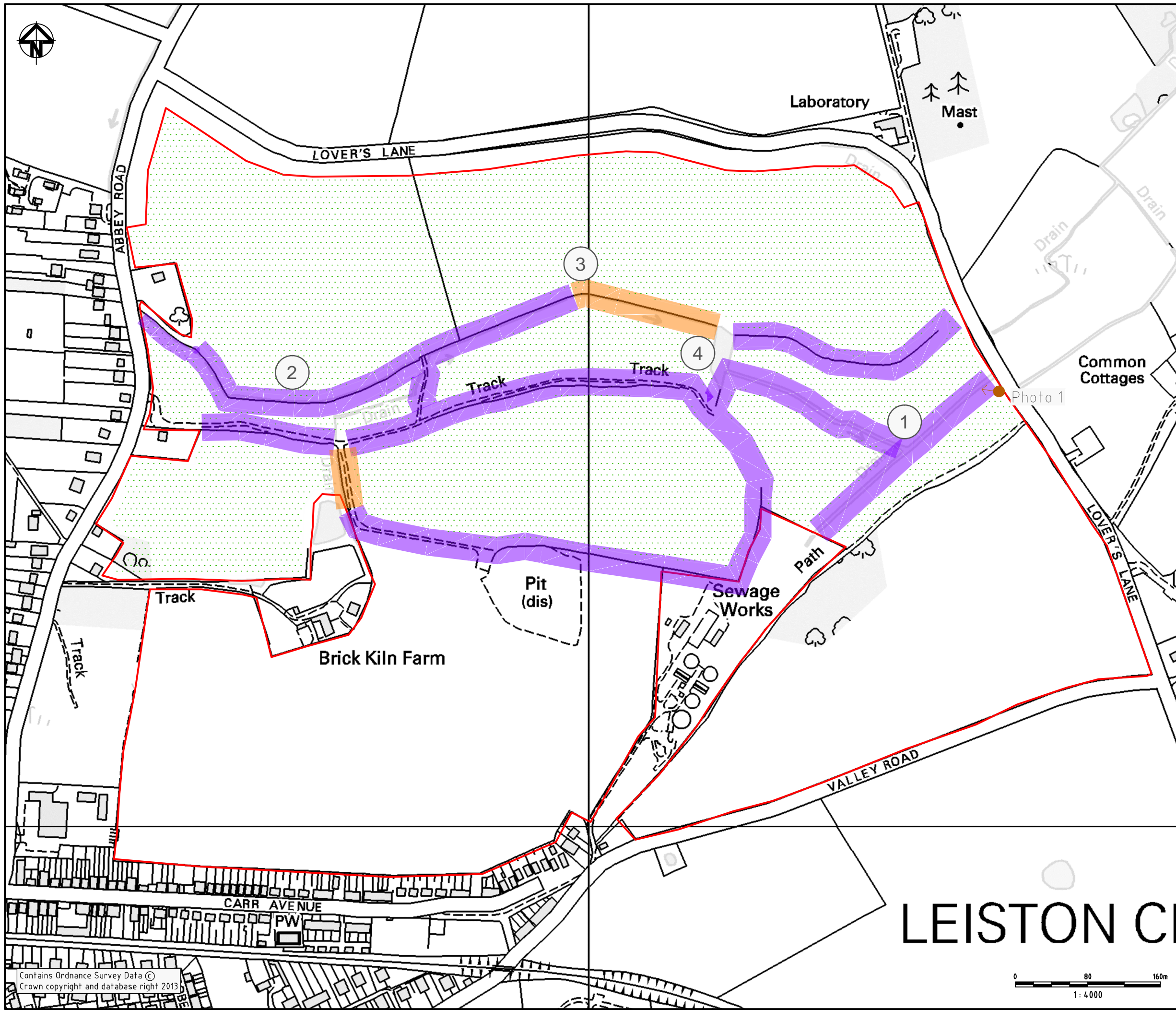


Aldhurst Farm
 Phase 1 Habitat Survey Report

Figure 3.2
Water Vole Survey Results

July 2011
 28130-A130.WOR tugwc





- Key
- Site Boundary
 - Drains, ditches, streams and boundaries intensively surveyed for otters and water voles
 - Area of ditch too dense to survey
 - Fields considered unsuitable for otters and water voles
 - Location and direction of photograph
 - ① Target Note

01	VERSION 1	18 OCT 13
Issue	Description	Date

Status
PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Scales	1:4000	Current Issue Signatures	
Original Size	A3	Author	J.WEAVER
Height Datum	NEWLYN	Checker	P.JAMES
Grid	0.S	Approver	J.DAVIES
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Filename: 1015-UA004506-STD-01_OTTERS_WV.DWG

Client



EDF ENERGY



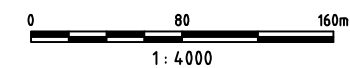
HYDER CONSULTING (UK) Limited
The Mill, Brimscombe Port
Brimscombe
Stroud, England
GL5 2QG
Tel: +44 (0)1453 423100
Fax: +44 (0)1453 887979

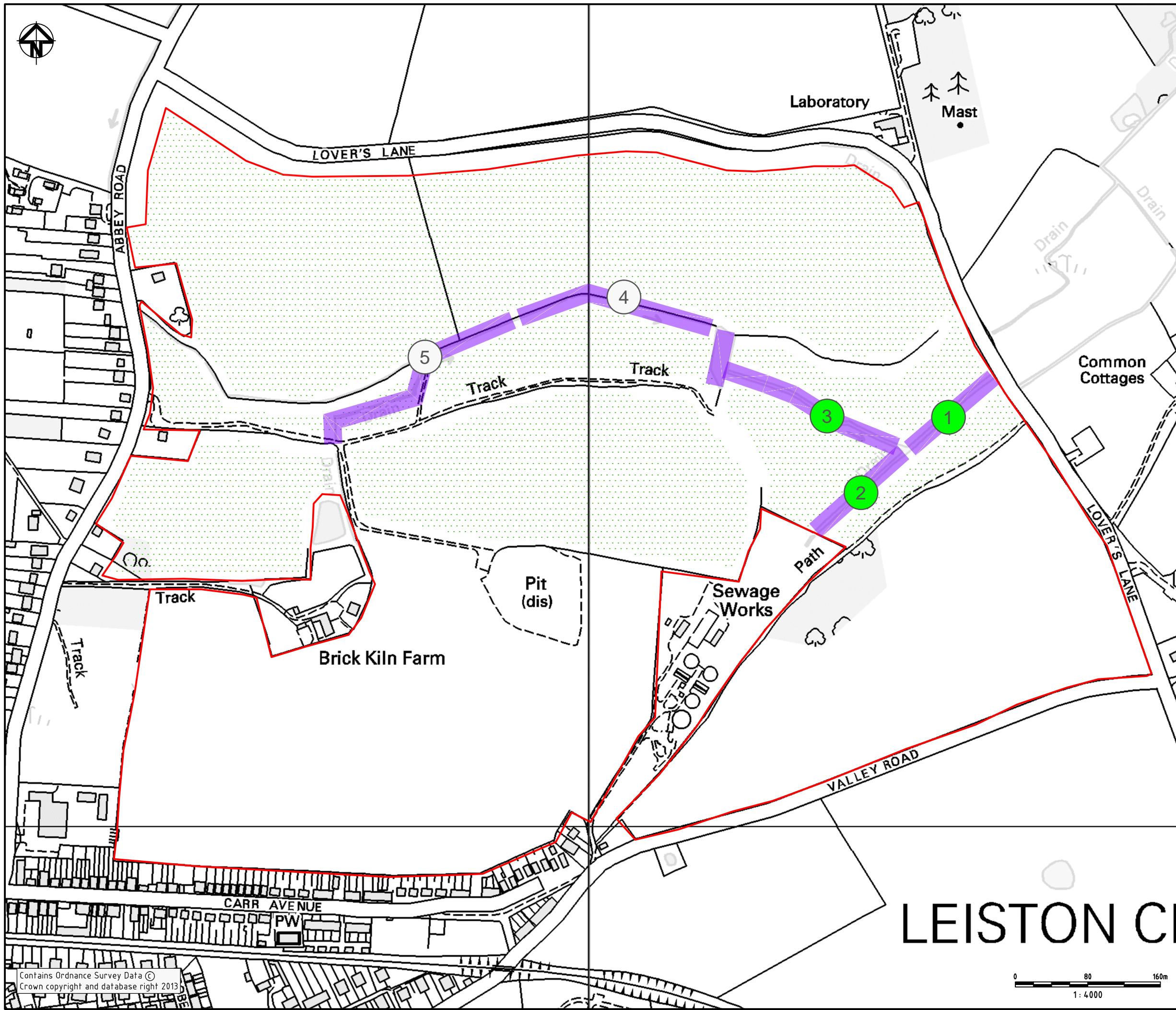
Project
SIZEWELL

Title
**FIGURE 2
OTTER AND WATER VOLE
SURVEY FROM HYDER (2013)**

Drawing No.	Project No.	Issue
1015	— UA004506 —	01

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- Key
- Site Boundary
 - Drains, ditches, streams and boundaries intensively surveyed for water voles
 - Fields considered unsuitable for water voles
 - ① Ditch sections
 - Ditches where evidence of water voles found and good water vole habitat quality

02	VERSION 2	04 JUL 14
01	VERSION 1	18 OCT 13
Issue	Description	Date

Status
PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Scales	1:4000	Current Issue Signatures	
Original Size	A3	Author	J.WEAVER
Height Datum	NEWLYN	Checker	P.JAMES
Grid	0.S	Approver	J.DAVIES
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Hyder HYDER CONSULTING (UK) Limited
The Mill, Brimscombe Port
Brimscombe
Stroud, England
GL5 2QG
Tel: +44 (0)1453 423100
Fax: +44 (0)1453 887979

Project
SIZEWELL

Title
**FIGURE 3
ALDHURST FARM
SURVEY AREA 2014**

Drawing No.	Project No.	Issue
1015	— UA004506 —	01

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WATER VOLE SURVEY FORM

BACKGROUND INFORMATION

Site name/river Sizewell - Ditch Section 2

Site number 10km square Grid ref

County Suffolk Water Authority

Recorder ML / KB Date 16/11/2014

HABITAT INFORMATION (mark features on map)

Survey distance km

Habitat

- Ditch
- Dyke
- Gravel pit
- Pond
- Lowland lake
- Upland loch
- Reservoir
- Running water
- Marsh/bog
- Canal

Shore/bank

- Boulders
- Stones
- Gravel
- Sand
- Silt
- Earth
- Rock cliffs
- Earth cliffs
- Canalized
- Poached
- Reinforced (man-made)

Bordering land use

- Upland grass
- Permanent/temporary grass
- Mixed broadleaf woodland
- Conifer wood
- Peat bog
- Arable crop
- Salt marsh
- Urban/industrial
- Park/garden
- Heath
- Fen
- Cattle/grazing
- Bank fenced?

Vegetation (DAFORN)

- Bankside trees
- Bushes
- Herbs
- Submerged weed
- Reeds/sedges
- Tall grass
- Short grass

Disturbance:

low

Bank profile

- Flat < 10°
- Shallow < 45°
- Steep > 45°
- Vertical/undercut

Depth

- < 0.5m
- 0.5-1m
- 1-2m
- > 2m

Width

- 1m
- 1-2m
- 2-5m
- 5-10m
- 10-20m
- 20-40m
- > 40m

Current

- Slow
- Rapid
- Sluggish
- Fast
- Static

WILDLIFE INFORMATION

Water voles

- Sightings (count)
- Latrines (count)
- Burrows (count)
- Footprints
- Pathway in vegetation
- Feeding remains
- Cropped grass around tunnel entrance

Rat

- Sightings
- Droppings
- Footprints/runs

Otter

- Sightings
- Droppings
- Footprints/runs

Mink

- Sightings
- Droppings
- Footprints/runs

Other wildlife

- Kingfisher
- Heron
- Coot
- Waterfowl
- Moorhen
- Dipper

Identified plants from feeding remains:

SKETCH OF SITE – vole activity indicated (if any)

KEY TO SYMBOLS (mark route surveyed and direction of flow)			ADJACENT LAND-USE CODES
Mature trees		Broadleaved wood BW	
Over-hanging branches		Conifer plantation CP	
Fallen tree		Moorland/heath MH	
Exposed roots		Rough pasture RP	
Pollarded tree		Wetland WL	
Sapling		Improved grass IG	
Scrub		Tilled land (crop) TL	
Hedgerow		Suburban/urban devel. (inc. gardens) URB	
Fence		OTHER FEATURES	
Reed/sedge bed		Roadbridge	
Flood bank		Footbridge	
Artificial bank		Weir	
Earth cliff		Culvert	
		Ford	
	Outfall		
	Dredgings/spoil		
	Silt bars		
	Islands mark position and size		
ADDITIONAL COMMENTS: water level management signs of drying out flood debris position evidence of pollution			

WATER VOLE SURVEY FORM

BACKGROUND INFORMATION				<i>Ditch Section 1</i>			
Site name/river		<i>Sizewell</i>					
Site number	10km square	Grid ref					
County		<i>Suffolk</i>		Water Authority			
Recorder		<i>M. KB</i>		Date			
				<i>16/4/2014</i>			

HABITAT INFORMATION (mark features on map)							
Survey distance				km			
Habitat <input checked="" type="checkbox"/> Ditch <input type="checkbox"/> Dyke <input type="checkbox"/> Gravel pit <input type="checkbox"/> Pond <input type="checkbox"/> Lowland lake <input type="checkbox"/> Upland loch <input type="checkbox"/> Reservoir <input checked="" type="checkbox"/> Running water <input type="checkbox"/> Marsh/bog <input type="checkbox"/> Canal		Shore/bank <input type="checkbox"/> Boulders <input type="checkbox"/> Stones <input type="checkbox"/> Gravel <input type="checkbox"/> Sand <input type="checkbox"/> Silt <input checked="" type="checkbox"/> Earth <input checked="" type="checkbox"/> Rock cliffs <input type="checkbox"/> Earth cliffs <input type="checkbox"/> Canalized <input type="checkbox"/> Poached <input type="checkbox"/> Reinforced (man-made)		Bordering land use <input type="checkbox"/> Upland grass <input type="checkbox"/> Permanent/temporary grass <input type="checkbox"/> Mixed broadleaf woodland <input type="checkbox"/> Conifer wood <input type="checkbox"/> Peat bog <input checked="" type="checkbox"/> Arable crop <input type="checkbox"/> Salt marsh <input type="checkbox"/> Urban/industrial <input type="checkbox"/> Park/garden <input type="checkbox"/> Heath <input type="checkbox"/> Fen <input type="checkbox"/> Cattle/grazing <input type="checkbox"/> Bank fenced?		Vegetation (DAFORN) <input checked="" type="checkbox"/> Bankside trees <input type="checkbox"/> Bushes <input type="checkbox"/> Herbs <input type="checkbox"/> Submerged weed <input type="checkbox"/> Reeds/sedges <input checked="" type="checkbox"/> Tall grass <input type="checkbox"/> Short grass	
Bank profile <input type="checkbox"/> Flat < 10° <input type="checkbox"/> Shallow < 45° <input checked="" type="checkbox"/> Steep > 45° <input type="checkbox"/> Vertical/undercut		Depth <input type="checkbox"/> < 0.5m <input checked="" type="checkbox"/> 0.5-1m <input type="checkbox"/> 1-2m <input type="checkbox"/> > 2m		Width <input type="checkbox"/> 1m <input checked="" type="checkbox"/> 1-2m <input type="checkbox"/> 2-5m <input type="checkbox"/> 5-10m <input type="checkbox"/> 10-20m <input type="checkbox"/> 20-40m <input type="checkbox"/> > 40m			
		Current <input checked="" type="checkbox"/> Slow <input type="checkbox"/> Rapid <input type="checkbox"/> Sluggish <input type="checkbox"/> Fast <input type="checkbox"/> Static		Disturbance: <i>NO SIGNS of disturbance</i>			

WILDLIFE INFORMATION							
Water voles <input checked="" type="checkbox"/> Sightings (count) <input checked="" type="checkbox"/> Latrines (count) <input checked="" type="checkbox"/> Burrows (count) <input checked="" type="checkbox"/> Footprints <input type="checkbox"/> Pathway in vegetation <input checked="" type="checkbox"/> Feeding remains <input checked="" type="checkbox"/> Cropped grass around tunnel entrance		Rat <input type="checkbox"/> Sightings <input type="checkbox"/> Droppings <input type="checkbox"/> Footprints/runs		Otter <input type="checkbox"/> Sightings <input type="checkbox"/> Droppings <input type="checkbox"/> Footprints/runs		Mink <input type="checkbox"/> Sightings <input type="checkbox"/> Droppings <input type="checkbox"/> Footprints/runs	
		Other wildlife <input type="checkbox"/> Kingfisher <input type="checkbox"/> Heron <input type="checkbox"/> Coot <input type="checkbox"/> Waterfowl <input type="checkbox"/> Moorhen <input type="checkbox"/> Dipper		Identified plants from feeding remains: 			

SKETCH OF SITE – vole activity indicated (if any)

KEY TO SYMBOLS (mark route surveyed and direction of flow)			ADJACENT LAND-USE CODES
Mature trees		Broadleaved wood BW	
Over-hanging branches		Conifer plantation CP	
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Exposed roots		Rough pasture RP	
Pollarded tree		Wetland WL	
Sapling		Improved grass IG	
Scrub		Tilled land (crop) TL	
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Fence		OTHER FEATURES	
Reed/sedge bed		Roadbridge	
Flood bank		Footbridge	
Artificial bank		Weir	
Earth cliff		Culvert	
		Ford	
		Outfall	
	Dredgings/spoil		
	Silt bars		
	Islands mark position and size		

ADDITIONAL COMMENTS:

water level management
 signs of drying out
 flood debris position
 evidence of pollution

L = latrine P = Pathway
 B = Burrow
 FR - Feeding Remains
 D - Droppings

Deep silt in bottom of ditch prevented entering water with waders.

WATER VOLE SURVEY FORM

BACKGROUND INFORMATION

Site name/river Sizewell Ditch Section 3

Site number 10km square Grid ref

County Suffolk Water Authority

Recorder MR / KB Date 16/4/14

HABITAT INFORMATION (mark features on map)

Survey distance km

Habitat

Ditch

Dyke

Gravel pit

Pond

Lowland lake

Upland loch

Reservoir

Running water

Marsh/bog

Canal

Shore/bank

Boulders

Stones

Gravel

Sand

Silt

Earth

Rock cliffs

Earth cliffs

Canalized

Poached

Reinforced (man-made)

Bordering land use

Upland grass

Permanent/temporary grass

Mixed broadleaf woodland

Conifer wood

Peat bog

Arable crop

Salt marsh

Urban/industrial

Park/garden

Heath

Fen

Cattle/grazing

Bank fenced?

Vegetation (DAFORN)

Bankside trees

Bushes

Herbs

Submerged weed

Reeds/sedges

Tall grass

Short grass

Disturbance:
low

Bank profile

Flat < 10°

Shallow < 45°

Steep > 45°

Vertical/undercut

Depth

< 0.5m

0.5-1m

1-2m

> 2m

Width

1m 1-2m 2-5m

5-10m 10-20m 20-40m > 40m

Current

Slow Rapid Fast

Sluggish Static

WILDLIFE INFORMATION

Water voles

Sightings (count)

Latrines (count)

Burrows (count)

Footprints

Pathway in vegetation

Feeding remains

Cropped grass around tunnel entrance

Rat

Sightings

Droppings

Footprints/runs

Otter

Sightings

Droppings

Footprints/runs

Mink

Sightings

Droppings

Footprints/runs

Other wildlife

Kingfisher Heron Coot Moorhen

Waterfowl Dipper

Identified plants from feeding remains:

SKETCH OF SITE – vole activity indicated (if any)

KEY TO SYMBOLS (mark route surveyed and direction of flow)		ADJACENT LAND-USE CODES
Mature trees		Broadleaved wood BW
Over-hanging branches		Conifer plantation CP
Fallen tree		Moorland/heath MH
Exposed roots		Rough pasture RP
Pollarded tree		Wetland WL
Sapling		Improved grass IG
Scrub		Tilled land (crop) TL
Hedgerow		Suburban/urban devel. (inc. gardens) URB
Fence		OTHER FEATURES
Reed/sedge bed		Roadbridge
Flood bank		Footbridge
Artificial bank		Weir
Earth cliff		Culvert
		Ford
		Outfall
	Dredgings/spoil	
	Silt bars	
	Islands mark position and size	

ADDITIONAL COMMENTS:

water level management
 signs of drying out
 flood debris position
 evidence of pollution

B - Burrow
 A - Latrine
 PD - Dropping
 P - Pathway
 FR - Feeding remains

WATER VOLE SURVEY FORM

BACKGROUND INFORMATION

Site name/river Tizewell Ditch Saker 4

Site number 10km square Grid ref

County Suffolk Water Authority

Recorder AL / RB Date 10/11/14

HABITAT INFORMATION (mark features on map)

Survey distance km

Habitat

- Ditch
- Dyke
- Gravel pit
- Pond
- Lowland lake
- Upland loch
- Reservoir
- Running water
- Marsh/bog
- Canal

Shore/bank

- Boulders
- Stones
- Gravel
- Sand
- Silt
- Earth
- Rock cliffs
- Earth cliffs
- Canalized
- Poached
- Reinforced (man-made)

Bordering land use

- Upland grass
- Permanent/temporary grass
- Mixed broadleaf woodland
- Conifer wood
- Peat bog
- Arable crop
- Salt marsh
- Urban/industrial
- Park/garden
- Heath
- Fen
- Cattle/grazing
- Bank fenced?

Vegetation (DAFORN)

- Bankside trees
- Bushes
- Herbs
- Submerged weed
- Reeds/sedges
- Tall grass
- Short grass

Disturbance:

low

Bank profile

- Flat < 10°
- Shallow < 45°
- Steep > 45°
- Vertical/undercut

Depth

- < 0.5m
- 0.5-1m
- 1-2m
- > 2m

Width

- 1m
- 1-2m
- 2-5m
- 5-10m
- 10-20m
- 20-40m
- > 40m

Current

- Slow
- Rapid
- Sluggish
- Fast
- Static

WILDLIFE INFORMATION

Water voles

- Sightings (count)
- Latrines (count)
- Burrows (count)
- Footprints
- Pathway in vegetation
- Feeding remains
- Cropped grass around tunnel entrance

Rat

- Sightings
- Droppings
- Footprints/runs

Otter

- Sightings
- Droppings
- Footprints/runs

Mink


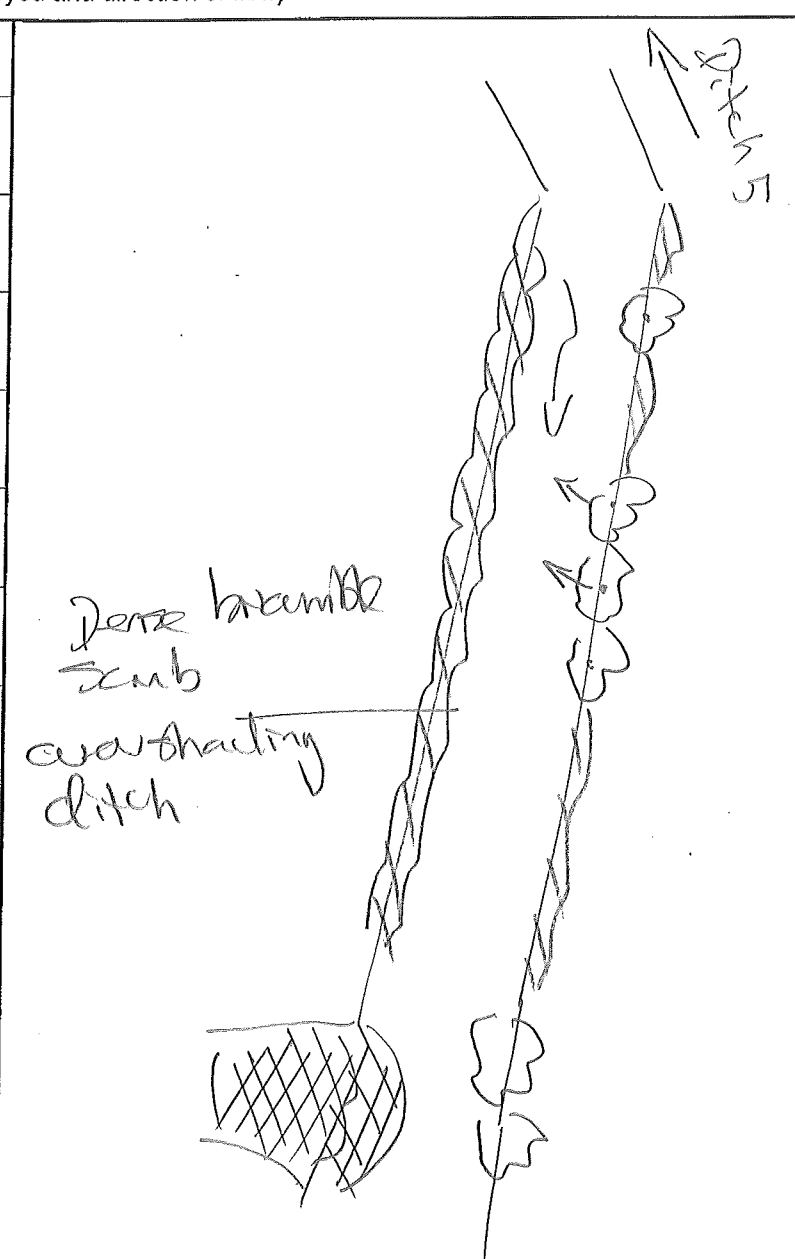

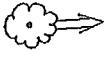



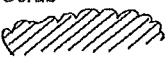
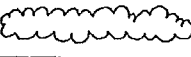
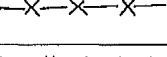


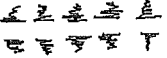

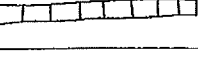

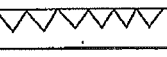

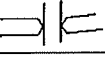


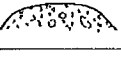
- Sightings
- Droppings
- Footprints/runs

Other wildlife

- Kingfisher
- Heron
- Coot
- Waterfowl
- Moorhen
- Dipper

Identified plants from feeding remains:

SKETCH OF SITE – vole activity indicated (if any)

KEY TO SYMBOLS (mark route surveyed and direction of flow)			ADJACENT LAND-USE CODES	
Mature trees			Broadleaved wood	BW
Over-hanging branches			Conifer plantation	CP
Fallen tree			Moorland/heath	MH
Exposed roots			Rough pasture	RP
Pollarded tree			Wetland	WL
Sapling			Improved grass	IG
Scrub			Tilled land (crop)	TL
Hedgerow			Suburban/urban devel. (inc. gardens)	URB
Fence			OTHER FEATURES	
Reed/sedge bed			Roadbridge	
Flood bank			Footbridge	
Artificial bank			Weir	
Earth cliff			Culvert	
ADDITIONAL COMMENTS:			Ford	
water level management			Outfall	
signs of drying out		Dredgings/spoil		
flood debris position		Silt bars		
evidence of pollution		Islands	mark position and size	

WATER VOLE SURVEY FORM

BACKGROUND INFORMATION

Site name/river Sprewell Ditch Section five

Site number 10km square Grid ref

County Water Authority

Recorder ML / KB Date 16/4/

HABITAT INFORMATION (mark features on map)

Survey distance km

Habitat

Ditch

Dyke

Gravel pit

Pond

Lowland lake

Upland loch

Reservoir

Running water

Marsh/bog

Canal

Shore/bank

Boulders

Stones

Gravel

Sand

Silt

Earth

Rock cliffs

Earth cliffs

Canalized

Poached

Reinforced (man-made)

Bordering land use

Upland grass

Permanent/temporary grass

Mixed broadleaf woodland

Conifer wood

Peat bog

Arable crop

Salt marsh

Urban/industrial

Park/garden

Heath

Fen

Cattle/grazing

Bank fenced?

Vegetation (DAFORN)

Bankside trees

Bushes

Herbs

Submerged weed

Reeds/sedges

Tall grass

Short grass

Disturbance:

low

Bank profile

Flat < 10°

Shallow < 45°

Steep > 45°

Vertical/undercut

Depth

< 0.5m

0.5-1m

1-2m

> 2m

Width

5-10m 1m 1-2m 2-5m

10-20m 20-40m > 40m

Current

Slow Rapid Fast

Sluggish Static

WILDLIFE INFORMATION

Water voles

Sightings (count)

Latrines (count)

Burrows (count)

Footprints

Pathway in vegetation

Feeding remains

Cropped grass around tunnel entrance

Rat

Sightings

Droppings

Footprints/runs

Otter

Sightings

Droppings

Footprints/runs

Mink

Sightings

Droppings

Footprints/runs

Other wildlife

Kingfisher Heron Coot Moorhen

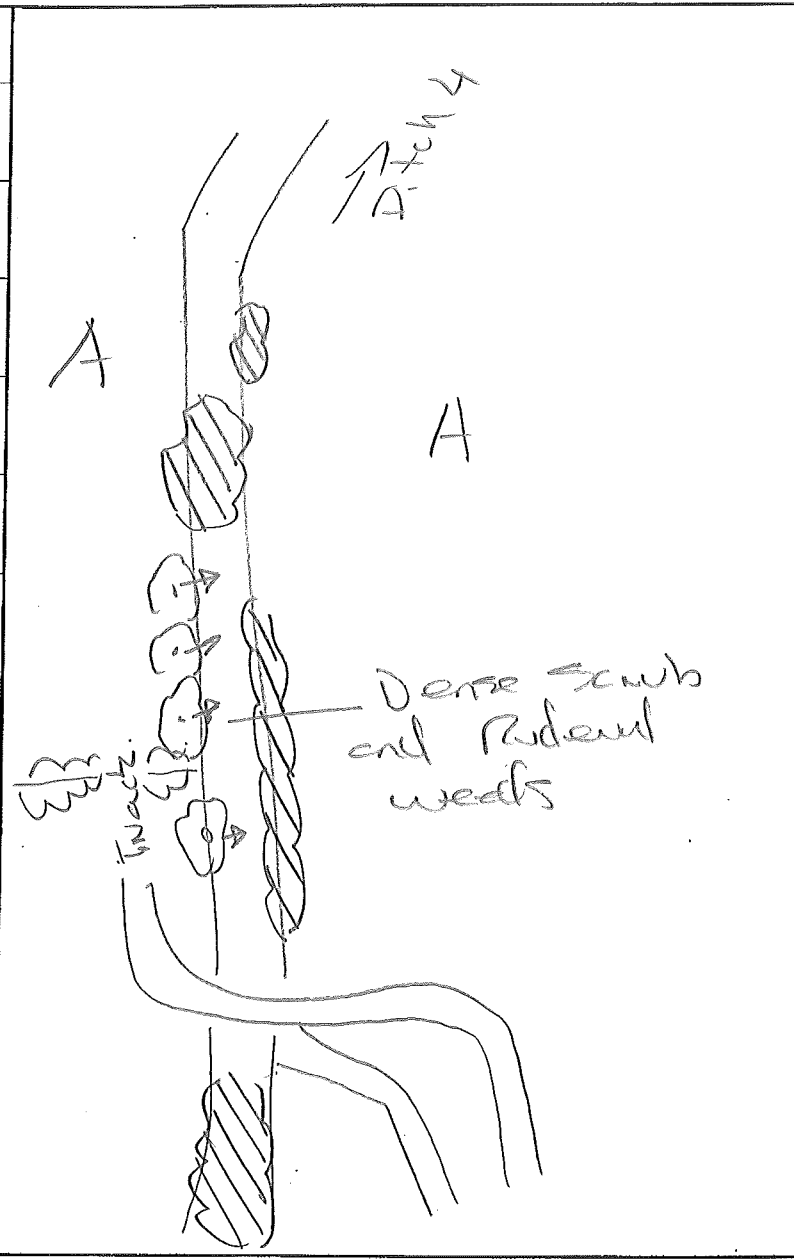
Waterfowl Dipper

Identified plants from feeding remains:

SKETCH OF SITE – vole activity indicated (if any)

KEY TO SYMBOLS
(mark route surveyed and direction of flow)

Mature trees	
Over-hanging branches	
Fallen tree	
Exposed roots	
Pollarded tree	
Sapling	
Scrub	
Hedgerow	
Fence	
Reed/sedge bed	
Flood bank	
Artificial bank	
Earth cliff	



ADJACENT LAND-USE CODES	
Broadleaved wood	BW
Conifer plantation	CP
Moorland/heath	MH
Rough pasture	RP
Wetland	WL
Improved grass	IG
Tilled land (crop)	TL
Suburban/urban devel. (inc. gardens)	URB
OTHER FEATURES	
Roadbridge	
Footbridge	
Weir	
Culvert	
Ford	
Outfall	
Dredgings/spoil	
Silt bars	
Islands	mark position and size

ADDITIONAL COMMENTS:

water level management
signs of drying out
flood debris position
evidence of pollution

- NO signs of water vole.