

The Sizewell C Project

6.3 Volume 2 Main Development Site Chapter 14 Terrestrial Ecology and Ornithology Appendix 14A5 Amphibians

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SIZEWELL C DEVELOPMENT – MAIN DEVELOPMENT SITE: VOLUME 2, CHAPTER 14:

APPENDIX 14A5 – AMPHIBIANS

Documents included within this Appendix are as follows:

APPENDIX 14A5 AMPHIBIANS

ANNEX 14A5.1 FIGURES (provided separately)

ANNEX 14A5.2 DESK STUDY

ANNEX 14A5.3 SECONDARY DATA

- Annex 14A5.3 Great Crested Newt Consolidated Report
- Annex 14A5.3 Sizewell Great Crested Newt Report 2007
- Annex 14A5.3 Natterjack Toad Technical Note 2008

ANNEX 14A5.4 PRIMARY DATA

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 14A5 – AMPHIBIANS

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Volume 2 Appendix 14A5 Amphibians |



Contents

Executi	ve Summary	1
1.	Amphibians	3
1.1	Introduction	3
1.2	Desk-study/secondary data	4
1.3	Field surveys – primary data	9
1.4	Baseline conditions – amphibian features and their importance 1	3
Referer	nces	20

Tables

Table 1.1: Summary results for natterjack toad surveys (Pond N1)	. 8
Table 1.2: Summary results for Arcadis 2014 great crested newt surveys.	12
Table 1.3: Ecological features taken forward for detailed assessment.	19

Plates

None provided.

Figures

Figure 14A5.1. Amphibian baseline results from desk-study, Wood Group surveys and Arcadis surveys for the main development site.



Executive Summary

This appendix assesses the baseline conditions for six amphibian species (natterjack toad (*Epidalea calamita*), common toad (*Bufo bufo*), common frog (*Rana temporaria*), great crested newt (*Triturus cristatus*), smooth newt (*Lissotriton vulgaris*) and palmate newt (*L. helveticus*)) within the Zone of Influence (ZOI) of the Sizewell C power station at the main development site (hereafter referred to as the "proposed development").

Two of these species (natterjack toad and great crested newt) are European Protected Species (EPS) (on Schedule 2 of the Conservation of Habitats and Species Regulations (Ref. 2.1); the remaining four are protected (from sale) under the Wildlife and Countryside Act (Ref. 2.2). Great crested newt, and both common and natterjack toad are priority species in the Suffolk Biodiversity Action Plan (Ref. 2.3) and are species of principal importance for the conservation of biodiversity under the Natural Environment and Rural Communities Act 2006 (NERC Act) (Ref. 2.4).

Desk-study data revealed no great crested newt or natterjack toad records within the proposed development site (hereafter referred to as the "site"). There are single desk-study records for common frog and smooth newt within the EDF Energy Estate.

In 2005, natterjack toad was introduced into two ponds within Retsom's Field, approximately 50m from the site boundary to the north of Goose Hill. Surveys by the Suffolk Wildlife Trust (SWT) between 2008 to 2018 revealed that the natterjack toad population has increased five-fold (based on numbers of tadpoles counted annually). The close-cropped, sheep-grazed turf of Retsom's Field constitutes ideal terrestrial foraging habitat for natterjack toad.

Surveys carried out between 2007 and 2010 recorded no great crested newt in 14 waterbodies on the EDF Energy Estate. Surveys in 2014 again recorded no great crested newt on the EDF Energy Estate. Great crested newts were, however, found in four ponds located within 500m of the western edge of the site boundary; the nearest of these was approximately 160m away. Subsequent eDNA surveys of ponds within the site in 2016 similarly found no evidence of great crested newt.

To ensure a robust Ecological Impact Assessment (EcIA) process, all amphibian 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 EcIA (Ref. 2.5). In addition, the amphibian populations have been assessed in accordance with the standard Environmental Impact Assessment (EIA) methodology used elsewhere within the Environmental Statement (ES).

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



- natterjack toad is considered to be an IEF at the national level under the CIEEM guidelines and of high importance, following the EIAspecific assessment methodology; and
- great crested newt is considered to be an IEF at the local level under the CIEEM guidelines (owing to their legal protection rather than their status) and of very low importance following the EIA-specific assessment methodology.



- 1. Amphibians
- 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") **ES Volume 2, Chapter 14**. This appendix presents a description of the amphibian baseline for the proposed development site (hereafter referred to as the "site") and its ZOI.
 - b) Establishing Zone of Influence, study area and survey area
- 1.1.2 For amphibians, the ZOI and study area is defined as the site and an additional buffer area of 2km. The survey area is defined as the site boundary, with an additional buffer zone of 500m, which is in accordance with standing advice from Natural England for assessing the impacts of developments on great crested newt (*Triturus cristatus*) (Ref. 2.6).
 - c) Structure of this appendix
- 1.1.3 This appendix has been set out as follows:
 - Section 1.2 sets out the approach and methodology used for obtaining the desk-study and secondary data, as well as the results of this data acquisition. The detail of the desk-study information acquired is presented in Annex 14A5.2, whilst the secondary data reports are presented in Annex 14A5.3.
 - Section 1.3 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 14A5.4**.
 - Finally, section 1.4 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 EcIA.
- **1.1.4** Figures summarising the ecological baseline with regard to amphibians are presented in **Annex 14A5.1 Figures**.



1.2 Desk-study/secondary data

- a) Approach and methodology
- i. Desk-study
- 1.2.1 Records for amphibians 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 site boundary. Citations for all designated sites within 2km of the site were reviewed to ascertain whether or not amphibians are cited as qualifying features. The Suffolk Biodiversity Action Plan (BAP), Suffolk's Priority Species and Habitats list (Ref. 2.7), and the habitats and species of principal importance included on the Section 41 list of the NERC Act, were also reviewed with reference to any amphibians present, or likely to be present, within the site and the wider ZOI/study area.
 - ii. Secondary data

Wood Group

- 1.2.2 After conducting an extended Phase 1 habitat survey, Wood Group (formerly Entec and Amec Foster Wheeler) considered that the terrestrial habitat within the site was suitable for great crested newt. However, ditches within Sizewell Marshes Site of Special Scientific Interest (in close proximity) were considered sub-optimal (as they were known to have stickleback populations), although it was considered there was still potential for great crested newts to be present.
- 1.2.3 Specific surveys using standard techniques for great crested newt were undertaken in 2007 and 2010. The detailed methodology, timings and results of these surveys are presented in the consolidated Wood Group great crested newt report (Ref. 2.8; see **Annex 14A5.3**).
- 1.2.4 Wood Group also reported in 2008 on the implications of the proposed development on natterjack toad (*Epidalea calamita*) (Ref. 2.9). This note is also included in British Energy PLC Natterjack Toad: The Implications of the New Nuclear Build on the Sizewell Estate (**Annex 14A5.3**).

Other secondary data

1.2.5 Since 2005, SWT (on behalf of EDF) have overseen a reintroduction project for natterjack toad at two ponds within Retsom's Field, to the north of Goose Hill. The results of this, including annual surveys of tadpoles and spawn string counts, are presented in the Sizewell Land Management Annual Reviews (Ref. 2.10, Ref. 2.11, Ref. 2.12, Ref. 2.13, Ref. 2.14, Ref. 2.15, Ref. 2.16, Ref. 2.17, Ref. 2.18, Ref. 2.19, Ref. 2.20, Ref. 2.21); and 2019 data (SWT, pers., comm.).



Natterjack toad was also reintroduced to the Royal Society for the Protection of Birds (RSPB) Minsmere Reserve in 1985.

- 1.2.6 In addition, the ES for the Galloper Wind Farm Eastern Super Grid Transformer Project (Ref. 2.22) was reviewed with regards to the survey work carried out for amphibians.
 - b) Results
 - i. Desk-study
- 1.2.7 No statutory or non-statutory designated site within 2km of the site have amphibians cited as a qualifying feature. Full details on the sites present, and their reasons for designation, are provided in **Appendix 14A2** Designated Sites.
- 1.2.8 The site (and wider study area) supports two United Kingdom (UK) amphibian species that have full legal protection and/or are of particular nature conservation concern (namely great crested newt and natterjack toad) and are thus considered for assessment in this appendix. The area also supports three more widespread species of amphibian, namely the smooth (common) newt (*Lissotriton vulgaris*), the common frog (*Rana temporaria*) and the common toad (*Bufo bufo*), which are considered for assessment in this appendix. Palmate newt (*L. helveticus*) is probably absent from Suffolk and has not previously been recorded within the site.
- 1.2.9 The desk-study revealed 62 records of amphibians within 2km of the site, with records dated from 1995 to 2017. Species recorded comprised common toad, natterjack toad, common newt, great crested newt and common frog; palmate newt was not recorded. The full results of the desk-study area presented in **Annex 14A5.2**.
- 1.2.10 There are single desk-study records for common frog and smooth newt within the EDF Energy Estate, and multiple records of common frog, common toad and smooth newt from the immediate surrounds to the north, west and south of the EDF Energy Estate. There is one natterjack toad desk-study result (see below) from RSPB Minsmere Reserve.
- 1.2.11 Suffolk is believed to be a stronghold for great crested newt, particularly in the north-east of the county, where there is a higher abundance of ponds (Ref. 2.23). The desk-study revealed no records for great crested newt within the site; however, two ponds within 500m of the site boundary were identified as supporting great crested newt. These were two ponds at Leiston Abbey located 270m and 300m from the site boundary (Ponds 4 and 2 respectively on Figure 14A5.1) with desk-study records from 1998. A further pond at Birchwood Farm, Theberton showed a positive desk-study record, but this was 510m from the site boundary, and outside the ZOI.



- 1.2.12 SWT, quoted in Wood Group (Ref. 2.24); see **Annex 14A5.3**, stated that great crested newt has never been observed by staff within the EDF Energy Estate despite a site presence of more than 20 years, and that opportunities within the EDF Energy Estate are considered sub-optimal. This is due to the sandy soil conditions that prevail, thereby reducing the opportunity for discrete ponds and pools to develop.
- 1.2.13 Natterjack toad desk-study records from the National Biodiversity Network database for Westleton (TM452692) (approximately 3.2km north of the site boundary and 4.5km from the Retsom's Field breeding pond), relate to reintroductions carried out by the RSPB in 1985; additional reintroductions were started at Mount Pleasant pools, Minsmere in 2005. There is a single desk-study record for natterjack toad at Vault Hill, RSPB Minsmere Reserve in 2005; however, this may be an erroneous location as this record is unknown to RSPB staff (RSPB, pers. comm.). The National Biodiversity Network database also revealed two historic records to the south-east of Leiston; for Aldringham (TM46T) in 1890 and at Coldfair Green (TM4361) in 1911.
- 1.2.14 Natterjack toad was formerly found in at least ten colonies in Suffolk, at sandy locations scattered along the east coast of the county and in some inland locations (Ref. 2.25). Eastern England, however, has seen the greatest declines in the numbers of this species, and the last natterjack toad colonies (excluding subsequent reintroductions) in Suffolk became extinct during the 1950s and 1960s.
- 1.2.15 According to the Suffolk BAP, current factors affecting the distribution of natterjack toad in Suffolk include: significant reduction in the area of formerly suitable habitat; loss of former breeding ponds; habitat fragmentation; and predation by rising levels of corvids.
- 1.2.16 A review of the Suffolk BAP and Suffolk's Priority Species and Habitats list identified great crested newt, as well as both common and natterjack toad, as priority species for conservation action in the county. Natterjack toad and great crested newt are protected under Schedule 5 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 which identifies them as species of principal importance for the purpose of conserving biodiversity in England.
 - ii. Secondary data

Wood Group

1.2.17 Great crested newt was not found in any of the waterbodies or ditches surveyed by Wood Group in 2007 or 2010. It was therefore concluded that great crested newt was not present within the site boundary. The location of waterbodies surveyed in are shown in **Figure 14A5.1** (Annex 14A5.1).



- 1.2.18 During the 2007 survey, small numbers of smooth newt were identified in Waterbodies A2 (at the south end of The Grove) and A8 (south-east of the woodland at Grimseys), with smooth or palmate newt eggs (it is not possible to distinguish between these two) also confirmed to be present at Waterbody A2.
- 1.2.19 During the 2010 survey, small numbers of smooth newt were identified in four waterbodies (Waterbodies A3, A11, A12 and A14). Smooth or palmate newt eggs were recorded in Waterbody A9 (north of Grimseys).
- 1.2.20 Although it is not possible to distinguish between palmate and smooth newt eggs, the newt eggs recorded during the surveys are most likely to be smooth newt, due to their confirmed presence here and the probable absence of palmate newt in Suffolk.

Other secondary data

- 1.2.21 The desk-study and consultation with local groups carried out as part of the Galloper Wind Farm Super Grid Transformer Project concluded that there were no records of great crested newt in the immediate area. Surveys in 2005 and 2010 revealed no evidence of the species in the immediate area, although it was noted that the wider area supports common species of amphibian, including smooth newt, common toad, and common frog.
- 1.2.22 A natterjack toad introduction programme based around two ponds commenced in 2005 (see **Figure 14A5.1**). Since 2007, one of these ponds (Pond N2) has not successfully held water. However, the other pond (Pond N1) remains viable for natterjack toad, which are successfully breeding at the site. Pond N1 is approximately 50m from the site boundary. A third pond in Retsom's Field, Pond N3, was dug in early-December 2015, approximately 250m east-north-east from the Pond N1, and the RSPB created a new pond (Pond N4) in 2018 to the north-east of Retsom's Field. Natterjack toads are known to hibernate in a rabbit warren in Retsom's Field (SWT, *pers. comm.*) that is within the site boundary.
- 1.2.23 **Table 1.1** summarises the data for peak natterjack toad tadpole counts, numbers of adults seen, number of spawn strings seen and number of emerging toadlets counted. Retsom's pond (N1) was described in 2014 as the only successful site for breeding natterjack toad in Suffolk (SWT, *pers. comm.*). 2016 also saw natterjack toad laying at Minsmere (SWT, *pers. comm.*).



Year	Estimated Natterjack Toad Tadpole Peak Counts.	Adults Seen.	Spawn Strings.	Toadlets
2006	-	One	-	-
2007	-	Males seen and heard.	Large number.	Some
2008	3,000	-	-	-
2009	3,000	-	16	A number.
2010	2,500	-	-	None known to have emerged.
2011	3,000	-	First strings in April. Second spawning in late July.	Toadlets emerged.
2012	5,000	-	In April. 4–6 strings in July (but no survival).	-
2013	5,000	Toads seen mating.	-	A good number.
2014	6–8,000 (more likely 10,000+).	-	11–13 in May.	200+ June/July.
2015	5,000+	-	First strings seen in May. Second brood of strings in July.	200+
2016	2,500–3,000.	2 adult couplings seen.	2	Minimum of 450.
2017	0	Single juvenile / small adult.	0	
2018	15,000 (conservative estimate).	Single	8 in May. 6 in June.	300–500
2019	10,000 thousand in May.	Four adults in pond 3 May.	7 in May 3 in July.	Several hundreds in May. A few hundred in July.

Table 1.1: Summary results for natterjack toad surveys (Pond N1).

1.2.24 The total natterjack toad adult population size can be estimated by counting spawn strings in breeding ponds. Spawn string numbers indicate the number of females; the total adult population is around double the spawn string number, since the number of males is usually the same as the number of females. Natterjack toad females usually produce one spawn string a year, between April and July, but may produce two, at the start and end of the season. It is, therefore, reasonable to assume spawn string counts in consecutive months are from different females, whereas those from the start and end of the breeding season (e.g. 2012) may be from the same female.



1.2.25 Using these assumptions, the SWT data **Table 1.1** can be used to estimate the Retsom's Field natterjack toad population size. There were 16, 13, 2, 14 and 10 spawn strings in 2009, 2014, 2016, 2018 and 2019 respectively, indicating a maximum population size of around 30 adult natterjack toads.

1.3 Field surveys – primary data

- a) Approach and methodology
- 1.3.1 In 2014, Arcadis Consulting (UK) Limited (formerly Hyder Consulting, and hereafter referred to as Arcadis) carried out surveys for amphibians in waterbody clusters that were located within 500m of the Sizewell C Project Associated Development site boundaries (including two proposed rail routes that passed though the main development site). 2014 survey results within 500m of the site boundary are discussed below.
- 1.3.2 In 2016, environmental DNA (eDNA¹) surveys in 2016 were carried out aimed at confirming the continued absence of great crested newt from the site.
 - b) Methods
 - i. 2014 pond surveys
- 1.3.3 Arcadis used standard great crested newt survey methodologies (including: calculating Habitat Suitability Index² for great crested newt (Ref. 2.26); and four or six survey visits using torchlight survey, bottle-trapping, egg search and netting), and estimate population size class (in accordance with Natural England's "Great Crested Newt Mitigation Guidelines" (Ref. 2.27)). Each pond was given a unique pond identification number. Figure 14A5.1 (Annex 14A5.1) shows ponds within 500m of the site boundary.
- 1.3.4 For those ponds found to contain great crested newt, populations were classified as "small" for maximum counts up to ten, "medium" for maximum counts between 11 and 100, and "large" for maximum counts over 100.
 - ii. eDNA surveys
- 1.3.5 In 2016, eDNA samples for great crested newt were taken from 14 ponds which had not been sampled in 2014, and pond descriptions (for Habitat Suitability Index) and photographs recorded. These were Ponds A3, A4, A6, A7, A8, A9, A10, A13, A14, 8, 17, 18, 98, and 99. Four ponds were not

¹ eDNA is a method for detecting genetic material (DNA) indicating the presence of great created newt in a waterbody.

² Habitat Suitability Index refers to the suitability of ponds for supporting great crested newt, a score of excellent indicates that the pond is suitable to support great crested newt.



surveyed because they were either dry (Pond A2, A5), no longer there (Pond A12), or unsafe to survey (Pond A1).

- 1.3.6 Sampling methodologies followed details in Biggs *et al.* (Ref. 2.28), and took place between 15 April and 30 June 2016, with samples collected by a licensed surveyor, as required by Natural England. Figure 14A5.1 (Annex 14A5.1) shows the locations of these ponds.
 - c) Results
 - i. 2014 pond surveys
- 1.3.7 For all of the pond clusters, where there was one pond in the cluster within 500m of the site boundary, scoped and surveyed in 2014, **Annex 14A5.4** presents the results of the Habitat Suitability Index assessment carried out for each pond, the full pond descriptions, and the full survey results.
- **1.3.8** Figure 14A5.1 (Annex 14A5.1) shows the locations of all ponds classified as follows:
 - ponds which were scoped out as requiring further surveys (e.g. no longer extant or dry at the time of survey);
 - ponds where access was not granted for scoping and surveying;
 - ponds where access was granted for scoping, but not for subsequent surveying;
 - ponds where great crested newt surveys were carried out; and
 - ponds that were found to contain great crested newt populations.
- 1.3.9 A total of 30 clusters of waterbodies were identified within 500m of the site boundary. Of these, there was no access granted for scoping or subsequent survey work at seven ponds (Ponds 6, 9, 10, 11, 17, 18 and 32 respectively), and one pond was scoped in but had no access for surveys (Pond 34). In addition, the desk-study record Pond 96 was not scoped or surveyed due to access issues. Ten ponds (Ponds 1, 7, 12, 13, 14, 15, 16, 31, 33 and 38) were scoped out of requiring further surveys, and further surveys for great crested newt were undertaken at 12 ponds (Ponds 2, 3, 4, 5, 8, 19, 30, 35, 54, 55, 56 and 57).
- 1.3.10 Great crested newts were found in four ponds (Ponds 2, 4, 5, and 30) within 500m of the site boundary, with evidence of breeding (from eggs) recorded in all four of these ponds. **Table 1.2** provides a summary of the 2014 survey results for ponds containing great crested newt.



1.3.11 In addition to the great crested newt survey results, the surveys also revealed small numbers of smooth and/or smooth/palmate newt³ in several ponds, see **Table 1.2** and **Annex 14A5.4**.

³ Indistinguishable at survey, but likely to be smooth newts, as palmate newts appear to be absent from Suffolk.

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Table 1.2: Summary results for Arcadis 2014 great crested newt surveys.

Pond	Desk-Study	Distance from Main	Survey Dates.	No. of	Gr	eat Crested New	wt:	Other
No.	Records.	Site Development Boundary (m).		Surveys.	Adults Present.	Eggs Present.	Max. No. Adults.	Amphibians Recorded ² .
2	Yes ¹	300	15/04/14 to 29/05/14.	6	Yes	Yes	1	Smooth
4	Yes	270	15/04/14 to 29/05/14.	6	Yes	Yes	44	Smooth, smooth/ palmate.
5	No	160	14/04/14 to 29/05/14.	6	Yes	Yes	8	Smooth/ palmate.
30	No	490	15/04/14 to 29/05/14.	6	Yes	Yes	12	Smooth, smooth/ palmate, frog tadpoles.

¹ The desk-study records reveal great crested newt in two ponds at Leiston Abbey; these are likely to be either Pond 2 or 3. ² Note that the few newts identified as 'palmate' newt were all female, and that distinguishing between female smooth and palmate newt can be difficult. It is assumed these are smooth newt.

1.3.12 No common toad or frog were found in any of the ponds surveyed in 2014.

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ii. eDNA Surveys

- 1.3.13 Great crested newt eDNA was not detected in any of the ponds sampled in 2016 (Ponds A3, A4, A6, A7, A8, A9, A10, A13, A14, 8, 17, 18, 98, and 99).
 Annex 14A5.4 presents the results of the Habitat Suitability Index assessment carried out for ponds surveyed in 2016.
- 1.4 Baseline conditions amphibian features and their importance

a) Introduction

- 1.4.1 This section describes the amphibian baseline and assigns an ecological value to the amphibian features 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 EcIA presented in **ES Volume 2, Chapter 14**.
- 1.4.2 In order to comply with both the CIEEM Guidelines for EcIA and with the standard EIA methodology used elsewhere within the ES, both methodologies have been used to assess the amphibians within the ZOI. Full details of both assessment methodologies are presented in Volume 1, Chapter 6 and Appendix 14A1 Introduction to the Ecological Baseline.
 - b) Description and assessment of ecological features
 - i. Feature: natterjack toad

Description

- 1.4.3 The natterjack toad population in Retsom's has increased by five-fold (based on numbers of tadpoles counted annually) since the 2005 introduction. The indicative population size is of around 30 adult natterjack toads. The closecropped, sheep-grazed turf of Retsom's field constitutes ideal terrestrial foraging habitat.
- 1.4.4 Studies have shown that, during the breeding season, natterjack toad move up to 500m between breeding sites and can move substantially further outside the breeding season (maximum overall distances ranged from 567m to 4,411m (Ref. 2.29)).
- 1.4.5 Natterjack toad is found at approximately 60 sites in Britain, and populations have declined significantly in the last century, due to habitat loss (Ref. 2.30). This species is confined to coastal sand dune systems, coastal grazing marshes and sandy heaths; notable populations exist on the sand dunes along the Merseyside coast, on the Scottish Solway, in coastal Cumbria, and used to be common on the Surrey and Hampshire heaths and also around the coast of East Anglia.



- 1.4.6 In Suffolk, the natterjack toad was formerly found in at least ten colonies, at sandy locations, scattered all down the east coast of the county, and in some inland locations. However, Eastern England has seen the greatest declines in the numbers of this species, and the last natterjack toad colonies in Suffolk (prior to the reintroduction programmes) became extinct during the 1950s and 1960s.
- 1.4.7 A review of the Suffolk BAP and Suffolk's Priority Species and Habitats list identified natterjack toad as a priority species for conservation action in the county. Natterjack toad is protected under Schedule 5 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

- 1.4.8 Given that the natterjack toad:
 - is legally protected (EPS);
 - is listed under Suffolk's Priority Species and Habitats list, and Section 41 of the NERC Act;
 - is a species found at relatively few sites across the whole of Britain, and has seriously declined (primarily due to habitat loss and fragmentation, and loss of breeding ponds) in the last 50 years;
 - has been reintroduced in 2005 to a pond approximately 250m from the current boundary of the site, where it has successfully bred;

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.
- ii. Feature: great crested newt

Description

1.4.9 Surveys of waterbodies within the site by Wood Group in 2007 and 2010 did not find great crested newt. The habitat conditions for great crested newt are sub-optimal across the site, as the sandy conditions that prevail reduce the opportunity for ponds and pools to develop. The presence of sticklebacks and coarse fish (such as pike, perch and rudd) in the ditches and other waterbodies surveyed by Wood Group further reduces the suitability of these habitats to support great crested newt.



- 1.4.10 Arcadis carried out surveys in 2014 and 2016, and this included waterbodies within 500m of the site. Great crested newt was not found within the site. From the 2014 Arcadis surveys, Ponds 2 and 4 at Leiston Abbey (also supported by desk-study records), and Pond 5 (to the north of Leiston Abbey), represent what is considered to be a "medium" sized meta-population⁴, as defined by English Nature. The nearest of these ponds (Pond 5) is approximately 160m from the site boundary (see **Figure 14A5.1**, **Annex 14A5.1**). Pond 30 (to the north-west of Leiston) is a separate "medium" sized meta-population. This pond is located approximately 490m from the site boundary (see **Figure 14A5.1**).
- 1.4.11 Although desk-study records revealed no records of great crested newt within the site boundary, this species has been recorded within the wider landscape, both to the north and west of the survey area (see Figure 14A5.1, Annex 14A5.1). Desk-study records indicated great crested newt at Pond 96 but this pond was not scoped or surveyed due to access issues. Ponds 9, 10 and 11 were nearby but were not surveyed due to access restrictions. Pond 9 is on the site boundary and Pond 96 is approximately 500m from the site boundary, close to the proposed accommodation campus site. The western edge of the site is, therefore, the only location where great crested newt has been recorded within the ZOI.
- 1.4.12 Great crested newt is widespread but patchily distributed throughout much of England and Wales; the national status is of concern due to loss of ponds, lack of pond management, loss of terrestrial habitat and habitat fragmentation (Ref. 2.31). Suffolk (along with Cheshire) boasts the highest density of ponds in England and is considered to be a stronghold for the great crested newt, particularly in the north-east of the county (which covers the EDF Energy Estate). Analysis of 900 of Suffolk's 22,000 estimated ponds between 2004 to 2007 (Ref. 2.32) revealed that, whilst over 14% of the ponds surveyed contained great crested newt, large and thriving populations were only recorded at a small number of ponds (sunny, well-vegetated ponds with good surrounding habitat), and the majority of Suffolk's ponds were found to be unsuitable for newts (due to heavy shade and organic matter, and/or the presence of predatory fish or damagingly high duck populations).
- 1.4.13 A review of the Suffolk BAP and Suffolk's Priority Species and Habitats list identified great crested newt as a priority species for conservation action in the county. Great crested newt is protected under Schedule 5 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.

⁴ Great crested newts often exist in meta-populations, a group of associated populations which breed in and live around a cluster of ponds. This means that populations within separate ponds can migrate between ponds when pond conditions fluctuate and therefore ensure stability within the overall population.



Assessment

- 1.4.14 Given that the great crested newt:
 - is legally protected (EPS);
 - is listed under Suffolk's Priority Species and Habitats list, and Section 41 of the NERC Act;
 - is widespread but patchily distributed with populations of conservation concern in the UK, and has a population stronghold in Suffolk; and
 - has not been found breeding in ponds within the site, and the habitat is sub-optimal (although there are populations approximately 160m to the west of the site boundary);

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

- an IEF at the local level under the CIEEM guidelines (owing to their legal protection rather than their status); and
- of very low importance following the EIA-specific assessment methodology.
- 1.4.15 Great crested newt has been scoped out of the detailed assessment process as no significant effects are expected, due to their likely absence from the site.
 - iii. Feature: other amphibians

Description

- 1.4.16 Surveys in 2007, 2010 and 2014 revealed relatively small numbers of smooth newt and newt eggs, in several of the waterbodies across the site. Small numbers of smooth newt were also found scattered across the site under refugia during reptile surveys in 2015 (Ref. 2.33).
- 1.4.17 No common toad or frog were found in any of the ponds surveyed in 2014 by Arcadis, and none were reported in the Wood Group surveys in 2007 and 2010. Small numbers of common toad were found under refugia during Arcadis reptile surveys in 2015 in the scrub habitat in Goose Hill.
- 1.4.18 The desk-study revealed records of common toad, frog and smooth newt from waterbodies within 2km of the site boundary.
- 1.4.19 Smooth newt, common toad and common frog are widely distributed across Suffolk. The conditions for all newt within the EDF Energy Estate are supoptimal, due to the sandy conditions and the presence of sticklebacks and coarse fish in the ditches and other waterbodies.



1.4.20 The four widespread species of amphibians (smooth (common) and palmate newt, common frog and common toad) are protected only by Section 9(5) of the Wildlife and Countryside Act, which prohibits 'sale, barter, exchange, transporting for sale and advertising to sell or to buy'. However, common toad is listed under Suffolk's Priority Species and Habitats list and Section 41 of the NERC Act.

Assessment

- 1.4.21 Given that the common toad:
 - has limited legal protection;
 - is listed under Suffolk's Priority Species and Habitats list (Section 41 of the NERC Act);
 - is found in relatively small numbers in terrestrial habitats and from desk-study records across the site;

then the population of this species located within the ZOI would:

- not be an IEF under the CIEEM guidelines; and
- be of very low importance following the EIA-specific assessment methodology.
- 1.4.22 Given that the smooth newt:
 - has limited legal protection;
 - is found in relatively small numbers in several of the waterbodies, and in terrestrial habitats, across the site, and that the habitat is considered sub-optimal;

then the population of this species located within the ZOI would:

- not be an IEF under the CIEEM guidelines; and
- be of low importance following the EIA-specific assessment methodology.
- 1.4.23 Given that the common frog:
 - has limited legal protection;
 - is found in relatively small numbers in terrestrial habitats and from desk-study records across the site;

then the population of this species located within the ZOI would:



- not be an IEF under the CIEEM guidelines; and
- be of low importance following the EIA-specific assessment methodology.
- c) Summary of ecological features/receptors
- 1.4.24 Following a review of the known baseline within the ZOI, **Table 1.3** lists the ecological features/receptors and identifies which will be carried forward into the detailed assessment. Those carried forward are IEFs of sufficient conservation value and that will be sufficiently affected by the proposed development to be a material consideration in the planning determination.

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Table 1.3: Ecological features taken forward for detailed assessment.

Feature/ Receptor.	Importance (CIEEM/ EIA Methodology).	Justification	Scope In/Out.
Natterjack toad.	National/High.	This species is found at relatively few sites across the whole of Britain, and has seriously declined (primarily due to habitat loss and fragmentation, and loss of breeding ponds) in the last 50 years. Natterjack toad was reintroduced in 2005 to a pond approximately 50m from the site boundary, where this species has successfully bred. There is, therefore, the potential for impacts on this species. Natterjack toad is protected under Schedule 5 of the Wildlife and Countryside Act, Schedule 2 of the	Scoped in.
		Conservation of Habitats and Species Regulations, and are listed under Section 41 of the NERC Act. Natterjack toad has therefore been scoped into the detailed assessment.	
Great crested newt.	Local/Very Low.	Great crested newt is a priority species for conservation action in the county, is protected under Schedule 5 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.	Scoped out.
		Great crested newt has not been found breeding in ponds within the site, and the habitat is sub-optimal; however, there are populations approximately 160m to the west of the site boundary. For this reason, great crested newt is considered an IEF owing primarily to their legal protection rather than their conservation status on site; this species is included as an IEF but has been scoped out of the detailed assessment. Appropriate mitigation that should be employed to safeguard great crested newt have been detailed within the ES.	
Common toad.	Local/Very Low.	This species is found in relatively small numbers in terrestrial habitats across the site. Common toad has therefore been scoped out of the detailed assessment.	Scoped out.
Common frog.	Local/Low.	This species is found in relatively small numbers in terrestrial habitats across the site. Common frog has therefore been scoped out of the detailed assessment.	Scoped out.
Smooth newt.	Local/Low.	This species is found in relatively small numbers in several of the waterbodies, and in terrestrial habitats, across the site, but the habitat is sub-optimal. Smooth newt has therefore been scoped out of the detailed assessment.	Scoped out.

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SIZEWELL C DEVELOPMENT – MAIN DEVELOPMENT SITE: VOLUME 2, CHAPTER 14:

APPENDIX 14A5 – AMPHIBIANS

Documents included within this Appendix are as follows:

ANNEX 14A5.1 FIGURES (provided separately)

ANNEX 14A5.2 DESK STUDY

ANNEX 14A5.3 SECONDARY DATA

- Annex 14A5.3 Great Crested Newt Consolidated Report
- Annex 14A5.3 Sizewell Great Crested Newt Report 2007
- Annex 14A5.3 Natterjack Toad Technical Note 2008

ANNEX 14A5.4 PRIMARY DATA



VOLUME 2, CHAPTER 14: APPENDIX 14A5 – AMPHIBIANS: ANNEX 14A5.2 DESK-STUDY

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Contents

1.	Desk-study Results for Amphibians	1
Referen	ICES	9

Tables

Table 1.1: Desk-study results for amphibians	2
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Plates

None provided.

Figures

None provided.

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1. Desk-study Results for Amphibians

- 1.1.1 Records for amphibians 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"). Records collected by the Suffolk Amphibian and Reptile Group and Suffolk Wildlife Trust (SWT) are provided to SBIS.
- 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 whether or not amphibians are cited as interest features.
- 1.1.3 The Suffolk Biodiversity Action Plan (BAP) (1.1), Suffolk's Priority Species and Habitats list (1.2), and the habitats and species of principal importance included on the Section 41 list of the Natural Environment and Communities (NERC) Act (1.3), were also reviewed with reference to any amphibians 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 amphibians.



Table 1.1: Desk-study results for amphibians.

Species	Location	Site Detail	Grid Reference	Longitude	Latitude	Year	Abundance	Pond survey number (see Figure 14A5.1) – where relevant
Common toad (<i>Bufo bufo</i>)	Aldringham-cum- Thorpe	B1122 Leiston Road	TM446606	1.578972857	52.18888981	2012	-	-
Common toad	Eastbridge	Chapel Road	TM451661	1.590255332	52.2380236	2011	-	-
Common toad	Leiston	Lane behind 50 King George's Avenue	TM450625	1.586186985	52.20576255	2010	-	-
Common toad	Theberton	Potters Street	TM446652	1.582295737	52.23016952	2010	-	-
Common toad	Leiston	Lime Tree Avenue, Leiston	TM441621	1.572752769	52.20257223	2010	-	-
Common toad	Leiston	Wood Farm, Westward Ho	TM437631	1.56763011	52.21172317	2011	-	-
Common toad	Aldringham-cum- Thorpe	B1122	TM446607	1.579045008	52.1897872	2011	-	-
Common toad	Leiston	IP16 4EY	TM444627	1.577567387	52.20782366	2010	-	-
Common toad	North Warren	-	TM462603	1.602116172	52.1854859	2009	1 count	-
Common toad	Knodishall	Aldeburgh Cottage, Leiston Road, Knodishall	TM439614	1.569327725	52.19637896	2008	-	-
Common toad	Westleton	The Studio, Blythburgh Road, Westleton	TM442664	1.577316652	52.24111563	2008	-	-

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Species	Location	Site Detail	Grid Reference	Longitude	Latitude	Year	Abundance	Pond survey number (see Figure 14A5.1) – where relevant
Common toad	Minsmere B. R.	Minsmere Scrape and beach	TM4766	1.617953808	52.23627726	2003	-	-
Common toad	Aldringham-cum- Thorpe	-	TM4460	1.569780401	52.18377115	2002	-	-
Common toad	Theberton	Moat Farm	TM432652	1.561835055	52.23078948	1999	3 counts of adult; 30 counts of juvenile	-
Common toad	Leiston	Pond behind Highbury Cottages	TM432629	1.560182059	52.21014922	1999	100 counts of males	-
Common toad	Aldringham Common and Walks / Thorpeness Golf Course	The Walks	TM470612	1.6144514	52.1932045	1999	1 count of adult	-
Common toad	Aldringham Common and Walks / Thorpeness Golf Course	-	TM468613	1.611603837	52.19419139	1998	1 count of adult	-
Common toad	Aldringham Common and Walks / Thorpeness Golf Course	-	TM463604	1.603648761	52.18633863	1998	-	-

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Species	Location	Site Detail	Grid Reference	Longitude	Latitude	Year	Abundance	Pond survey number (see Figure 14A5.1) – where relevant
Natterjack toad (<i>Epidalea</i> <i>calamita</i>)	Minsmere B. R.	Compartment 3,4, and 104	TM460672	1.604211132	52.24749319	2005	-	-
Common frog (<i>Rana</i> <i>temporaria</i>)	Minsmere B. R.	Minsmere RSPB	TM4722366855	1.621838505	52.24384945	2017	-	-
Common frog	Sizewell	Kenton Hills, Sizewell	TM458640	1.598961037	52.21886694	2012	-	-
Common frog	Leiston	50 King Georges Avenue	TM450625	1.586186985	52.20576255	2010	-	-
Common frog	Leiston	High Street, Leiston	TM446622	1.580127732	52.20324802	2010	-	-
Common frog	Aldringham-cum- Thorpe	B1122	TM446606	1.578972857	52.18888981	2011	-	-
Common frog	Leiston	Wood Farm, Westward Ho	TM437631	1.56763011	52.21172317	2011	-	-
Common frog	Leiston	21 Eastward Ho	TM447624	1.581732788	52.20499841	2011	-	-
Common frog	Eastbridge	NE end of Eastbridge	TM451661	1.590255332	52.2380236	2011	-	-
Common frog	Theberton	Potters Street	TM446652	1.582295737	52.23016952	2010	-	-
Common frog	Knodishall	Aldeburgh Cottage, Leiston Road, Knodishall	TM439614	1.569327725	52.19637896	2008	-	-
Common frog	Leiston	Leiston, Leiston Carr end of Kenton Woods	TM456642	1.596184074	52.22075086	2005	-	-
Common frog	Leiston	Leiston 31 Quakers Way	TM450621	1.585897661	52.20217303	2004	-	-

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Species	Location	Site Detail	Grid Reference	Longitude	Latitude	Year	Abundance	Pond survey number (see Figure 14A5.1) – where relevant
Common frog	Leiston	Leiston 1 Central Road	TM445623	1.578739342	52.20418977	2004	-	-
Common frog	Minsmere B. R.	Compartment 74 site 1 on Drakes 1987 survey	TM460663	1.603555988	52.23941698	2003	-	-
Common frog	Minsmere B. R.	Minsmere Island Mere	TM4666	1.603337675	52.2367249	2003	-	-
Common frog	North Warren	Alexander Wood	TM462605	1.602261392	52.18728063	2002	-	-
Common frog	Aldringham-cum- Thorpe	-	TM4460	1.569780401	52.18377115	2002	-	-
Common frog	Aldringham Common and Walks / Thorpeness Golf Course	The Walks	TM470612	1.6144514	52.1932045	1999	1 count of adult	-
Common frog	Leiston	Pond behind Highbury Cottages	TM432629	1.560182059	52.21014922	1999	1 count of female; 8 counts of males	-
Common frog	Theberton	Moat Farm	TM432652	1.561835055	52.23078948	1999	1 count of adult	-
Common frog	Leiston	-	TM440636	1.572373087	52.2160774	1998	-	-
Common frog	Aldringham Common and Walks / Thorpeness Golf Course	Pond	TM463604	1.603648761	52.18633863	1998	-	-

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Species	Location	Site Detail	Grid Reference	Longitude	Latitude	Year	Abundance	Pond survey number (see Figure 14A5.1) – where relevant
Common frog	Aldringham Common and Walks / Thorpeness Golf Course	Aldringham Walks	TM460608	1.599559044	52.19006197	1997	Present	-
Common frog	Leiston	Pond at Leiston Primary School	TM4562	1.585825339	52.20127565	1995	several counts of adults	-
Smooth newt (<i>Lissotriton</i> <i>vulgaris</i>)	Thorpeness	Ness House	TM476613	1.623285504	52.19383281	2011	-	-
Smooth newt	Sizewell	Ivy Cottages	TM472619	1.617882395	52.19939634	2011	-	-
Smooth newt	Minsmere B. R.	Minsmere: Compt 58: The Sluice (Centroid)	TM477661	1.628258139	52.23686017	2009	-	-
Smooth newt	Aldringham Common and Walks / Thorpeness Golf Course	-	TM463607	1.603866697	52.18903073	2002	-	-
Smooth newt	Aldringham-cum- Thorpe	-	TM4460	1.569780401	52.18377115	2002	-	-
Smooth newt	Theberton	Moat Farm	TM432652	1.561835055	52.23078948	1999	20 counts of adults	-

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Species	Location	Site Detail	Grid Reference	Longitude	Latitude	Year	Abundance	Pond survey number (see Figure 14A5.1) – where relevant
Smooth newt	Leiston	Pond behind Highbury Cottages	TM432629	1.560182059	52.21014922	1999	1 count of male	-
Smooth newt	Aldringham Common and Walks / Thorpeness Golf Course	The Walks	TM470612	1.6144514	52.1932045	1999	1 count of adult	-
Smooth newt	Leiston	Former Abbey Farm (Abbey Grounds)	TM445643	1.580183789	52.22213748	1998	-	-
Smooth newt	Minsmere B. R.	Minsmere Scott's Hall	TM4667	1.604065517	52.24569848	1995	-	-
Smooth newt	Minsmere B. R.	-	TM465673	1.611593968	52.24816686	1995	10 counts of adults	-
Great crested newt (<i>Triturus</i> <i>cristatus</i>)	Leiston	-	TM436630	1.56609729	52.21086998	2011	-	No obvious pond on OS map
Great crested newt	Leiston	Wood Farm, Westward Ho	TM437631	1.56763011	52.21172317	2011	-	Pond 36
Great crested newt	Theberton	Theberton, Birchwood farm	TM447652	1.583757186	52.23012511	2007	-	Pond 96
Great crested newt	Theberton	Theberton Wood	TM43226507	1.562033864	52.22961403	2000	18 counts of adults	Moat House; 1km north of Pond 53

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Species	3	Location	Site Detail	Grid Reference	Longitude	Latitude	Year	Abundance	Pond survey number (see Figure 14A5.1) – where relevant
Great newt	crested	Theberton Wood	Theberton Wood	TM432651	1.561763144	52.22989208	2000	-	Moat House; 1km north of Pond 53
Great newt	crested	Theberton	Moat Farm	TM432652	1.561835055	52.23078948	1999	15 counts of adults	Moat House; 1km north of Pond 53
Great newt	crested	Leiston	Former Abbey Farm (Abbey Grounds)	TM445643	1.580183789	52.22213748	1998	-	Pond 4
Great newt	crested	Leiston	Abbey Fish Pond	TM445642	1.580111531	52.2212401	1998	-	Pond 2/3

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ANNEX 14A5.3 SECONDARY DATA

- Annex 14A5.3 Great Crested Newt Consolidated Report
- Annex 14A5.3 Sizewell Great Crested Newt Report 2007
- Annex 14A5.3 Natterjack Toad Technical Note 2008



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

Draft Great Crested Newt Survey Report 2007-2010

June 2012

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Contents

1.	Introd	luction	1							
	1.1	Purpose of this Report	1							
	1.2	Survey Area and Scope	1							
2.	Metho	ods	2							
	2.1	Desk Study	2							
	2.2	Field Survey	2							
	2.2.1	Screening	2							
	2.2.2	Presence/Absence Survey	2							
	2.3	Personnel	3							
3.	Resul	ts	4							
	3.1	Desk Study	4							
	3.2	Screening	4							
	3.3	Presence/Absence Survey	8							
4.	Summ	nary	9							
5.	Refere	ences	10							
	Table 3.1	Descriptions of water bodies and results of screening	5							
	Figures	After Page 10								
	Appendix A Full Survey Results									



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 great crested newt (*Triturus cristatus*) (GCN) 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

Aerial photographs and the relevant OS base map were used to identify discrete water bodies within the study area, which comprised all areas within 750m of the proposed (2007/2010) preliminary works areas/access road.

Previous surveys undertaken by various organisations, such as the Suffolk Wildlife Trust (SWT), the Environment Agency, and those commissioned by Magnox in association with the decommissioning of the existing nuclear facility, were also included within the desk study.

2.2 Field Survey

2.2.1 Screening

All of the water bodies identified during the desk study were visited to determine if they still existed and if they were likely to support great crested newts. In addition to discrete water bodies, a very large number of, often interconnected ditches criss-cross the study area. Logistically, and form the point of view of safe access, it would have been impossible to survey every one. A sample of the water bodies considered most suitable to support great crested newt were therefore selected for further screening.

Key features that were used to screen out water bodies from further surveys included:

- Receiving discharge of pollutants at excessive levels or containing anoxic waters;
- Insufficient aquatic vegetation or other material that could be used for egg laying;
- Extreme levels of fish activity (e.g. an intensively managed fishing lake) or waterfowl activity (where the number of waterfowl present exceeds 10 per 1000m² [Oldham et al., 2000]);
- Links to fast flowing streams, or the presence of an extreme management regime; and
- The lack of suitable connecting features e.g. mature hedgerows, ditches or woodland between the water body and the site that newts could follow, or a significant barrier to movement between the water body and the development area.

2.2.2 Presence/Absence Survey

Presence/absence surveys were undertaken at ten water bodies in 2007 and eight in 2010. The latter sample included some of those surveyed previously and some that had not previously been identified through the desk study but were discovered during field work in the interim. Each water body was visited four times within the optimum survey period, following best practice



guidance (English Nature, 2001), i.e., between mid-March and mid-June. During each survey at least three methods of surveying where employed. These were:

- Bottle-trapping bottle traps made from two-litre polyethylene bottles were secured to the substrate using a bamboo cane attached through two holes within the plastic bottle. The traps were set at regular intervals around accessible areas of the water body margins. Upon installation, each bottle trap included an air bubble to prevent newts suffocating. The traps were set each evening between 1930 and 2130 hours and retrieved between 0600 and 0800 hours the following morning;
- Torch-light surveying (using an adequately powerful torch); and
- Egg search marginal aquatic macrophytes were inspected for the presence of great crested newt eggs.

Sweep netting is an additional method that can be used to investigate the presence of newts in a water body. However, it was considered that the above survey methods would be more effective and less destructive than sweep netting given the nature of the water bodies on site and the importance of the aquatic plant communities within them.

2.3 Personnel

All 2007 surveys were carried out by Emma Toovey (Natural England GCN Licence No. 20070675). The 2010 surveys were carried out by Dyfrig Hubble (Natural England GCN Licence No. 20103750), Katheryn Leggat (Natural England GCN Licence No. 20103457) and John Baker (Natural England GCN Licence No. 201020101376).



3. Results

3.1 Desk Study

Surveys for aquatic invertebrates conducted by Bioscan at Sizewell Belts in 1991 did not record great crested newts at any life stage, although the method used would not conform to current guidelines for GCN survey. Cresswells conducted limited great crested newt surveys (following English Nature guidelines) as part of their decommissioning work for Sizewell A. This included the survey of a ditch at the eastern edge of the Sizewell Marshes SSSI. No great crested newts were recorded.

In addition, as part of work completed relating to the Sizewell Wents Substation located at TM468626, a single-visit survey for great crested newt was carried out by SWT in May-June 2005. No evidence of great crested newts was identified and most water bodies, with the exception of one pond, were considered to be sub-optimal. The pond providing suitable great crested newt habitat was located south of Sizewell Gap Road and east of Home Farm. Following this, as part of an Environment Appraisal¹ of underground cable route options for the Greater Gabbard wind farm, two ponds to the south of Sizewell Gap road, and a network of drains to the north of woodland in the Sizewell Marshes SSSI, were therefore surveyed for the presence of great crested newts in April-June 2006. The surveys met with best practice guidelines, and did not detect great crested newt presence in any of the water bodies.

The mapping exercise identified 12 discrete water bodies and a very large and extensive ditch system comprising more than 50 interlinked ditches within the study area.

3.2 Screening

Due to the presence of a main road (Lover's Lane and Abbey Road), cutting across the southwestern corner of the study area, four water bodies and a small isolated, ditch network were scoped out of further assessment as the road will act as a barrier for the migration of great crested newts into the affected areas.

The most suitable water bodies within 250m of the preliminary works areas/access road then underwent further screening as outlined below. The locations of the water bodies that were screened in for survey are shown in Figure 3.1. Table 3.1 provides a brief description of each water body and the reasoning behind the screening decision in each case.

¹ Undertaken by AMEC E&I UK; formerly Entec UK.



Table 3.1 Descriptions of water bodies and results of screening

Water body No.	Description	Screening decision
WB1 (Pond)	This water body is essentially a large area of reed bed with some patches of open water (total area ~50m x ~50m and a depth of ~3m). A number of ditches are connected to this water body and flow continuously. The water body margins are heavily vegetated with common reed (<i>Phragmites australis</i>). Waterfowl occur frequently within these habitats.	Screened in: The margins of the water body area are considered to be suitable due to well vegetated banks and margins. However, waterfowl are present in abundance (as defined above), and fish were observed during the surveys thereby reducing the potential of the water body to support newts.
WB2 (Ditch)	WB2 is located on the northern boundary of the BE landholding and forms part of the extensive network of ditches that extends across the entire area. The ditch is bordered by marshy grassland to the east and deciduous woodland to the west. The ditch is approximately 3-5 wide and a depth ~75cm. The ditch is heavily shaded (>80%) by over-hanging trees resulting in a build up of leaf litter. Invertebrate species number and diversity appeared to be high during the survey visit. Aquatic vegetation is limited. A low flow was also noted during the initial survey visit.	Screened in: The terrestrial and aquatic habitats are considered suitable to support GCN however, the potential for saline conditions and the frequent occurrence of waterfowl and low numbers of sticklebacks observed at this location reduces the value of this water-body for GCNs.
WB3 (Pond and ditches)	WB3 is an artificial water body created for the benefit of waterfowl. The water body is approximately 40m x 30m, with shallow margins of 30cm and a deeper centre (~1m). The water body is connected to WB4 by a ditch. The terrestrial habitats surrounding the water body include wet/marshy grassland. Aquatic vegetation mainly consists of emergents, including a predominance of common reed. Due to the proximity of these water bodies to the coast, there is some potential for the water to be saline to some degree 2^{-3} The presence of whorled	Screened in: The terrestrial and aquatic habitats are considered suitable to support GCN however, the potential for saline conditions and the frequent occurrence of waterfowl at this location reduces the value of this feature for GCNs.
	water-milfoil (<i>Myriophyllum verticillatum</i>) in some of the ditches within the locality indicates some potential for brackish waters. ⁴	

 $^{^2}$ Similar pools and ditches ~100m inland from the sea at Walberswick, along the coast from Sizewell are known to be brackish as a result of seawater seepage through the shingle, sea spray and the breaching of shingle banks at very high tide (CEFAS, (2006).

³ The *Suffolk Coast Maritime Natural Area Profile* (English Nature (now Natural England), 1997) notes that "Dyke systems within grazing marshes, some of which are mediaeval in origin, have a range of water salinities from fresh to brackish. They support a range of plant communities, from those with submerged and floating plants to those filled with tall emergents such as reed. Scarce plants such as whorled water-milfoil *Myriophyllum verticillatum* and soft hornwort *Ceratophyllum submersum* can often be found, particularly where nutrient levels are low and there is a brackish influence. The invertebrate interest of dykes is often significant. Species diversity can be high, especially amongst groups such as water beetles."

⁴ High levels of salinity would generally preclude the presence of GCNs although they can tolerate brackish waters to some degree.



Water body No.	Description	Screening decision
WB4 (Pond)	As with WB3, WB4 is an artificial water body created for its value to waterfowl. The water body is approximately 100m by 20m, with shallow margins of 30cm and reaching a central depth of more than 1m. The margins are dominated by common reed. Terrestrial habitats are the same as noted above.	Screened in: The terrestrial and aquatic habitats are considered suitable to support GCN however, the potential for saline conditions and the frequent occurrence of waterfowl at this location reduces the value of this feature for GCNs.
	There is some potential for the water within this water body to be saline to some degree. (Refer to footnotes above with regard to salinity).	
WB5 (Ditch)	WB5 separates an area of wet/marshy grassland from plantation coniferous woodland habitats. The ditch is approximately 2-4m wide with a depth ~1m. The ditch is heavily shaded by trees and scrub (>90%) with limited macrophyte cover (<10%). Species diversity and numbers for invertebrates was observed to be generally high during the visit. Large numbers of fish, primarily sticklebacks and small numbers of pike and eel, were observed during the survey visits. A smooth flow ⁵ was also observed.	Screened in: The habitats were considered suitable to support this species in the more sheltered margins, however, the potential for saline conditions and the frequent occurrence of fish and waterfowl at this location reduces the value for GCNs.
WB6 (Ditch)	WB6 is approximately 2-4m wide with a depth ~1m. The sides of the ditch are steep and comprise bare earth with some patches of dense common reed and yellow flag iris (<i>Iris pseudocorus</i>). The ditch is heavily shaded by scrub and trees resulting in limited aquatic vegetation and a build up of leaf litter. There is a smooth flow. A variety of invertebrate species were noted in high numbers as well as the presence of large numbers of fish.	Screened in: The habitats were considered suitable to support GCN in the more sheltered margins, however, following two initial surveys (see results below) large numbers of stickleback were captured and as such, the water body was screened out from further assessment. Furthermore, a strong flow was also noted at times.
WB7 (Ditch)	WB7 is approximately 2-4m wide with a depth ~1m. The ditch separates an area of reed bed (TN1) and some pasture and rank grassland. The sides of the ditch are steep and are heavily vegetated with common reed. The ditch is shaded by scrub and trees resulting in limited aquatic vegetation and a build up of leaf litter. There is smooth flow. A variety of aquatic invertebrate species during the visit.	Screened in: The sheltered margins of the ditch were considered to have potential to support GCNs. Following two initial surveys (see results below) during which large numbers of stickleback were captured, the water body was screened out from further assessment. Furthermore, a smooth flow was also noted at times.
WB8 (Ditch)	WB8 connects into WB7 and then into the wider ditch network. The ditch is approximately 2-4m wide with a varying depth (~1m). This area is very heavily shaded by trees and shrub and in areas (~95%) where this vegetation extends into the ditch there is a build up of trapped aquatic vegetation. A smooth flow occurs in the shallow and narrow sections of this ditch. There is generally limited vegetation other than patches of common reed and yellow iris.	Screened in: The habitats were considered suitable to support this species in the more sheltered margins, however, following two initial surveys (see results below) large numbers of stickleback were captured and as such, the water body was screened out from further assessment. Furthermore, a strong flow was also noted at times.
WB9 (Ditch)	WB9 comprises a network work of interconnecting ditches separated by marshy grassland habitats, seasonally grazed by cattle. The width of the ditch network varies from 2-5m with depths ~1m. The ditches are heavily vegetated with aquatic, emergent and bank-side vegetation. Fish were observed during the initial survey work.	Screened in: The terrestrial and aquatic habitats are considered to be suitable to support GCNs, although the presence of a flow within the network and an abundance of fish (sticklebacks primarily) reduces the likely value of the area to GCN.

 $[\]frac{1}{5}$ As defined by the Environment Agency's *River Habitat Survey Manual* (2003).



Water body No.	Description	Screening decision
WB10 (Ditch)	WB10 runs parallel with the sea and is located within marshy grassland habitats. The ditch is approximately 3-5m wide and has a depth ~1m. The margins of the ditch on both sides have a think covering of common reed and a number of rush species (<i>Juncus</i> spp.) with the side of the water course dropping off steeply resulting in little to no submerged aquatic vegetation. There is a smooth flow and there is some potential for the water to be saline to some degree.	Screened in : The habitats were considered suitable to support GCN in the more sheltered margins, however, following some initial surveys (see results below) large numbers of stickleback were captured and as such, the water body was screened out from further assessment. Furthermore, due to the location of the dich close to the sea, the water here is likely to be saline to some degree.
WB11 (Pond)	WB11 is oval in shape and approximately 10m x 7m, with a depth <50cm. The substrate consists mostly of thick leaf litter. The pond is heavily chocked with algae, which became very thick and covered most of the pond by the last survey visit. During periods of heavy rain the water level rises in both the pond and a ditch line, which subsequently connects the pond to ditches in the Sizewell belts. There is scrub along most sections of this water body and a path running along the southern bank. Sticklebacks were observed in low numbers within this pond.	Screened in: The terrestrial and aquatic habitats are considered to be suitable to support GCNs, although the presence of fish and absence of areas of open water reduces the likely value of the area to GCN.
WB12 (Pond)	WB12 is an artificial water body created for the control of forest fires. The water body is square in shape and approximately $5m \times 5m$. The pond has not been maintained and has become chocked with leaf litter and algae. The terrestrial habitats surrounding the water body include rough grassland and coniferous plantation woodland.	Screened in: The terrestrial and aquatic habitats are considered to be suitable to support GCNs, although the absence of areas of deep open water reduces the likely value of the area to GCN.
WB13 (Pond)	WB13 is a small pond (approximately 2m x 3m) located within a patch of dense rhododendron growth. The pond is heavily shaded with no aquatic vegetation. The pond forms part of a ditch system that flows into the wetland grazing marsh. The terrestrial habitats surrounding the water body comprise of dense rhododendron with rough grassland and coniferous plantation woodland within close proximity.	Screened in: The terrestrial and aquatic habitats are considered to have some potential to support GCNs, although the absence of aquatic vegetation and heavy shading reduces the likely value of the area to GCN.
WB14 (Pond)	WB14 is very similar to WB12, an artificial water body created for the control of forest fires. The water body is square in shape and approximately 5m x 5m. The pond has not been maintained and has become chocked with leaf litter and algae. The terrestrial habitats surrounding the water body include an access track, bramble scrub and coniferous plantation woodland.	Screened in: The terrestrial and aquatic habitats are considered to be suitable to support GCNs, although the absence of areas of deep open water reduces the likely value of the area to GCN.



3.3 Presence/Absence Survey

The full survey findings are provided in Tables A1-A8 in Appendix A and are summarised below.

Presence/absence surveys were undertaken at ten water bodies in 2007 (water bodies 1-10) and eight in 2010 (water bodies 2, 3, 5, 9 and 11-14). No great crested newts were found in any of the surveyed water bodies in either year.

During the 2007 survey small numbers of smooth newts (*Lissotriton vulgaris*) were identified in water body 2 (a maximum count of 4 adult newts on one evening) and water body 8 (single male smooth newt was identified on one visit). Smooth or palmate (*Lissotriton helveticus*) newt eggs⁶ (likely to be smooth due to their confirmed presence here) were confirmed to be present at water body 2 only.

During the 2010 survey small numbers of smooth newts were identified in water body 11 (male smooth newt was identified on one visit), water body 12 (a maximum count on one evening of 2), water body 14 (a maximum count on one evening of 10) and water body 3 (female smooth newt was identified on one visit). Smooth or palmate newt eggs (likely to be smooth due to their confirmed presence here) were confirmed to be present at water body 9 only.

⁶ It was not possible to establish which species these were from.



4. Summary

All water bodies within the expected zone of influence of new build proposals at Sizewell were screened for their potential to support great crested newts. Presence/absence surveys were carried out at any water body that was considered suitable for newts following screening, with ten water-bodies surveyed in 2007 and eight in 2010. Each water body was visited four times within the optimum survey period, during which at least three methods of surveying where employed. These methods included bottle-trapping, torch-light surveying and egg-searching. All of the surveys were undertaken by suitably experienced and licensed surveyors.

No great crested newts were found in any of the surveyed water bodies in 2007 or 2010. Small numbers of smooth newts and smooth/palmate eggs were identified in some of the water bodies.



5. References

CEFAS (2006). Radiological Habits Survey: Sizewell. CEFAS, Lowestoft.

English Nature (2001). *Great Crested Newt Mitigation Guidelines*. English Nature, Peterborough.

Oldham, R.S. et al. (2000). Evaluating the suitability of habitat for the great crested newt (*Triturus cristatus*). *Herpetological Journal* 10; 143-155.





Appendix A Full Survey Results

Key: M = male, F = female, SN = smooth newt.

Table A1Survey results 10/5/2007

	Survey condi	tions	Survey method					
Water body	Precipitation	Turbidity	Air temp.	Water temp.	рН	Torching	Trapping	Egg search
WB1	None	1	14ºC	12ºC	pH 6-7	0	0	0
WB2		2			pH 6-7	0	4M &2F (SN)	5 (SN)
WB3		1			pH 6-7	0	0	0
WB4		1			pH 6-7	0	0	0
WB5		1			pH 6-7	0	0	0
WB6		1			pH 6-7	0	0	0
WB7		1			pH 6-7	0	0	0
WB8		1			pH 6-7	0	0	0
WB9		1			pH 6-7	0	0	0
WB10		1			pH 6-7	0	0	0

Table A2Survey results 16/5/2007

	Survey condi	Survey method						
Water body	Precipitation	Turbidity	Air temp.	Water temp.	рН	Torching	Trapping	Egg search
WB1	None	1	13ºC	15ºC	pH 6-7	0	0	0
WB2		3			pH 6-7	0	4M (SN)	3 (SN)
WB3		1			pH 6-7	0	0	0
WB4		1			pH 6-7	0	0	0
WB5		1			pH 6-7	0	0	0
WB6		1			pH 6-7	0	0	0
WB7		1			pH 6-7	0	0	0
WB8		1			pH 6-7	1M (SN)	0	0
WB9		1			pH 6-7	0	0	0
WB10		1			pH 6-7	0	0	0



	Survey condi	tions	Survey method					
Water body	Precipitation	Turbidity	Air temp.	Water temp.	рН	Torching	Trapping	Egg search
WB1	Intermittent	2	15ºC	14ºC	pH 6-7	0	0	0
WB2	-	3			pH 6-7	0	1M (SN)	0
WB3		2			pH 6-7	0	0	0
WB4		2			pH 6-7	0	0	0
WB5		2			pH 6-7	0	0	0
WB6		no visit			no visit	no visit	no visit	no visit
WB7		no visit			no visit	no visit	no visit	no visit
WB8		2			pH 6-7	0	0	0
WB9		2			pH 6-7	0	0	0
WB10		2			pH 6-7	0	0	0

Table A3Survey results 30/5/2007

Table A4Survey results 4/6/2007

	Survey condi	tions	Survey method					
Water body	Precipitation	Turbidity	Air temp.	Water temp.	рН	Torching	Trapping	Egg search
WB1	None	1	11ºC	14ºC	pH 6-7	0	0	0
WB2		3			pH 6-7	0	0	0
WB3		1			pH 6-7	0	0	0
WB4		1			pH 6-7	0	0	0
WB5		1			pH 6-7	0	0	0
WB6		no visit			no visit	no visit	no visit	no visit
WB7		no visit			no visit	no visit	no visit	no visit
WB8		1			pH 6-7	0	0	0
WB9		1			pH 6-7	0	0	0
WB10		1			pH 6-7	0	0	0



	Survey condi	Survey conditions						Survey method		
Water body	Precipitation	Turbidity	Air temp.	Water temp.	рН	Torching	Trapping	Egg search		
WB11	None	1	8ºC	12ºC	pH 6-7	0	0	0		
WB12		2			pH 6-7	1M SN	0	0		
WB13		3			pH 6-7	0	0	0		
WB14		2			pH 6-7	1M & 2F SN	0	0		
WB9		2			pH 6-7	0	0	1 SN		
WB5		1			pH 6-7	0	1M SN	0		
WB3		1			pH 6-7	0	1F SN	0		
WB2		1			pH 6-7	0	0	0		

Table A5Survey results 08/04/2010

Table A6Survey results 26/4/2010

	Survey condi	tions	Survey method					
Water body	Precipitation	Turbidity	Air temp.	Water temp.	рН	Torching	Trapping	Egg search
WB11	None	1	10ºC	12ºC	pH 6-7	0	0	0
WB12		2			pH 6-7	2M SN	0	0
WB13		3			pH 6-7	0	0	0
WB14		2			pH 6-7	2M & 8F SN	0	0
WB9		1			pH 6-7	0	0	0
WB5		1			pH 6-7	0	0	0
WB3		1			pH 6-7	0	0	0
WB2		1			pH 6-7	0	0	0



	Survey condi	tions	Survey method					
Water body	Precipitation	Turbidity	Air temp.	Water temp.	рН	Torching	Trapping	Egg search
WB11	None	1	7ºC	13ºC	pH 6-7	1M SN	0	0
WB12		2			pH 6-7	1M SN	0	0
WB13		3			pH 6-7	0	0	0
WB14		2			pH 6-7	3M & 2F SN	0	0
WB9		1			pH 6-7	0	0	1 SN
WB5		1			pH 6-7	0	0	0
WB3		1			pH 6-7	0	0	0
WB2		1			pH 6-7	0	0	0

Table A7Survey results 05/5/2010

Table A8Survey results 20/05/2010

	Survey conditions				Survey method			
Water body	Precipitation	Turbidity	Air temp.	Water temp.	рН	Torching	Trapping	Egg search
WB11	None	1	11ºC	13ºC	pH 6-7	0	0	0
WB12		2			pH 6-7	0	0	0
WB13		3			pH 6-7	0	0	0
WB14		2			pH 6-7	2M SN	0	0
WB9		1			pH 6-7	0	0	0
WB5		1			pH 6-7	0	0	0
WB3		1			pH 6-7	0	0	0
WB2		1			pH 6-7	0	0	0

British Energy Group PLC Sizewell Great Crested Newt Survey Report 2007

1. Introduction

1.1 Background to Development

British Energy (BE) is at the early stages of investigating the feasibility of building new nuclear power stations at a range of sites within their UK land holding. Sizewell has been identified as one potential site for investigation and likely progression to EIA. An area of land directly north of the Sizewell 'A' and 'B' Power Stations has been identified as having potential to accommodate nuclear new build. The proposed power station footprint, a further area that has been identified as having the potential to accommodate construction compounds and the route of the indicative access road are collectively referred to in this document as the 'preliminary works area.' The preliminary works area, shown on **Figure 1.1**, covers a total of 0.67km²/67ha.

In March 2007 an extended Phase 1 habitat survey was conducted of the preliminary works area and the surrounding land up to 750m beyond the site boundary (Entec report reference 19081cr036).

There are few discrete pools within the preliminary works area, but the extensive ditch system (and associated open linked waterbodies) associated with the Sizewell Marshes, and adjacent to the site, does have some potential to support great crested newts. The ditches were not systematically surveyed for newts as part of the EIA for the decommissioning work for Sizewell 'A' and there has been no historical survey or sampling programme commissioned by BE. The indications are that due to a combination of factors (predominantly the presence of a wide variety of fish, the year round presence of water birds, the variable rate of flow and the salinity of some of the ditches) the ditches are sub-optimal for newts. Nevertheless, great-crested newts do occur within the wider area, having been recorded in pools to the west of the British Energy Estate (at Abbey Farm and Lady Chapel) in the late 1990s. These pools are approximately 2.5km west of the proposed new build area and more than 900m from the indicative location of the proposed access road.

Alan Miller (Suffolk Wildlife Trust, pers comm.) noted that great crested newts had not been observed within the estate in more than 20 years by estate staff and opportunities within the estate were considered sub-optimal due the sandy and peaty soil conditions that prevail, thereby reducing the opportunity for discrete ponds and pools to develop.

It was considered that further work was required to determine the status of great crested newts (*Triturus cristatus*) in relation to the proposed development site and, it follows, to enable appropriate mitigation and compensation for the species to be incorporated within the scheme design should they be present.

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1.2 Legislation

1.2.1 Great Crested Newt

The great crested newt has suffered major declines in population size across its entire range in Europe (from France in the west, to the Urals in the east) over the past 100 years due to the loss and fragmentation of suitable breeding and terrestrial habitats. Despite this, the UK still has some of the largest populations of this species in the world, although the status of some of these populations is under threat. Due to the long term decline that the European population has undergone, and the rarity of the species across much of its range, great crested newts are fully protected under UK and European legislation.

The Wildlife and Countryside Act 1981 transposes into UK law the Convention on the Conservation of European Wildlife and Natural Habitats (commonly referred to as the 'Bern Convention'). The great crested newt is listed on Schedule 5 of the 1981 Act, and is therefore subject to all the Sections of Section 9. In 2000 the Countryside and Rights of Way (CRoW) Act 2000 received Royal Assent and, via Schedule 12 of the Act, it extends the protection that great crested newts are afforded by Section 9 of the Wildlife and Countryside Act 1981. Therefore under the amended Wildlife and Countryside Act 1981 it is an offence to:

- Intentionally kill, injure or take a great crested newt [Section 9(1)];
- Possess or control any live or dead specimen or anything derived from a great crested newt [Section 9(2)];
- Intentionally or recklessly damage, destroy or obstruct access to any structure or place used for shelter or protection by a great crested newt [Section 9(4)(a)]; and
- Intentionally or recklessly disturb a great crested newt while it is occupying a structure or place which it uses for that purpose [Section 9(4)(b)].

The *Conservation (Natural Habitats &c.) Regulations* 1994 (the Habitats Regulations) as amended (2007) transpose into UK law Council Directive 92/43/EEC of 21st May 1992 on the Conservation of Natural Habitats and of Wild Fauna and Flora (often referred to as the 'Habitats [and Species] Directive.'). Great crested newt is listed on Annex II and Annex IV of the Directive. Annex II relates to the designation of Special Areas of Conservation (SACs) for this species. Even where great crested newts occur outside SACs their inclusion on Annex II serves to underline their conservation significance.

Inclusion on Annex IV (as a 'European protected species') means that member states are required to put in place a system of strict protection as outlined in Article 12, and this is done through inclusion on Schedule 2 of the *Conservation (Natural Habitats &c.) Regulations 1994 (as amended, 2007).* Regulation 39 makes it an offence to:

- Deliberately capture or kill a great crested newt [Regulation 39(1)(a)];
- Deliberately disturb a great crested newt [Regulation 39(1)(b)];
- Deliberately take or destroy the eggs of a great crested newt [Regulation 39(1)(c)]; and
- Damage or destroy a breeding site or resting place of a great crested newt [Regulation 39(1)(d)].

The legislation applies to all life stages of great crested newts.

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Natural England can issue licences for great crested newts 'in respect of development' to permit otherwise unlawful activities (identified above) to take place. Typically a licence will be required if great crested newts are present on site or have been recorded using breeding habitat within $500m^1$, and the development activity is likely to result in an offence being committed.

1.2.2 Smooth and Palmate Newt

Both smooth (*Triturus vulgaris*) and palmate (*Triturus helveticus*) newt are also protected under the Wildlife and Countryside Act 1981 (as amended), but they are only protected under Section 9(5) of the Act. This prohibits the sale, barter, exchange, transporting for sale and advertising to sell or buy of each of these species.

1.3 Purpose of Survey Work

The implication of this legislation is that proposed developments need to take account of potential effects on great crested newts. In areas where suitable habitat exists, and in the absence of contemporary baseline data existing for the species (that is directly relevant to a proposed development site), survey work is necessary to establish whether great crested newts are likely to be present and to estimate the size of the local population. This enables mitigation, translocation, habitat enhancement and creation initiatives to be planned and incorporated into the design of the development concerned, and ensures that there is no significant negative effect on the conservation status of the species at local level. Given the presence of water bodies at Sizewell, and the lack of contemporary baseline data, survey work was therefore undertaken.

2. Method

2.1 Desk Study

A considerable amount of baseline ecological work has been conducted on the Sizewell Estate during the past twenty-five years. This has been carried out by a range of organisations including ecological consultants (commissioned directly or indirectly by Nuclear Electric and latterly British Energy), the Suffolk Wildlife Trust, the Environment Agency, academic institutions, individuals and special interest groups. The volume of this work is considerable. In addition there is data available from survey work commissioned by Magnox in association with the decommissioning of the existing nuclear facility and species records are held by the Suffolk Biological Records Centre (SBRC).

In addition to the data collected during the desk study, aerial photographs, and the relevant OS basemap were used to identify waterbodies within the preliminary works area and up to 750m from this boundary. For most sites, waterbodies are only considered in relation to developments within 500m of a site boundary. Due to the potential for design changes to occur, however, a wider search area was considered to ensure that if the site boundary changed slightly no areas of potentially suitable newt habitat would fall within 500m of the development footprint.

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¹ English Nature. 2001. Great Crested Newt Mitigation Handbook. English Nature. Peterborough.

2.2 Field Surveys

2.2.1 Screening

All the water bodies identified during the desk study were visited to determine if they still existed and if they were likely to support great crested newts. Key features that were used to screen out water bodies from further surveys included:

- Receiving discharge of pollutants at excessive levels or containing anoxic waters;
- Insufficient aquatic vegetation or other material that could be used for egg laying;
- Extreme levels of fish activity (e.g. an intensively managed fishing lake) or waterfowl activity (where the number of waterfowl present exceeds 10 per 1000m2 [Oldham *et al* 2000]);
- Links to fast flowing streams, or the presence of an extreme management regime; and
- The lack of suitable connecting features e.g. mature hedgerows, ditches or woodland between the water body and the site that newts could follow, or a significant barrier to movement between the water body and the development area.

2.2.2 Presence/Absence

Presence/absence surveys were carried out at any water body that was considered suitable for newts following screening. Each water body was visited four times within the optimum survey period², during which at least three methods of surveying where employed. These were:

- <u>Bottle-trapping</u> bottle traps made from two-litre polyethylene type bottles were secured to the substrate using a bamboo cane attached through two holes within the plastic bottle. The traps were set at regular intervals around accessible areas of the water body margins. Upon installation, each bottle trap included an air bubble to prevent newts suffocating. The traps were set each evening between 1930 and 2130 hours and retrieved between 0600 and 0800 hours the following morning.
- <u>Torch-light surveying</u> (using an adequately powerful torch) and
- <u>Egg search</u> marginal aquatic macrophytes were inspected for the presence of great crested newt eggs.

Sweep netting is an additional method that can be used to investigate the presence of newts in a water body. However, it was considered that the above survey methods would be more effective and less destructive than sweep netting given the nature of the water bodies on site and the importance of the aquatic plant communities within them.

2.3 Personnel

All surveys were carried out by Entec Ecologists Emma Toovey (Natural England Licence No. 20070675), and Dyfrig Hubble (working as an accredited agent under Emma Toovey).

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² Between mid-March and mid-June (as per the Great Crested Newt Mitigation Guidelines [English Nature, 2001])

2.4 Constraints

Due to the extensive system of water bodies present across the study area it was not possible to include every waterbody within the scope of the survey. A screening process, as outlined below was adopted to scope out many of the waterbodies from further survey work. Ten water bodies (one of which included two additional linked ditches (WB3)) within the Sizewell Marshes were then surveyed for great-crested newts. All are within 250m of the proposed new build area, temporary works area and/or access road. The water bodies selected for survey were those that appeared most suitable for newts, having a good ratio of aquatic vegetation to open water and a low flow in and out. Given the sub-optimal conditions for newts that occur across Sizewell Marshes this was considered an appropriate sampling strategy to investigate presence or absence.

Some of the banks of the waterbodies on site were heavily vegetated and as such, full access to the entire shoreline was not always possible.

3. Results

3.1 Desk Study

Great-crested newts (*Triturus cristatus*) have been recorded in pools to the west of the British Energy Estate at Abbey Farm and Lady Chapel. SBRC holds records for two pools in this area, both from 1998. This is approximately 2.5km west of the proposed new build area and 900m from the indicative location of the proposed access road. Surveys for aquatic invertebrates conducted by Bioscan at Sizewell Belts in 1991 did not record great crested newts at any life stage. The method used would not conform to current guidelines. Cresswells conducted limited great crested newt surveys (following English Nature guidelines) as part of their decommissioning work for Sizewell A. This included the survey of a ditch at the eastern edge of the Sizewell Marshes SSSI. No great crested newts were recorded.

In addition, as part of work completed relating to the Sizewell Wents Substation located XXX, a single-visit survey for great crested newt was carried out by SWT in May-June 2005. No evidence of great crested newts was identified and most water bodies, with the exception of one pond, were considered to be sub-optimal. The pond providing suitable great crested newt habitat was located south of Sizewell Gap Road and east of Home Farm. Following this, as part of an Environment Appraisal³ of underground cable route options for the Greater Gabbard wind farm two ponds to the south of Sizewell Gap road, and a network of drains to the north of woodland in the Sizewell Marshes SSSI, were therefore surveyed for the presence of great crested newts in April-June 2006. The surveys met with best practice guidelines, and did not detect great crested newt presence in any of the water bodies.

The mapping exercise identified 12 discrete water bodies and a very large and extensive ditch system comprising more than 50 interlinked ditches within the 750m study area.

Due to the presence of a main road (Lover's Lane and Abbey Road), cutting across the southwestern corner of the study area, 4 waterbodies and a small isolated, ditch network have been scoped out of further assessment as the road will act as a barrier for the migration of great crested newts into the affected areas.

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³ Undertaken by Entec UK Ltd

3.2 Screening

All waterbodies within 750m of the preliminary works areas/access road were screened for their potential to support great crested newts. The desk study, as outlined above, scoped some of these water bodies. The most suitable waterbodies within 250m of the preliminary works areas/access road then underwent further screening as outlined below. The locations of these waterbodies that were screened are illustrated in **Figure 3.1** Table 3.1 below provides a brief description of each water body and outline the reasoning behind the screening decision in each case. Photographs of each water body are contained in **Appendix A**.

Water body Number	Description	Distance from preliminary works area boundary	Screening Decision
WB1 (Pond)	This waterbody is essentially a large area of reed bed with some patches of open water (total area ~50m x ~50m and a depth of ~3m). A number of ditches are connected to this waterbody and flow continuously. The water body margins are heavily vegetated with common reed (<i>Phragmites australis</i>). Waterfowl occur frequently within these habitats	~110m west of the site	Screened in : The margins of the water body area are considered to be suitable due to well vegetated banks and margins. However, waterfowl are present in abundance (as defined above), and fish were observed during the surveys thereby reducing the potential of the water body to support newts.
WB2 (Ditch)	WB2 is located on the northern boundary of the BE landholding and forms part of the extensive network of ditches that extends across the entire area. The ditch is bordered by marshy grassland to the east and deciduous woodland to the west. The ditch is approximately 3-5 wide and a depth ~75cm. The ditch is heavily shaded (>80%) by over-hanging trees resulting in a build up of leaf litter. Invertebrate species number and diversity appeared to be high during the survey visit. Aquatic vegetation is limited. A low flow was also noted during the initial survey visit.	270m north of the temporary works area.	Screened in: This ditch is considered to provide suitable aquatic and terrestrial habitat that could support GCNs although the likely fish populations present and the presence of a flow within the ditch limit its value for this species.

Table 3.1 Descriptions of Water Bodies and Results of Screening

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Water body Number	Description	Distance from preliminary works area boundary	Screening Decision	
WB3 (Pond and ditches)	WB3 is an artificial water body created for the benefit of waterfowl. The water body is approximately 40m x 30m, with shallow margins of 30cm and a deeper centre (~1m). The water body is connected to WB4 by a ditch. The terrestrial habitats surrounding the water body include wet/marshy grassland. Aquatic vegetation mainly consists of emergents including a predominance of common reed.	~348m northwest of the site.	Screened in: The terrestrial and aquatic habitats are considered suitable to support GCN however, the potential for saline conditions and the frequent occurrence of waterfowl at this location reduces the value of this feature for GCNs.	
	Due to the proximity of these waterbodies to the coast, there is some potential for the water to be saline to some degree. ^{4 5} The presence of whorled water-milfoil (<i>Myriophyllum</i> <i>verticillatum</i>) in some of the ditches within the locality indicates some potential for brackish waters. ⁶			
WB4 (Pond)	As with WB3, WB4 is an artificial waterbody created for its value to waterfowl. The water body is approximately 100m by 20m, with shallow margins of 30cm and reaching a central depth of more than 1m. The margins are dominated by common reed. Terrestrial habitats are the same as noted above.	~320m north of the preliminary works area	Screened in: The terrestrial and aquatic habitats are considered suitable to support GCN however, the potential for saline conditions and the frequent occurrence of waterfowl at this location reduces the value of this feature for GCNs.,	
	There is some potential for the water within this waterbody to be saline to some degree. (Refer to footnotes above with regard to salinity).			

Table 3.1 (continued) Descriptions of Water Bodies and Results of Screening

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⁴ Similar pools and ditches ~100m inland from the sea at Walberswick, along the coast from Sizewell are known to be brackish as a result of seawater seepage through the shingle, sea spray and the breaching of shingle banks at very high tide (CEFAS (2006) *Radiological Habits Survey*: Sizewell, CEFAS, Lowestoft)

⁵ The *Suffolk Coast Maritime Natural Area Profile* (English Nature (now Natural England), 1997) notes that "Dyke systems within grazing marshes, some of which are mediaeval in origin, have a range of water salinities from fresh to brackish. They support a range of plant communities, from those with submerged and floating plants to those filled with tall emergents such as reed. Scarce plants such as whorled water-milfoil *Myriophyllum verticillatum* and soft hornwort *Ceratophyllum submersum* can often be found, particularly where nutrient levels are low and there is a brackish influence. The invertebrate interest of dykes is often significant. Species diversity can be high, especially amongst groups such as water beetles."

⁶ High levels of salinity would generally preclude the presence of GCNs although they can tolerate brackish waters to some degree.

Water body Number	Description	Distance from preliminary works area boundary	Screening Decision
WB5	WB5 separates an area of wet/marshy	250m east of the	Screened in: The habitats were
(Ditch)	grassiand from plantation coniterous woodland habitats. The ditch is approximately 2-4m wide with a depth ~1m. The ditch is heavily shaded by trees and scrub (>90%) with limited macrophyte cover (<10%). Species diversity and numbers for invertebrates was observed to be generally high during the visit. Large numbers of fish, primarily sticklebacks, were observed during the initial survey visit. A smooth flow ⁷ was also observed.	preliminary works area.	considered suitable to support this species in the more sheltered margins, however, following some initial surveys (see results below) large numbers of stickleback were captured and as such, the waterbody was screened out from further assessment. Furthermore, a strong flow was also noted at times.
WB6	WB6 is approximately 2-4m wide with a	150m west of	Screened in: The habitats were
(Ditch)	steep and comprise bare earth with some patches of dense common reed	works area	the more sheltered margins, however, following two initial surveys (see results
	and yellow flag iris (<i>Iris pseudocorus</i>). The ditch is heavily shaded by scrub and trees resulting in limited aquatic		below) large numbers of stickleback were captured and as such, the waterbody was screened out from
	vegetation and a build up of leaf litter. There is a smooth flow. A variety of invertebrate species were noted in high numbers as well as the presence of large numbers of fish.		further assessment. Furthermore, a strong flow was also noted at times.
WB7	WB7 is approximately 2-4m wide with a depth. 1m. The ditch separates an area	20m west of the	Screened in: The sheltered margins of
(Ditch)	of reed bed (TN1) and some pasture and rank grassland. The sides of the ditch are steep and are heavily vegetated with common reed. The ditch is shaded by scrub and trees resulting in limited aquatic vegetation and a build up of leaf litter. There is smooth flow. A variety of aquatic invertebrate species during the visit.	works area	potential to support GCNs. Following two initial surveys (see results below) during which large numbers of stickleback were captured, the waterbody was screened out from further assessment. Furthermore, a smooth flow was also noted at times.
WB8	WB8 connects into WB7 and then into the wider ditch network. The ditch is	50m west of the	Screened in: The habitats were
(Ditch)	approximately 2-4m wide with a varying depth (~1m). This area is very heavily shaded by trees and shrub and in areas (~95%) where this vegetation extends into the ditch there is a build up of trapped aquatic vegetation. A smooth flow occurs in the shallow and narrow sections of this ditch. There is generally limited vegetation other than patches of common reed and yellow iris.	works area	species in the more sheltered margins, however, following two initial surveys (see results below) large numbers of stickleback were captured and as such, the waterbody was screened out from further assessment. Furthermore, a strong flow was also noted at times.

Table 3.1 (continued) **Descriptions of Water Bodies and Results of Screening**

⁷ As defined by the Environment Agency's *River Habitat Survey Manual* (2003).

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Water body Number	Description	Distance from preliminary works area boundary	Screening Decision
WB9 (Ditch)	WB9 comprises a network work of interconnecting ditches separated by marshy grassland habitats, seasonally grazed by cattle. The width of the ditch network varies from 2-5m with depths ~1m. The ditches are heavily vegetated with aquatic, emergent and bankside vegetation. Fish were observed during the initial survey work	250m west of the preliminary works area	Screened in: The terrestrial and aquatic habitats are considered to be suitable to support GCNs although the presence of a flow within the network and an abundance of fish (sticklebacks primarily) reduces the likely value of the area to GCN.
WB10 (Ditch)	WB10 runs parallel with the sea and is located within marshy grassland habitats. The ditch is approximately 3- 5m wide and has a depth ~1m. The margins of the ditch on both sides have a think covering of common reed and a number of rush species (<i>Juncus</i> spp.) with the side of the water course dropping off steeply resulting in little to no submerged aquatic vegetation. There is a smooth flow and there is some potential for the water to be saline to some degree.	200m north of the preliminary works area	Screened in: The habitats were considered suitable to support GCN in the more sheltered margins, however, following some initial surveys (see results below) large numbers of stickleback were captured and as such, the waterbody was screened out from further assessment. Furthermore, due to the location of the ditch close to the sea, the water here is likely to be saline to some degree.

able 3.1 (continued)	Descriptions of Water Bodies and Results of Screening
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3.2.1 Water Bodies within the Wider Landscape

The network of ditches present within the study area extends along the coastline to the north and south. Wetland habitats are commonplace within the locality due to the high water table.

3.3 Presence/Absence

The full survey findings are included within Tables B.1 to B.4, Appendix B and have been summarised below.

No great crested newts were found in any of the surveyed water bodies.

Small numbers of smooth newts were identified in waterbody 2 (a maximum count of 4 adult newts on one evening) and waterbody 8 (single male smooth newt was identified on one visit). Smooth or palmate newt eggs⁸ (likely to be smooth due to their confirmed presence here) were confirmed to be present at water body 2 only.

4. Conclusions

No evidence of great crested newts was found within the study area or in the immediate surrounding area, although low numbers of smooth newts where found during the survey.

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⁸ It was not possible to establish which species these were from.



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Smooth newts are more common and widespread throughout the UK in comparison to GCNs, whose distribution is more patchy.

Whilst great crested newts have been recorded to the north (2.5km) of the preliminary works area and west of the access road (900m), conditions for GCNs (and smooth newts to a certain extent, hence the very low numbers observed) are considered to be sub-optimal across the entire study area (within 750m of the affected areas). The presence of sticklebacks in all of the water bodies surveyed and the presence of course fish including pike (predatory fish species) reduces the suitability of these habitats to support newts. The ditch network is often subject to smooth flows or greater and some of the waterbodies are likely to experience varying levels of salinity due to their proximity to the sea, thereby further reducing the value of these areas for great crested newts.

The survey results indicate the likely absence of great crested newts within 250m of the preliminary works area/temporary works area/access road. Bearing in mind the nature of the water bodies within 750m of these affected areas, anecdotal evidence from site managers, the known geology of the estate and the presence of infrastructure to the west of the study area (roads are located between historic records of GCN to the west and the build areas/access road) it is concluded that great crested newts are also likely to be absent from water bodies within 500m of the indicated affected areas and as such, need not be considered a constraint to the proposed development.

Without survey information for all water bodies within the study area it is not possible to conclude the likely absence of great crested newts and as such, it may still be necessary to assume great crested newts are present on site and to implement appropriate mitigation. This could include obtaining a great crested newt development licence from Natural England and using newt exclusion fencing along parts of or the entire site boundary to prevent newts accessing the site during development. Pitfall trapping may also be required to clear the site of newts before construction can begin. The mitigation requirements for the site (in the absence of surveys) would need to be determined in consultation with Natural England. Any mitigation or licensing recommendation will also need to take account of the amendments to the Habitat Regulations, which came into force on the 21st August 2007.

The survey results are likely to remain valid for up to two years (if conditions remain broadly similar). After this time, it is advisable that the area is resurveyed for newts.

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6 August 2008

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Appendix A Water body photographs




Plate 1: WB1



Plate 2: WB2



Plate 3: WB3



Plate 4: WB4



Plate 5: WB5



Plate 6: WB6



Plate 7: WB7



Plate 8: WB8





Plate 9: WB9



Plate 4: WB10

Appendix B Amphibian Survey Results



KEY: M = Male, F = Female, SN = Smooth newt

	Survey Condi	Survey Method						
Water body	Precipitation	Turbidity	Air Temp	Water Temp	рН	Torching	Trapping	Egg search
WB1	None	1	14ºC	12ºC	pH 6-7	0	0	0
WB2		2			pH 6-7	0	4M &2F (SN)	5 (SN)
WB3		1			pH 6-7	0	0	0
WB4		1			pH 6-7	0	0	0
WB5		1			pH 6-7	0	0	0
WB6		1			pH 6-7	0	0	0
WB7		1			pH 6-7	0	0	0
WB8		1			pH 6-7	0	0	0
WB9		1			pH 6-7	0	0	0
WB10		1			pH 6-7	0	0	0

Table B.1 Amphibian Survey Results 10/5/2007

Table B.2 Amphibian Survey Results 16/5/2007

	Survey Condi	Survey Method						
Water body	Precipitation	Turbidity	Air Temp	Water Temp	рН	Torching	Trapping	Egg search
WB1	None	1	13ºC	15⁰C	pH 6-7	0	0	0
WB2		3			pH 6-7	0	4M (SN)	3 (SN)
WB3		1			pH 6-7	0	0	0
WB4		1			pH 6-7	0	0	0
WB5		1			pH 6-7	0	0	0
WB6		1			pH 6-7	0	0	0
WB7		1			pH 6-7	0	0	0
WB8		1			pH 6-7	1M (SN)	0	0
WB9		1			pH 6-7	0	0	0
WB10		1			pH 6-7	0	0	0

	Survey Cond	Survey Method						
Water body	Precipitation	Turbidity	Air Temp	Water Temp	рН	Torching	Trapping	Egg search
WB1		2	15ºC	14ºC	pH 6-7	0	0	0
WB2	drizzle	3		pH 6-7	0	1M (SN)	0	
WB3		2			pH 6-7	0	0	0
WB4		2			pH 6-7	0	0	0
WB5		2			pH 6-7	0	0	0
WB6		no visit			no visit	no visit	no visit	no visit
WB7		no visit			no visit	no visit	no visit	no visit
WB8		2			pH 6-7	0	0	0
WB9		2			pH 6-7	0	0	0
WB10		2			pH 6-7	0	0	0

Table B.3 Amphibian Survey Results 30/5/2007

Table B.4 Amphibian Survey Results 4/6/2007

	Survey Condi	Survey Method						
Water body	Precipitation	Turbidity	Air Temp	Water Temp	рН	Torching	Trapping	Egg search
WB1	None	1	11ºC	14ºC	pH 6-7	0	0	0
WB2		3			pH 6-7	0	0	0
WB3		1			pH 6-7	0	0	0
WB4		1			pH 6-7	0	0	0
WB5		1			pH 6-7	0	0	0
WB6		no visit			no visit	no visit	no visit	no visit
WB7		no visit			no visit	no visit	no visit	no visit
WB8		1			pH 6-7	0	0	0
WB9		1			pH 6-7	0	0	0
WB10		1			pH 6-7	0	0	0

British Energy PLC Natterjack Toad: The Implications of New Nuclear Build on the Sizewell Estate.

1. Background to the Development

British Energy (BE) is currently investigating the feasibility of building new nuclear power stations at a range of sites within their UK land holding. Sizewell has been identified as one potential site for investigation and likely progression through an Environmental Impact Assessment (EIA).

An area of land directly north of the Sizewell 'A' and 'B' Power Stations has been identified as having potential to accommodate nuclear new build. This area, which covers 0.316km²/31.6ha and has an approximate central grid reference of TM473640, is referred to in this document as 'the preliminary works area.' A boundary, including an indicative access road and construction compound (accounting for a potential further 0.336km²/33.6ha of land take) is shown in **Figure 1.1**. It should be noted that this initial development footprint is purely indicative, as we are at a relatively early stage in the design process.

Natterjack toad was introduced to the BE land holding in 2004 following the creation of 2 ponds in Retsom's Field¹ towards the north-eastern edge of the land holding. Following further reintroductions in subsequent years, a breeding population has become established. It is therefore necessary to understand the legislative implications of this population with regard to proposed new build.

1.1 Preliminary Works Area Description and Context

In March 2007 an extended Phase 1 habitat survey was conducted of the preliminary works area and a perimeter area of 750m (Entec report reference 19081cr036). This survey identified and mapped the extent of habitats and other features of conservation interest, whilst also highlighting the presence/potential presence of legally protected or otherwise notable species. The field survey was informed by an initial desktop study in which existing data regarding the potential development area was collated.

The preliminary works area can be divided into 3 zones: the proposed power station site, the proposed access road, and the indicative location of the construction compounds.

The Proposed Power Station

The eastern boundary of the proposed power station area comprises bare shingle and heavily disturbed, poorly developed dune grassland. To the west of this is a bank of improved grassland and scattered scrub. Further inland, habitats are dominated by improved grazed pasture with

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¹ Retsoms Field has been partially restored to a mixture of heathland acid grassland (through a range of management measures that have included sulphuring and the spreading of heather litter) by the Suffolk Wildlife Trust, in conjunction with British Energy.

two small belts of semi-natural broad-leaved woodland. In the southwest of the proposed power station area is land previously associated with the construction zone of Sizewell 'B'. In this area the dune habitats have been replaced by semi-improved tussocky grassland, with planted scrub.

The Proposed Access Road

The proposed access road follows the route of an existing permissive path along the northern edge of Kenton Hills and continues east through Dunwich Forest and Goose Hills to the proposed power station. Much of the route of the proposed access track is through coniferous and mixed woodland. The route of the access road also passes over and adjacent to a number of channels that form part of the Sizewell Belts ditch system, to the south of Dunwich Forest. At the most easterly point of the proposed route, the access road passes over a small area of semi-improved grassland that forms part of the Sizewell Marshes Site of Special Scientific Interest (SSSI) (see below), before reaching the location of the proposed power station.

The Proposed Construction Compounds

The majority of the area allocated for construction compounds is situated to the north of the proposed access road and is composed of arable land to the west, a small belt of deciduous woodland and a large area of pine plantation to the east.

The Wider Area

The BE Estate at Sizewell covers approximately 669ha and in addition to the habitats found in the preliminary works area, as described above, incorporates heathland, arable farmland and the Sizewell Marshes SSSI. This designated area covers 104.33ha of lowland, unimproved wet meadows, with an extensive network of ditches in a low-lying basin of deep fen peat. Areas of reedbed and alder carr are also included within the SSSI boundary (Natural England, 2008a).

Lying adjacent to the BE estate boundary to the north is the Minsmere to Walberswick Heaths and Marshes SSSI. Much of this 2325.89ha site is also designated as a Special Protection Area (SPA) under EC Directive 79/409 on the Conservation of Wild Birds, and as a Wetland of International Importance under the Ramsar Convention. The site supports a number of important wetland habitats, including the largest continuous stand of reedbed in England and Wales, mudflats, shingle beach and grazing marsh. A 20ha area of shallow lagoons and islands has also been created for wading birds and wildfowl, whilst higher ground supports lowland heath, unimproved acid grassland, woodland and scrub (Natural England, 2008a., www.ramsar.org).

2. Legislation and Policy Concerning Natterjack Toad

Natterjack toad is protected under Schedule 5 (Section 9) of The Wildlife and Countryside Act (1981). The wording of the Act has been amended several times, most recently by the Countryside and Rights of Way (CRoW) Act 2000 which added the words 'or recklessly' to Section 9(4)(a) and (b). In summary it is an offence to:

- Intentionally kill, injure or take a natterjack toad;
- Possess or control any live or dead specimen or anything derived from a natterjack toad;

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- Intentionally or recklessly damage, destroy or obstruct access to any structure or place used for shelter or protection by a natterjack toad;
- Intentionally or recklessly disturb a natterjack toad while it is occupying a structure which it uses for that purpose; or
- Transport for sale or exchange (or offer for sale or exchange) a live or dead natterjack toad, or any part of a natterjack toad.

Natterjack toad is also listed under Schedule 2 of the Conservation (Natural Habitats & c.) Regulations (known as the Habitats Regulations) and as such receives protection under Regulation 39 of these Regulations. This makes it an offence to:

- Deliberately capture or kill a natterjack toad;
- Deliberately disturb a natterjack toad;
- Deliberately take or destroy the eggs of a natterjack toad;
- Damage or destroy a breeding site or resting place of a natterjack toad; or
- Keep, transport, sell or exchange or offer for sale any natterjack toad or anything derived from this species.

This main implication of this additional legislation is that it infers additional protection on natterjack toad habitat.

The Conservation (Natural Habitats, &c.) (Amendment) Regulations 2007 (the 2007 Regulations) have updated the Conservation (Habitats &c.) Regulations 1994. Among the main changes brought about by this legislation are the removal of the defence that rests on an offence (whether this relates to the death, capture or disturbance of an animal or damage to its breeding or resting places) being the incidental result of an otherwise lawful action or operation.

The natterjack toad is a UK BAP Priority Species and a Local BAP Priority Species in Suffolk. The original plan drawn up for the 1995 to 2005 period had the following objectives:

- Maintain the size of all existing populations at known or presumed 1995 levels;
- Where appropriate, restore each population to its size in the 1970s. (The 1970s level was chosen as a date when baseline information was available, and represents a recent historic date for which the targets should be both achievable and measurable);
- Re-establish five further populations between 1995 and 2005 within the species' former range.

A new national action plan and implementation guide is currently being drawn up (John Buckley, Herpetological Conservation Trust, pers comm). The new targets which have been drafted to date are the following (Biodiversity Action Reporting System [BARS], 2008):

- Achieve an increase in the number of breeding females in the UK, from 2500 to 3500 by 2010;
- Achieve an increase in the range from 27 to 28 occupied 10km squares in the UK by 2010; and

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• Achieve an increase in the range from 17 to 21 occupied vice counties in the UK by 2010.

The natterjack is also listed under Section 41 of the Natural Environment and Rural Communities Act (NERC Act) 2006. The Secretary of State for Environment, Food and Rural Affairs was required under Section 41(1) of the NERC Act 2006 to prepare a list of the species and habitats considered to be of principal importance for the purpose of conserving biodiversity in England. Under Section 41 of the act consultation was required with Natural England in determining the species and habitats to appear on the list and also to take steps (where they are reasonably practicable), and promote the taking of steps by others, to further the conservation of the habitats and species on the list. The Section 41 list has recently been published. It replaces the list published by Defra in 2002 under Section 74 of the Countryside and Rights of Way (CRoW) Act 2000. Planning Policy Statement 9 (PPS9) refers to the steps that local authorities should take through the planning process in relation to species and habitats of principal importance. The new list of species of principal importance is found at http://www.defra.gov.uk/wildlife-countryside/biodiversity/sect41-nerc.htm

The national planning policy statement for biodiversity, known as PPS9, places emphasis on local authorities to conserve, enhance and restore biodiversity through the planning process, and to encourage sustainable development. PPS9 states that:

"Species have been identified as requiring conservation action as species of principal importance for the conservation of biodiversity in England. Local authorities should take measures to protect the habitats of these species from further decline through policies in local development documents. Planning authorities should ensure that these species are protected from the adverse effects of development, where appropriate, by using planning conditions or obligations. Planning authorities should refuse permission where harm to the species or their habitats would result unless the need for, and benefits of, the development clearly outweigh that harm" (Office of the Deputy Prime Minister, 2005).

3. **Purpose of this Report**

The implication of this legislation and policy is that proposed developments need to take account of potential impacts on natterjack toads and their places of shelter. The purpose of this report is to identify whether there is the potential for current proposals to result in the contravention of protective legislation or to affect the conservation status of natterjack toad on the Sizewell Estate.

4. Natterjack Toads on the Sizewell Estate

4.1 Ecology

The natterjack toad loosely resembles the more widespread common toad as it has a similar body shape and warty skin. However it is usually smaller and it has a distinctive pale yellow dorsal stripe which runs from between the eyes to vent. Males can be distinguished by the blue or purple sheen on the underside of their throats which is generally absent from the females (Beebee & Griffiths, 2000).



Habitat Requirements

Across its European range, which stretches from the Iberian Peninsula to southern Sweden and the Baltic states, natterjack toad is found in a range of habitats, including mountainous areas. In Britain the natterjack toad is on the north-western edge of its range and occurs almost exclusively in sandy areas. Despite this variety, there are two general features which are common to nearly all habitats used by the natterjack throughout its European range (Beebee & Griffiths, 2000):

- The strong preference for open, unshaded areas of bare ground or grazed habitat; and
- The presence of unshaded temporary ponds.

Adult and juvenile natterjack toads need open habitats, such as bare or minimally vegetated ground (including short-grazed fields), to forage for invertebrates, which they actively pursue rather than ambush. They are generally nocturnal and also require a substrate (sand, rock piles etc.) into which they can burrow to escape extremes of weather (Beebee & Denton, 1996). Natterjack toads dig burrows around 25cm or 30cm deep which are often used by a number of individuals during the day. Some individuals remain quite close to their burrows throughout the year, although movements of foraging animals of up to 500m have been recorded (Beebee & Griffiths, 2000). It is known that the majority of natterjack toads are sedentary, sometimes using the same burrows for several years.

The habitats used at Retsoms are suitable for natterjacks, both in terms of foraging, breeding and burrowing, suggesting little need for long distance movements.

Reproduction

The reproductive season can start before the end of March, immediately after toads emerge from hibernation, and lasts well into August (though a peak in activity occurs generally in April and early May). Males usually arrive first to the ponds following a nocturnal migration from their hibernation areas. Natterjack toads require unshaded, ephemeral ponds with shallow margins for reproduction. This is due to the size and competitive inferiority of the tadpoles compared other frog and toad species' tadpoles. As a result, they will not survive in ponds used by large numbers of the commoner species. Great crested newts (*Triturus cristatus*) are known to eat natterjack tadpoles, as do numerous species of predatory invertebrates. Shallow, unshaded ponds tend to be warmer and tadpoles have been recorded in margins with a water temperature of as much as 39°C, which results in the accelerated development of the tadpoles of this species. The ephemeral nature of many natterjack ponds ensures that numbers of large predatory invertebrates, fish and more competitive native amphibians remain low (Beebee & Griffiths, 2000., Beebee & Denton, 1996).

Male natterjack toads tend to spend much of the breeding season calling from pond margins, gathering food in the vicinity of the pond and only venturing further when their reserves are depleted and need to forage to restore them. Females tend to leave once they have laid their eggs in long filaments in the pond margins (though occasional second clutches around 9 weeks later have been recorded). The activity period for natterjack toad extends well into September or even November on coastal sites, after which natterjack toads dig deep burrows and allow the substrate to collapse around them. Hibernation can last into March the following year (Beebee & Griffiths, 2000).

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4.2 Distribution at Sizewell

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 2004² specifically for natterjack toad, in line the aims of the UK Biodiversity Action Plan for the species (ADAS/SWT, 2005). The position and context of Retsoms Field (in terms of habitat types adjacent to it) is shown on **Figure 4.1**.

Following the creation of the ponds, what was intended to be a 3 year introduction programme commenced in 2005. Tadpoles were brought from Holme National Nature Reserver (NNR) in Norfolk and released into both ponds in 2005 and again in 2006 (ADAS/SWT, 2008). No reintroduction was carried out in 2007, due to the confirmation of natural spawing.

One of the ponds has a butyl liner and the other was formed using a bentonite clay. In 2005 an algal bloom developed within the butyl lined pond, killing many of the tadpoles, although a number of toadlets were observed emerging later in the season. In 2006 the butyl lined pond was pumped dry and allowed to refill naturally. The second tadpole introduction was made following this inundation. Several toadlets were identified to have survived the 2005 introduction at this point, being found around the pond margins (ADAS/SWT, 2008).

Male natterjack toads were seen and heard calling in spring 2007 and a large number of spawn strings were laid, presumably by females from the original 2005 introduction. Toadlets did emerge later in the year following the installation of protective netting to reduce predation (ADAS/SWT, 2008). Natterjack toad burrows can be observed at a short distance (approximately 10–20m) from the breeding ponds within old rabbit warrens (Dyfrig Hubble, pers comm.).

The ponds are located approximately 550m from the indicative location of the construction compounds and 600m from the indicative plant access road. Habitats between the ponds and the areas potentially earmarked for development consist of plantation dominated by Corsican pine.

4.3 National and County Status

Natterjack toad suffered a major decline during the first half of the twentieth century due to a number of factors including habitat loss and anthropogenic acidification of breeding sites. The habitats preferred by the species are transient and tend, when left unmanaged, these to succeed to other habitat types which the species can not persist in. It follows that lack of management, habitat fragmentation and the establishment of barriers to movement have all contributed to the species' decline.

Extensive research in the 1980s provided the foundations for an intensive, 3-year species recovery program funded by the statutory nature conservation organizations in the 1990s. This resulted in a partial reversal of the natterjack toads' decline. In 1995 there were thought to be about 50 natterjack toad populations scattered around Britain. The coastal dune and upper saltmarshes of the Irish Sea coast from Liverpool to the Solway Estuary support numerous populations, but these area are fragmented and often isolated, preventing dispersal of individuals between them. Further populations are present on the east coast dunes in Norfolk and

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² At National Grid Reference TM 47140, 65118 (accurate to 7.6m)

Lincolnshire as well as on heathlands in Norfolk, Suffolk, Staffordshire, Bedfordshire, Surrey, Hampshire and Dorset (Beebee & Denton, 1996).

The current populations in Suffolk are all the result of reintroduction programmes. Apart from at Sizewell, natterjacks are present at Minsmere RSPB reserve to the north where sympathetic management of heath and acid grassland ensures the conservation of the species. Measures include grazing, heather and scrub management and controlling invasive woody plants, such as birch and pine.

Two further reintroduction sites exists to the north of Dunwich Forest, and are managed by Suffolk Wildlife Trust: one on Westleton Heath (5.5km north-northwest of the site) and one west of Westwood Marshes (8.1km north-northwest of the site) (John Wilkinson [HCT] pers comm).

Text Figure 3.1 shows the distribution of the Natterjack within Suffolk, taken from the Provisional Suffolk Amphibian and Reptile Atlas (2007), obtained from the Suffolk Amphibian and Reptile Group (SARG).



Text Figure 3.1. Distribution of the Natterjack Toad in Suffolk.

The blue dot in the north of the county is a now extinct population. The red dots represent the populations present within the Sizewell Estate and Minsmere-Walberswick Heath and Marshes SSSI and Special Area of Conservation immediately to the north of this.





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5. Conclusions

The reintroduced natterjack toad population on the Sizewell Estate has now begun breeding, as demonstrated by spawn found in 2007. Assuming that land management remains consistent and the suitability of the ponds is maintained, this population is likely to increase and become self sustaining.

The areas within the Sizewell Estate that are likely to be affected by the proposed development are at their closest (the indicative location of the construction compounds), 550m from the breeding ponds. Given this species' habitat preferences (i.e. habitats with very short or no vegetation) it is likely that the plantation woodland adjacent to the reintroduction site forms a barrier to movement that prevents animals reaching the potential development areas. In addition, much of the construction compound consists of plantation woodland, resulting in a very low probability of natterjack presence.

Due to the high numbers of reptiles on the Sizewell Estate (see Entec Report ref 19801cb166), a number of measures would need to be adopted prior to the commencement of work in order to ensure compliance with wildlife legislation and policy. This would require an integrated reptile mitigation strategy, which by default (especially the destructive search element of it) would be likely to locate any natterjack toads that had moved into the work areas.

It has also been recommended, given the likely significant effect on the local reptile population that will result from the proposed development, that BE should look to identify an area within their landholding that can be managed to provide suitable reptile habitat in the medium and long term. This habitat creation would provide an opportunity to maintain and enhance the natterjack population on the Sizewell Estate.

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SIZEWELL C DEVELOPMENT – MAIN DEVELOPMENT SITE: VOLUME 2, CHAPTER 14: APPENDIX 14A5 – AMPHIBIANS: ANNEX 14A5.4 PRIMARY DATA

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Volume 2 Annex 14A5.4 Primary Data



Contents

1	Primary Data1			
1.1	Introduction1			
1.2	2014 Assisted Development site surveys1			
1.3	2016 eDNA surveys)		
1.4	Results)		
References61				

Tables

Table 1.1: HSI for ponds surveyed by Arcadis in 2015	4
Table 1.2: Pond descriptions for ponds surveyed by Arcadis in 2014.	5
Table 1.3: Amphibian survey results for ponds surveyed by Arcadis in 2014	. 17
Table 1.4: eDNA survey results for ponds surveyed in 2016	. 60

Plates

None provided.

Figures

None provided.

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1 Primary Data

1.1 Introduction

1.1.1 This is an annex to Appendix 14A5 for the Sizewell C power station at the main development site (referred to throughout this volume as the "proposed development") Environmental Statement (ES) **Volume 2, Chapter 14.** This annex presents the primary data collected for amphibian baseline for the proposed development site (hereafter referred to the "site").

1.2 2014 Assisted Development site surveys

- a) Methodology
- 1.2.1 Arcadis Consulting (UK) Limited (formerly Hyder Consulting, and hereafter referred to as Arcadis) reviewed Ordinance Survey (OS) maps and aerial photos to identify any waterbodies within 500m of the boundaries of the offsite associated development sites, including two proposed rail routes that passed though the site. Relevant survey results within 500m of the site boundary are discussed below.
- 1.2.2 Each pond was given a unique pond identification number. Figure 14A5.1 (Annex 14A5.1) shows which of these ponds is within 500m of the site boundary.
- 1.2.3 Arcadis ecologists visited each pond (where access was granted) between 31 March and 15 April 2014, and made detailed site descriptions of the ponds. At this stage, some ponds were screened out, as they either no longer existed as ponds or had been dry for a considerable period (estimated as being more than 2 to 3 years) and were considered unsuitable for great crested newts or other amphibians. For those ponds that were screened in, a Habitat Suitability Index (HSI) for great crested newts (Ref. 1.1) was calculated. The HSI scores a water body across ten habitat characteristics; from these ten suitability indices, a geometric mean is calculated, giving an overall numerical index ranging between zero and one. A score of near zero indicates unsuitable habitat for great crested newts, whilst a score near one represents optimal habitat.
- 1.2.4 The HSI score for each pond was used to assess its general suitability for supporting great crested newts; however, the HSI is not a substitute for undertaking newt surveys. If a waterbody is awarded a high HSI score, this does not guarantee that great crested newts will be present, only that they are likely to be using the pond if they are present in the local area, and vice versa.

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Volume 2 Annex 14A.5 Primary Data 1



- 1.2.5 Great crested newt surveys were undertaken at all of those ponds identified during the scoping surveys as being potentially suitable for breeding amphibians. Four survey visits to each pond were carried out in suitable weather conditions between 14 April and 2 June 2014. Where great crested newts were recorded, an additional two surveys were undertaken (making a total of six surveys) to allow an estimate of population size class to be made (in accordance with Natural England's "Great Crested Newt Mitigation Guidelines" (Ref. 1.2).
- 1.2.6 Depending upon the different characteristics of each pond (such as turbidity, or abundance of aquatic vegetation), a variety of survey methods was undertaken, again following Natural England's guidelines. The three preferred standard survey methods (torchlight survey, bottle-trapping and egg search) were carried out on each visit to the ponds, wherever possible, although in certain cases fewer survey techniques (the most appropriate one to the pond) could be used. Netting was used as a last resort on a single pond only, once all other options had been proven ineffective.
- 1.2.7 Each torchlight survey comprised a single walk around the pond at a measured pace, using a 500,000 candle-power torch to locate and identify amphibians. During the survey, all amphibians observed were counted, sexed and identified to species, where possible (female smooth and palmate newts can be difficult to distinguish, particularly by torch surveys). Survey timings and weather conditions were also recorded.
- 1.2.8 The bottle trapping surveys involved the setting of bottle traps (comprising ridged 1.5 litre mineral water bottles, where the top end has been cut off and inverted inside the main body of the bottle). These were submerged in the pond on canes wedged into the pond sediment. Traps were set in the evening and were checked early the following morning. All amphibians captured overnight were identified to species and life stage, and were also sexed, where possible. Suitable aquatic vegetation at the pond margins was also checked at this time for the presence/absence of newt eggs.
- 1.2.9 For those ponds found to contain great crested newts, populations were classified as "small" for maximum counts up to ten, "medium" for maximum counts between 11 and 100, and "large" for maximum counts over 100 (Ref. 1.2).
- 1.2.10 Appropriate biosecurity measures were adopted whilst undertaking the surveys, in order to avoid the inadvertent spreading of chytridiomycosis. This is a fungal disease which can have a devastating effect on amphibian populations. Measures implemented included the thorough drying of traps between surveys, and the application of Virkon antiseptic solution to survey equipment, wading poles and surveyor's waders between visits, where ponds are separated by a distance of over 1km.

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- 1.2.11 The waterbodies occasionally exhibited conditions rendering certain survey methods impractical or unsafe. For example, a pond with heavy duckweed cover may not be effectively torched, and certain ponds had banks too steep to safely allow the deployment of bottle traps. For this reason, although effort was made to use three survey methods for each pond, occasionally this was not possible. Occasionally, bank vegetation and conditions restricted access to sections of the water body, rendering surveying the entire perimeter of a pond impossible. In the event of accidental trapping of water shrew (*Neomys fodiens*), no further bottle trapping surveys were undertaken.
 - b) Results
 - i. Overview
- 1.2.12 A total of 30 clusters of waterbodies were identified within 500m of the site boundary. Of these, there was no access granted for scoping or subsequent survey work at seven ponds (Ponds 6, 9, 10, 11, 17, 18 and 32 respectively), and one pond was scoped in but had no access for surveys (Pond 34). Ten ponds (Ponds 1, 7, 12, 13, 14, 15, 16, 31, 33 and 38) were scoped out of requiring further surveys, and further surveys for great crested newts were undertaken at 12 ponds (Ponds 2, 3, 4, 5, 8, 19, 30, 35, 54, 55, 56 and 57).
 - ii. HSI results
- **1.2.13 Table 1.1** details the result of the 2014 HSI survey results.



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Table 1.1: HSI for ponds surveyed by Arcadis in 2015.

Feature	Pond	Pond										
	2	3	4	5	8	19	30	35	54	55	56	57
Location	1	1	1	1	1	1	1	1	1	1	1	1
Pond area	0.2	0.2	0.2	0.3	0.1	0.2	1	0.2	0.7	0.5	1	0.48
Pond drying	1	0.5	0.9	0.9	0.1	0.9	0.9	0.9	0.5	0.9	0.9	0.9
Water quality	0.67	0.33	1	0.67	0.33	0.33	1	0.67	0.3	0.67	0.33	0.67
Shade	0.6	0.2	1	0.6	1	1	1	1	0.4	1	1	1
Fowl	0.67	0.67	0.67	1	0.67	0.67	0.67	1	0.67	1	0.67	0.67
Fish	0.67	1	0.67	1	1	1	1	1	1	1	0.01	1
Ponds	0.95	0.95	0.95	1	0.55	0.1	0.98	0.7	1	1	1	1
Terrestrial habitat	1	1	1	0.33	0.33	0.33	0.67	1	0.67	0.67	0.33	0.67
Macrophytes	0.8	0.3	1	0.4	1	1	0.55	0.35	0.8	0.33	0.3	0.35
HSI Score	0.7	0.51	0.77	0.65	0.46	0.52	0.86	0.7	0.66	0.64	0.43	0.73
Suitability for Great Crested Newt	Good	Below average	Good	Average	Poor	Below average	Excellent	Good	Average	Average	Poor	Good

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- iii. Pond descriptions
- **1.2.14 Table 1.2** provide the pond descriptions of the ponds survey by Arcadis in 2014. See **Figure 14A5.1** (Annex 14A5.1) for the locations of these ponds.

 Table 1.2: Pond descriptions for ponds surveyed by Arcadis in 2014.

Pond 2	
Grid reference	TM441645
Description	A pond surrounded by trees in Leiston Abbey grounds, with arable fields to the north and scrub/rough grassland to the south.
Area	90m ²
Perimeter	70m
Depth	2m

In

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Scoped in/out

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Pond 3	
Grid reference	TM444643
Description	A shallow tree-lined pond in an area of woodland, with arable fields to the north, and scrub/rough grass to south.
Area	90m ²
Depth	0.7m
Perimeter	70m
Scoped in/out	In

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Volume 2 Annex 14A.5 Primary Data 7



Pond 5	
Grid reference	TM445646
Description	A small, heavily shaded pond in a hedgerow, with arable fields bordering to the north and south. Heavy algal and duckweed cover, range of emergent vegetation species.
Area	150m ²
Depth	1m
Perimeter	50m
Scoped in/out	In

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Pond 8	
Grid reference	TM448642
Description	A small, shallow depression in an arable field, likely to dry out regularly. Dominant rush cover, hedgerow connectivity to nearby Ash Wood.
Area	120m ²
Depth	0.1m
Perimeter	50m
Scoped in/out	In

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Pond 19	
Grid reference	TM/61626
Description	A shallow, isolated pond situated within a sandy former arable field. Likely to occasionally dry out. It has a heavy cover of tall rushes, shading approximately 80% of the pond's open water, with occasional sedge and duckweed. Some short grass immediately surrounds the pond, and there is a small area of scrub approximately 15 metres away which provides some opportunities for foraging and shelter, otherwise suitable habitat for great crested newts is scarce. Two mallards were seen during scoping.
Area	100m ²
Depth	0.5m
Perimeter	70m
Scoped in/out	In

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Pond 30	
Pond 30	
Grid reference	TM440635
Description	A large pond in a slight depression at the northern edge of a broadleaf woodland, with arable fields bordering on three sides. The pond is well vegetated, with large patches of tall rush and sedges, though there is a minor waterfowl presence at the site. Good foraging and hibernating opportunities from large earthen banks around pond, as well as within woodland. Otherwise poor connectivity; an isolated wood within arable fields with no immediate hedgerow connections.
Area	500m ²
Depth	>2m
Perimeter	100m
Scoped in/out	In

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Pond 35	
Grid reference	TM456638
Description	A pond within broadleaf woodland, with coniferous woodland (Kenton Hills) to the north, and an arable field nearby to the west. The pond has total duckweed cover, with limited alternative macrophyte cover. There are opportunities for foraging and shelter within the woodland, and the pond is connected via ditches to nearby Pond 34.
Area	110m ²
Depth	1.5m
Perimeter	55m
Scoped in/out	In

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Pond 54	
Grid reference	TM438644
Description	A shallow, highly shaded pond within a copse between four fields. Very heavy duckweed cover, with little other emergent vegetation noted. There are opportunities for hibernation and foraging within the copse itself, including within shallow tree-lined earthen banks which line the pond, as well as within a patch of scrub and rough grassland to the north of the pond. Grazed sheep pasture to the east, with arable fields to the south and west. Good hedgerow connectivity to other nearby ponds.
Area	340m ²
Depth	0.5m
Perimeter	80m
Scoped in/out	In

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Pond 55	
Grid reference	TM439643
Grid reference Description	TM439643 A small, shaded pond within the garden of Hill Farm. Some small patches of flag iris, otherwise little emergent vegetation noted. Steep banks are heavily vegetated with scrub and small trees. Short, grazed pasture lies to the south and west beyond the garden, with arable fields to the east. Good connectivity via hedges.
Grid reference Description Area	TM439643 A small, shaded pond within the garden of Hill Farm. Some small patches of flag iris, otherwise little emergent vegetation noted. Steep banks are heavily vegetated with scrub and small trees. Short, grazed pasture lies to the south and west beyond the garden, with arable fields to the east. Good connectivity via hedges. 150m ²
Grid reference Description Area Depth	TM439643 A small, shaded pond within the garden of Hill Farm. Some small patches of flag iris, otherwise little emergent vegetation noted. Steep banks are heavily vegetated with scrub and small trees. Short, grazed pasture lies to the south and west beyond the garden, with arable fields to the east. Good connectivity via hedges. 150m ² 1.5m
Grid reference Description Area Depth Perimeter	TM439643 A small, shaded pond within the garden of Hill Farm. Some small patches of flag iris, otherwise little emergent vegetation noted. Steep banks are heavily vegetated with scrub and small trees. Short, grazed pasture lies to the south and west beyond the garden, with arable fields to the east. Good connectivity via hedges. 150m ² 1.5m 50m

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Pond 56	
Grid reference	TM440644
Description	A large pond within a farmyard. The pond is well stocked with fish, including roach and carp, and is occasionally visited by waterfowl. Amenity grassland and grazed pasture borders to the west, with paved farm yard to the north and east. Little emergent vegetation was present, likely limited by heavy fish presence. Suitable terrestrial habitat for great crested newts nearby is limited.
Area	650m ²
Depth	2m
Perimeter	100m
Scoped in/out	In

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Pond 57	
Grid reference	TM441645
Description	A large pond on the western edge of a copse, with arable fields to three sides (north, west, south) beyond a 10 metre buffer of short grass. Connectivity via hedgerows and woodland, which also provide some opportunities for foraging and shelter. Small amount of flag iris and <i>Typha</i> spp. along the banks, otherwise little emergent vegetation present. Occasionally used by waterfowl.
Area	250m ²
Depth	2m
Perimeter	80m
Scoped in/out	In

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- iv. Survey results for ponds surveyed by Arcadis in 2014
- **Table 1.3** provides the survey results of the great crested newt surveys conducted by Arcadis in 2014.

Table 1.3: Amphibian survey results for ponds surveyed by Arcadis in2014

Key to tables:

Wind speed: (1 = no wind; 2 = light wind; 3 = strong wind)

Rain: (heavy/light/none)

Turbidity score (0-5): (0 = completely clear, 5 = very turbid)

Vegetation cover score (0-5): (0 = no vegetation obscuring water, 5 = water completely obscured by vegetation)

Pond	2

Pond 2	Visit 1		15/04	4/14						
Temperature:	7ºC		Rain	1		None				
Wind speed	Light		Clou	id cover		None	None			
Turbidity score	-		Veg	etation cover	-					
Survey constraints	No acce steep ba	ss for trap nks limits a	ping; iccess	too much del to perimeter f	ond for net	nd for netting; deep water and asons				
% of perimeter surveyed	75%		Othe	er amphibians	None					
Species	Egg	Torchlight survey								
	search	Larvae	Eft	Immature	Adult			Total		
					Male	Female	Unknown			
Great crested newt	None						1	1		
Smooth newt	None					0				
Palmate newt								0		
Smooth/palmate newt								0		

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Pond 2	Visit 2		2	23/04/14							
Temperature:	10ºC			Rain			Non	е			
Wind speed	Light			Cloud cover				None			
Turbidity score	2			Vegetation cover				1			
Survey constraints	No acce banks lii	ess for trapping; too much debris in pond for netting; o mits access to perimeter for H&S reasons							ater and steep		
% of perimeter surveyed	30%		Other amphibians								
Species	Egg	Torchlig	Torchlight survey								
	search	Larvae	Eft	Immature	Adult				Total		
					Male	Fer	nale	Unknown			
Great crested newt	None								0		
Smooth newt	None				1				1		
Palmate newt									0		
Smooth/palmate newt									0		

Pond 2	Visit 3			30/04/14						
Temperature:	11ºC			Rain			No	ne		
Wind speed	Light			Cloud cover				Overcast		
Turbidity score	3			Vegetation cover 2						
Survey constraints	No acce steep ba	ess for trap anks limits	opinę acc	g; too much de ess to perimet	vater and					
% of perimeter surveyed	-			Other amphil	pians	None				
Species	Egg	Torchlig	ht sı	irvey						
	search	Larvae	Eft	t Immature	Adult				Total	
					Male	Ferr	nale	Unknown		
Great crested newt	None					1			1	
Smooth newt	None								0	
Palmate newt									0	
Smooth/palmate newt									0	

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Pond 2	Visit 4			13/05/14						
Temperature:	11ºC			Rain				None		
Wind speed	Light			Cloud cover				Overcast		
Turbidity score	3			Vegetation cover 2						
Survey constraints	No acce steep ba	No access for trapping; too much debris in pond for netting; deep water a steep banks limits access to perimeter for H&S reasons								
% of perimeter surveyed		Other amphibians None						ne		
Species	Egg	Torchlig	ht su	irvey		•				
	search	Larvae	Eft	Immature	Adult				Total	
					Male	Ferr	ale	Unknown		
Great crested newt	None				1				1	
Smooth newt	None									
Palmate newt										
Smooth/palmate newt										

Pond 2	Visit 5			27/05/14						
Temperature:	16ºC			Rain			He	avy		
Wind speed	No wind	l		Cloud cover				Overcast		
Turbidity score	-			Vegetation cover				-		
Survey constraints	No acce steep ba	No access for trapping; too much debris in pond for netting; deep wa steep banks limits access to perimeter for H&S reasons								
% of perimeter surveyed				Other amphi	bians		No	ne		
Species	Egg	Torchlig	ht su	irvey						
	search	Larvae	Eft	Immature	Adult				Total	
					Male	Ferr	nale	Unknown		
Great crested newt	Yes								0	
Smooth newt	None								0	
Palmate newt									0	
Smooth/palmate newt									0	

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Pond 2	Visit 6			29/05/14						
Temperature:	16ºC			Rain			No	ne		
Wind speed	No wind	l		Cloud cover				Overcast		
Turbidity score	-			Vegetation cover				-		
Survey constraints	No acce steep ba	No access for trapping; too much debris in pond for netting; deep water steep banks limits access to perimeter for H&S reasons								
% of perimeter surveyed			Other amphibians None					ne		
Species	Egg	Torchlig	ht su	irvey						
	search	Larvae	Eft	Immature	Adult				Total	
					Male	Fema	ale	Unknown		
Great crested newt	None					1			1	
Smooth newt	None								0	
Palmate newt									0	
Smooth/palmate newt									0	

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Pond 3

Pond 3	Visit 1			15/04/14							
Temperature:	7ºC			Rain			Nor	ne			
Wind speed	Light			Cloud cover				None			
Turbidity score	2			Vegetation cov	ver	1	1				
Survey constraints	No acces	s for trappi	ng;	too much debris	for net	ting					
% of perimeter surveyed	100%			Other amphibia	ans		Nor	ie			
Species	Egg	Torchlight survey									
	search	Larvae	Ef	t Immature	Adult				Total		
					Male	Fem	ale	Unknown			
Great crested newt	None								0		
Smooth newt	None								0		
Palmate newt									0		
Smooth/palmate newt									0		

Pond 3	Visit 2			23/04/14						
Temperature:	10ºC			Rain			Noi	ne		
Wind speed	No wind			Cloud cover				None		
Turbidity score	2			Vegetation co	ver	1	1			
Survey constraints	No acces	ss for trapp	ing;	too much debris	oo much debris in pond for netting					
% of perimeter surveyed	65%			Other amphibians None						
Species	Egg	Torchlight survey								
	search	Larvae	Ef	t Immature	Adult				Total	
					Male	Fem	ale	Unknown		
Great crested newt	None								0	
Smooth newt	None								0	
Palmate newt								0		
Smooth/palmate newt									0	

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Pond 3	Visit 3			30/04/14						
Temperature:				Rain			No	ne		
Wind speed	Light win	d		Cloud cover				Overcast		
Turbidity score	1			Vegetation co						
Survey constraints	No acces	ss for trapp	ing; t	oo much debris	in pond	for net	ting			
% of perimeter surveyed	-			Other amphib	ians		No	ne		
Species	Egg	Torchlight survey								
	search	Larvae	Eft	Immature	Adult				Total	
					Male	Fem	ale	Unknown		
Great crested newt	None								0	
Smooth newt	None								0	
Palmate newt									0	
Smooth/palmate newt									0	

Pond 3	Visit 4			1:	3/05/14	13/05/14						
Temperature:				F	Rain			Ligl	nt			
Wind speed	Light win	d		Cloud cover					-			
Turbidity score	2			V	/egetation cov	/er		2				
Survey constraints	No acces	s for trapp	too	o much debris	in pond	ond for netting						
% of perimeter surveyed	-			Other amphibians					None			
Species	Egg	Torchlight survey										
	search	Larvae	Ef	ft	Immature	Adult				Total		
						Male	Fem	ale	Unknown			
Great crested newt	None									0		
Smooth newt	None									0		
Palmate newt										0		
Smooth/palmate newt										0		

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Pond 4

Pond 4	Visit 1			15/04/14	15/04/14					
Temperature:	7ºC			Rain		No	one			
Wind speed	Light			Cloud cover		No	one			
Turbidity score	0			Vegetation c	over	2				
Survey constraints	No acce	ss for trap	ping							
% of perimeter surveyed	90%		Other amphibians None							
Species	Egg	Torchlig	ht su	rvey						
	search	Larvae	Eft	Immature	Adult			Total		
					Male	Female	Unknown			
Great crested newt	Yes					2		2		
Smooth newt	None						0			
Palmate newt						0				
Smooth/palmate newt						0				

Pond 4	Visit 2			23/04/14				
Temperature:	10ºC			Rain		N	one	
Wind speed	No wind			Cloud cover		N	one	
Turbidity score	0			Vegetation c	over	2		
Survey constraints	No acce	ss for trap	ping					
% of perimeter surveyed	100%			Other amphil	one			
Species	Egg	Torchlig	ht su	rvey				
	search	Larvae	Eft	Immature	Adult			Total
					Male	Female	Unknown	
Great crested newt	na					2		2
Smooth newt	None				1			1
Palmate newt								0
Smooth/palmate newt						3	1	4

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Pond 4	Visit 3			30/04/14					
Temperature:	11ºC			Rain			No	ne	
Wind speed	Light wi	nd		Cloud cover			Ov	ercast	
Turbidity score	0			Vegetation c	over		4		
Survey constraints	No acce	ess for trap	ping						
% of perimeter surveyed	-		Other amphibians None						
Species	Egg	Torchlig	ht su	rvey					
	search	Larvae	Eft	Immature	Adult				Total
					Male	Ferr	ale	Unknown	
Great crested newt	na				1	3			4
Smooth newt	None			1 1					2
Palmate newt]								0
Smooth/palmate newt							0		

Pond 4	Visit 4			13/05/14					
Temperature:				Rain			No	ne	
Wind speed	Light wir	nd		Cloud cover			Ov	ercast	
Turbidity score	0			Vegetation co	over		5		
Survey constraints	No acce	ss for trap	ping						
% of perimeter surveyed	-		Other amphibians None						
Species	Egg	Torchlig	ht sui	rvey					
	search	Larvae	Eft	Immature	Adult				Total
					Male	Fema	ale	Unknown	
Great crested newt	na					2			2
Smooth newt	None								0
Palmate newt						0			
Smooth/palmate newt						1		1	1

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Pond 4	Visit 5			27/05/14						
Temperature:	16ºC			Rain			He	avy		
Wind speed	No wind			Cloud cover			Ov	ercast		
Turbidity score	-			Vegetation co	over		-			
Survey constraints	No acce	ss for trap	s for trapping							
% of perimeter surveyed			Other amphibians None							
Species	Egg	Torchlig	ht su	irvey						
	search	Larvae	Eft	t Immature	Adult				Total	
					Male	Fem	ale	Unknown		
Great crested newt	na				11	20		5	36	
Smooth newt	None				3	2			5	
Palmate newt									0	
Smooth/palmate newt					0					

Pond 4	Visit 6			29/05/14							
Temperature:	12ºC			Rain			No	ne			
Wind speed	Light wir	nd		Cloud cover			Ov	ercast			
Turbidity score	0			Vegetation co	over		2				
Survey constraints	No acce	ess for trap	ping								
% of perimeter surveyed	-			Other amphik	Other amphibians None						
Species	Egg	Torchlig	ht su	rvey							
	search	Larvae	Eft	Immature	Adult				Total		
					Male	Ferr	ale	Unknown			
Great crested newt	Yes		4		14	30			48		
Smooth newt	None				2	1			3		
Palmate newt									0		
Smooth/palmate newt						3			3		

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Pond 5

Pond 5	Visit 1			1	14/04/14							
Temperature:	7ºC				Rain						None	
Wind speed	No wind				Cloud cov	/er					None	
Turbidity score	3				Vegetatio	n cov	'er				4	
Survey constraints	Deep wa	ater and ve	egetati	on	on banks	limits	ac	cess	to perir	nete	er for H&S rea	asons
% of perimeter surveyed	60%				Other am	phibia	ans				None	
Species	Egg	Torchligh	nt surv	'ey								
	search	Larvae	Eft		Immatu	ire	A	dult				Total
							N	1ale	Fema	ale	Unknown	
Great crested newt	None											0
Smooth newt	None											0
Palmate newt												0
Smooth/palmate newt												0
Species		Trap sur	vey								•	
		Larvae	Eft	In	nmature	Adı	ult					Total
						Ма	le	Fe	male	U	nknown	
Great crested newt						1						1
Smooth newt												0
Palmate newt								1				1
Smooth/palmate newt												0

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Pond 5	Visit 2			22/04/14							
Temperature:	10ºC			Rain			No	ne			
Wind speed	Light wir	ıd		Cloud cover			No	ne			
Turbidity score	4			Vegetation co	over		3				
Survey constraints	Too turk perimete	oid to toro er for H&S	h. [reas	Deep water ar ons	eep water and vegetation on banks limit						
% of perimeter surveyed	80%			Other amphik	bians		No	ne			
Species	Egg	Trap sur	vey								
	search	Larvae	Ef	t Immature	Adult				Total		
					Male	Fem	ale	Unknown			
Great crested newt	None				3	3			6		
Smooth newt	None								0		
Palmate newt						1			1		
Smooth/palmate newt									0		

Pond 5	Visit 3			29/04/14					
Temperature:	-			Rain			-		
Wind speed	-			Cloud cover			-		
Turbidity score	-			Vegetation c	over		-		
Survey constraints	Too turk perimete	Too turbid to torch. Deep water and vegetation on banks limits ac perimeter for H&S reasons							
% of perimeter surveyed	-	Other amphibians None							
Species	Egg	Trap su	rvey						
	search	Larvae	Eft	Immature	Adult				Total
					Male	Ferr	ale	Unknown	
Great crested newt	None				2	6			8
Smooth newt	None				1				1
Palmate newt									0
Smooth/palmate newt									0

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Pond 5	Visit 4			22/05/14					
Temperature:	-			Rain			-		
Wind speed	-			Cloud cover			-		
Turbidity score	-			Vegetation co	over		-		
Survey constraints	Too turl perimete	oid to toro er for H&S	ch. rea:	Deep water ar sons	nd vege	tation	on l	oanks limits	access to
% of perimeter surveyed	-			Other amphik	bians		No	ne	
Species	Egg	Trap sur	vey						
	search	Larvae	Ef	it Immature	Adult				Total
					Male	Ferr	ale	Unknown	
Great crested newt	None				2				2
Smooth newt	None				2	2			4
Palmate newt									0
Smooth/palmate newt									0

Pond 5	Visit 5	27/05/14							
Temperature:	-			Rain			He	avy	
Wind speed	No wind			Cloud cover			Ov	ercast	
Turbidity score	5			Vegetation co	over		3		
Survey constraints	Too turk perimete	oid to torc er for H&S	d to torch. Deep water and vegetation on banks limits for H&S reasons					access to	
% of perimeter surveyed				Other amphik	pians		No	ne	
Species	Egg	Trap sur	vey						
	search	Larvae	Ef	t Immature	Adult				Total
					Male	Ferr	ale	Unknown	
Great crested newt	None								0
Smooth newt	None								0
Palmate newt									0
Smooth/palmate newt									0

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Pond 5	Visit 6			30/05/14					
Temperature:	13ºC			Rain			-		
Wind speed	-			Cloud cover			-		
Turbidity score	-	Vegetation cover -							
Survey constraints	Too turl perimete	bid to torch. Deep water and vegetation on banks limits ad er for H&S reasons							access to
% of perimeter surveyed	-			Other amphi	bians		No	ne	
Species	Egg	Trap su	rvey						
	search	Larvae	Eft	Immature	Adult				Total
					Male	Ferr	ale	Unknown	
Great crested newt	None				1				1
Smooth newt	None								0
Palmate newt									0
Smooth/palmate newt									0

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Pond 8

Pond 8	Visit 1								
Temperature:	7ºC			Rain			No	ne	
Wind speed	No wind			Cloud cover			No	ne	
Turbidity score	1			Vegetation co	over		2		
Survey constraints	Too shal	llow to bot							
% of perimeter surveyed	100%								
Species	Egg	Torchlig	ht sui	vey					
	search	Larvae	Eft	Immature	Adult				Total
					Male	Fem	ale	Unknown	
Great crested newt	None								0
Smooth newt	None				4				4
Palmate newt									0
Smooth/palmate newt						18			

Pond 8	Visit 2			24/04/14					
Temperature:	10ºC			ne					
Wind speed	Light			Cloud cover			No	ne	
Turbidity score	2			Vegetation c	over		2		
Survey constraints	Too sha	llow to bot	tle tra						
% of perimeter surveyed	100%								
Species	Egg	Torchlig	ht su	rvey					
	search	Larvae	Eft	Immature	Adult			Total	
					Male	Fem	ale	Unknown	
Great crested newt	None								0
Smooth newt	None								0
Palmate newt									0
Smooth/palmate newt								7	7

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Pond 8	Visit 3			28/04/14					
Temperature:	11ºC			Rain			No	ne	
Wind speed	No wind			Cloud cover			Ov	ercast	
Turbidity score	-			Vegetation c	over		-		
Survey constraints	Too sha	llow to bottle trap							
% of perimeter surveyed	-	Other amphibians None							
Species	Egg	Torchlig	ht su	rvey					
	search	Larvae	Eft	Immature	Adult				Total
					Male	Fem	ale	Unknown	
Great crested newt	None								0
Smooth newt	None				1				1
Palmate newt									0
Smooth/palmate newt]					7			7

Pond 8	Visit 4			12/05/14						
Temperature:	10ºC			Rain			Lig	ht		
Wind speed	Light			Cloud cover			Ov	ercast		
Turbidity score	5			Vegetation c	over		3			
Survey constraints	Too sha	llow to bot	tle tra	р						
% of perimeter surveyed	100%	Other amphibians None								
Species	Egg	Torchlig	ht sur	vey						
	search	Larvae	Eft	Immature	Adult			Total		
					Male	Fem	ale	Unknown		
Great crested newt	None								0	
Smooth newt	None								0	
Palmate newt									0	
Smooth/palmate newt								1	1	

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Pond 19

Pond 19	Visit 1		1	5/04/14					
Temperature:	4ºC		F	Rain			Nor	ne	
Wind speed	Light		(Cloud cover			Nor	ne	
Turbidity score	1		١	/egetation co	ver		4		
Survey constraints	None								
% of perimeter surveyed	100%		(Other amphib	ians		Nor	ne	
Species	Egg _.	Torchlig	ht surv	vey					
	search	Larvae	Eft	Immature	Adult				Total
					Male	Ferr	nale	Unknown	
Great crested newt	None								0
Smooth newt	None								0
Palmate newt									0
Smooth/palmate newt									0

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Pond 19	Visit 2		22	2/04/14					
Temperature:	10ºC		F	Rain			No	one	
Wind speed	Light		C	Cloud cover			No	one	
Turbidity score	4		V	egetation cov	er		3		
Survey constraints	Difficult	to torch – t	urbid	water betwee	n reeds				
% of perimeter surveyed	100%		C	Other amphibia	ans		N	one	
Species	Egg	Torchlig	ht sur	vey					
	search	Larvae	Eft Immature Adult						Total
					Male	le	Unknown		
Great crested newt	None								0
Smooth newt	None								0
Palmate newt									0
Smooth/palmate newt									0
Species		Trap sur	vey						
		Larvae	Eft	Immature	Adult				Total
					Male	Fema	le	Unknown	
Great crested newt									
Smooth newt			3 2						
Palmate newt									
Smooth/palmate newt									

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Pond 19	Visit 3		29	9/04/14					
Temperature:	13ºC		F	Rain			No	one	
Wind speed	No wind		C	Cloud cover			0	vercast	
Turbidity score	0		٧	egetation cov	er		3		
Survey constraints	None		·						
% of perimeter surveyed	100%		C	Other amphibia	ans		No	one	
Species	Egg	Torchlig	ht sur	vey					
	search	Larvae	Eft	Immature	Adult				Total
					Male	Fema	le	Unknown	
Great crested newt	None								0
Smooth newt	None								0
Palmate newt									0
Smooth/palmate newt						8			8
Species		Trap sur	vey						
		Larvae	Eft	Immature	Adult				Total
					Male	Fema	le	Unknown	
Great crested newt									
Smooth newt					2	3			
Palmate newt									
Smooth/palmate newt									

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Pond 19	Visit 4				12/05/14								
Temperature:	10ºC				Rain					No	one		
Wind speed	No wind				Cloud co	ver				O	vercast		
Turbidity score	4				Vegetatio	on cov	er			3			
Survey constraints	Difficult	to torch – t	turbid	wat	er related	l to ea	rlie	r rair	ıfall				
% of perimeter surveyed	100%				Other an	nphibia	ans			No	one		
Species	Egg	Torchlig	ht surv	/ey									
	search	Larvae	Eft		Immat	ure	Adult						Total
							Μ	Male Fem		nale Unkn		own	
Great crested newt	None												0
Smooth newt	None								2				2
Palmate newt													0
Smooth/palmate newt											1		1
Species		Trap sur	vey			•							
		Larvae	Eft	Im	nmature	Adu	ult					Tota	al
						Male	e	Fei	nale	Unl	known		
Great crested newt												0	
Smooth newt						1						1	
Palmate newt												0	
Smooth/palmate newt												0	

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Pond 30

Pond 30	Visit 1			1	15/04/14							
Temperature:	6ºC				Rain					Ν	one	
Wind speed	No wind				Cloud co	ver				Li	ight	
Turbidity score	3				Vegetatio	on cov	er			3		
Survey constraints	Steep b	anks limit a	access	s to i	much of p	perime	eter					
% of perimeter surveyed	25% tor	ched			Other am	nphibia	ans			N	one	
Species	Egg	Torchlig	nt surv	/ey								
	search	Larvae	Eft		Immati	ure	A	dult				Total
							М	Male Fema		ale	Unknown	
Great crested newt	Yes						2	2				2
Smooth newt	None											0
Palmate newt												0
Smooth/palmate newt												0
Species		Trap sur	vey									
		Larvae	Eft	Im	mature	Adu	lt					Total
						Mal	е	Fer	nale	Un	iknown	
Great crested newt						3						3
Smooth newt								2				2
Palmate newt												0
Smooth/palmate newt												0

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Pond 30	Visit 2				30/04/14							
Temperature:	11ºC				Rain					Ν	lone	
Wind speed	Light				Cloud co	ver				С	Vercast	
Turbidity score	3				Vegetati	on co	ver			3		
Survey constraints	Steep b	anks limit	access	s to	much of	perin	nete	er		•		
% of perimeter surveyed	25% tor	ched			Other an	nphib	ians	3		С	common frog	
Species	Egg	Torchlig	ht surv	/ey								
	search	Larvae	Eft		Immat	ure	A	dult				Total
							Μ	lale	Fema	ale	Unknown	
Great crested newt	n/a											0
Smooth newt	None											0
Palmate newt	-											0
Smooth/palmate newt									2			2
Species		Trap su	vey									
		Larvae	Eft	In	nmature	Adı	ult					Total
						Ма	le	Fer	nale	Ur	nknown	
Great crested newt				1		7		4				12
Smooth newt												0
Palmate newt												0
Smooth/palmate newt												0

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Pond 30	Visit 3			-	13/05/14							
Temperature:	11ºC				Rain					Ν	lone	
Wind speed	Light				Cloud co	ver				С	Overcast 90%)
Turbidity score	3				Vegetati	on co	ver			3		
Survey constraints	Steep b	anks limit :	acces	s to	much of	perin	nete	ər		•		
% of perimeter surveyed	25% tor	ched			Other an	nphib	ians	S		N	lone	
Species	Egg	Torchlig	ht surv	/ey								
	search	Larvae	Eft		Immat	ure	A	dult				Total
							N	lale	Fem	ale	Unknown	
Great crested newt	n/a											0
Smooth newt	None											0
Palmate newt												0
Smooth/palmate newt									1			1
Species		Trap sur	vey									
		Larvae	Eft	In	nmature	Adı	ult					Total
						Ма	le	Fei	nale	Ur	nknown	
Great crested newt												0
Smooth newt						1		3				4
Palmate newt]											0
Smooth/palmate newt												0

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Pond 30	Visit 4			1	14/05/14							
Temperature:	8ºC				Rain					Ν	one	
Wind speed	Light				Cloud co	ver				Ν	one	
Turbidity score	3				Vegetatio	on cov	/er			3		
Survey constraints	Steep ba	anks limit a	access	s to i	much of p	oerim	eter					
% of perimeter surveyed	25% tor	ched			Other an	nphibi	ans			N	one	
Species	Egg .	Torchlig	nt surv	/ey								
	search	Larvae	Eft		Immat	ure	Adult					Total
							Ма	ale	Fema	ale	Unknown	
Great crested newt	n/a											0
Smooth newt	None											0
Palmate newt												0
Smooth/palmate newt												0
Species		Trap sur	vey									
		Larvae	Eft	Im	mature	Adı	ult					Total
						Ма	le	Fer	nale	Ur	Iknown	
Great crested newt						1		3				4
Smooth newt												0
Palmate newt												0
Smooth/palmate newt												0

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Pond 30	Visit 5				28/05/14							
Temperature:	13ºC				Rain					N	lone	
Wind speed	Light				Cloud co	ver				С	Overcast	
Turbidity score	2				Vegetatio	on co	ver			3		
Survey constraints	Steep ba	anks limit a	access	s to	much of p	oerim	ete	r				
% of perimeter surveyed	25% tor	ched			Other an	nphibi	ans	3		N	lone	
Species	Egg	Torchlig	ht surv	/ey								
	search	Larvae	Eft	t	Immat	ure	A	Adult				Total
							N	lale	Female		Unknown	
Great crested newt	n/a						1		1			0
Smooth newt	None											0
Palmate newt												0
Smooth/palmate newt												0
Species		Trap sur	vey									
		Larvae	Eft	lr	nmature	Adı	ult					Total
						Ма	le	Fei	nale	Ur	nknown	
Great crested newt						5	3					8
Smooth newt												0
Palmate newt												0
Smooth/palmate newt												0

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Pond 30	Visit 6				29/05/14							
Temperature:	13ºC				Rain					N	lone	
Wind speed	Light				Cloud co	ver				С	Vercast	
Turbidity score	3				Vegetatio	on co	ver			3		
Survey constraints	Steep b	anks limit a	access	s to	o much of	perim	ete	r		•		
% of perimeter surveyed	25% tor	ched			Other an	nphibi	ians	8		С	common frog	
Species	Egg	Torchlig	ht surv	vey	/					•		
	search	Larvae Eft			Immat	ure	A	dult				Total
						Ν	lale	Fema	ale	Unknown		
Great crested newt	n/a											0
Smooth newt	None											0
Palmate newt												0
Smooth/palmate newt												0
Species		Trap sur	veys									
		Larvae	Eft	I	mmature	Adı	ult					Total
						Ма	le	Fer	nale	Ur	nknown	
Great crested newt						3		1				4
Smooth newt												0
Palmate newt]											0
Smooth/palmate newt												0

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Pond 35	Visit 1				15/04/1	4			
Temperature:	7ºC				Rain			None	
Wind speed	No wind				Cloud	cover		None	
Turbidity score	-				Vegeta	tion cov	ər	5	
Survey constraints	Torching	difficult du	e to	heav	vy duckwee	d cover			
% of perimeter surveyed	70%				Other a	amphibia	ns	None	
Species	Egg	Torchligh	nt sui	rvey					
	search	Larvae	Eft	t I	Immature	Adult			Total
						Male Female			
Great crested newt	None								0
Smooth newt	None								0
Palmate newt								0	
Smooth/palmate newt									0
Species		Trap sur	vey						
		Larvae		Eft	Immature	e Adul	t		Total
						Male	Female	Unknown	
Great crested newt								0	
Smooth newt						5	1		6
Palmate newt								0	
Smooth/palmate newt									0

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Pond 35	Visit 2	Visit 2							
Temperature:	11ºC				Rain			None	
Wind speed	None				Cloud co	over		None	
Turbidity score	-				Vegetat	ion cove	r	5	
Survey constraints	Torching	g suspende	ed due	e to	heavy du	ckweed	cover		
% of perimeter surveyed	70%				Other ar	None			
Species	Egg	Trap sur	vey						
	search	Larvae	Eft	Ir	nmature Adult				Total
						Male	Female	Unknown	
Great crested newt	None								0
Smooth newt	None					18			18
Palmate newt							2		2
Smooth/palmate newt									0

Pond 35	Visit 3				12/05/14	ļ			
Temperature:	9ºC				Rain			None	
Wind speed	Light				Cloud c	over		Overcast	
Turbidity score	-				Vegetat	ion cove	r	5	
Survey constraints	Torchinę	g suspend	ed due	e to	heavy du	ickweed	cover		
% of perimeter surveyed	70%				Other ar	mphibiar	าร	None	
Species	Egg	Trap su	vey						
	search	Larvae	Eft	In	nmature	Adult			Total
						Male	Female	Unknown	
Great crested newt	n/a								0
Smooth newt	None								0
Palmate newt									0
Smooth/palmate newt									0

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Pond 35	Visit 4			2	28/05/14				
Temperature:	13ºC				Rain			None	
Wind speed	No wind				Cloud c	over		Overcast	
Turbidity score	-				Vegetat	ion cove	er	5	
Survey constraints	Torching	g suspend	ed du	e to h	neavy du	ickweed	cover		
% of perimeter surveyed	70%				Other a	mphibia	าร	None	
Species	Egg	Trap su	rvey						
	search	Larvae	Eft	Imr	mmature Adult				Total
						Male	Female	Unknown	
Great crested newt	n/a								0
Smooth newt	None								0
Palmate newt									0
Smooth/palmate newt									0

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NOT PROTECTIVELY MARKED

Volume 2 Annex 14A.5 Primary Data 44



Pond 54

Pond 54	Visit 1			15/04/14								
Temperature:	7ºC				Rain					Ν	lone	
Wind speed	No wind				Cloud co	ver				Ν	lone	
Turbidity score	0				Vegetati	on co	ver			4		
Survey constraints	Torching to deep	g difficult c silt.	lue to	hea	avy duck	weed	COVE	er. Un	safe	to t	trap all of poi	nd due
% of perimeter surveyed	75%				Other an	nphib	ians			N	lone	
Species	Egg	Torchlig	ht surv	'ey								
	search	Larvae	Eft		Immat	ure	Ad	ult				Total
					Ма			ale F	Fema	ale	Unknown	
Great crested newt	None										0	
Smooth newt	None									0		
Palmate newt											0	
Smooth/palmate newt											0	
Species		Trap sur	vey		-						·	
		Larvae	Eft	Im	mature	Adı	ult					Total
						Ма	le	Fema	ale	Un	nknown	
Great crested newt												0
Smooth newt												0
Palmate newt												0
Smooth/palmate newt												0

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Pond 54	Visit 2				24/04/14							
Temperature:	10ºC				Rain					Ν	lone	
Wind speed	Light				Cloud co	ver				N	lone	
Turbidity score	3				Vegetatio	on cov	/er			5		
Survey constraints	Torching to deep	g not effec silt.	tive du	ue t	o total du	ckwee	ed c	over	, unsaf	e to	trap all of po	nd due
% of perimeter surveyed	60%				Other am	nphibia	ans			N	lone	
Species	Egg	Torchlig	nt surv	vey						•		
	search	Larvae	Eft	t	Immati	ure	A	dult				Total
							М	lale	Fema	ale	Unknown	
Great crested newt	None											0
Smooth newt	None											0
Palmate newt												0
Smooth/palmate newt												0
Species		Trap sur	vey									
		Larvae	Eft	Ir	nmature	Adu	ılt					Total
						Mal	е	Fer	nale	Ur	nknown	
Great crested newt												0
Smooth newt												0
Palmate newt												0
Smooth/palmate newt												0

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Pond 54	Visit 3				13/05/14			1		
Temperature:	13ºC				Rain			None		
Wind speed	Light				Cloud co	ver		Light		
Turbidity score	5				Vegetatio	on cover		5		
Survey constraints	Torching all of por	suspended ad due to de	d due t eep silt	io tu t.	urbid water	and tota	al duckweed	cover, unsafe	e to trap	
% of perimeter surveyed	60%				Other an	nphibians	3	None		
Species	Egg	Trap surv	/ey							
	search	Larvae	Eft	In	nmature	Adult		Total		
						Male	Female	Unknown		
Great crested newt	None								0	
Smooth newt	None								0	
Palmate newt									0	
Smooth/palmate newt									0	

Pond 54	Visit 4				15/05/14				
Temperature:	11ºC				Rain			-	
Wind speed	-				Cloud co	ver		-	
Turbidity score	-				Vegetatio	on cover		-	
Survey constraints	Steep ba	inks limit ad	ccess to	o mu	uch of per	imeter			
% of perimeter surveyed	25%				Other an	nphibians	3	None	
Species	Egg	Trap surv	/ey						
	search	Larvae	Eft	lmı	mature	Adult		Total	
						Male	Female	Unknown	
Great crested newt	None								0
Smooth newt	None								0
Palmate newt									0
Smooth/palmate newt									0

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Pond 55

Pond 55	Visit 1			•	15/04/14							
Temperature:	7ºC				Rain					N	lone	
Wind speed	No wind				Cloud co	ver				L	ight	
Turbidity score	3				Vegetatio	on cov	er			2		
Survey constraints	Difficult possible	to torch d only from	ue to within	quit por	e turbid v nd.	water,	hea	avy v	vegetat	ion	on banks so	survey
% of perimeter surveyed	50%				Other am	nphibia	ans			N	lone	
Species	Egg	Torchlig	ht surv	/ey								
	search	Larvae	Eft		Immati	ure	Adult					Total
							М	ale	Female		Unknown	
Great crested newt	None											0
Smooth newt	None											0
Palmate newt												0
Smooth/palmate newt												0
Species		Trap sur	vey									
		Larvae	Eft	In	nmature	Adu	ılt					Total
						Male	е	Fer	male	Ur	nknown	
Great crested newt						1	2					3
Smooth newt						1					1	
Palmate newt												0
Smooth/palmate newt											0	

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Pond 55	Visit 2			2	24/04/14							
Temperature:	10ºC				Rain					Ν	lone	
Wind speed	Light				Cloud co	ver				L	ight	
Turbidity score	3				Vegetatio	on co	ver			1		
Survey constraints	Difficult to t possible on	orch due	to quit nin por	te ti nd.	urbid wa	ter, h	iea	vy ve	egetatio	on c	on banks so	survey
% of perimeter surveyed	50%				Other an	nphib	ian	S		N	lone	
Species	Egg	Torchlig	ht surv	/ey						•		
	search	Larvae	Eft		Immat	ure	A	dult				Total
								Male Fema		ale	Unknown	
Great crested newt	None											1
Smooth newt	None										0	
Palmate newt												0
Smooth/palmate newt												0
Species	Egg	Trap sur	vey									
	search	Larvae	Eft	Im	nmature	Adı	ult					Total
						Ма	le	Fei	male	Ur	nknown	
Great crested newt	None							1				1
Smooth newt	None											0
Palmate newt												0
Smooth/palmate newt												0

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Pond 55	Visit 3			13/05/14						
Temperature:	14ºC				Rain		None			
Wind speed	Light				Cloud co	ver	Overcast			
Turbidity score	-				Vegetation cover			-		
Survey constraints	Torching due to he	Torching suspended due to turbid water, survey possible only from within p due to heavy vegetation on banks.						thin pond		
% of perimeter surveyed	50%				Other amphibians			None		
Species	Egg search	Trap survey								
		Larvae	Eft li		nmature	Adult			Total	
						Male	Female	Unknown		
Great crested newt	None						4		0	
Smooth newt	None								4	
Palmate newt									0	
Smooth/palmate newt									0	

Pond 55	Visit 4			15/05/14					
Temperature:	11ºC				Rain		-		
Wind speed	-				Cloud co	ver	-		
Turbidity score	-				Vegetatio	on cover	-		
Survey constraints	Torching due to he	Torching suspended due to turbid water, survey possible only from within po due to heavy vegetation on banks.							
% of perimeter surveyed	50%				Other amphibians			None	
Species	Egg search	Trap survey							
		Larvae	rvae Eft l		nmature	Adult			Total
						Male	Female	Unknown	
Great crested newt	None						1		1
Smooth newt	None								0
Palmate newt									0
Smooth/palmate newt									0

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Pond 55	Visit 5			27/05/14					
Temperature:	12ºC				Rain		Heavy		
Wind speed	None				Cloud cover			Overcast	
Turbidity score	5				Vegetation cover			2	
Survey constraints	Torching due to he	Torching suspended due to turbid water, survey possible only from within due to heavy vegetation on banks.						thin pond	
% of perimeter surveyed	50%				Other amphibians			None	
Species	Egg search	Trap survey							
		Larvae	Eft Ir		nmature	Adult			Total
						Male	Female	Unknown	
Great crested newt	None					5	1		6
Smooth newt	None								0
Palmate newt									0
Smooth/palmate newt									0

Pond 55	Visit 6			29/05/14					
Temperature:	13ºC				Rain		-		
Wind speed	-				Cloud co	ver	-		
Turbidity score	5				Vegetatio	on cover	2		
Survey constraints	Torching due to he	Torching suspended due to turbid water, survey possible only from within po due to heavy vegetation on banks.							
% of perimeter surveyed	50%				Other amphibians			None	
Species	Egg search	Trap survey							
		Larvae	Eft li		nmature	Adult			Total
						Male	Female	Unknown	
Great crested newt	None						2		2
Smooth newt	None								0
Palmate newt									0
Smooth/palmate newt									0

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Pond 56

Pond 56	Visit 1				15/04/14							
Temperature:	7ºC				Rain				Ν	lone		
Wind speed	No wind				Cloud co	ver			Ν	None		
Turbidity score	4				Vegetati	on co	ver	1	1			
Survey constraints	Torchin	g difficult d	turb	Irbid water, trap locations limited by gravel sub								
% of perimeter surveyed	80%				Other an	nphib	ians	N	None			
Species	Egg	Torchlig	ht surv	/ey					•			
	search	Larvae	Eft		Immat	ure	Adu	lt			Total	
							Mal	e Fem	ale	Unknown		
Great crested newt	None										0	
Smooth newt	None										0	
Palmate newt											0	
Smooth/palmate newt											0	
Species		Trap sur	vey					<u>.</u>				
		Larvae	Eft	In	nmature	Ad	ult				Total	
						Ма	le F	emale	Ur	nknown		
Great crested newt											0	
Smooth newt											0	
Palmate newt											0	
Smooth/palmate newt											0	

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Pond 56	Visit 2			2	24/04/14								
Temperature:	10ºC				Rain					Ν	None		
Wind speed	Light				Cloud cover						Light		
Turbidity score	4				Vegetatio	on cov	er			2			
Survey constraints	Difficult	ficult to torch due to turbid water. Trap locations limited by gravel substrate											
% of perimeter surveyed	80%		Other amphibians						ns None				
Species	Egg	Torchlig	orchlight survey										
	search	Larvae	Eft		Immature			ult				Total	
							Male Fema		ale	Unknown			
Great crested newt	None											0	
Smooth newt	None											0	
Palmate newt												0	
Smooth/palmate newt												0	
Species		Trap sur	vey		•							•	
		Larvae	Eft	Im	nmature	Adu	lt					Total	
						Male	е	Fer	nale	Ur	ıknown		
Great crested newt												0	
Smooth newt												0	
Palmate newt												0	
Smooth/palmate newt												0	

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Pond 56	Visit 3				13/05/14						
Temperature:	14ºC				Rain		None	None			
Wind speed	Light				Cloud co	over	Overcast	Overcast			
Turbidity score	5				Vegetati	on cover	1	1			
Survey constraints	Torching substrate	not effect	not effective due to very turbid water. Trap locations limited by g								
% of perimeter surveyed	20%		Other amphibians								
Species	Egg	Trap sur	Trap survey								
	search	Larvae	Eft	lr	nmature	Adult			Total		
						Male	Female	Unknown			
Great crested newt	None								0		
Smooth newt	None								0		
Palmate newt									0		
Smooth/palmate newt									0		

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Pond 56	Visit 4			•	14/05/14								
Temperature:	8ºC				Rain					Ν	one		
Wind speed	Light				Cloud cover Light						ight		
Turbidity score	4		Vegetation cover 1									1	
Survey constraints	Difficult	fficult to torch due to turbid water. Trap locations limited by gravel substrate											
% of perimeter surveyed	80%				Other amphibians					N	one		
Species	Egg	Torchlig	Torchlight survey										
	search	Larvae	Eft		Immature Adu			lult				Total	
							Male Fema		ale	Unknown			
Great crested newt	None											0	
Smooth newt	None											0	
Palmate newt												0	
Smooth/palmate newt												0	
Species	Egg	Trap sur	vey										
	search	Larvae	Eft	In	nmature	Adu	lt					Total	
						Male	е	Fen	nale	Un	Iknown		
Great crested newt	None											0	
Smooth newt	None											0	
Palmate newt												0	
Smooth/palmate newt												0	

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Pond 57

Pond 57	Visit 1			•	14/04/14								
Temperature:	7ºC				Rain					Ν	lone		
Wind speed	Light				Cloud cover						None		
Turbidity score	3		Vegetation cover 1										
Survey constraints	Access	s to pond perimeter limited by steep bramble covered banks.											
% of perimeter surveyed	33%				Other amphibians					N	lone		
Species	Egg	Torchlig	Torchlight survey										
	search	Larvae	Eft	I	Immat	ure	Ac	dult				Total	
							Ma	ale	Female		Unknown		
Great crested newt	None								2			2	
Smooth newt	None											0	
Palmate newt												0	
Smooth/palmate newt												0	
Species		Trap sur	vey		·								
		Larvae	Eft	Im	nmature	Adu	lt					Total	
						Male	е	Fer	nale	Ur	nknown		
Great crested newt												0	
Smooth newt												0	
Palmate newt												1	
Smooth/palmate newt												0	

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Pond 57	Visit 2			22/04/14									
Temperature:	10ºC			Rain				None					
Wind speed	Light			Cloud co	Cloud cover								
Turbidity score	2			Vegetati	Vegetation cover								
Survey constraints	Access	to pond pe	pond perimeter limited by steep bramble covered banks.										
% of perimeter surveyed	33%		Other amphibians										
Species	Egg	Torchlig	ht surv	/ey			-						
	search	Larvae	Eft	Immature	Adult		Total						
					Male	Female	Unknown						
Great crested newt	None							0					
Smooth newt	None							0					
Palmate newt								0					
Smooth/palmate newt								0					
Species		Trap sur	vey										
		Larvae	Eft	Immature	Adult		Total						
					Male	Female	Unknown						
Great crested newt					1			1					
Smooth newt					2			2					
Palmate newt								0					
Smooth/palmate newt								0					

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Pond 57	Visit 3			29/04/14	29/04/14						
Temperature:	12ºC			Rain		-					
Wind speed	-			Cloud c	over	-	-				
Turbidity score	5			Vegetat	ion cove	1					
Survey constraints	Torching limited b	Forching not effective due to very turbid water, access to pond perimeter imited by steep bramble covered banks.									
% of perimeter surveyed	33%	Other amphibians None									
Species	Egg	Trap sur	vey								
	search	Larvae	Eft	Immature	Adult			Total			
					Male	Female	Unknown				
Great crested newt	None							0			
Smooth newt	None				1	1		2			
Palmate newt								0			
Smooth/palmate newt								0			

Pond 57	Visit 4			14/05/2014							
Temperature:	8ºC			Rain			None				
Wind speed	Light			Cloud cover			None				
Turbidity score	4			Vegetation c	over		1				
Survey constraints	Difficult shrew r covered	to torch du ecorded i banks.	due to very turbid water, trapping suspended due to drowned wa in visit 3. Access to pond perimeter limited by steep bram								
% of perimeter surveyed	33%			Other amphibians None							
Species	Egg	Torchlig	ht su	rvey							
	search	Larvae	Eft	Immature	Adult				Total		
					Male	Fem	ale	Unknown			
Great crested newt	None								0		
Smooth newt	None								0		
Palmate newt									0		
Smooth/palmate newt									0		

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1.3 2016 eDNA surveys

- a) Methodology
- 1.3.1 In 2016, Arcadis conducted great crested newt environmental DNA (eDNA) surveys on 14 ponds which had not been sampled in 2014, and pond descriptions (for HSI) and photographs recorded. These were Ponds A3, A4, A6, A7, A8, A9, A10, A13, A14, 8, 17, 18, 28, and 99 (see Figure 14A5.1, Annex 14A5.1). Four ponds were not surveyed because they were either dry (Pond A2, A5), no longer there (Pond A12), or unsafe to survey (Pond A1).
- 1.3.2 Sampling methodologies followed details in Biggs *et al.* "Analytical and methodological development for improved surveillance of Great Crested Newt, Appendix 5, Technical advice note for field and laboratory sampling of great crested newt environmental DNA" (Ref. 1.3)). As required by Natural England, samples were collected by a licensed surveyor between 15 April and 30 June 2016.
- 1.3.3 The samples were sent to the Food and Environment Research Agency's (FERA) eDNA testing service for analysis. The analysis method detects pond occupancy from great crested newts using traces of eDNA shed into the pond environment. The detection of great crested newt eDNA is carried out using real-time Polymerase Chain Reaction (PCR) to amplify part of the cytochrome 1 gene found in mitochondrial DNA. The method followed details in Biggs *et al.* (Ref. 1.3).
- 1.3.4 The limits of this method are as follows: (1) any variation between the characteristics of the sample and a batch will depend on the sampling procedure used; (2) the method is qualitative and therefore the levels given in the score are for information only, they do not constitute the quantification of great crested newt DNA against a calibration curve; (3) a 'not detected' result does not exclude the presence at levels below the limit of detection.
- 1.3.5 Appropriate biosecurity measures, as those described above, were adopted.
- 1.4 Results
- **Table 1.4** presents the results of the eDNA sampling from 2016. Great crested newt eDNA was not detected in any of the ponds sampled.

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Pond	Date sampled	Fera reference	GCN detection	GCN score	Inhibition	Degradation
A3	07/06/2016	S16-012041	Negative	0	No	No
A4	07/06/2016	S16-012026	Negative	0	No	No
A6	07/06/2016	S16-012028	Negative	0	No	No
A7	07/06/2016	S16-012032	Negative	0	No	No
A8	08/06/2016	S16-012016	Negative	0	No	No
A9	07/06/2016	S16-012027	Negative	0	No	No
A10	07/06/2016	S16-012035	Negative	0	No	No
A13	07/06/2016	S16-012045	Negative	0	No	No
A14	07/06/2016	S16-012042	Negative	0	No	No
8	08/06/2016	S16-012036	Negative	0	No	No
17	08/06/2016	S16-012038	Negative	0	No	No
18	08/06/2016	S16-012025	Negative	0	No	No
28	09/06/2016	S16-012043	Negative	0	No	No
99	08/06/2016	S16-012018	Negative	0	No	No

Table 1.4: eDNA survey results for ponds surveyed in 2016

1.4.2 Analysis was conducted in the presence of the following controls: (1) extraction blank; (20 appropriate positive and negative PCR controls for each of the TaqMan assays (GCN, Inhibition and Degradation). All controls performed as expected.

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References

- 1.1 Oldham R.S., Keeble J., Swan M.J.S. & Jeffcote M. 2000. Evaluating the suitability of habitat for the Great Crested Newt (*Triturus cristatus*). Herpetological Journal. 10(4): 143-155.
- 1.2 English Nature. 2001. Great Crested Newt Mitigation Guidelines. Peterborough: English Nature.
- 1.3 Biggs, J., Ewald N., Valentini A., Gaboriaud C., Griffiths R.A., Foster J., Wilkinson J., Arnett A., Williams, P. and Dunn, F. 2014. Analytical and methodological development for improved surveillance of Great Crested Newt. Appendix 5. Technical advice note for field and laboratory sampling of great crested newt (*Triturus cristatus*) environmental DNA. Oxford: Freshwater Habitats Trust.

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