

Norfolk Boreas Offshore Wind Farm

Appendix 22.9

Norfolk Hawker Dragonfly Survey Report

Environmental Statement

Volume 3

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Norfolk Vanguard Norfolk Hawker dragonfly survey

Report prepared by Norfolk Wildlife Services Ltd.
on behalf of Royal HaskoningDHV

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2. Introduction

2.1. Project background

2.1.1. Norfolk Vanguard is a proposed offshore wind farm being developed by Vattenfall Wind Power Limited (or an affiliate company), with a capacity of 1800MW, enough to power 1.3 million UK households. The offshore wind farm comprises two distinct areas, Norfolk Vanguard East (NV East) and Norfolk Vanguard West (NV West) and will be connected to the shore by offshore export cables installed within the provisional offshore cable corridor. The project will also require onshore infrastructure in order to connect the offshore wind farm to the National Grid at the existing National Grid substation at Necton, which in summary will comprise the following:

- Landfall;
- Cable relay station (if required);
- Underground cables;
- Onshore substation; and
- Extension to the existing Necton National Grid substation.

2.1.2. The location of the onshore electrical infrastructure is shown on Figure 1, Appendix A of the Extended Phase 1 Habitat Survey Report (Royal HaskoningDHV, 2017a). Collectively the onshore electrical infrastructure is herein referred to as the 'onshore project area'.

2.1.3. During the development of the project, the onshore Scoping Area that was initially defined has been refined to include three landfall options, associated cable relay search zones, as well as an onshore substation search zone in proximity to the Necton National Grid substation. A 200m wide cable corridor has been identified within which the buried cable will be located, and Horizontal Directional Drilling (HDD) zones and mobilisation zones have been identified along the cable corridor.

2.1.4. The surveys described within this report were designed and based on the onshore project area which was in use when the project Extended Phase 1 Habitat Survey was undertaken (February 2017). As the project design is further refined, these search zones will decrease in size, and the final options for the siting of infrastructure (i.e. one cable relay station, one landfall, one onshore substation) will be taken forward for the final Development Consent Order (DCO) application in June 2018.

2.2. Aim of report

2.2.1. As Norfolk Vanguard is a Nationally Significant Infrastructure Project (NSIP) an Environmental Impact Assessment (EIA) is required as part of a DCO application under the Planning Act 2008.

2.2.2. Norfolk Wildlife Services were appointed in late April 2017 to undertake additional ecological surveys to support this application as set out within the Survey Scope (Royal HaskoningDHV, 2017b).

2.2.3. The Extended Phase 1 Habitat Survey (Royal HaskoningDHV, 2017a) identified the potential for legally protected species located within the project area plus a 50m buffer surrounding the project area, and provided recommendations for further surveys required to characterise the ecological baseline for the project area.

2.3. Survey scope

2.3.1. A single female Norfolk hawkler *Anaciaeschna isosceles* (Müller, 1767) had been previously recorded on the 5th June 2017, on the adjacent side of the River Bure, grid

reference TG 20027 28654 during reptile surveys as part of the Phase 2 survey scope. In light of this finding, further surveys were commissioned in order to establish the extent of the *A. isoceles* population within habitats in the River Bure catchment that are also within the project area.

2.4. Survey objective

2.4.1. The aim of this report is to provide baseline information on *A. isoceles* in relation to the project area.

2.5. Conservation status of the Norfolk Hawker dragonfly

2.5.1. The species *A. isoceles* is protected under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended). The Act makes it an offence to intentionally kill, injure or take this species, and prohibits interference with waterbodies known to contain nymphs of this species without a licence. Additionally, this species is listed under Section 41 of the 2006 Natural Environment and Rural Communities (NERC) Act. Under Section 40 of the Act, all public bodies including local and regional authorities have a legal duty "to have regard" to the conservation of this species when carrying out their normal functions.

3. Methodology

3.1. This Section of the report sets out the proposed survey protocol as agreed between Royal HaskoningDHV and Norfolk Wildlife Services prior to any field work commencing and Section 4 sets out how the surveys were delivered in relation to the protocol and identifies any deviations or modifications that took place during the delivery phase.

3.1. Relevant guidance

3.1.1. The following guidance documents were used to inform development of the survey methodology:

- Hill D, Fasham M, Tucker G, Shewry M, Shaw P (2005) Handbook of biodiversity methods. Survey, evaluation and monitoring. Cambridge University Press, Cambridge.
- Drake, C.M., Lott, D.A., Alexander, K.N.A. and Webb, J. (2007). Surveying terrestrial and freshwater invertebrates for conservation evaluation. Natural England Research Report NERR005. Natural England, Peterborough.
- Smallshire, D. & Beynon, T. (2010) Dragonfly Monitoring Scheme Manual. British Dragonfly Society.

3.2. Desktop survey

3.2.1. A brief desktop search for relevant literature on the distribution of *A. isoceles* in the surrounding area will be carried out. Records of *A. isoceles* within the surrounding area will be requested from the British Dragonfly Society County Recorder (Pam Taylor) and the National Trust (landowner). Norfolk Biodiversity Information Service database was previously searched by Royal HaskoningDHV.

3.3. Field method

3.3.1. Two transects are identified for survey, shown in Appendix 1 (recorded as NH01 and NH02) consisting of wet ditch systems within the River Bure catchment. Each transect will be sub-divided into approximate 100m sections (recorded as S[number]) with a photograph and GPS co-ordinates taken at the start of each section.

3.3.2. A scoping survey for both transects was carried out on 5th July 2017 to consolidate the methodology and to categorise the ditch habitats.

A. *isoceles* visual survey

3.3.3. A visual only methodology is prescribed for the survey.

3.3.4. The transects will be walked at a slow and constant speed, keeping to the edge of the ditch. Adult and teneral *A. isoceles* dragonflies will be recorded in front of, and to the sides of the surveyor. Additional dragonfly species will be recorded where possible without causing distraction to the identification of *A. isoceles*.

3.3.5. Dominant habitats present within the ditch sections and immediate adjacent land will be categorized into three levels according to habitat types in the Dragonfly Monitoring Scheme (Smallshire *et al.*, 2010, Appendix 2).

3.3.6. Three surveys of each transect will be undertaken during the *A. isoceles* main flight period during mid-May to mid-July (Cham *et al.*, 2014).

Survey timing, equipment and weather conditions

3.3.7. Surveys will only be carried out under the following conditions as outlined in the Dragonfly Monitoring Scheme:

- Between 10.00 and 16.00 BST.
- During sunny weather, with cloud cover less than 5/8 and no rain.
- During windspeed of less than Beaufort Windscale 4.
- Temperature never reaching below 15°C or over 30°C.

3.3.8. Close focusing binoculars will be used for this survey. A hand-held GPS receiver (Garmin eTrex) will be used to record co-ordinates.

Personnel

3.3.9. All surveys will be undertaken by suitably experienced invertebrate surveyors, who will either be members of CIEEM or act according to its code of conduct.

4. Delivery

4.1. Desktop survey

4.1.1. The desktop survey was carried out between July and August 2017, with confirmation of any records from NBIS received by Royal HaskoningDHV in June 2017.

4.2. Access to survey sites

4.2.1. Site surveys were carried out on both transects on 5th, 12th, 13th and 19th July 2017.

4.3. Survey timing, equipment and weather conditions

4.3.1. There were no deviations from the methodology in the equipment used for the survey.

4.3.2. The surveys were carried out between the hours of 10:00 and 16:00 BST. A summary of the weather conditions for each survey can be found in Table 1 below.

Table 1 : Summary of weather conditions during transect surveys carried out in 2017

Survey visit	Beaufort Windscale	Temperature (°C)	Cloud cover (Eighths)
05/07/2017	1	21	4/8
12/07/2017	2 (gusts of 3)	20	4/8
13/07/2017	1	21	2/8
19/07/2017	2	24	4/8

4.4. Personnel

4.4.1. All survey visits were carried out by Ben Christie GradCIEEM. Ben has over 6 years' experience in surveying invertebrates, across terrestrial and aquatic habitats.

4.5. Limitations

4.5.1. The surveys were carried out in July, towards the end of the main flight period for *A. isoceles*. Although toward the end of the flight period, the surveys were still within the flight season so are considered suitable for providing data on presence of Norfolk hawkers.

5. Results

5.1. Desktop survey

5.1.1. The nearest verified record for Norfolk Hawker was approximately 8km east, near Westwick (British Dragonfly Society, 2010). No existing records for *A. isoceles* within the surrounding area were found through the sources searched (including pers. comm. Pam Taylor 07/08/2017), or through the previously searched NBIS database (pers. comm. Gordon Campbell, 28/06/2017).

5.1.2. *A. isoceles* is a scarce and locally distributed dragonfly. The major stronghold of the dragonfly in Norfolk is thought to be restricted to the Norfolk Broads (Pickwell *et al.*, 2012; Shirt, 1987; Southwood *et al.*, 2005). Data from the Dragonfly Recording Network between 1970 and 2009 show an increase in population and distribution in Norfolk focused around the geographical area of the Norfolk Broads (Pickwell *et al.*, 2012).

5.1.3. The habitat utilised by *A. isoceles* was once thought to be restricted to slow-flowing waterbodies containing water soldier *Stratolites aloides* (Shirt, 1987; Southwood *et al.*, 2005). This restriction was proved to be false (Pickwell *et al.*, 2012) and instead will inhabit slow-flowing ditches and pools with mesotrophic, meso-eutrophic and oligohaline water conditions with relatively diverse plant communities such as floating pondweed *Potamogeton spp.* (Doarks and Leach, 1990).

5.2. Field survey

5.2.1. A single male *A. isoceles* dragonfly was observed briefly quartering section 4 of transect 1 before flying away to the southeast towards the River Bure during the scoping survey on 5th July. No further observations of this species were recorded during the surveys. Survey results have been summarised in Table 2.

5.2.2. Seven additional dragonfly species (adult Eiprocta only) were observed during the surveys, they were: brown hawker *Aeshna grandis*, southern hawker *Aeshna cyanea*, emperor dragonfly *Anax imperator*, four-spotted chaser *Libellula quadrimaculata*, broad-bodied chaser *Libellula depressa*, black-tailed skimmer *Orthetrum cancellatum*, and common darter *Sympetrum striolatum*.

5.2.3. The dominant aquatic habitats were open water, slow-flowing drains with mesotrophic to meso-eutrophic water conditions. The banks of transect 1 were generally marshy with stands of tall herbs. Transect 2 banks were generally marshy, although section 1 was noted to be primarily neutral grassland. Surrounding habitat was dominated by grazed neutral grassland, with small pockets of marshy grassland. A natural spring was present close to section 1 of transect 2. The ditches had been cleared of vegetation and a partial clearance of sediment in spring 2017 (pers. comm.. Robert Mitchell, tenant farmer, 05/07/2017).

Table 2 : Summary of results for *A. isoceles* transect surveys in 2017, habitat codes in Appendix 2

Section	Grid reference	Aquatic habitats (level 1 and 2)	Terrestrial habitats (level 3)	Presence 05/07/2017 (scoping survey)	Presence 12/07/2017	Presence 13/07/2017	Presence 19/07/2017
NH01S1	TG 19664 28946	Dr, Me/Eu	Ma/Thf, Gr	N	N	N	N
NH01S2	TG 19728 28899	Dr, Me/Eu	Ma/Thf, Gr	N	N	N	N
NH01S3	TG 19814 28835	Dr, Me/Eu	Ma/Thf, Gr	N	N	N	N
NH01S4	TG 19865 28781	Dr, Me/Eu	Ma/Thf, Gr	Y	N	N	N
NH01S5	TG 19828 28780	Dr, Me/Eu	Ma/Thf, Gr	N	N	N	N
NH01S6	TG 19753 28858	Dr, Me	Ma/Thf, Gr	N	N	N	N

Section	Grid reference	Aquatic habitats (level 1 and 2)	Terrestrial habitats (level 3)	Presence 05/07/2017 (scoping survey)	Presence 12/07/2017	Presence 13/07/2017	Presence 19/07/2017
NH01S7	TG 19717 28847	Dr/Sp, Me	Ma/Thf, Gr	N	N	N	N
NH01S8	TG 19776 28802	Dr, Me/Eu	Ma/Thf, Gr	N	N	N	N
NH02S1	TG 19422 28929	Dr/Fs, Me	Gr/Thf, Gr	N	N	N	N
NH02S2	TG 19497 28928	Dr, Me	Ma, Gr	N	N	N	N
NH02S3	TG 19589 28920	Dr, Me	Ma, Gr	N	N	N	N
NH02S4	TG 19653 28946	Dr, Me/Eu	Ma, Gr	N	N	N	N
NH02S5	TG 19621 28868	Dr, Me	Ma, Gr	N	N	N	N
NH02S6	TG 19535 28886	Dr, Me/Eu	Ma/Thf, Gr	N	N	N	N

6. Conclusions

6.1. The ditches are clearly north of the current distribution range of *A. isoceles*. British dragonflies are expanding their ranges in a northward trend (Hickling *et al.*, 2005), therefore there is potential for *A. isoceles* to utilise the River Bure catchment north of Aylsham.

6.2. The habitats present within the ditch system are suitable for *A. isoceles*, however the absence of abundant aquatic plants is likely to prevent breeding from taking place. In the instance aquatic vegetation clearance of the ditches takes place annually in spring, the habitat present within the survey area will remain unsuitable for breeding *A. isoceles*.

6.3. A single male was recorded on the 5th July 2017 during the surveys, additionally a single female was previously recorded nearby on the 5th June 2017. No breeding was observed within the survey area. However, the peak flight period for the dragonfly is June, and therefore adults may have been active along the ditches prior to the surveys taking place. Due to two sightings, one of each sex of the dragonfly, it is possible that *A. isoceles* are breeding in the surrounding area if not in the ditches surveyed.

7. Recommendations

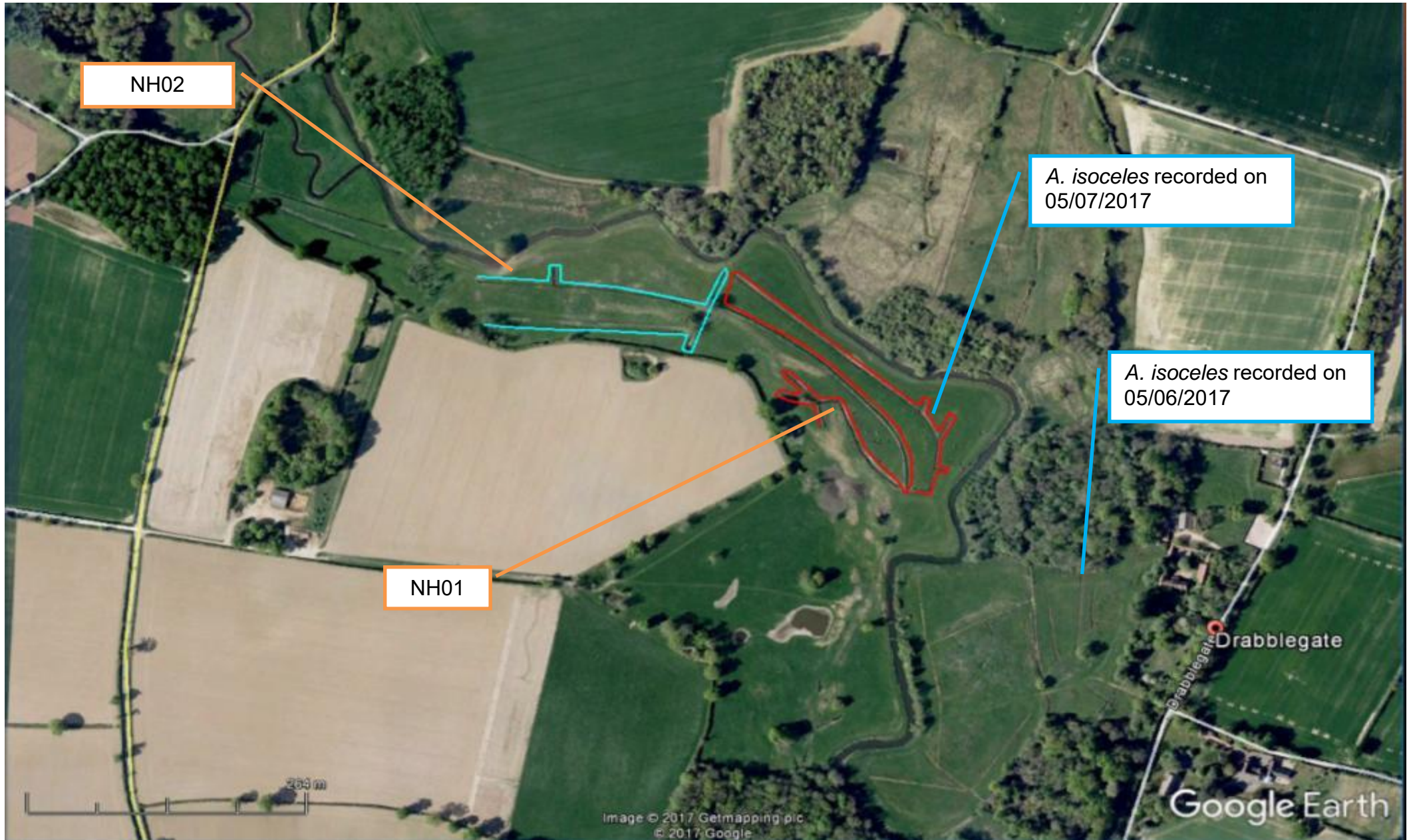
7.1. The proposed future management for the ditches should be established. In the instance annual clearance will take place to the extent observed during the 2017 season, no further surveys are required.

7.2. In the instance the management of the ditches is minimal or rotational, further assessment of the ditches is recommended. Repeat visual surveys for *A. isoceles* can take place during the peak flight period in June prior to works within the survey area taking place. Alternatively, targeted aquatic surveys for dragonfly nymphs could be carried out during the main active season between May and September (N.B. this will require a suitably qualified ecologist with a survey licence A29 from Natural England).

8. Bibliography

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- Shirt, D.B. (1987) British red data books: 2. Insects. Nature Conservancy Council, Peterborough, 402pp.
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Appendix 1: Survey map (Google Earth, 2017)



Appendix 2: Habitat types

Habitat types of the Dragonfly Monitoring Scheme (Smallshire *et al.*, 2010)

Code	Level 1	Code	Level 2	Code	Level 3
LL	Large Lake (>5ha)	Eu	Eutrophic	Sw	Swamp
SL	Small Lake (2-5ha)	Me	Mesotrophic	Ma	Marsh
LP	Large Pond (0.1-2ha)	Ol	Oligotrophic	Thf	Tall herb fen
SP	Small Pond(s) (<0.1ha)	Dy	Dystrophic	Gr	Grassland
RI	River (>3m wide)	Ust	Uncertain trophic status	Bb	Blanket bog
S	Stream (30cm-3m)	Mw	Mineral working	Urb	Upland raised bog
RU	Runnel (<30cm)	Pw	Peat working	Lrb	Lowland raised bog
CA	Canal	Res	Reservoir	Vm	Valley mire
DR	Drain/Ditch/Dyke	Bal	Balancing	Bm	Basin mire
FS	Flush/Spring	Sed	Sedimentation	Fp	Flood plain
				Gm	Grazing marsh
		Fp	Fishpond	Uh	Upland heath
		Oa	Other artificial water	Lh	Lowland heath
		Oxb	Oxbow	T	Tillage
		Bp	Borrow pit	Blw	Broad-leaved woodland
		Ds	Dune slack	Cw	Coniferous woodland
		Sl	Saline lagoon	Mw	Mixed woodland
		Tmp	Temporary	Sc	Scrub
		Smf	Slow-medium flow	Bg	Bare ground
		Ff	Fast-flowing	Gr	Grazed
		Ac	Acidic - pH<6	Cu	Cut
		Ne	Neutral - pH 6-8	Bu	Burnt
		Ca	Calcareous - pH>8	Ur	Urban (developed)
		Br	Brackish	Pos	Urban (public open space)

Dystrophic	Brownish acidic waters; high concentration of humic matter; few plants and fish; e.g bog pool
Eutrophic	Rich in mineral and organic nutrients; abundant plant life, especially algae; low dissolved oxygen content
Grassland	Permanent grassland running up to the water's edge, typically <1.5m tall; specify whether acidic (pH<6), neutral

	(pH 6-7) or calcareous (pH 8 or above); include Bracken stands here
Lowland heath	Heathers and gorses, typically below 300m
Marsh	Grass-like vegetation, <1.5m above water by late summer (e.g. rushes <i>Juncus</i> species)
Mesotrophic	Clear waters with beds of submerged aquatic plants and medium nutrient levels
Mineral working	Working or abandoned sand, gravel or clay pit
Oligotrophic	Lacking in plant nutrients (phosphates, nitrates) and organic matter; few plants; high concentration of dissolved oxygen
Oxbow	Cut-off river meander, sometimes seasonal
Peat working	Typically worked and flooded, includes the Broads
Reservoir	Impoundment for drinking water, canal feed or irrigation
Saline lagoon	May be hypersaline (unsuitable for Odonata); salt-tolerant vegetation
Sedimentation	Impoundment used to trap fine sediment
Swamp	Grass-like vegetation, >1.5m above water by late summer (e.g. Reed <i>Phragmites australis</i>)
Tall herb fen	Meadowsweet and other tall herbs and grasses, >1.5m above waterlogged land by late summer
Temporary	Waters (especially small ponds) are assumed to be permanent unless described in this way.
Tillage	Cultivated arable & horticultural land
Upland heath	Heathers, typically above 300m

Appendix 3: Photographs

Figure 1 : NH02S1, facing east



Figure 2 : NH02S2, facing east



Figure 3 : NH02S3, facing east



Figure 4 : NH02S4, facing north



Figure 5 : NH02S5, facing south



Figure 6 : NH02S5, facing west



Figure 7 : NH02S6, facing west



Figure 8 : NH02S6, dog-leg, facing east



Figure 9 : NH01S1, facing southeast



Figure 10 : NH01S2, facing southeast



Figure 11 : NH01S3, facing southeast



Figure 12 : NH01S3, spur ditch, facing south



Figure 13 : NH01S4, facing south



Figure 14 : NH01S5, facing northwest



Figure 15 : NH01S6, facing northwest



Figure 16 : NH01S7, facing southeast



Figure 17 : NH01S7, spur ditch and pool, facing east



Figure 18 : NH01S8, facing southeast

