ORNITHOLOGY

INTRODUCTION

8.1 This Addendum assesses the effects of the proposed minor amendments to the Heckington Fen Wind Park on birds. It uses the same data and follows the same methods and guidance as detailed in Chapter 8: Ornithology in the original Environmental Statement (ES). The assessment considers the following changes to the permitted scheme:

- *Amending the onsite access track along two sections within the Development Site and an allowance for micro-siting as set out in **Figure 3.1**;*
- *Relocating and increasing the footprint of the onsite substation, including relocating the temporary construction compound to an area of existing hardstanding, providing temporary auxiliary crane pad areas and an underground cabling corridor from the turbines to the onsite substation as set out in **Figure 3.1**; and,*
- *Amending the turbine rotor diameter from 90m, as indicated on the consented Site Edged Red plan (4038_A0085_03), to a maximum rotor diameter of up to 103m and a 10 metre radius micro-siting allowance around each turbine location where onsite constraints allow as set out in **Figure 3.1**.*

8.2 **Chapter 3: Details of the Variation** provides further details of these amendments.

8.3 The proposed amendments would result is an overall decrease in the permanent loss of arable habitat from an original 99,035m^2 to 83,650m^2 as shown on **Figure 3.3**.

8.4 The proposed amendment to the maximum rotor diameter is due to rapidly improving wind turbine technology which would allow Ecotricity to maximise renewable energy generation on the site. The maximum tip height will remain the same at 125m; however the lower blade sweep could be reduced by a maximum of 6m from 28m to 22m.

8.5 The potential effects of an increased rotor diameter (between 101m and 103m) will be assessed (see **Table 8.2**).

8.6 These minor amendments have the potential to result in a number of changes in the effects on birds when compared to the consented development:

- Changes in the level of disturbance during construction: construction of tracks, turbines, buildings and hard-standings;
- Changes in the level of disturbance during turbine operation and associated maintenance activities; and,
- Changes in the level of disturbance during decommissioning.

8.7 The potential effects of the proposed wind park on birds are:

- Changes in the direct habitat loss: due to land-take by wind turbine bases, access tracks and ancillary structures;
- Changes in indirect habitat loss: due to the displacement of birds as a result of construction and maintenance activities, or due to the presence of the operating wind turbines close to nesting or feeding sites or habitual flight routes; and,
- Changes in collision risk resulting in the killing or injury of birds following collision with rotating turbine blades and associated structures.

8.8 In the original ornithological assessment concerns were raised by RSPB and Natural England over the potential effect on two bird species: Marsh Harrier and Golden Plover through possible collision with turbine blades. During these discussions it was noted that Ecotricity had taken a very precautionary approach to the collision risk estimates. It was also noted that a single field to the north of the site was ploughed at the end of September which attracted large numbers of birds which were feeding on the exposed soils (see **Figure 8.1: Comparison of Bird Survey Vantage Point Areas**).

8.9 The baseline ornithological surveys had been carried out prior to the turbine location freeze and had used a 200m buffer around the developable area rather than the actual turbine locations (see **Figure 8.1**). The Vantage Point (VP) area surveyed was 6.9km^2 whereas the area, including the actual 200m buffer around the consented turbines, is 3.3Km^2. Whilst areas 6 and 7 were not included in the original collision risk calculation, the flights of birds in the remaining areas (1-5) were included. This included the areas between the 'Calculation Area' (within 200m of any turbine location), which is indicated by a solid black line on **Figure 8.1**, and the 'Flight Activity Survey Area' (within 200m of the original developable area), which is indicated by a solid green line on **Figure 8.1**. This area is shaded in light green on **Figure 8.1**.

8.10 The collision risk for both of these species has been recalculated for each of the 3 possible new turbine blades using the original oversized VP area and then for Golden Plover using the actual 200m buffer from the turbine locations rather than the buffer around the original developable area.

8.11 The assessment is based on information available at the time of writing (February 2015).

CHANGES IN LAYOUT AND DESIGN

On-site access tracks

8.12 It is proposed that the location of onsite access tracks will change as shown **in Figure 3.3.** This will result in a reduction in the area of arable habitat lost by 1.9 ha.

Ditch crossings

8.13 The minor changes in turbine and access tracks will increase the number of crossing of dry ditches from 15 to 16 but will not change the number of crossing of permanently wet ditches (**Figure 3.3**).

Crane Pads and substation

8.14 The area of land required for permanent crane pads will remain the same as the original layout but the substation will be moved to the east and the area required will increase by 0.35 ha. The substation will be screened with existing woodland and where appropriate new planting of woodland and hedgerow (**Figure 3.3**).

Temporary infrastructure

8.15 The area for temporary infrastructure will increase by 0.5 ha due to an increase in the area of the construction compound and the potential need for temporary auxiliary crane pads depending on the final turbine selected. The temporary construction compound will now be placed within an area of bare ground screen by existing woodland in the centre of the site (**Figure 3.3**).

Overall change in land take

8.16 Although the proposed changes in layout will result in a temporary increase land take of 0.5 ha, overall the new layout will require 1.54 ha less land assuming the 22 turbine layout. The land take will be less with the 18 or 19 turbine layout. There will be approximately 660m^2 of additional woodland planting.

Change in blade size

8.17 The potential changes in blade size, whilst not increasing the maximum tip height, will increase the swept area and reduce the height of the lowest point of the blade sweep. The changes in total blade sweep length and lower height of the blade sweep are shown in **Table 8.1** below. In order to optimise output from the permitted wind farm the number of turbines can be reduced with some models as set out in **Table 8.1.**

Table 8.1: Proposed new turbine dimensions

Turbine	Generator	Hub Height	Rotor Diameter	Lower sweep	Number of Turbines
Siemens SWT101	2.3 MW	74.5m	101m	24m	22
GE 103	2.85 MW	73.5m	103m	22m	19
Enercon E101	3.05 MW	74.5m	101m	24m	18

Changes in construction disturbance

8.18 The proposed alternative turbines will require the same construction techniques and construction time, although layouts with fewer turbines may slightly reduce the construction period. It is considered that changes in turbine blade lengths will not result in any significant change in the level of construction disturbance. It is therefore concluded that the level will be similar to that considered in the permitted layout; therefore no further assessment is required.

Changes in operation disturbance

8.19 The proposed alternative turbines will be in the same locations as the permitted turbines and therefore the level of maintenance disturbance will be similar. It is considered that changes in turbine blade lengths will not result in any significant change in the level of operational disturbance; therefore no further assessment is required.

Changes in collision risk

8.20 Increasing the blade size will increase the potential risk of bird collision. However, since the original surveys were conducted there has been no change in the land use of the site. It is all under intensive arable cultivation and there have been no significant changes in population size or distribution of the two species considered in this assessment. Therefore, it is considered appropriate that re-analysis of the original data will provide a robust and very precautionary estimate of changes in potential collision risk if a suitable precautionary approach is taken.

8.21 The original survey used flight categories 0-28m, 28-140m and 140m plus. In order to take account of the proposed change in turbine blade length it was assumed that the flights recorded in the original lower height zone of 0-28m were equally distributed. Using this methodology, the appropriate numbers of flights from the lower zone were then added to the total for the middle flight zone 28m-140m to calculate the number of flights through the blade sweep area.

8.22 Whilst Golden Plover may be equally distributed between 0 and 28m, this is very unlikely to be the case for Marsh Harrier as the majority of flights recorded for this species were birds hunting low along ditches typically 3-4m above the ground. Thus assuming an equal distribution of flights between 0 and 28m will over-estimate the potential collision risk for Marsh Harrier.

8.23 It should also be noted that for the original collision risk calculation a very precautionary approach was taken. The original survey area used for flight activity was significantly larger (6.93km^2) than the 200m buffer around the turbine locations (3.26km^2). The data collected for VP6 and VP7 was not used in the original collision risk assessments. However, even with VP areas 6 and 7 removed, the total flight area used in the collision risk calculations was 5.05km^2 which is 55% greater than the area within the 200m buffer around the actual turbine locations.

8.24 The previously agreed avoid rate of 99%, as accepted by Natural England, has been used, although there is increasing evidence that actual avoidance rates of turbines by birds are considerably higher[1] and a considerably more realistic estimate of collision risk may be ten times less than presented in **Table 8.2**.

Table 8.2: Estimates of collision risk for Marsh Harrier and Golden Plover for each of the possible new turbine configurations taking the most precautionary approach

	Marsh Harrier		Golden Plover	
Turbine	Collision p.a. using original larger VP area and 99% avoidance rate	Time between collision (years)	Collision p.a. using original larger VP area and 99% avoidance rate	Collision p.a. using actual 200m buffer around turbines VP area and 99% avoidance rate
Permitted	0.17	5.89	44.45	
Siemens SWT101	0.31	3.24	157	31.76
GE 103	0.25	4.07	125	25.51
Enercon E101	0.21	4.69	118	23.99

[1] *Whitfield D.P, 2007 Effects of Wind Farms on shorebirds (Waders: Charadrii) Especially with regard to Golden Plovers. Natural Research Ltd Report to Your Energy*

ASSESSMENT OF EFFECTS

Collision

8.25 The level of collision would depend on the amount of flight activity over the site, the extent to which birds are displaced by the turbines and the ability of birds to detect and manoeuvre around rotating turbine blades. Birds that collide with a turbine are likely to be killed or fatally injured.

8.26 The extent to which birds are able to avoid collision with wind turbines has not yet been adequately quantified. The indications from studies so far are that birds readily avoid wind turbines and that collisions are rare events and occur mainly at sites where there are unusual concentrations of birds and turbines, or where the behaviour of the birds concerned leads to high-risk situations[2]. Examples include concentrated migration flyways, other situations where large numbers of birds may be flying at night or in poor visibility (e.g. tidal feeding movements), areas where the food resource is exceptional, 'wind wall' turbine layouts (a close array of turbines across a wind funnel), and the use of lattice towers by perching birds. There are no such unusual circumstances at Heckington Fen that are likely to result in a high level of collision to birds.

Marsh harrier

8.27 There was no evidence to suggest that marsh harrier bred in the vicinity of the proposed development site in 2008 and no display-flights (often undertaken at higher altitude) were observed. Instead the vast majority of marsh harrier flights recorded were foraging flights characteristically at low level - during the total of 360 hours of flight activity work undertaken in the five recording zones that include proposed wind turbine locations during the April-September period that marsh harriers were present in the area, a total of 118 flights were recorded, and only 1,429 seconds were within potential rotor-sweep height for the original turbine blade. However, taking the highly precautionary approach as described in paragraph 8.25 this increased to between 3,322 seconds (Enercon E101) and 5,688 seconds with the Siemens SWT 101. Though work has yet to be undertaken on marsh harriers foraging on wind farms, extensive work has been conducted on the similar northern/hen harrier in the USA and continental Europe. This has shown that fatalities are extremely rare events such that northern/hen harriers do not appear to be susceptible to colliding with turbine blades and that collision mortality on wind farms should rarely be a serious concern[3]. The collision risk for marsh harrier has been re-calculated for each of new proposed turbine blade lengths. This would increase from one every 5.89 years with the permitted turbines, to one every 4.69 years with the Enercon E101, to one every 3.24 years with the Siemens SWT 101 (**Table 8.2**). Although as noted in **paragraph 8.23** these are very precautionary estimates.

8.28 However, the avoidance rate in this species is completely unknown and, as noted in **paragraph 8.23** above, the avoidance rates of the northern hen harrier in detailed studies over a number of years on at least eight large wind farms estimated avoidance rates of approaching 100%. Harriers' behaviour is to hunt low to the ground and they tend to only fly high during courtship or territorial flights. The true fatality rate is therefore likely to be much less than that calculated in **Table 8.2**. Marsh harrier populations have increased dramatically since the 1970's and are now breeding in sub-optimal habitat such as arable fields[4], where breeding success is significantly lower than in wetlands. This indicates that the population has probably reached carrying capacity in natural habitat and the greatest threat to their ongoing recovery is the loss of wetland habitat. Therefore, without the creation of new wetlands further population increases are likely to be limited. Taking all factors into account, the spatial magnitude of collision effects on marsh harrier is considered to be **negligible**. The overall effect is therefore **neutral** and there is predicted to be **no effect** on marsh harrier as a result of collision.

Golden plover

8.29 During the total of 600 hours of flight activity work undertaken in the five recording zones, that include proposed wind turbine locations, during the July-April period that golden plovers were present in the area, a total of 221 flights were recorded, 125 of these within potential rotor-sweep height. However, flights within potential rotor-sweep height were infrequent (averaging one flight every 4.8 hours),

8.30 In Autumn 2007 flocks of up to 2,100 birds (mean flock size of 66) were attracted to a recently ploughed field to the north of the site outside the land ownership (**Figure 8.1**). In this intensively farmed landscape most fields are ploughed and cultivated directly after harvest and within the following year crops are sown. By September most fields already have crops over 100mm tall, making them less attractive to sight-feeding foraging species such as golden plover and lapwing. Thus, this ploughed field in 2007 provided an exceptional feeding opportunity which attracted abnormally large numbers of golden plover to fields adjacent to the wind farm site, resulting in the large number flights in this area in October and November 2007.

8.31 Pre-construction ornithological surveys for this site commenced in November 2014 and the number of golden plover flights over the wind farm area was 28 times lower in November 2014, and twice as low in December 2014 as compared with December 2007 as **Table 8.3** indicates.

Table 8.3: A comparison of Golden Plover activity in 2007 and 2014

Number of bird seconds (flight time x number of birds) recorded per km^2 in 2007 and 2014 for Golden Plover			
Nov 2007	Dec 2007	Nov 2014	Dec 2014
251,692	21,560	8,681	10,163

8.32 The extent to which golden plovers are able to avoid collision with wind turbines has never been investigated or quantified. However, studies of onshore wind turbines in Schleswig-Holstein showed that waders reacted to turbines up to 200-500m away and showed either a change in flying height or direction in order to avoid them[5]. Studies of offshore wind farms in Denmark recorded similar responses in migrating waterfowl (primarily common eiders), both diurnally and nocturnally[6]. Studies

[2] *Dong Energy (2006). Danish Offshore Wind: key environmental issues. Dong Energy, Fredericia, Denmark.*

[3] *Whitfield, D.P. & Madders, M. 2006. A review of the impacts of wind farms on hen harriers Circus cyaneus and an estimation of collision avoidance rates. Natural Research Information Note 1 (revised). Natural Research Ltd, Banchory, UK.*

[4] *Bennet C, (2014). Evaluating the influence of habitat on nest distribution and breeding performance of the Marsh harrier, Circus aeruginous in UK. Msc Imperial Collage London*

[5] *Koop, B. (1997); cited in Langston, R.H.W. & Pullan, J.D. (2002). Windfarms and birds: an analysis of the effects of windfarms on birds and guidance on environmental assessment criteria and site selection issues. Birdlife International report to the Bern Convention. Convention on the Conservation of European Wildlife and Natural Habitats, Strasbourg, France.*

[6] *Dong Energy (2006). Danish Offshore Wind: key environmental issues. Dong Energy, Fredericia, Denmark.*

of *Aythya* ducks wintering in the Netherlands showed that they were able to negotiate four turbines, both on moonlit and moonless nights[7]. The eyesight of golden plover is highly likely to be at least as good as all these species, so similar avoidance action is likely to be taken in the majority of instances. Frequent observations over a prolonged period of a flock of up to 500 golden plovers at Penrhyddlan & Llidiartywaun Wind Farm, Powys witnessed frequent avoidance behaviour to enable the birds to regularly commute to a small area of prime foraging habitat completely surrounded by wind turbines[8].

8.33 The collision risk for golden plover at Heckington Fen was re-calculated (**See Table 8.2**). The proposed increase in blade length will increase the collision risk for golden plover from 44 collisions per annum to between 118 collisions per annum with Enercon E101 to 157 collisions per annum with the Siemens SWT 101. This collision rate would represent between 0.16 and 0.22% of the over wintering population recorded on the SPAs. However, as noted by Jackson et al [9] a significant and increasing number of golden plover winter away from coastal wetland on intensive farmland. Thus the region's wintering population of golden plover may well be between two to three times the peak mean based on coastal web counts, in which case the collision rate would be significantly less.

8.34 As noted in paragraph 8.24 the original VP area included a 200m buffer around the original developable areas which was much greater than the final layout area. The majority of flights from the large flock of golden plover around this ploughed field to the north of the site were outside the 200m envelope around the turbine and therefore should be excluded from the collision risk calculations. However, in the original planning application a highly precautionary approach was taken and has been taken in **Table 8.2**. If these flights are excluded from the original collision risk assessment then the original collision risk would have been reduced to 14.4 per annum and estimated collision risk with the larger turbines would be between 24.0 and 31.8 birds per annum.

8.35 The avoidance rate in this species (input as 99% and crucial to the fatality rate outcome) is completely unknown, but given the species' characteristic flocking behaviour (where numerous eyes are on the look-out for danger, the entire flock then instantly reacting accordingly) and the observations made in Powys (where the avoidance rate, at least diurnally, was clearly very much more than 99%), the avoidance rate is likely to be very much closer to 99.9%[7]. There are currently no records of golden plover casualties at wind farms in the UK. Three extensive studies on bird collision with turbines in Europe (Germany, Belgium and the Netherlands) presented at the International Wind and Wildlife Conference Trondheim 2011 found that, despite there being large numbers of wintering golden plover on the coast and farmland in this part of Europe where relatively large number of casualties of water birds, gull and passerine were recorded, no golden plover casualties were recorded[10]. In detailed studies in North America (Buffalo Ridge and Foote Creek Rim), even taking into account search efficiency and predator removal, estimated avoidance rates were between 99.56 - 100% for American Glover Plover[11]. Thus the true avoidance rate is very likely to be closer to 99.9%. If the more ecologically appropriate estimate avoidance rate of 99.9% is used, then the collision risk would be reduced to between 11.8 and 15.7 collisions per annum. This would be considerably lower if only the flights within the 200m buffer area of the turbines were considered (between 2.4 and 3.2 birds per annum) rather than all the flights in the wider VP area.

8.36 Taking all factors into account, the spatial magnitude of collision effects on golden plover is considered to be, at worst, **low**. The overall effect is considered to be **negative** and there is predicted to be an effect of **minor significance** (not significant in terms of the EIA regulations) on golden plover as a result of collision, as was concluded in the original EIA.

Decommissioning

8.37 Habitat reinstatement would be decided in consultation with the statutory authorities at the time of decommissioning. It is assumed that habitats lost to the wind park infrastructure would be reinstated. Disturbance effects due to decommissioning and reinstatement of habitats would be similar to those identified for construction. As for construction, no decommissioning work would be undertaken within 500m of any breeding Schedule 1 species. In summary, there is predicted to be **no effect** on all species as a result of decommissioning.

MITIGATION

8.38 The original consented scheme has three conditions relating to nature conservation, namely Conditions 16, 17 and 18. A draft Nature Conservation Programme of Works relating to the discharge of these conditions has been prepared. Ecotricity will seek to agree this programme of works following the outcome of the Variation of Consent application. The wording of the conditions can be found in **Appendix 1.1: Original Consent Notice**.

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[7] *Spaans et al (1998); cited in Langston, R.H.W. & Pullan, J.D. (2002). Windfarms and birds: an analysis of the effects of windfarms on birds and guidance on environmental assessment criteria and site selection issues. Birdlife International report to the Bern Convention. Convention on the Conservation of European Wildlife and Natural Habitats, Strasbourg, France.*

[8] *Shepherd, K.B. (2001 & subsequent observations). Penrhyddlan & Llidiartywaun Wind farm proposed extension: Wintering bird survey and assessment. Report to: Ingenco, Glasgow.*

[9] *Jackson S.F, Graham E. Austin & Michael, Armitage J, S. (2006) Surveying water birds away from major water bodies: implications for water bird population estimates in Great Britain: Capsule Population size estimates of widely dispersed water bird species in Great Britain were improved using a stratified random sample of habitats in addition to standard counts of known wetlands., Bird Study, 53:2, 105-111*

[10] *NINA Report 693 Proceeding of a Conference on Wind Energy and Wildlife Impact 2-5 May 2011, Trondheim, Norway. Roel May , Kjetil Bevanger (eds)*

[11] *Whitfield D.P, 2007 Effects of Wind Farms on shorebirds (Waders: Charadrii) Especially with regard to Golden Plovers. Natural Research Ltd Report to Your Energy*

Table 8.4: Original summary of collision risk assessments from EIA

Species	Nature conservation importance	Behavioural sensitivity	Spatial magnitude	Temporal magnitude	Overall impact magnitude	Mitigation	Residual significance
Marsh harrier	High	Moderate	Negligible	Long-term	Neutral	Not required	No impact
Golden plover	High	Moderate	Low	Long-term	Negative	Not required	Minor

Table 8.5: Summary of collision risk assessment based on proposed new turbines

Species	Nature conservation importance	Behavioural sensitivity	Spatial magnitude	Temporal magnitude	Overall impact magnitude	Mitigation	Residual significance
Marsh harrier	High	Moderate	Negligible	Long-term	Neutral	Not required	No impact
Golden plover	High	Moderate	Low	Long-term	Negative	Not required	Minor