



The Sizewell C Project

5.10 Shadow Habitats Regulations Assessment Volume 4: Compensatory Measures

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1 Introduction

1.1 Background

1.1.1 The conclusion of Stages 1 (screening) and 2 (appropriate assessment (AA)) of SZC Co.'s **Shadow Habitats Regulations Assessment Report** (Doc Ref. 5.10) for the Sizewell C Project is that an adverse effect on the integrity of the Minsmere-Walberswick Special Protection Area (SPA) and Ramsar site cannot be discounted. This conclusion is reached due to the potential effect of noise and visual disturbance from construction activities on the breeding marsh harrier *Circus aeruginosus* population.

1.1.2 Given the above, SZC Co. has prepared information to demonstrate that there are 'no alternative solutions' to (Stage 3), and 'imperative reasons of overriding public interest' for (Stage 4) the Sizewell C Project in line with the requirements of The Conservation of Habitats and Species Regulations 2017 (the Habitats Regulations).

1.1.3 In parallel (and as part of Stage 4 of the Habitat Regulations Assessment (HRA) process), SZC Co. has prepared this document to describe the measures required to deliver appropriate compensatory habitat to offset potential adverse effects on the breeding marsh harrier population of the SPA and Ramsar site. Specifically, this document provides the information required to satisfy the requirements of the National Policy Statement (NPS) for Nuclear Power Generation (EN-6)¹ (Ref. 1.1), which states that where site-level assessments identify that compensation is required, it must:

- be appropriate for the area and the loss caused by the Sizewell C Project;
- be capable of protecting the overall coherence of the Natura 2000 network;
- be capable of implementation;
- be capable of ensuring that the Natura 2000 site is not irreversibly affected by the Sizewell C Project before the compensation is in place;
- be directed in measurable proportions to the habitats and species negatively affected;

¹ Annex A to Volume II of EN-6 presents a case for imperative reasons of overriding public interest (IROPI) for those instances where the strategic level appropriate assessment concluded that adverse effects on the integrity of European sites could not be ruled out. Section A.7 of Annex A explains the requirement for compensatory measures if IROPI can be demonstrated and contains the criteria that compensatory measures must meet, as listed above.

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- be related to the same biogeographical region (within the United Kingdom (UK));
- serve functions that are comparable to those that motivated the original area's submission for designation; and,
- be clearly defined, with implementation goals and managed so that the compensatory measures can achieve the goal of maintaining or improving the overall coherence of the Natura 2000 network.

1.1.4 In essence, the above criteria relate to the ecological feasibility of the compensation measures, their timing relative to the timing of the predicted effect on the SPA and Ramsar site, fitness for purpose and ability to be secured and implemented; these aspects are explored in this document.

1.1.5 The relationship between the various documents that comprise SZC Co.'s Stage 3 of the HRA process is as follows:

- **Shadow HRA Report, Volume 1:** Stages 1 and 2 - Screening and Appropriate Assessment.
- **Shadow HRA Report, Volume 2:** Stage 3 – Assessment of Alternative Solutions .
- **Shadow HRA Report, Volume 3:** Stage 4 Imperative Reasons of Overriding Public Interest (IROPI).
- **Shadow HRA Report, Volume 4:** Compensatory Measures (this document).

1.2 Structure of this document

1.2.1 The remainder of this document is structured as follows:

- Section 2 summarises the conclusions of the **Shadow HRA** (insofar as they are relevant to the requirement to provide compensatory habitat).
- Section 3 describes the proposed compensation measures, their timing and how they have been secured.
- Section 4 analyses the suitability of the proposed compensatory habitat (in terms of marsh harrier prey abundance and provision), as well as its location and extent. It also considers habitat management.
- Section 5 presents the conclusion reached regarding suitability of the compensatory measures in light of the requirements of EN-6.

1.3 Stage 2 Conclusion

1.3.1 The conclusion reached in the AA with respect to the effect of the construction phase of the Sizewell C Project is based on the following:

- the assumption that foraging marsh harrier within a potential visual impact zone which extends 150 metres (m) from the main development site boundary would be disturbed by the presence of human movement or infrastructure within the main development site (but not beyond 150m); and,
- for noise disturbance, a likely noise level threshold at which a potentially adverse behavioural response could be initiated for foraging marsh harrier is taken to be 70 decibel (dB) L_{Amax} , with it being assumed that foraging birds would be displaced from habitat encompassed by the 70dB L_{Amax} contour for the worst-case scenario construction phase. Furthermore, high noise levels (of approximately 80dB L_{Amax} or above) occurring across a large part of the main development site are assumed to cause a barrier effect and prevent access to foraging habitat within the Sizewell Marshes.

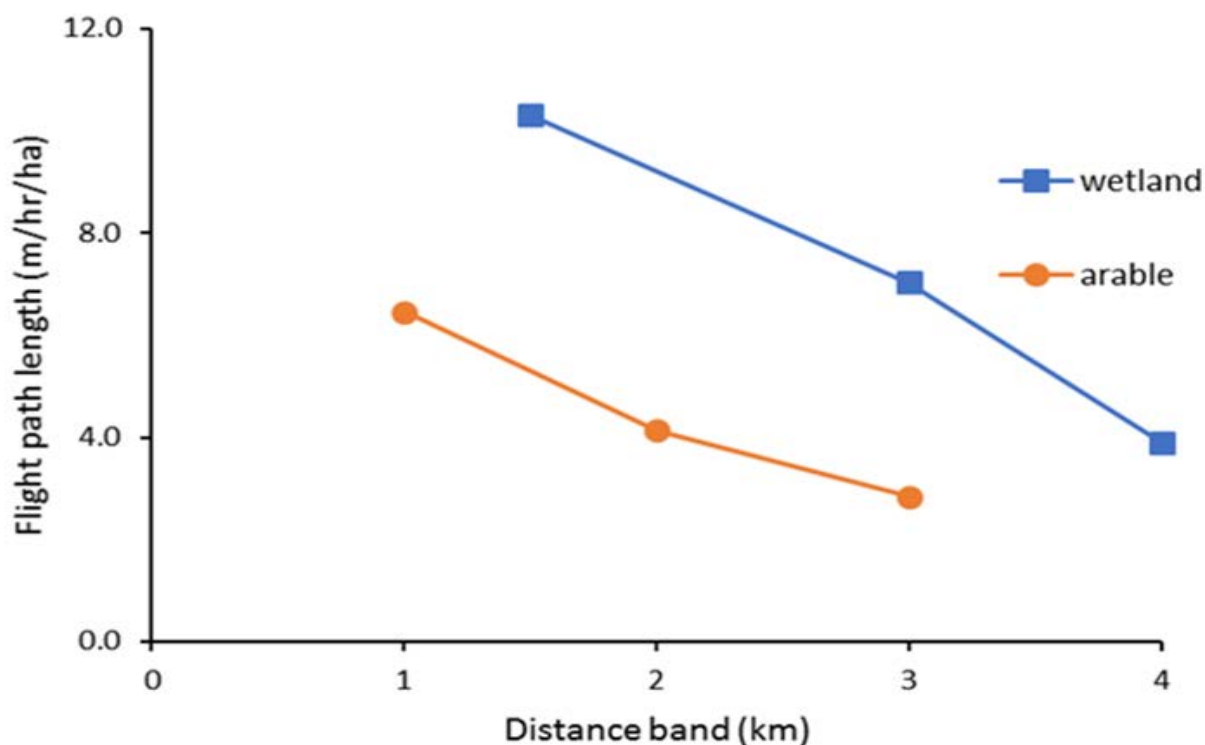
1.3.2 Based on these zones of influence, the AA estimates the extent of ‘loss’ of the available foraging habitat due to noise and visual disturbance. Coastal grazing marsh, reedbed/fen and agricultural land provide the three main foraging habitats for marsh harrier nesting at Minsmere. The extent of the assumed habitat loss to foraging marsh harrier as a result of noise and visual disturbance during the construction phase has been calculated as follows:

- the assumed visual impact zone and noise impact zone from and within the main development site boundary were mapped.
- the distribution and extent of the broad habitat-types surrounding the Minsmere marsh harrier nesting area was mapped, using available land classification information from existing mapped and aerial data.
- the total areas of reedbed/fen, coastal grazing marsh and agricultural land were extracted from the mapped data for a series of 1 kilometre (km) concentric radii centred on the Minsmere marsh harrier nesting area, out to a distance of 4km.
- the areas of reedbed/fen, coastal grazing marsh and agricultural land assumed to be lost to foraging marsh harrier (i.e. due to being within the 70dB L_{Amax} footprint, Sizewell Marshes (due to the assumed barrier effect described above) and/or the 150m potential visual impact zone) were calculated for each of the 1km concentric radii and expressed as a percentage of the total habitat area.

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- 1.3.3** On this basis, the percentage of each foraging habitat-type potentially lost to marsh harriers at different distances out from the nesting area as a result of construction-related disturbance (from both visual and noise stimuli) was estimated (as detailed in Table 8.12 in the AA). These calculations indicated that approximately 21% of the wetland habitats (i.e. reedbed/fen and coastal grazing marsh) and 24% of the agricultural habitats within 4km of the Minsmere nesting area would be lost as a result of construction-related disturbance.
- 1.3.4** The close proximity of the individual marsh harrier nesting sites within the reedbed at Minsmere suggests that these birds form an aggregation or loose colony, as opposed to occupying clearly defined, exclusive, individual territories. As such, this is likely to mean that any of the birds present within the breeding area could make use of adjacent habitat for foraging and that there is a significant overlap in the home ranges of these birds (Ref. 1.2). Therefore, for the purposes of the assessment it was assumed that the potential loss of these areas of habitat through displacement (and barrier effect) could affect all of the breeding population at Minsmere (i.e. approximately 50% of the SPA population).
- 1.3.5** Determining the consequences of the loss of this area of foraging habitat on the marsh harrier population at Minsmere requires consideration of the potential foraging value of the affected areas, the likely behavioural response of harriers to the loss of the habitat and the likely resulting effect on the population (in terms of breeding productivity and mortality). Therefore, consideration was also given to the foraging effort (as indexed by measured marsh harrier flight activity on a range of survey plots) estimated to occur on different habitat-types at varying distances from the nesting area, with this being higher on the wetland habitats than on agricultural land and decreasing with distance from the nesting area (**Figure 2.1**).

Plate 1.1: The intensity of marsh harrier flight activity on wetland and arable habitats in relation to distance from the Minsmere nesting area



[Survey plots are assigned to 1km distance bands, with mean values of flight activity intensity calculated for multiple plots within a distance band); the value for wetland for the 1 and 2km distance bands is combined and set at 1.5 because a single large survey plot straddled these bands.]

1.3.6 The AA reports that marsh harriers show significant plasticity in foraging behaviour and can adapt to both changes in prey availability and habitat quality without showing marked reductions in breeding productivity. In particular, it seems likely that the species is sufficiently adaptable to mean that the loss of areas of relatively low foraging value (e.g. agricultural land in intensive production – **Figure 2.1**; Ref. 1.2, Ref. 1.3) could be counteracted by an increase in foraging trips, changes in the home range to incorporate replacement habitat and / or selection of larger prey (if available) from existing habitats within the home range. This is especially the case for agricultural land within proximity of the Minsmere nesting area, given the extensive areas which occur. This suggests that the availability of this relatively low quality foraging habitat is unlikely to be limiting.

1.3.7 However, the potential loss of the wetland habitats is likely to be of greater significance to the marsh harrier population because they represent the preferred foraging habitats (**Figure 2.1**) and are relatively scarce within proximity of the Minsmere nesting area. Therefore, only the wetland habitats were considered in estimating the loss of the available foraging

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resource to the marsh harrier population as a result of construction-related disturbance. On this basis, the foraging resource that would be potentially lost was calculated by combining the area of wetland habitat estimated to be lost in each of the four 1km distance bands out from the Minsmere nesting area with the foraging effort estimated at that distance (as detailed in Table 8.14 of the AA). This suggested that approximately 15% of the wetland foraging resource within 4km of the Minsmere nesting area could be lost as a result of construction-related disturbance.

- 1.3.8 Given the long-term duration (approximately 10 years) of the construction period, it is acknowledged that over this time period the potential loss of approximately 15% of the foraging resource on the preferred foraging habitats within 4km of the Minsmere nesting area could conceivably affect the overall breeding productivity. A reduction in productivity does not necessarily translate into a reduction in population size, particularly for relatively long-lived species such as marsh harriers (which may have an average lifespan of 6 - 7 years). However, given the duration of the construction period and the fact that young birds may otherwise recruit into the population, then the potential exists for a reduction in the SPA population size to result from any reduction in breeding productivity.
- 1.3.9 In reality, it is difficult to determine at what point a potential foraging resource loss would translate into an absolute change in productivity and consequent population decline. However, given the plasticity that marsh harrier show in adapting their foraging range and behaviour to deal with changes in prey availability, it is considered that a small losses of wetland resource would be unlikely to have a detectable population impact. However, the scale of the predicted loss (under the worst-case scenario which is applied) together with the long duration of the construction period means that population-level impacts cannot be discounted.
- 1.3.10 In light of the above, it is not possible to discount the potential for an adverse effect to occur on the marsh harrier population as a consequence of noise and visual disturbance from construction activities associated with the Sizewell C Project. Consequently, an adverse effect on the integrity of the Minsmere-Walberswick SPA and Ramsar site cannot be excluded.

2 Proposed Compensatory Habitat

2.1 Description of the proposed compensatory habitat

2.1.1 The proposed compensatory habitat comprises an area of 48.7ha that is located within the EDF Energy estate. It is proposed that this arable land would be managed and enhanced with the aim of supporting abundant prey species (birds and small mammals) for marsh harriers.

2.1.2 The feasibility and design of the proposed habitat enhancement measures have been investigated over a number of years. Initial designs were discussed at a workshop (held in 2015) with Natural England, the Royal Society for the Protection of Birds and Suffolk Wildlife Trust. The workshop identified the following principles to be taken into account in the design:

- Create habitats to maximise marsh harrier prey (small mammals and breeding birds) abundance and availability (as opposed to just maximising abundance).
- Take account of the way marsh harriers hunt, typically ambush hunters surprising their prey.
- Must be practical to deliver and manage.

2.1.3 The feasibility and design process considered a number of options for habitat enhancement, which took into account the above principles (Ref. 1.4). The components included in the proposed compensatory habitat comprise the following:

- Tussocky grassland to be managed to provide a mosaic of tall and short vegetation.
- Existing and reinforced hedges.
- Hedge / scrub belts.
- Earth banks provided alongside scrub belts, sown with tussocky grass mix.
- Scrub foci (small patches of gorse / broom around wood / brash piles).

2.1.4 The options identified in the feasibility and design report (Ref. 1.4) were variations on the same theme, with a different balance of habitats and areas provided by each option. Option 2 (and two sub-options, 2a and 2b) was identified as the preferred option, as provided in **Appendix A** to this document.

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2.1.5 A further element of the compensatory habitat proposals (developed subsequent to the feasibility and design process referred to above) is connected to the inclusion of a water resource storage area in the north-eastern area of the 48.7ha site. This feature is required as part of the construction on the Sizewell C Project and offers the opportunity for ecological enhancement. The water resource storage area itself is a non-permanent feature, required only for the duration of the construction phase for the Sizewell C Project. During this phase, wetland habitat margins will be incorporated into the design of the water resource storage area, and wetland habitat would extend to the south, along the edge of The Grove (comprising wet woodland habitat and a linear reedbed). In the longer term (i.e. post-construction), more extensive wetland habitat will be created in this area.

2.1.6 In addition to the above, tree/hedgerow planting is proposed to reinforce existing vegetation around the perimeter of the field, providing visual screening and connective habitat between Sandpytle Plantation and The Grove/proposed wet woodland and reedbed habitat.

2.2 Habitat components of the preferred option(s)

2.2.1 Option 2 (Ref. 1.4) comprises tussocky grassland, hedges, scrub belts and banks predominantly orientated in a north-south direction. This orientation is considered to be the most suitable given the likely flight direction of marsh harriers and adds to the diversity in hedge alignments of the site, given there are already east-west orientated hedges established on the site. The north-south orientation also results in hedge and scrub belts being further apart than in other options considered, which means the fields are less enclosed; enhancing the availability of prey to marsh harriers.

2.2.2 **Table 1.1** summarises the proposed habitat components of the preferred compensation option(s) as described in Ref. 1.4 – Option 2, 2a and 2b.

2.2.3 The wetland habitat would comprise approximately 0.7ha of wet woodland and approximately 1.2ha of reedbed habitat, extending in a north-south direction within the eastern part of the compensation area.

2.3 Securing the habitat compensation

2.3.1 The area of land proposed for habitat enhancement is located entirely within the EDF Energy estate and is, therefore, already legally secured by EDF Energy. Consequently, there is no obstacle to securing the required land from a legal perspective.

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2.4 Timing

- 2.4.1** The proposed habitat enhancement land was taken out of agricultural production approximately 4 years ago and some habitat management – for the purposes of offsetting the effects of the Sizewell C Project – has been implemented in the intervening period and is ongoing. Further habitat enhancement, including scrub and hedgerow planting was undertaken in early 2020.
- 2.4.2** Assuming grant of the Development Consent Order (and start of construction) in 2022, the habitat enhancement measures would have been developing over a period of approximately 7 years prior to start of construction (albeit not all elements would have been in place for that period of time).
- 2.4.3** The water resource storage area and the wetland habitat would be constructed during the first winter of the construction phase. The wetland would, therefore, be present for the first full spring / summer of the construction period, and habitats would continue to develop in subsequent years. At the end of construction, the water resource storage area would be removed, but the wetland habitats retained (along with the other habitats within the compensation site).
- 2.4.4** Given the length of time that it would have been out of agricultural production, the land is considered to be ‘functional’ (meaning that it would have been improved for marsh harrier foraging and fulfilling its role as effective compensation) by the time that construction works commence, with the habitats continuing to develop through the construction phase.

Table 1.1: Habitat components of the preferred compensation option(s) (Ref. 1.4)²

	Short Grassl and (ha)	Tussocky Grassland (ha)	Arable (ha)	Wild Bird Seed Mix/ Nectar Rich Mix (ha)	Existing Hedge-Rows (m)	New Hedge / Scrub Belts (m)	Extent Of Bank (m)	No. Of Hedge Inter-Sections	Scrub Foci (No./ Area) (ha)
Baseline	1	0.71	39.4	5.35	1650	-	-	2	-

² The habitat areas quoted do not take account of the water resource storage area and the wetland habitat (wet woodland and reedbed) which were included in the design following completion of the feasibility and design report (Ref. 1.4)

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	Short Grassl and (ha)	Tussocky Grassland (ha)	Arable (ha)	Wild Bird Seed Mix/ Nectar Rich Mix (ha)	Existing Hedge-Rows (m)	New Hedge / Scrub Belts (m)	Extent Of Bank (m)	No. Of Hedge Inter-Sections	Scrub Foci (No./ Area) (ha)
Option 2	8	26	0	8	1650	2540	250	18	21/0.063
Option 2a	8	25	0	8	1650	2540	1310	18	21/0.063
Option 2b	8	24	0	8	1650	2540	2130	18	21/0.063

3 Suitability of Proposed Compensatory Habitat

3.1 Introduction

3.1.1 Assessment of the suitability of the proposed compensatory habitat has been based on the range of habitats that would be delivered by Options 2, 2a and 2b. This approach (i.e. assessing the range of options) has been taken given that the options / sub-options included in **Table 1.1** are similar and that, in practice, it is difficult to precisely predict how the habitat would develop. This approach accounts for any uncertainty in the detail of the implementation of the habitat enhancement measures to ensure that a conservative scenario is captured (i.e. a lower bounding case, or worst-case, is considered together with the most likely best-case scenario).

3.2 Predicted effect on habitat prey abundance

3.2.1 The feasibility and design report (Ref. 1.4) for the proposed habitat enhancement measures makes predictions regarding the effect of the proposed measures on prey abundance relative to baseline conditions. These predictions are expressed as a ratio of potential numbers of prey items for the habitat enhancement measures relative to baseline conditions, based on the change in the extent of predicted habitats between the baseline and the habitat enhancement options (as shown in **Table 1.1**).

3.2.2 The quantitative predictions do not take into account the effect of the water resource storage area and wetland habitats on prey type, availability and abundance. However, these elements are expected to further enhance the prey resource given they represent an increase in habitat diversity within the compensation area and constitute habitats that are known to be used by foraging marsh harriers in the wider area.

3.2.3 For Option 2 and sub-options 2a and 2b, the number of mammals (including rabbits) is predicted to increase by a factor of between 6.6 and 10.7 relative to the baseline conditions. This range derives from the assumed minimum and maximum numbers of mammals present under baseline conditions for each habitat type. For example, the baseline number of mammals for tussocky grassland is assumed to range from 100 per ha to 300 per ha. The predicted change in mammal abundance from baseline to post-habitat enhancement conditions is calculated based on the change in area of this habitat type and application of the same mammal density as for baseline conditions to the area of each habitat present following enhancement.

3.2.4 The predicted effect on breeding bird (as prey items) abundance is inferred from the change in key habitats relative to baseline conditions. The proposed habitats enhancement measures (for Option 2 and sub-options 2a and 2b) are predicted to increase key habitats as follows:

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- Hedge/scrub belt per ha - increased by a factor of 2.35.
- Number of intersections - increase from 2 to 18.
- Number of scrub foci - increase from 0 to 21.

3.2.5 There are no data on typical abundances of breeding birds per unit of hedgerow, although the British Trust for Ornithology Research Report No.29 (Ref. 1.5) concludes that the greater the length of hedge per unit area, the greater the density of breeding birds present (at least up to a hedge density of 130m per ha). In addition, hedges within 25m of an intersection hold 70% more birds per unit length than straight sections. Wren, dunnock, song thrush, willow warbler, blue and great tits and chaffinch show nearly double density at such locations (Ref. 1.5).

3.3 Predicted effect on habitat provision (prey availability)

3.3.1 Prey availability is measured by a simple comparison of all of the habitat enhancement options (rather than predicting a change from baseline conditions) to provide a ranking. Each habitat type is allocated a metric score according to the area or extent of that habitat present within each of the habitat enhancement options. The scores for each habitat are then summed to give a total metric score for each option (Ref. 1.4).

3.3.2 The outcome of the assessment is that sub-option 2b is ranked as the best option for habitat provision of prey items, followed by sub-option 2a and then Option 2. This illustrates that Option 2 and its sub-options are the three most preferable approaches to habitat management in terms of creating habitat that maximises the prey availability of those habitat enhancement options considered in the design and feasibility study.

3.4 Predicted effect on marsh harrier foraging

a) Type of prey

3.4.1 Marsh harriers are prey generalists and opportunists and will take a wide variety of prey from a range of habitats, but notably grasslands, wetlands and agricultural crops. Underhill-Day documented the prey taken by marsh harrier in East Anglia during 1983-84 and found that they preyed upon most species of birds and mammals present in their hunting areas (Ref. 1.6). Small birds, young gamebirds and waterbirds and mammals (including rabbits) formed 90-95% of the diet by numbers and weight.

3.4.2 Tornberg and Haapala studied the diet of marsh harriers during the breeding seasons 2002–2009 on the isle of Hailuoto in the Gulf of Bothnia in Finland (Ref. 1.7) and found that birds accounted for 73–93% of prey

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numbers for the marsh harrier during the breeding season. Passerine birds were the most numerous during the nestling (63%) and fledging periods (21%), while ducks and gulls/terns had the highest biomass (29% and 12%, respectively). Muskrat was the most important prey among mammals by number and weight (15% and 18%, respectively). An important finding of their study was that the opportunistic foraging strategy of marsh harrier and the diversity of prey taken was likely to have contributed to the rapid population increase in the species compared to other raptor species.

- 3.4.3 In the Minsmere-Sizewell area, the main prey species are likely to comprise small birds, young gamebirds, waterbirds, small mammals (e.g. voles, mice, shrews) and rabbits. These prey species occur in all of the key habitats used by marsh harrier, namely wetland (reedbed and fen vegetation), lowland grassland (grazing marsh) and agricultural (arable) land. The available evidence indicates that marsh harrier make limited use of heathland and very limited use of woodland (apart from grassland along woodland edges) for foraging.
- 3.4.4 The above analysis confirms that the nature of the proposed habitat enhancement and the prey items expected to be supported are appropriate in terms of the diet of foraging marsh harriers.

b) **Extent and location of proposed compensation measures**

- 3.4.5 The **Shadow HRA** concludes that approximately 100ha of grazing marsh and reedbed habitat (including 78ha at Sizewell Marshes) could become unavailable (through displacement and barrier effects) to marsh harrier. As noted in section 2 of this document, it is estimated that 15% of the total wetland foraging resource within 4km of the Minsmere breeding site would be lost (with the Sizewell Marshes alone accounting for 10% of this resource). Based on the averaged flight path length per hour³, the potential displacement of birds could equate to a loss of 642 m/hr (for Phase 2 of the construction phase) to 694 m/hr (for Phase 1 of the construction phase) of flight activity for the approximate 100ha of lost wetland habitat (with Sizewell Marshes accounting for 449 m/hr of this flight activity).
- 3.4.6 In order to replace this function, the increase in marsh harrier flight activity on the compensation land would need to equate to a flight path length of 13 – 14 m/hr/ha (i.e. 642 or 694m of flight path length per hour across the 48.7ha area). The arable area in the vicinity of the compensation land currently provides an estimated resource of 5.3 m/ha/hr. Therefore, provision of the additional 13 – 14 m/ha/hr required to fully replace the activity that is estimated to occur on habitat potentially 'lost' to disturbance

³ The total length of flight path divided by the number of hours of observation to determine a m/hr value.

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effects would require the improved habitat to support an average flight activity level of 18 – 19 m/ha/hr.

- 3.4.7 This level of flight activity is greater than the average levels that have been recorded for the Sizewell Marshes and the southern part of Minsmere South Levels. However, the recorded flight activity over the northern-central part of the Minsmere South Levels is substantially higher than that recorded over the Sizewell Marshes and the southern part of the Minsmere South Levels, with flight activity in this area tending to range from 15 – 50 m/hr/ha. While this may in part reflect prey abundance and availability, the closer proximity of this part of the Minsmere South Levels to the reedbed breeding site is likely to be of critical importance in explaining the high usage.
- 3.4.8 The proposed compensation land lies immediately adjacent to the northern part of the Minsmere South Levels and is, therefore, at a similar distance from the breeding site as the northern-central part of the Minsmere South Levels.
- 3.4.9 Given this, it is considered highly likely that the compensation area would attract a greater level of usage than an equivalent area at the same distance from the Minsmere reedbed as the Sizewell Marshes or the southern part of the Minsmere South Levels. If the habitat management undertaken on the compensation land can deliver prey abundance and availability (via suitable vegetation structure) comparable to that on the Sizewell Marshes, then the proximity of the compensation land to the nesting area should enable it to deliver the necessary function (i.e. equivalent to the flight activity from the wetland habitat assumed to be lost at Sizewell Marshes and elsewhere) and represent sufficient compensatory measures.
- 3.4.10 The above conclusion is based upon calculations which assume that displacement as a result of noise and visual disturbance and the barrier effect to Sizewell Marshes would operate at 100%. This is highly precautionary, particularly when considering that the predicted worst-case noise levels on which the assessment is based are likely to occur over a limited period only during both Phases 1 and 2, and that the extent of the 70dB LA_{max} footprint is predicted to reduce from Phase 3 onwards. If displacement and (particularly) barrier effects operate at less than 100% then the overall functional replacement (and therefore compensation) requirement would also be reduced.
- 3.4.11 This is illustrated by the compensation requirement calculated (as flight path values in m/hr/ha) for a range of displacement/barrier effect values (**Table 1.2** – upper section). Similarly, the rate at which displacement and barrier effects operate would interact with the level of response in foraging activity by marsh harriers over the compensation area to affect the net loss or,

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under some scenarios, gain in the overall foraging resource that is available (**Table 1.2** – lower section).

3.4.12 It is only the potential loss of the foraging resource from the wetland habitats that is considered here in terms of assessing potential adverse effects on breeding marsh harriers from noise and visual disturbance during construction, by contrast to the loss of arable land. This is because the relatively scarce wetland habitats of reedbed/fen and coastal grazing marsh provide the key foraging areas for the breeding marsh harriers, whereas land in arable production is of relatively low value for foraging and is widely available within the foraging range of the SPA/Ramsar site breeding population.

3.4.13 Given the adaptability of marsh harriers in terms of their ability to exploit a range of prey resources and foraging habitats, the breeding marsh harriers would be able to counteract the predicted loss of this low-quality foraging habitat via modifications in foraging behaviour.

c) Habitat management and monitoring

3.4.14 The compensation habitat would require ongoing management to maximise its potential as a foraging area for marsh harrier. The measures are likely to include managing vegetation (e.g. planting, removal, mowing to control structure, extent and height) and, potentially, the rabbit population to ensure that rabbits do not create significantly expanded areas of short-grazed habitats (Ref. 1.4).

3.4.15 The habitat management potentially required (referred to above) would not involve novel or untried techniques and is, therefore, capable of implementation to ensure that the objectives of the compensatory measures can continue to be met in the long-term.

3.4.16 SZC Co. will implement a programme of monitoring to assess the effectiveness of the compensation measures (prey abundance and use of the area by foraging marsh harrier) prior to the start of construction.

3.4.17 In terms of funding and implementation, habitat management and monitoring would be the responsibility of SZC Co.

Table 1.2: The effect of varying assumed rates of displacement (the barrier effect) on (i) the required foraging activity over the compensation area and (ii) the extent of foraging resource loss for different foraging activity responses over the compensation area

Compensation Land	Rate Of Displacement / Barrier Effect (%)					
	100	80	60	40	20	10

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Required flight path length (m/hr/ha) to replace function of wetland resource	13.7	11.0	8.2	5.5	2.7	1.4
Total flight path length m/hr/ha inclusive of existing activity over compensation land (5.3 m/hr/ha)	19.0	17.1	14.1	11.2	8.2	6.8
Habitat Resource	Rate Of Displacement / Barrier Effect (%)					
	100	80	60	40	20	10
% of total wetland foraging resource lost assuming 0% increase in activity over compensation land	15.2	12.2	9.1	6.1	3.0	1.5
% of total wetland foraging resource lost assuming 50% increase in activity over compensation land	12.3	9.2	6.2	3.1	0.1	+1.4
% of total wetland foraging resource lost assuming 100% increase in activity over compensation land	9.3	6.3	3.2	0.2	+2.8	+4.3
% of total wetland foraging resource lost assuming 150% increase in activity over compensation land.	6.4	3.4	0.3	+2.7	+5.8	+7.3

[For the purposes of these calculations, the values for flight path length over the compensation land and for the percentage of lost wetland foraging resource are taken as the mean of Construction Phase 1 and 2 derived values]

3.5 Conclusion

- 3.5.1 In drawing a conclusion on the suitability of the proposed compensatory measures, the requirements of NPS EN-6 (Ref. 1.1) in this context are analysed in turn (**Table 1.3**).

Table 1.3: Analysis of the proposed compensatory measures in light of the requirements of EN-6 (Ref 1.1)

The Compensation Requirement Must:	Conclusion
Be appropriate for the area and the loss caused by the Sizewell C Project	<p>The compensation habitat is considered appropriate in that it would replace locally foraging resource that is predicted to be lost to the marsh harrier population.</p> <p>The high degree of precaution in the conclusion of the Shadow HRA is important in this respect, namely:</p> <ul style="list-style-type: none"> - the assumption that displacement as a result of noise and visual disturbance and the barrier effect to Sizewell Marshes would operate

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The Compensation Requirement Must:	Conclusion
	<p>at 100%; and,</p> <ul style="list-style-type: none"> - the predicted worst-case noise levels on which the assessment is based are likely to occur over a limited period only during both Phases 1 and 2.
Be capable of protecting the overall coherence of the Natura 2000 network	The compensatory habitat is intended to address an effect which is predicted to occur for part of the construction phase and does not result in a physical direct effect on habitats within the boundaries of the SPA and Ramsar site. As a result of the compensatory measures, no negative effect on marsh harrier productivity is predicted and the coherence of the Natura 2000 network would be protected.
Be capable of implementation	The compensatory measures would have been developing over a period of approximately 7 years prior to start of construction and do not require the adoption of innovative or untested measures. This demonstrates that the measures are clearly capable of implementation.
Be capable of ensuring that the Natura 2000 site is not irreversibly affected by the Sizewell C Project before the compensation is in place	The compensatory measures have been initiated and would have been developing over a period of approximately 7 years prior to start of construction. It is expected that marsh harrier would forage over the compensation habitat prior to the start of the construction phase. With the proposed compensation measures in place, combined with the fact that no physical damage to habitats within the SPA and Ramsar site would occur, it can be concluded that the SPA and Ramsar site would not be irreversibly affected.
Be directed in measurable proportions to the habitats and species negatively affected	The analysis of the area of compensatory measures considered necessary concludes that the compensation area would attract a greater level of usage by foraging marsh harrier than an equivalent area at the same distance from the Minsmere reedbed as the Sizewell Marshes or the southern part of the Minsmere South Levels. Importantly, the proximity of the compensation land to the marsh harrier nesting area should enable it to deliver the necessary functionality.
Be related to the same biogeographical region (within the UK)	The proposed measures are in very close proximity to the SPA and Ramsar site and in the same biogeographical region in the UK.
Serve functions that are comparable to those that motivated the original area's submission for designation	The SPA and Ramsar site are (in part) classified for breeding marsh harrier, with land within the European site providing a supporting function (foraging habitat) to the breeding marsh harrier population. However, marsh harrier also forage over significant areas of land outside of the boundaries of the European site and it is (largely) this non-designated area that is predicted to be affected by noise and visual disturbance during the construction phase. The compensatory measures do, therefore, serve a function that is comparable to that which motivated the designation of the SPA and Ramsar site.
Be clearly defined, with implementation goals and managed so that the compensatory measures can achieve the goal of maintaining or improving the overall coherence of	The compensatory measures are clearly defined, with quantified targets for the various habitat types. The habitats can be managed over the long-term to ensure that they continue to achieve their objectives and maintain the overall coherence of the Natura 2000 network.

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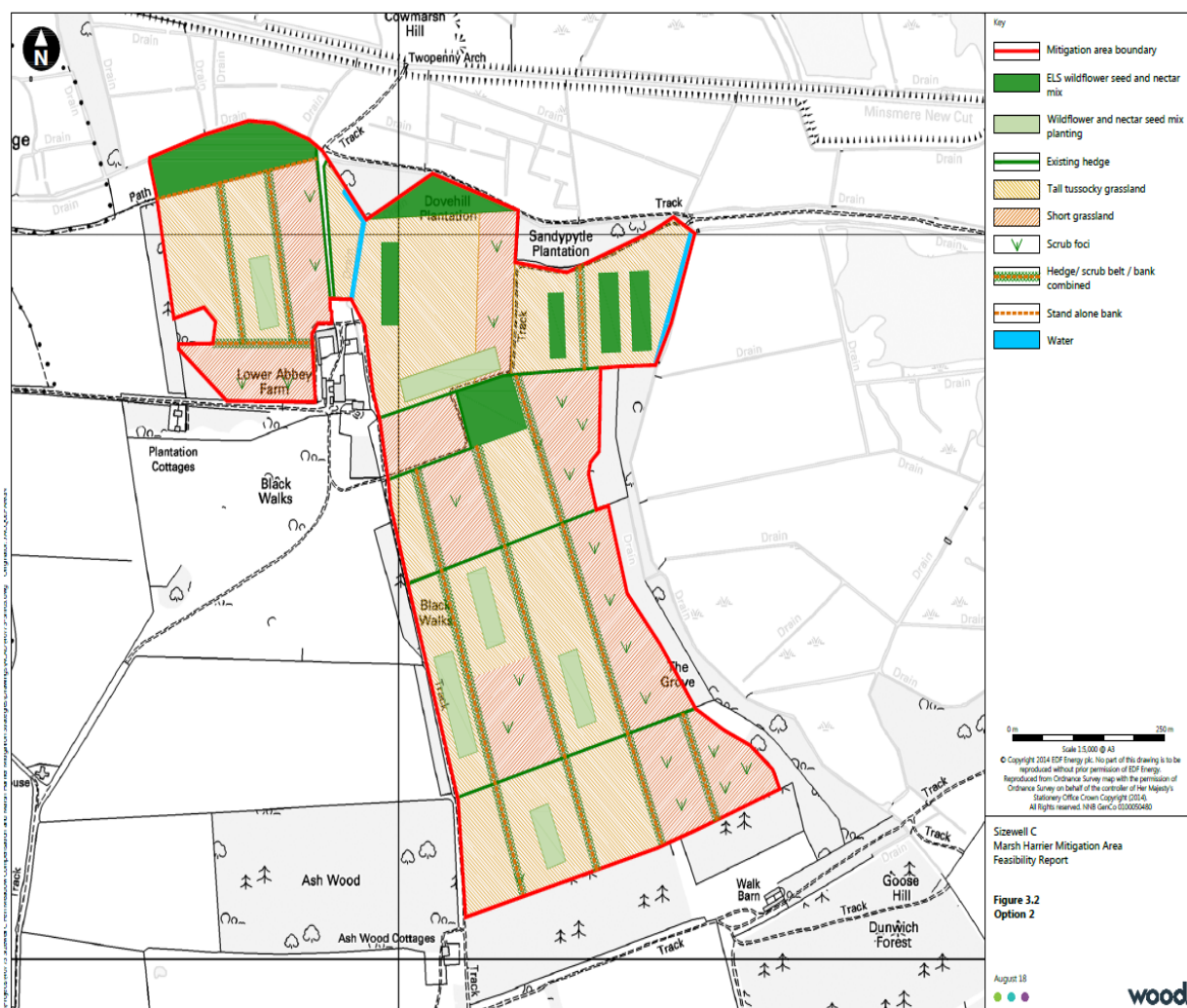
The Compensation Requirement Must:	Conclusion
the Natura 2000 network	

3.5.2 In summary, the analysis presented in **Table 1.3** demonstrates that the proposed compensatory measures would meet the requirements of EN-6.

References

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APPENDIX A: PLAN OF THE PROPOSED COMPENSATORY HABITAT



[NOTE: FINAL DESIGN TO BE REVISED TO INCLUDE ENHANCED COMPENSATORY HABITAT COMPRISING WET WOODLAND AREA AND TEMPORARY WATER STORAGE AREA SURROUNDED BY VEGETATED MARGINS WITH THE AIM OF PROVIDING GREATER FORAGING OPPORTUNITIES FOR MARSH HARRIERS]