MARSH HARRIER EVIDENCE BASE

1.0 INTRODUCTION

1.1 The purpose of this note is to conduct a review of available information from publicly available sources, previous survey information, biological records, and published literature in order to better inform the assessment of impacts and mitigation in relation to marsh harrier in the vicinity of the proposed development on Land off Barnsley Road, Goldthorpe.

1.2 This note is also to provide a basis for further engagement and discussion regarding marsh harrier impacts and mitigation with the RSPB and Barnsley Metropolitan Borough Council (BMBC).

2.0 MARSH HARRIER STATUS

2.1 The British Trust for Ornithology (BTO) state that the Marsh Harrier is a large and bulky bird of prey that feeds on small waterbirds and mammals, caught in the marshes around our eastern coasts. Made extinct in Britain by persecution in the 19th century, the current population has grown from a single breeding group in Suffolk in 1971.

2.2 In the last fifty years, the species has doubled the extent of its breeding range, extending north and west with occasional pairs reaching Scotland.

2.3 The BTO estimated the UK breeding population of Marsh Harrier was 590 pairs in 2016[1] and the RSPB website states that there are around 400 pairs[2] . A single breeding pair therefore represents at most 0.25% of the UK breeding population.

2.4 Marsh harriers are included as Amber Listed on the list of UK birds of Conservation Concern and listed as Least Concern on the list of Species of European Conservation Concern and the IUCN Red List of Threatened Species (Global).

2.5 The BTO state that the species is sufficiently widespread to enable short-term breeding bird survey trends to be calculated; these show a 36% increase over the most recent 10 year period for which results are available (2008–18) (Harris et al. 2020).

2.6 European breeding population is estimated at 93,000–140,000 breeding pairs. It status is given as 'Secure' (BirdLife International 2004) [3].

Overview

2.7 Marsh harrier breeding populations are stable and increasing across Europe and the UK.

Local/Regional Status

[1] https://www.bto.org/understanding-birds/birdfacts/marsh-harrier
[2] https://www.rspb.org.uk/birds-and-wildlife/marsh-harrier
[3] https://europeanraptors.org/western-marsh-harrier

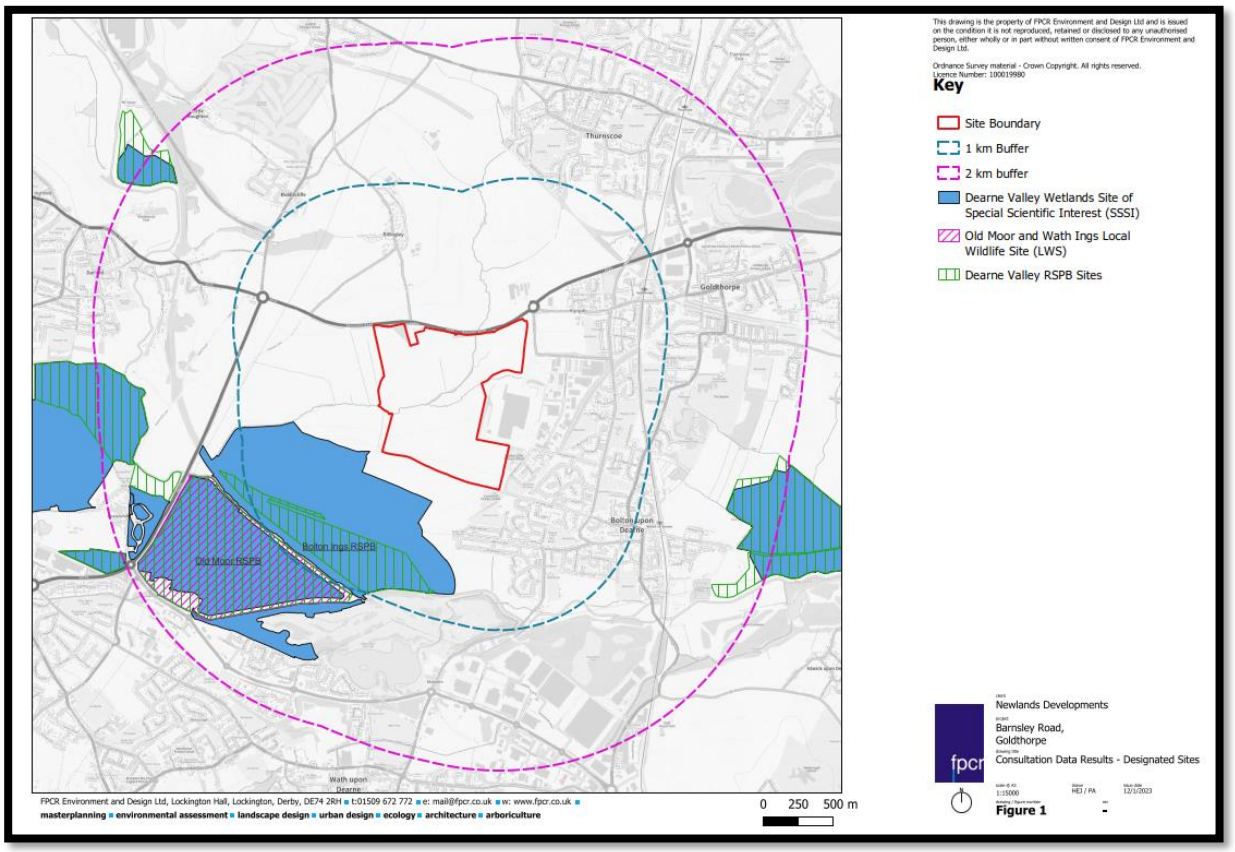
2.8 According to survey information from Middleton Bell (2020) a single pair of marsh harrier bred at RSPB Old Moor in 2020 and were using the south-western area of the Site. Further information was recently provided by RSPB in their consultation response to the application. Details are below:

Year	Records
2020	1 breeding pair; 3 juveniles
2021	1 breeding pair; 4 juveniles
2022	1 breeding pair; 3 juveniles
2023	1 breeding pair; 3 juveniles

2.9 Additionally it was noted that 2 pairs were observed over Old Moor/Bolton Ings in 2024.

2.10 The RSPB state that 2020 was the first-time marsh harrier had been recorded breeding in Barnsley.

2.11 The above information indicates that the population of marsh harrier in the vicinity of Old Moor is stable at a single breeding pair.



Location of the Site (Red Line) in relation to Sites of conservation importance in the vicinity.

2.12 It is noted that marsh harriers are not listed as a local priority species in the Barnsley Biodiversity Trust Biodiversity Action Plan (BAP), draft for consultation 2023[4].

2.13 A search of information from publicly available sources highlighted that marsh harriers also breed at a number of sites within Yorkshire and Humber Region (includes North Lincolnshire), including;

[4] http://www.barnsleybiodiversity.org.uk/birds.html

2.14 Yorkshire Wildlife Trust Potteric Carr Nature Reserve, Doncaster, South Yorkshire

- Moorland near Denton, North Yorkshire[5]
- Wheldrake Ings, North Yorkshire[6]
- North Cave Wetlands, North Yorkshire[5]
- RSPB Blacktoft Sands, East Riding of Yorkshire[7]
- RSPB Read's Island, North Lincolnshire (on the River Humber)[8]

2.15 A news story from 2011 stated that 13 nests were present at Blacktoft Sands, with "between 45 and 50 nesting females elsewhere around the Humber while there have also been nesting attempts at undisclosed sites in South, North and West Yorkshire."[9]

Overview

2.16 The population of marsh harrier in the Barnsley area appears to be stable at a single breeding pair. There are numerous other breeding sites across the Yorkshire and Humber region with stable and increasing populations of marsh harrier.

2.17 Using the geographical level of value as set out in the Ecological Impact Assessment (EcIA) this would indicate that a single breeding pair would not be important at the Regional scale (Yorkshire).

2.18 To be considered to be important at the County scale the species would have to meet the criteria;

"Any regularly occurring, locally significant population of a species which is listed in a County/Metropolitan "red data book" or BAP on account of its regional rarity or localisation.

A regularly occurring, locally significant number of a County/Metropolitan important species."

2.19 Although marsh harriers are not a local BAP species, this species may be considered to have importance at a county level due to its rarity in the county and its Schedule 1 status. As such, it is considered that the population in the vicinity of the Site is of **County level** importance.

3.0 MARSH HARRIER NESTING

3.1 Clarke R. 1995[10] describes the marsh harrier has having a close association with common reed *Phragmites australis* with nest sites most often in *dense, tall vegetation growing in water* and that reedswamp, principally common reed is the vegetation mostly selected for nesting. The chapter further presents that in Britian nest habitats are predominately associated with reedbeds.

3.2 Clarke further explains that marsh harriers require old reed habitat, as they hide the nest site in the old stems from previous growth at a time when new spring growth is just beginning. Old reed stems are reported in the text as remaining standing for up to 3 years.

[5] https://www.nwcu.police.uk/news/wildlife-crime-press-coverage/police-investigate-persecution-of-breeding-marsh-harriers-in-north-yorkshire/
[6] https://yorkshireswildlife.co.uk/every-breeding-bird-counts-yorkshire-birds-on-show-as-they-gear-up-for-the-mating-game.html
[7] https://community.rspb.org.uk/placestovisit/blacktoftsands/b/blacktoftsands-blog/posts/breeding-season-reaching-a-new-crescendo-as-marsh-harriers-fledge; and https://www.countryfile.com/wildlife/birds/marsh-harrier-guide-identification-distribution-and-where-to-see
[8] https://www.yorkshirepost.co.uk/news/environment/birdwatch-marsh-harrier-success-story-of-conservation-1923292
[9] https://www.yorkshirepost.co.uk/news/environment/birdwatch-marsh-harrier-success-story-of-conservation-1923292
[10] Clarke, R. 1995. The Marsh Harrier. Hamlyn. London.

Overview

3.3 Marsh harriers have a strong preference for nesting sites with reedbed habitat. The Site does not have any reedbed habitat and therefore is sub-optimal for marsh harrier nesting. Previous surveys (Middleton Bell 2020 and FPCR 2022) have not identified marsh harriers breeding/nesting at the Site.

4.0 MARSH HARRIER FORAGING HABITAT

4.1 Clarke 1995[10] states that "marsh harriers prefer a diversely structured environment, with variations in vegetation height and features such as ditches which offer them the most chances for surprise as they fly over these and suddenly appear at close quarters to prey hidden in them. They therefore tend to avoid large, uniform areas without tall vegetation."

4.2 Clarke further cites studies which looked at vegetation preferences in hunting harrier species which showed that "female harriers preferred hunting over wet reedbeds and males hunted there, too, but exploited adjoining habitats with shorter vegetation more than females did."

4.3 The text does go on to say that where arable habitats provide higher returns marsh harriers will use these and that in some areas farmland bird species can feature heavily in the diet of the harriers.

Overview

4.4 Clarke's description of the marsh harrier's foraging habits indicates the species is adaptive to varied habitats with a preference for wetlands but able to use arable habitats where prey is abundant (this is supported by studies from Cardador et el. Detailed further below).

4.5 Clarke's statement that marsh harrier prefer diversely structured environments with vegetation of varying heights and ditches has been considered within the habitat creation proposals and will be further developed in the habitat management for the Site to provide grasslands with varied structure, hedgerows on the Site boundary providing ambush opportunities, a pond to provide further varied vegetation structure and prey habitat and retaining an area of open grassland on the banks of Carr Dike in the south-west of the Site.

5.0 LEGAL PROTECTION

5.1 All UK birds are offered some legal protection; however, in the UK marsh harriers are also listed on Schedule 1of the Wildlife and Countryside Act 1981 (as amended) and are provided with additional protection.

Wildlife and Countryside Act

"5) If any person intentionally

- *a) disturbs any wild bird included in Schedule 1 while it is building a nest or is in, on or near a nest containing eggs or young; or*
- *b) (b)disturbs dependent young of such a bird, he shall be guilty of an offence"*[11]

Birds Directive

[11] https://www.legislation.gov.uk/ukpga/1981/69

5.2 Marsh harriers are not listed within the Birds Directive Annex 1 which provides additional protection to the habitats of certain species of bird.

Dearne Valley SSSI

5.3 Marsh harriers are not designated within the citation for Dearne Valley Wetlands SSSI (designated in 2022)[12].

Overview

5.4 Although marsh harriers are provided with legal protection above that offered to all wild birds, this extends only to nests and dependant young.

5.5 There is no significant reedbed, swamp or marsh habitat with tall vegetation present within the area of the Site. As such, conditions at the Site are considered to be sub-optimal for marsh harrier to nest. Furthermore, the habitats present in the wider area at the Old Moor reserve provide extensive reedbed habitat conditions and a much greater suitability for marsh harrier nest sites.

Relating to "dependent young":

5.6 Bavoux et al 1998 indicates that young marsh harrier begin flights around 40-45 days old and up until 50 days of age young marsh harrier are fed by parents at or near the nest (indicating the young are still dependent upon the parents). After 50 days feedings are spaced out to stop around 60-65 days. It is also stated that as soon as the young leave the nest they begin to practice prey-catching skills (passerines, small mammals, reptiles and insects). In the same study birds under 60 days old were not recorded at distances of over 1km from the nest. After 60 days young began to venture further[13].

5.7 Given that previous surveys have not identified breeding/nesting marsh harrier (Middleton Bell 2020, FPCR 2022) and conditions are not optimal for breeding it is considered that marsh harrier do not currently breed/nest within the Site.

5.8 The exact location of previous marsh harrier nesting is not known, but the RSPB have reported that this is within the Old Moor reserve.

5.9 The area of Carr Dike identified as being used by marsh harriers in the Middleton Bell study in 2020 is around 1.5-1.7km from the reedbed hide of RSPB Old Moor. From the edge of Old Moor to the area of Carr Dike within the Site is approximately 1.2km. As such, it is considered unlikely that young using the area within the Site are dependent on the parents.

5.10 As such, the marsh harriers and the associated foraging habitats within the Site are not considered to have any specific legal protection.

6.0 MIDDLETON BELL MARSH HARRIER ACTIVITY 2020

6.1 The Middleton Bell report of 2020 provides a "heat map" showing marsh harrier flight lines and activity. The image below has been produced by FPCR and shows the Middleton Bell "heat map" with the current Site red line boundary superimposed (the dashed red line represents the Middleton

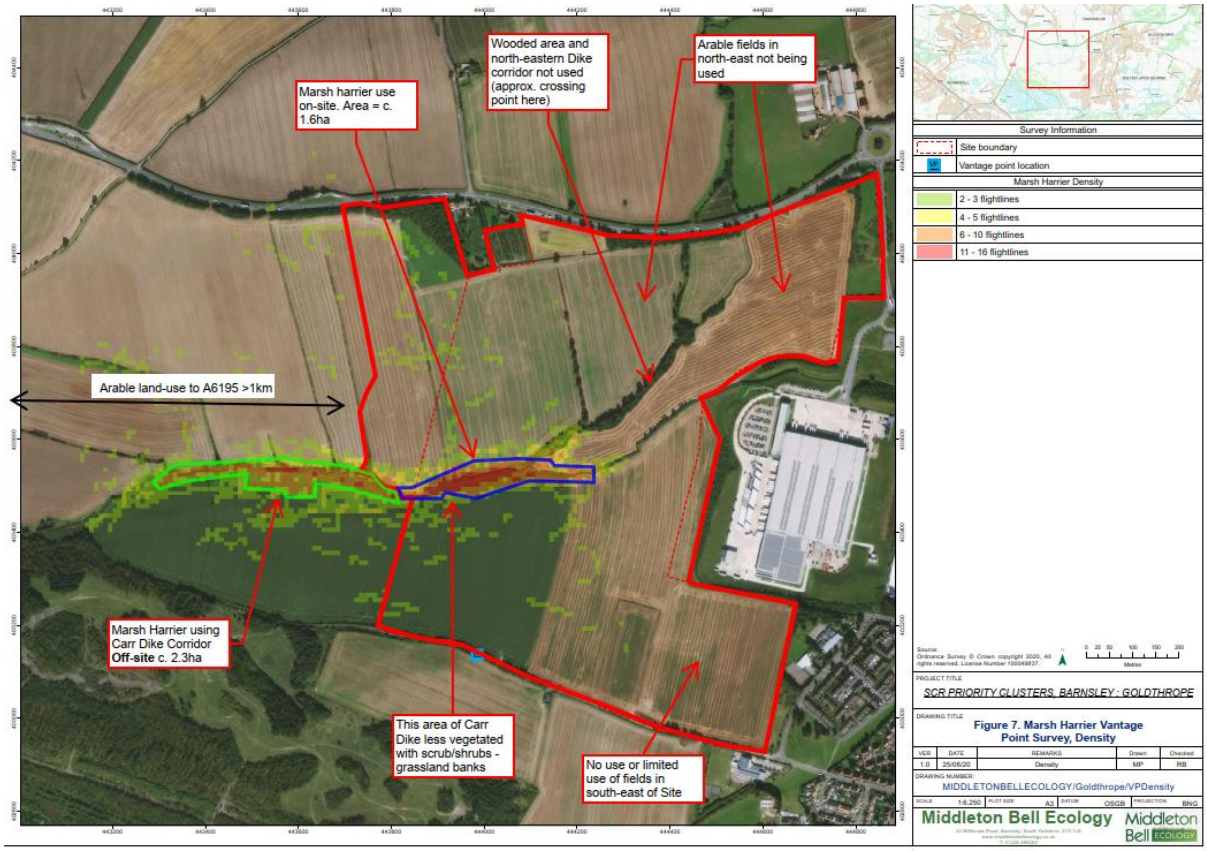
[12] https://designatedsites.naturalengland.org.uk/PDFsForWeb/Citation/2000814.pdf
[13]Bavoux et Al 1998. Dependence and Emancipation in Juvenile Marsh Harriers. Holarctic Birds of Prey. http://www.raptors-international.org/book/holarctic_birds_of_prey_1998/Bavoux_Burneleau_1998_91-100.pdf

Bell survey area, corresponding to the ES10 allocated Site) and the areas of most activity highlighted.

6.2 The map shows that there is an area of high activity along Carr Dike, this includes the area within the south-west of the Site (highlighted in Blue) as well as the further corridor of Carr Dike immediately to the west of the Site (highlighted in Green).

6.3 There is an absence of activity in the north-east and south-east areas of the Site and the northern corridor of Carr Dike. The reduction of marsh harrier activity in the northern area of Carr Dike appears to coincide with the area of existing plantation woodland.

6.4 There is some activity in the arable agricultural areas surrounding Carr Dike, including areas in close proximity to areas of existing woodland and the road to the north, however it is acknowledged the flight lines here represent less activity than those associated with Carr Dike.



Middleton Bell Marsh Harrier Survey Heat Map

Overview

6.5 The “heat map” plan shows the majority of marsh harrier activity is focused on Carr Dike. With some lesser activity over the fields in the west of the Site or to the west of the Site.

6.6 The most activity appears to be in the areas where the banks of Carr Dike are more grassland habitat rather than wooded/scrub. This equates to around 1.6ha within the Site.

6.7 Marsh harrier activity does occur off-site, the majority following Carr Dike corridor to the west of the Site, this area equates to around 2.3ha, though activity here is a little lower.

6.8 It is considered that this shows a preference by the marsh harriers to use the areas of Carr Dike which are less vegetated with woody species, providing grassland banks.

7.0 ES10 MASTERPLAN ALLOCATION AND MITIGATION REQUIREMENTS

7.1 The ES10 masterplan allocation included discussions with Barnsley Metropolitan Borough Council (BMBC) regarding mitigation for marsh harriers although the BMBC Local Plan did not include any specific requirements for marsh harrier mitigation.

7.2 Options for mitigation were proposed by Middleton Bell and further discussed with the BMBC ecologist and included a 70m wide corridor along Carr Dike, or a north-south corridor from Carr Dike to Barnsley Road (A635) with a total width of 35m wide with a double hedgerow and corridor of 35m wide along Carr Dike, located off-site to the west of the proposed development and a 20m buffer along Carr Dike within the Site.

8.0 MARSH HARRIER RANGE AND HABITAT USE

Cardador et el. (2009) Ranging behaviour of Marsh Harriers Circus aeruginosus in agricultural landscapes

8.1 This study is from Catalonia Spain, semi-arid environment, intensive agricultural area, considered to be a different environment to that of Barnsley.

8.2 The study is based on data from only 11 birds (nesting), and 3 birds (post fledging, winter, pre-laying) which is considered to be a relatively small dataset.

8.3 The study states that marsh harriers in this area are nesting in numerous artificial ponds created in recent years. This could indicate that harriers are selecting nest sites based on availability rather than quality of habitats.

Foraging range during nesting period

Females: – range c. 600m from nest.
50% range (area of intensive use) = 31ha. 90% range = 136ha
Males: – range up to 3km from nest.
50% range (area of intensive use) = 484ha. 90% range = 3287ha

Post Fledging

No females included in this area of study.
Males: – range up to 4km from nest.
50% range = 566ha. 90% range = 3430ha.

8.4 The paper states that male harriers provide most of the food during nesting (Simmons 2000).

8.5 Intensive use areas were noted to be single use areas including fields around nests – only observed in males, however and the paper acknowledges that there is a large variation in ranges between birds and the sample size was relatively small.

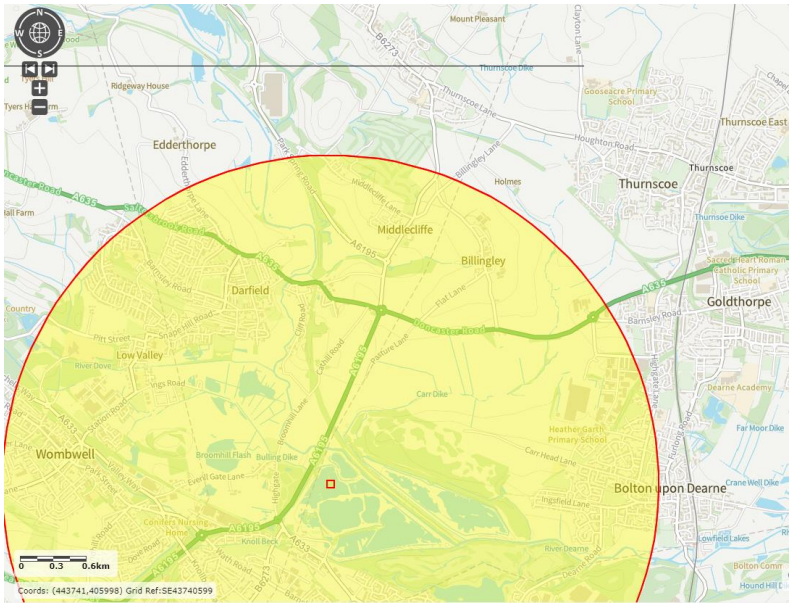
8.6 This paper also cites Kenward (1982), Marquiss & Newton (1982), and Village (1982) stating that *"The uses of smaller home ranges on grasslands may reveal a higher habitat quality in grasslands compared to our study (cultivated areas), as home-range size in raptors mainly depends on prey availability."*

8.7 Also states that *"In fact, conversion of grasslands into cultivated areas has been linked with impoverished food supplies" (Butet & Leroux 2001).* This is further backed up by citing evidence in Montagu's harrier Salamolard (1997).

Overview

8.8 This study shows that marsh harriers in a semi-arid environment are using artificially created ponds as nest sites and foraging in the intensively farmed fields in the vicinity.

8.9 During nesting females remain close to the nest site with small ranges. Male marsh harriers range further and over a much larger area during the nesting period. This shows that the wetland habitats close to the nest site are important to female marsh harriers during nesting whereas males will forage over a much larger area with more diverse habitats.



3km from Old Moor Reedbed area

8.10 The above image shows that the area within 3km of the likely marsh harrier nest site/habitat includes the Site, but also a diverse range of other habitats including areas of wetland, scrub, woodland, river, ditches, and arable agricultural habitats. This area represents the area which might be most used by male harriers for foraging during the nesting period.

8.11 Although no surveys have been conducted on the wider landscape to determine which habitats are being used, given the information from published sources (Cardador, and Clarke provide evidence and further examples/citations), it is considered likely that marsh harriers would also exploit other habitats within this range. It would be considered likely that females would use the reedbed and swamp habitats in Old Moor, Bolton Ings and other wetlands closer to the nest. And male harriers would adapt foraging to those most productive habitats in the 3km range.

8.12 Intensive farming is further explored in other papers by this author (Cardador, see below) and explained to be areas of intensive planting which are irrigated and watered (within a semi-arid landscape), rather than large expanses of cereal crops like those common in the area of the Site.

8.13 In this study, it may be that marsh harriers are using agricultural habitats opportunistically due to a lack of choice of higher quality habitats rather than choosing to use agricultural habitats preferentially. And, although marsh harriers are shown to forage and use agricultural habitats this does not indicate that these habitats are specifically important for the species.

8.14 The paper acknowledges that other studies have seen that grasslands represent a higher habitat quality and show a reduction in home ranges, and reinforces that grasslands are of higher quality than arable habitats to marsh harriers. Mitigation proposals for the Site take this into account by

looking to improve areas of homogenous arable land with a more varied and suitable grassland habitat.

Cardador and Manosa (2011) Foraging Habitat Use and Selection of Western Marsh- Harriers (Circus aeruginosus) in Intensive Agricultural Landscapes

8.15 This paper states that most marsh harrier hunting was recorded within 3km of the nest.

8.16 The paper indicates that there is a "*trade-off between the quality of the different patches and the distance at which they were located from the nesting/roosting sites"* cite Carrete and Donazar (2005), Cardador et el (2009).

8.17 *"Western Marsh harriers took advantage of the presence of regularly mown fields (intensively managed alfalfa), which may offer an adequate vegetation structure for hunting during most of the year, especially when crops are <10 cm in height or when stubble is present"* (Ursua et al. 2005, Kitowski 2007)

8.18 *"Like other generalist predators, Western Marsh-Harriers may be able to exploit transient resources in intensive agricultural habitats and may be less sensitive to habitat degradation than other more specialized species*" (Siriwardena et al. 1998).

Overview

8.19 This paper indicates that whilst marsh harriers will use arable habitats, within the context of northern Spain they select habitats preferentially towards those more intensively farmed habitats with more irrigation and which may include lower crop heights (alfalfa), and at times when crops are still relatively short or have been harvested.

8.20 The paper acknowledges that marsh harriers are generalist predators that exploit resources and may be less sensitive to habitat degradation.

8.21 As such, this supports that marsh harriers will select habitats preferentially towards those that will yield higher prey resource or higher hunting success.

Cardador, Carrete, and Manosa (2014) Factors affecting the expansion success of bird populations in human-transformed environments: the case of the Marsh Harrier Circus aeruginosus in the Ebro Valley

8.22 This study was conducted in a semi-arid environment in Northern Spain.

8.23 The study states that "the Marsh Harrier could be taking advantage of the numerous artificial ponds constructed in recent years"

8.24 The paper states that "intensive agricultural areas represent higher quality habitat for Marsh Harriers than extensive croplands", in this study the intensified agricultural crops are those which are densely planted and irrigated and include a diversity in crop species such as legumes rather than homogenous cereal crops.

8.25 The paper suggests that the preference for intensive crops is due to more prey items and potentially a reduction in other predators within areas of intensive agriculture.

8.26 The paper also suggests that as marsh harrier are a "*generalist species, able to adapt to temporal variation in resource availability."* The study found that marsh harriers would use different areas of

vegetation at different times when vegetation heights and densities were more optimal for hunting (providing some cover but not too dense for prey to hide completely from marsh harriers).

Overview

8.27 This study provides evidence that marsh harriers are not selecting areas of homogenous arable cropland for foraging resource on a preferential basis.

8.28 In fact, less homogenous vegetation is being selected in areas of intensive crops rather than extensive crops.

8.29 Vegetation of different kinds is used through the growing season based on the chances of hunting success.

8.30 This study further suggests that extensive areas of arable land-use are not optimal for marsh harrier foraging. The reduction of the arable habitat (particularly in the north and east of the Site) does not represent a specific reduction in foraging habitat (as show on the heat map these areas are less used or not used by marsh harrier).

9.0 IMPACTS FROM DEVELOPMENT AND DISTURBANCE

Senzaki, Yamaura and Nakamura 2017. Predicting Off-site Impacts on Breeding Success of the Marsh harrier

9.1 This study was conducted on Eastern marsh harrier (not Western Marsh Harrier) and the study area was located in Japan with a different environment and climate to that of the Site.

9.2 The study found that the amount of wetland forage habitat within 0.5km positively impacts the number of breeding pairs of Eastern marsh harrier in a specific area.

9.3 The study also found that the amount of artificial land-use within 2km negatively influenced number of pairs and number of juveniles per pair.

9.4 The study highlights that when considering off-site impacts (on habitat away from the nest) species abundance and biological processes (including resource availability) should be considered in relation to different land-uses.

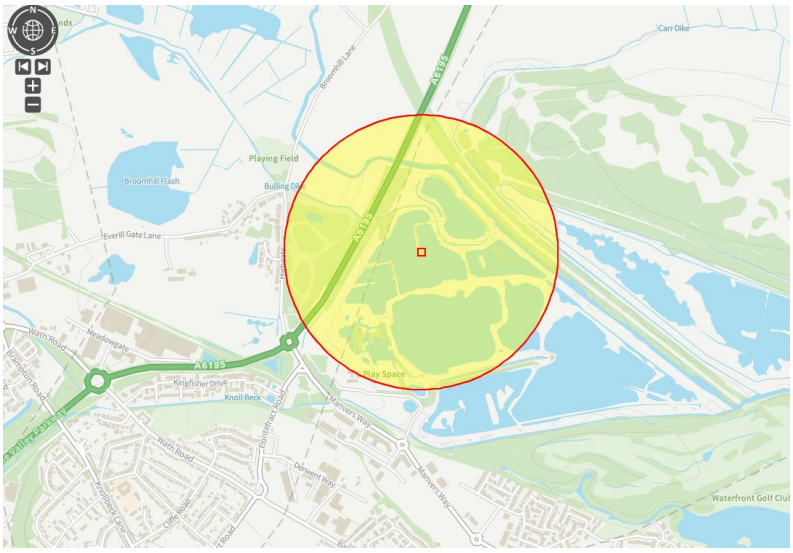
Overview

9.5 As the study focuses on Eastern marsh harrier in a different environment to that of the proposed development it is considered that the findings may not be representative of the situation at the proposed Site.

9.6 The findings indicate that breeding success in terms of numbers of pairs breeding and number of juveniles in a brood are positively affected by the availability of wetland foraging habitat within 0.5km but negatively affected by artificial land-use within 2km.

9.7 Given that at the Goldthorpe site there is only one breeding pair (known from RSPB records 2020-2023) the only impact that would be negative to the local population would be an impact that would deter the pair from breeding completely.

9.8 The nesting area is understood to be within Old Moor RSPB reserve, the area within 0.5km includes much of the wetland areas of the Old Moor reserve. This would imply a positive effect on the potential for breeding site selection and success.



0.5km from the reedbed area of RSPB Old Moor.

9.9 The area within 2km of the potential nest Site already includes areas of artificial land-use (residential areas to the south and north-west, and infrastructure). Some of the development will be located within but at the periphery of the 2km radius. The north-eastern area and south-eastern areas of the Site are noted to be outside of this radius.

9.10 As there will be some development within the 2km, according to the findings of the study it could be expected that there would be some impact upon marsh harriers within this area. It is difficult to predict what that impact would be. Should there have been a higher number of breeding pairs it might be expected that the number of pairs would be reduced, however at Goldthorpe there is only one breeding pair and therefore reduction of resources and competition for resources between breeding pairs is therefore not expected to be an issue.

9.11 According to the findings of the study, the proposed development might also be expected to have some negative impact upon the number of juveniles in a brood, though the study was looked at areas with multiple breeding pairs. Again it is difficult to assess the potential impact of additional development within 2km. The breeding pair at Goldthorpe has been noted to fledge 3-4 juveniles per year. The BTO website states that marsh harriers on average produce 4-5 eggs per year, indicating a good breeding success rate.

9.12 Overall, it is difficult to predict any impacts based on the findings of this study given that it was conducted on a different species, in a different environment, and in areas mainly with multiple breeding pairs where competition for resources might be expected to have additional impacts.

Bright, Langston, and Anthony 2009. Mapped and written guidance in relation to birds and onshore wind development in England.

9.13 This paper looks at impacts to birds in relation to wind farms.

9.14 The paper states that marsh harriers “fly low during foraging, collision risk only during display” (in relation to wind farms).

9.15 As such the paper indicates that within 1km of nest – there is a high sensitivity for marsh harriers (in relation to collision risk – wind farm) and within 2km a medium sensitivity for marsh harriers (in relation to collision risk – wind farm).

9.16 The paper states that “routes frequently used by walkers and cyclists resulted in an avoided corridor about 240 m across, thus limiting available foraging habitat” (Gamauf, 1993) (Assume that this means the corridor has the route in the centre, therefore avoidance area is 120m from each side of the route).

9.17 “Titchwell marsh RSPB reserve in Norfolk would not build nests closer than 450 m from a path, and on average sited nests 600 m and 800 m from two heavily used footpaths.” Gamauf (1993)

Overview

9.18 The paper indicates that development within 2km from a nesting Site may have sensitivity to marsh harriers, although this is more specific to collision risk from wind farms.

9.19 The paper states that marsh harriers avoid habitats within certain distances from paths which are frequently used. This would be expected to be related to movement and noise from use of the routes rather than the presence of a building or structure.

9.20 The second quote relates to nesting avoiding areas near to paths, however marsh harriers are not nesting at the proposed development Site and therefore this is not considered to be an issue.

9.21 At the proposed development it is considered unlikely that there will be any frequent use of the western area of the Site (wet grassland, attenuation area) and that activities associated with the operational development will be visually and audibly screened by the earth bund and planting of woodland and scrub.

9.22 Some disturbance may result from the access road located at the south-west of Plot 1. Although some screening will remain (hedgerow) which could reduce this impact.

10.0 ASSESSMENT OF IMPACTS

10.1 As stated above the conservation importance of marsh harriers in the vicinity of the Site is considered to be of Country level significance, given that there is only a single pair of breeding marsh harrier known in the county. The potential loss of this pair would be a significant impact at the local level but given population status and numbers of breeding pairs in the wider Yorkshire and Humber Region would not be considered to be significant at the Regional level or above.

10.2 There is no specific legal requirement to mitigate the loss of marsh harrier foraging habitat, though the proposed development provides mitigation in the form of habitat creation and enhancement that looks to increase the availability of foraging habitat.

10.3 There is a lack of specific evidence on the level of avoidance from development and disturbance for marsh harrier. Evidence in literature relates to walkers and cyclists (active disturbance through movement and sound) rather than the presence of buildings/structures. It is assumed that the development will have some impact on marsh harriers through its presence, but this will be in part mitigated by screening of the developed areas with earth bunds and planting. The extent of this impact cannot be fully qualified due to a lack of evidence base.

10.4 However, given that the habitats in the west of the Site will be enhanced and screened and that habitats present to the west of the Site and in the wider landscape will remain available (and that literature supports that marsh harriers are generalists able to adapt hunting to a variety of habitats, with females particularly favouring wetland hunting habitat closer to the nest), it is assumed that the overall impact would not be significant to the single pair/population of marsh harrier.

10.5 I.e. the single pair of breeding marsh harriers are considered likely to remain (population status will be maintained) and continue to breed. It is considered likely that the harriers will adapt to the presence of the development, use habitats in the wider area when appropriate (as per the findings of Cardador and explanations of Clarke showing marsh harrier to be generalists and adapt to different habitats and environments), and continue to use the enhanced habitats in the west of the Site and retained areas of Carr Dike (grasslands being more productive and reported to be more suitable to marsh harriers) and at times corresponding to least disturbance and highest chances of hunting success (as reported marsh harriers will adapt to growing seasons and hunt when chances of success are greatest).

11.0 MITIGATION PRINCIPALS

11.1 Given the above information and evidence the following principles of mitigation have been developed in relation to the proposed development.

11.2 It is also acknowledged that the land to the south-west and west of the Site (including the areas of Carr Dike previously observed to be used by marsh harrier) are not allocated for development, are located within Green Belt and specifically the area directly to the west is also covered by a countryside stewardship scheme (Middle Tier). As such, it is assumed that this land would remain in its current use and continue to be used by marsh harriers.

1. Retain the area currently used by marsh harrier as much as possible

The area most used by marsh harrier on Carr Dike has been retained. Previously woodland was proposed in this area which is now proposed to be scaled back and appropriately managed grassland will be provided. The extent of this will be further discussed with RSPB and BMBC.

2. Provide a north-south route to allow for marsh harriers to disperse to the north

The area to the west of the ES10 masterplan site has been acquired to provide land to allow a north-south corridor as well as functions for visual screening and flood alleviation. The western area of the Site will provide a north-south corridor with an earth bund and planting screening the built development to the east.

The amount of planting proposed on the bund and to the north of this area has been reduced to allow for some more openness in the habitat here for marsh harriers. The bund and planting will screen any development activities from marsh harriers using this western corridor. The corridor will be in excess of the 35m previously proposed at the time of the ES10 allocation.

3. Create higher quality habitats for marsh harrier foraging

Evidence from previous survey shows the marsh harriers were not using the arable fields frequently but preferred the grassland banks of Carr Dike. This may be due to the potential for ambush of prey within the ditch or due to the vegetation being more open allowing prey to be seen.

Published evidence shows that marsh harriers prefer varied grassland habitats but will exploit a wide range of habitats if prey is available.

The banks of Carr Dike will be managed as grassland with a varied structure to promote small mammals. Carr Dike itself will be managed to promote use by waterfowl

A pond will be created with reedbed habitat which will provide additional potential habitat for waterfowl as prey and small mammals and amphibians. The western corridor will be managed as a wet grassland area with features such as scrapes to provide variation in the structure and composition of the habitat and vegetation, allowing for more potential for prey species and ambush opportunities.

The western site boundary will be provided with a hedgerow managed at an appropriate height to allow for ambush opportunities.

Further engagement will be made with RSPB to finalise details of the habitat management and inclusion of any other features within the red line which may enhance the area for marsh harriers.

4. Retain the Carr Dike corridor for dispersal of marsh harriers

Although woodland areas are not optimal for marsh harriers to hunt in, the Carr Dike corridor through the Site will be maintained with natural/semi-natural habitats (predominately woodland and scrub), which will provide a potential corridor for dispersal to the north-east. The woodland areas will provide "hop over" functions to promote bird flight above the internal roadways and the A635 to the north.