

**National Infrastructure Planning
Cleve Hill Solar Park
CPRE Kent (Reference 2002146)**

**Written Representation:
ECOLOGY AND BIODIVERSITY**

Summary

It is quite clear from currently available publications and research that there needs to be more research on the effects of solar farms per se in regard to nature, biodiversity and in particular, direct effects on fauna, such as birds and invertebrates, especially aquatic insects, and by altering the environment. With this in mind, and the fact that we are presently losing species at an alarming rate globally, placing a large-scale solar farm, with unproven technology seriously lacking in research, with an orientation in which the effects on the flora and fauna are largely unknown, next to and in such an environmentally sensitive site such as Graveney Marshes, makes it impossible to mitigate successfully against, and make an informed decision. The project conflicts with NE's recommendations, the EU's policy and that of the UK Government's 25-year EP, it also conflicts with the guidance and advice from industry specialists and the Department for Communities and Local Government Planning practice guidance for renewable and low carbon energy.

Some of CHS's surveys are dated, not as robust as they should be and at times it is questionable if they even reach industry best practice. CHS omitted one protected species from being surveyed all together. This calls into question the robustness of their findings and in turn any conclusions arrived at, and any ancillary mitigation. Therefore, the surveys do not provide enough accurate information for any informed decisions to be made. We are especially concerned about the level of mitigation for the brent geese not being enough, the combining of mitigation of the golden plover and lapwing with the brent geese, the management plan for brent geese not being suitable for management plans for golden plover and lapwing, the accuracy of the bird days data, the accuracy of the bat survey, the accuracy of the reptile survey, the lack of consideration/research given to aquatic insects and polarization, the culverting of waterways and the abstraction of water from the waterbodies on site. Our detailed comments follow.

Furthermore, we note with some concern that Hive Energy (linked to CHS Ltd) now appear to assert that the solar farm will remain '*in perpetuity*' in stark contrast to the de-commissioning statement and further comments on de-commissioning that are made in the subsequent surveys (see Hive Energy's website).¹

¹ <http://www.hiveenergy.co.uk/our-uk-solar-parks/>, downloaded 24th June 2019

Environmental Statement

Volume 1

Chapter 8 Ecology

The EA Ecology report contradicts itself in a number of places for example Page 2, 8.1.2 Scope of Assessment acknowledges that there will be habitat loss/change, disturbance and criminal damage, yet at page 6 under action states *'no direct impacts are predicted, and indirect impacts are proposed to be mitigated where required.'*

Page 8, summary of response CPRE Kent. CHS state *'There will be gaps between the solar panel strings and 'corridors' of connecting natural habitats in areas of the site that are not currently represented by this habitat'*

Whilst the solar panels are mounted on struts which may be removed, CHS fail to take into consideration the pouring of concrete for the battery housing, the burying of electrical cabling and the use of earth and clay on site to create the bund to surround the battery storage area. They also fail to take into consideration the culverts planned and mentioned on Page 10 by the Kent Wildlife Trust (KWT). After the proposed 40 years of being in place removing these culverts could cause more damage than being left in place depending on how embedded they become.

CHS also state, *'There will be extensive open strips of grazing land suitable for grazing livestock that will be available between the arrays and to the margins of the solar panel layout.'*

We understand that the sheep will be fenced off from going between the panels. Furthermore, we would not describe 2.5 metre gaps as extensive.

Page 8, summary of response KCC. CHS describe the crops as monocrop, yet this is the very same crop that the brent geese graze upon. CHS also comment that the 5m to 8m strip to be left on either side of the ditches is an improvement on the current 2m strip either side of the ditch. However, if the sheep were to be grazed on the area then poaching and erosion is likely to occur along ditch edges. Furthermore, the 2m strip is unmown and tussock grass which is ideal for invertebrates, reptiles and other flora and fauna, heavily grazed areas do not encourage wildflowers, lepidoptera (butterflies) and Linnaeus (bees) with no barriers and no shade.

Page 7, Natural England's comments Page 4 (NE) contradict the Environment Agency's comments (EA)

NE state *'In addition, the presence of ditches within the development site offers the opportunity to enhance the water vole population of the site.'*

The EA state 'Given that the area will become intertidal habitat and so unsuitable for water voles, we do not want any enhancement work, specifically for the benefit of water voles, to be delivered by the developer that will increase use of the site by this species.'

Page 7, Graveney with Goodnestone PC express concern for the loss of opportunity to enhance the site for habitat creation and landscape were the MEAS to go ahead as planned. We concur that the MEAS will be a lost opportunity and the solar farm will negatively impact on the landscape and ecology of the site.

CHS state that the panels are to be placed away from aquatic habitats. As the site is surrounded by aquatic habitats, namely the sea and interjected with ditches which crisscross across the site, all water courses are likely to be negatively affected either indirectly or directly

Page 10. KWT. We concur with the KWT that the placing of culverts can cause habitat fragmentation and inhibit the free movement of aquatic insects and mammal movement utilizing the ditch network and therefore should be avoided.

Page 10, KWT. We concur with the KWT that 50% of species of bats on one site in one area is significant and should be regarded as such when addressing the importance of this site for biodiversity and status.

Page 11, Swale Friends of the Earth (SFoE), state that they agree with the PEIR in regard to change of land use and therefore no more use of agricultural chemicals. However, agricultural chemicals may be absent were the solar farm to go ahead, but SFoE and CHS fail to consider the threat to the health of the aquatic insect population, which is highly likely to face a different risk that could affect their viability. Insect biomass is falling by 2.5 per cent per year (Sanchez-Bayo, Wyckhuys 2019)². This ground-breaking paper cites four aquatic taxa as 'imperiled' having lost a large proportion of species. Dragonflies (Anisoptera) and damselflies (Zygoptera) depend on water bodies for larval development and both are present on site. The International Union for Conservation Nature (IUCN) says that out of 118 aquatic species of endangered insects, 106 are Odonata (dragonflies and damselflies) with 10% being threatened with extinction. Freshwater insects have fixed life cycles with one brood of offspring annually and are therefore, sensitive to habitat change with flow alterations, habitat fragmentation and pollution being among the main threats. Odonata lay their eggs in water as does the damsel fly (*Saucium*) – very little data concerning population exists on this species. It is well documented that aquatic insects are affected by mistaking solar arrays for waterbodies and trying to lay eggs on the panels. (Explained in more detail later). Furthermore, flying insects are affected by light and as there are to be significant security lighting surrounding the site, it is likely these groups of insects will also be negatively affected.

² <https://www.sciencedirect.com/science/article/pii/S0006320718313636>

Page 11, Swale Green Party. CHS state that species on site are 'principally' along the field margins and drainage ditches.

Brent geese graze upon the crops grown, the lapwing and golden plover utilize the crop area as cover for laying eggs and the Marsh harrier hunts over wide, open areas such as farmland. All are SPA species.

Page 11, The Faversham Society mention the significance of invertebrates on site. CHS fail to take into consideration the negative impact construction dust will have on watercourses, (explained in more detail later). The report also fails to take into consideration the negative effect security lighting will have on winged insects and they fail to consider the negative effect the panels will have on aquatic insects, which will be also be explained in more detail.

Page 14. The Extended Phase 1 Habitat Survey (2015) is now four years old.

8.2.3.3, 23. CHS state *'It was concluded within the Updated Extended Phase 1 Habitat survey report that the status of protected or priority species is likely to remain broadly unchanged, because factors including habitat types have remained unchanged since the previous surveys were undertaken....and there is no need to update all protected or priority species surveys for the purpose of this ES.'*

CHS failed to consider hazel dormice (*Muscardinus avellanarius*) in either the original Extended Phase 1 Habitat Survey or the Updated Extended Phase 1 Habitat Survey, yet there is clear evidence that hazel dormice are present on site, which would have been established had CHS considered dormice when carrying out their Phase 1 Habitat Surveys. (see Appendix 1: photograph of a dormouse nest present on the Local Wildlife Site (LWS) OS ref. TR026636). This nest has been recorded with PTES and NE and is now part of the National Dormouse scheme. It is likely dormice will have inhabited areas in and around the site, such as the ditch network and scrub.

Dormice are afforded full protection under Schedule 5 of the Wildlife and Countryside Act 1981, as amended. Protection to the species is also afforded by Schedule 2 of the Conservation (Natural Habitats &c) Regulations, 1994, making the hazel dormouse a European Protected Species. These two pieces of legislation operate in unison, however, there are some minor differences in scope and wording.

Under the provisions of Section 9 of the Wildlife & Countryside Act, it is an offence to:

- Intentionally kill, injure or take a dormouse;
- Possess or control any live or dead specimen or anything derived from a dormouse (unless it can be shown to have been legally acquired);
- Intentionally or recklessly damage, destroy or obstruct access to any structure or place used for shelter or protection by a dormouse;
- Intentionally or recklessly disturb a dormouse while it is occupying a structure or place which it uses for that purpose.

Schedule 2 of the Conservation (Natural Habitats, &c) Regulations, 1994 makes it an offence to:

- Deliberately capture or kill a dormouse;
- Deliberately disturb a dormouse;
- Damage or destroy a breeding site or resting place of a dormouse;
- Keep transport, sell or exchange, or offer for sale or exchange a live or dead dormouse or any part of a dormouse.

Dormice are a Priority Species under the UK Biodiversity Action Plan (UK BAP) and has been adopted as a Species of Principal Importance in England under section 41 of the NERC Act 2006 (section 42 in Wales).

The hazel dormouse is a nocturnal and generally arboreal rodent that follows an omnivorous diet such as; flowers, fruits, invertebrates, pollen and nuts. Dormice can be found in deciduous woodlands, hedgerows and scrub, but will also adopt other habitats including gardens, conifer plantations and they have even been found on roadside verges and central reservations. Dormice are active between April and late October, spending the winter/autumn seasons in hibernation down on and in the ground, where they are particularly vulnerable to heavy plant machinery. Distributed primarily in southern England and Wales, the dormouse is absent from Scotland, Northern Ireland and the Republic of Ireland. They are slow breeders and poor dispersers.

The dormouse has the protection of law because its numbers and habitat have declined by at least 50% over the course of the last century and continue to do so. This is primarily due to the loss, destruction and fragmentation of habitat as a result of logging, urbanisation and intensive agricultural practices. Dormice have declined as a species by a third since 2000 and 50 per cent since the mid 1990s.

Amphibian Survey

The Amphibian Survey 2015 is now four years old.

ES Vol. 4 Technical Appendix A8.2a, Amphibian Survey

6. Discussion, CHS state *'In the dry of the summer months the ditches dry out and some contain very little water.'*

ES Vol. 4 Technical Appendix 5.4, Outline Construction Environmental Management Plan 3.3 Vehicle washing and 4.4, 73, and 74. Dust Suppression and control, CHS suggest extracting water from drainage water and local water courses or ground water despite being aware that the ditches can run low or even dry out during times of no rainfall. This is highly likely to put the ditch network under even more stress during dry weather bouts to the point where the water could be exhausted. Any ground water aquifers feeding these ditches could also be exhausted. Any amphibians, mammals and aquatic insects are likely to be negatively impacted by the extraction of water from their habitat.

Amphibian Survey, Revision A

Great Crested Newt Habitat and eDNA survey

This survey is four years old.

Several of the main factors for the decline of GCN as listed in GCN Conservation Handbook 2001 published by Froglife are;

- The deliberate filling in or destruction of ponds
- Chemical pollution and nutrification of breeding sites
- Loss of terrestrial habitat
- Habitat fragmentation
- Habitat management which renders sites unsuitable for GCN
- Deterioration of ponds through neglect or misuse

Adult GCN are active in the water from January to December with the peak times being March to September. During these times GCN are also extremely active on land and egg laying usually occurs between April and May. Between June and August GCN are in their larval stage with metamorphosis occurring mid-August to mid-September. This staggered activity means that if construction of the solar farm commenced at any time, it would be impossible not to negatively affect the newts at some stage in their cycle. The type of habitat around the pond bordering the site will have an influence on the movement of the newts. Newts tend to rest in crevices and shaded areas and will share mammal burrows or adopt abandoned ones. The continuous movement of lorries etc and the consequential dust disturbed on dry days may bury some newts, prevent them from immigrating or emigrating between ponds in the area and is highly likely to result in the fatalities of any newts attempting to cross the construction site either to or from waterbodies depending on the time of day.

The potential pollution from oil drips onto the earth from vehicles and subsequent stirring of contaminated dust across waterbodies and surrounding vegetation is likely to have an accumulative polluting effect on the water and surrounding vegetation. Some dust particles are likely to float reducing light levels within the water and thereby reducing photosynthesis, making it difficult for aquatic plants and animals to obtain oxygen. Furthermore, in heavy rain there is likely to be run off from the construction site towards ponds and water bodies in areas depending on the camber of the site during construction, unless suitable drainage channels were constructed. However, such drainage channels could in themselves create a toxic barrier around waterbodies for the GCN and further fragment the habitat.

GCN lay one egg on a leaf at a time around pond edges. If any construction was to take place during the egg laying season the dust and dirt that is likely to blow (especially in such an open landscape) and cover the surrounding vegetation could result in the destruction of the embryo. It is an offence under the Wildlife and Countryside Act 1981 and the Conservation (Natural Habitats & CROW Act 2000) 1994 Regulations which make it illegal to;

- Deliberately disturb GCN or intentionally or recklessly disturb them in a place used for shelter or protection
- Damage or destroy a breeding site or resting place
- Intentionally or recklessly damage, destroy or obstruct access to a place used for shelter or protection.

The activity, pollution and noise of construction in such close proximity to any waterbody utilized by GCN would make it impossible to not contravene the above regulations. Furthermore, the movement of lorries on site could also result in the destruction of GCN that have a range from any breeding pond of up to 500m.

Survey

Nothing to add.

Preliminary Aquatic and Terrestrial Invertebrate Surveys

The Preliminary Invertebrate Survey Report 2015 is now four years old.

Summary; The report states; *'Due to the presence of suitable habitats, a series of invertebrate surveys of the ditch habitats be undertaken when species are most likely to be active, namely May to September.'*

Yet the actual days surveyed were not May to September as industry standards recommend as best practice; the report indicates in the summary that surveys were carried out only during August to September. Therefore, only two out of five months of surveys were completed.

What is equally concerning is that AECOM Ltd feel this to be acceptable and state *'...this is not considered to be a major constraint to this scheme, as an extensive species list was established from the later season visits...'*

If an extensive species list was established from only two months then had the whole survey season been undertaken, as best practice dictates, the species list would likely be even more comprehensive, important due to the number of *'...unusual and uncommon species...'*

Of the invertebrates found during the very limited survey times, there were at least five nationally scarce water beetle and two other notable aquatic species, one water boatman and another water beetle. All of these species are polarotactic insects and lay eggs in water, with some species laying eggs on the water surface. Were the proposed solar farm to go ahead then it could have negative implications for the area to sustain minimum viable populations of aquatic insects due to the polarization effect and the insects mistaking the solar panels for water bodies.

The smooth surface of water (Jeal et al 2019)³ horizontally polarizes reflected sun and night light. This reflection is evolutionary and provides a vital cue to over 300 species of aquatic insects of the presence of a water body.

This man-made polarized pollution (Horvath et al 2009)⁴, can be so harmful that it creates ecological traps, where insects have been found to mate above and oviposit on artificial surfaces. Not only can this cause reproductive failure (Visser et al 2018)⁵, but it places the insects at increased predation from insectivorous raptors and insect gleaning bats (which

³ <https://www.tandfonline.com/doi/abs/10.2989/00306525.2019.1581296>

⁴ <https://esajournals.onlinelibrary.wiley.com/doi/10.1890/080129>

⁵ https://www.researchgate.net/publication/327508687_Assessing_the_impacts_of_a_utility-scale_photovoltaic_solar_energy_facility_on_birds_in_the_Northern_Cape_South_Africa

have been established to be present on site) that use the area for foraging. When taking the sheer size of this proposed solar farm into consideration, it is feasible it could cause a catastrophic crash in aquatic insect population, which in turn, would negatively affect prey species that rely on these aquatic species for survival.

Page 6. The survey concludes *'that based on the low number of invertebrates species found, the site appeared to have a low biodiversity value.'*

Having only surveyed two out of the five months, it's difficult to understand how they could have arrived at that conclusion with only a partial survey season having been completed, yet the report quotes earlier *'...this is not considered to be a major constraint to this scheme, as an extensive species list was established from the later season visits...'* This statement seems to contradict the statement on page 6. Either there was a low number of invertebrates or there was an extensive species list, demonstrating a high degree of biodiversity.

The survey acknowledges several scarce and unusual insects and several scarce and unusual aquatic insects, but there are other rare insects present on site not mentioned within the report. Tom Harrison, entomologist, recorded with the Kent and Medway Biological Records Centre (KMBRC) – *Hister quadrimaculatus*; a very rare carrion beetle and Cleve Hill is one of its strongholds and *Diachromus germanus*; a species of ground beetle which became extinct in Britain but has recently recolonised in the last 15 years, with only four modern records known. It colonizes the edge of ploughed fields and is threatened by conversion of arable into solar farm where arable would be replaced by mown grass.

Bat Survey

The Bat Survey Report

4 Methodology, 4.2, the survey states that it *'was undertaken by two experienced AECOM ecologists'* However, the report fails to detail their qualifications and experience as is usual with surveying, especially with licenced species.

Page 9. 5.1, the desk study revealed there were nine bat species recorded on site. There are 18 bat species in the UK so nine is significant and amounts to 50 per cent of UK species present on one site.

Page 19. 6 Discussion and recommendations. The survey notes that bat activity was limited within the fields. Fig. 1 (Appendix 2) shows that the bat detectors were all placed around the perimeter of the site. Although the walked transects ran across the fields along ditches, the most accurate way of measuring activity these days is by static bat detectors, which is why they are employed.

Reptile Survey

The Reptile Survey Report is now four years old.

Page 1. Summary. The report states *'It should be noted that, where it is predictable that reptiles are likely to be killed or injured by an activity (such as site clearance or any development related works) this could legally constitute 'intentional killing or injuring', even if that was not the intention of the activity'*.

CPRE Kent concurs with this statement and would like to know how is this to be policed/monitored were the solar farm to go ahead and how a conflict of interest is to be avoided?

There were 413 artificial refugia placed at the site. However, when regarding Fig. 1 (see Appendix 3) it seems the boundary along the southern and western edge of the site was omitted and no refugia were placed. We would like to know the reasons as to why the surveyor saw fit to not place refugia along these areas, especially considering they border suitable habitat.

When considering the results of the survey it is important to also consider the points made in Froglife Advice Sheet 10⁶, namely the following;

- *'reptiles are relatively challenging animals to find as they tend to be secretive, camouflaged, occur in comparatively low numbers on a given site, and may be inactive for long periods during winter or hot, dry summers.'*
- *'There has been a lack of easily available and workable guidance on how to survey reptiles.'*
- *...'sometimes, even determining the presence of a species can be arduous, let alone obtaining some idea of population size.'*

Page 4. 4, Methodology. Froglife Advice Sheet 10 goes on to mention the preferred habitat types, which the Reptile Survey says was identified in collaboration with the farm. However, Froglife Advice Sheet 10 goes on to warn of the bias that is likely to occur when only placing refugia on identified suitable habitat, which it refers to as 'hot spots' and that these areas are best used for establishing presence or absence rather than population estimates. The advice sheet also recommends placing the refugia or tins *'evenly over the habitat to examine the distribution of reptiles on a given site.'* With this survey the refugia were placed only along the ditch network and sea wall area and not over the whole site (see Appendix 3). The advice sheet goes on to recommend that for general survey purposes, between five and ten refugia should be placed per hectare and for more detailed surveys this figure should be increased. This site is around 360 hectares, that equates to 1,800 refugia using the lower recommended figure of five, far more than the 413 refugia actually placed. The advice sheet also notes that as it's difficult to prove absence, that the more visits made the more confident the surveyor can be of the assessment of the site. However, the advice sheet also states that to convert survey counts into an indication of relative population is difficult to do for reptiles due to the challenges involved with surveying them and due to their ecology not being fully understood.

Page 4. 4.1 Constraints: The report states that despite communicating with the farm 50 felts were destroyed. This incident, despite being regarded by AECOM as *'not considered to be a major constraint'* is likely to have affected the overall results and further diminishes the number of refugia from 413 to now just 363 refugia.

⁶ [Froglife advice sheet 10](#)

Water vole Survey

The Water Vole Survey Report is now four years old.

Page 4. Constraints; the report states that ditch 6 was not surveyed due to strimming taking place at the time. When considering Fig. 1 (see Appendix 3) a map of the ditch network over the site, ditch 6 feeds all ditches from 7 to 21, making ditch 6 one of the key ditches present on site in terms of connectivity. As strimming occurred on one day, a return visit to the site at a later date to complete the survey would have provided a more complete survey, especially considering the significant position of ditch 6 and its connectivity to the rest of the site to the west.

OCEMP Technical Appendix A5.4. Page 28: The inclusion of culverts could fragment the habitat and has the potential to pollute the water course by the pouring of concrete and associated works disturbing the water voles during construction and increasing the risk of flooding the burrows during heavy rainfall. The.GOV.UK site states the following;

'Avoidance and mitigation methods

You should address the potential impacts you've identified on water voles with your mitigation plans.

Aim to avoid negative effects by:

- *avoiding works to areas where there are water voles*
- *avoiding habitat fragmentation and isolation by ensuring connectivity of habitat*
- *limiting damage to water vole habitat'*

Adding in culverts to the ditch network meets none of the above avoidances. On the contrary the culverts serve the developer and there is no evidence of consideration having been afforded the water vole, preserving its habitat and connectivity.

Furthermore, the.GOV.UK site goes on to state;

'If the tide affects your watercourse

Culverts

The risk management authorities are unlikely to give you permission to build a culvert - an underground structure that a watercourse can flow through. Culverts can increase flood risk and damage the environment.'

The EA's policy on culverts⁷ is quite clear. They state:

8.6.1 General policy regarding culverts

Environment Agency policy is that no watercourse should be culverted unless there is an overriding need to do so. This is because:

- *the ecology of the watercourse is likely to be degraded by culverting;*
- *culverting introduces an increased risk of blockage (with consequent increase in flood risk);*
- *it can complicate maintenance because access into the culvert is restricted (in some cases being classified as a confined space and requiring trained operatives and specialist equipment).*

⁷ <http://evidence.environment-agency.gov.uk/FCERM/en/FluvialDesignGuide/Chapter8.aspx?pagenum=6>

A blockage in a culvert can be very difficult to remove and likely to result in a severe flood risk. For these reasons the provision of a screen at the entrance to the culvert is often considered. Such a screen eliminates the risk of a blockage inside a culvert but introduces a significant maintenance obligation (to ensure that the screen is kept clean) which far exceeds the typical maintenance requirements of an open watercourse.'

A screen added would also slow down water flow, increase the chances of flooding and prevent the free movement of water voles and other fauna.

The EA also list the negative effects culverts can have on the environment, some of which are listed below.

8.6.2 Impacts of culverting

The culverting of watercourses can have many different impacts on the water environment including ecology, channel form, flow regime and chemistry.

- *Ecology: culverts can be impassable to riverine fauna and can create barriers to the movement of fish*
- *Culverts result in the loss of natural in-stream and bankside through direct removal and loss of daylight*
- *Morphology: Culverted sections may create or exacerbate downstream or upstream bank and bed erosion or promote sediment deposition, as a result of altered water velocities and disruption to the natural transport of sediment*

The BRE National solar Centre publication on planning guidance for the development of largescale ground mounted solar PV systems states:

Culverting existing watercourses/drainage ditches should be avoided. Where culverting for access is unavoidable, it should be demonstrated that no reasonable alternatives exist...'

There is no evidence that we can see that CHS has explored any other method other than culverting the ditches.

Ornithology Technical Appendix

Page 27. 43; the report states that 6 surveys were carried out and admits the site was so large that some visits were split over two days. However, the Common Bird Census (CBC, now superseded by the BBS) recommend that 8-10 visits should be carried out.

Page 29. 49, Table A9.17. Although a pair of marsh harriers were seen on site it was decided they were not breeding. However, several local residents have observed a pair of marsh harriers carrying out nesting behaviour and feeding chick behaviour in a ditch on site, but not had not subsequently recorded this with the KMBRC. Therefore, it is possible a pair of marsh harriers were breeding on site. Marsh Harriers use both dry and wet habitats. (Raptors: a field guide for surveys and monitoring). The nest sites are generally freshwater or brackish reed beds and other wetlands or tall crops adjacent to wetlands, as with Graveney Marshes.

Page 38. 94 and 96; the sentences are incomplete and so it's difficult to know what the report is referring to.

Page 40. 106. The report states that it was' *...necessary to remove double counts (when the same flock of birds was recorded in two different fields on the same survey).*'

This demonstrates the foraging range of the brent geese is far wider than the intended set aside for mitigation.

The report also refers to section 9.8. When referring back to table 9.8 (Page 17) lapwing count, it was noted that bird scarers were in use when four of the seasonal bird counts took place, namely 2008/09, 2009/10, 2010/11, 2011/12, the same for the counts of golden plover and for brent geese. The use of bird scarers at the time are likely to have had a negative effect on the count. Therefore, how can these years be taken into consideration when the desired effect of bird scarers is to displace birds? This calls into question the validity and accuracy of the peak mean count for these three species of bird and in turn the robustness of the number of bird days and subsequent mitigation. In a nutshell, the bird count for these three bird species could be grossly under stated especially as CHS wish to use the same mitigation area for all three species even though the proposed mitigated area *'falls short of the requirement for lapwing...'*

For instance; the peak mean count for brent geese including the seasons with bird scarers is 468 birds, the peak mean count without the seasons with bird scarers, namely 2012/13, 2013/14, 2014/15, 2015/16, 2016/17 is 645.

Page 42. 114. The report indicates that there will be no direct competition between the brent geese, golden plover and lapwing. Whilst the golden plover and lapwing can and do coexist there needs to be enough land area to support both species and therefore not cause them to be in competition with one another. Furthermore, it is worth noting that the mitigation has been calculated on an average figure, bird numbers can and do go up and down depending on a number of variables, so considering the brent geese have numbered in the past to around 3,000, would this mitigation area realistically be enough to sustain the brent geese, lapwing and golden plover without negatively affecting the value of the SPA, SSSI and Ramsar areas?

114. The report admits that *'golden plover and lapwing generally exhibit preference for feeding in grassland with short sward height, but also use open arable habitats such as open ploughed land and young winter cereals, preferring large open fields providing good visibility for predators.'* (One presumes they mean good visibility to spot predators and not good visibility for predators to spot them).

As CHS intend to cover the majority of arable fields in 4m (12') high solar panels and then enclose the solar panels with 2m (6') high deer fencing effectively creating a linear area, is likely to negatively affect the golden plover and lapwing by permanently removing suitable open habitat from their preferred range. The fencing off of the solar panels and the

proposed 8m buffer up to the ditches will create a closed in linear effect, far from the open farmland setting preferred by the golden plover.

Page 43. 115. lists '*removal of bird scaring*' as mitigation. 119. states that the current landowner does not adopt any bird scaring activities. Therefore, how can it be 'removed' for mitigation if it does not exist in the first place?

Page 44. 121. 122. 123. 124. The report extensively covers the justification for the size of mitigation. However, whilst allegedly managing the proposed grassland in favour of the brent geese, this management is not necessarily favourable for either the golden plover or the lapwing whose diet consists of beetles, earthworms and plant materials such as berries, seeds and grasses, (some taken by probing 1-2cm down), moth caterpillar, fly larvae, molluscs, land snails, amphipods, crustaceans, and earthworms, are also a particularly important component of the lapwing diet. (European Management Plan 2009-2011 EUMP)^{8,9}. The golden plover is also attracted to winter cereals, stubbles, fallows, harvest-fields and to closed-grazed pastures. This does not fit with the proposed management plan intended for brent geese, for instance clover being sown. Furthermore, according to the EUMP (lapwing) fertilizer grassland can reduce the value for lapwing. It creates higher nutrient levels which in turn increase vegetation growth leading to more 'homogenous' grasses, unsuitable for lapwing nesting and foraging early in the season. This does not fit with CHS plans to use manure for fertilization of the grazing for brent geese. CHS mention grazing sheep on the proposed mitigation land, the EUMP states that increased stocking densities increases the occurrence of trampled nests. Furthermore, high stocking densities can interrupt the incubation timetable risking an increase in nest predation. Furthermore, agricultural machinery has been cited as yet another further risk to the destruction of nests. This does not fit with CHS plans to mow the proposed mitigation area.

BRE's Planning guidance for the development of large-scale ground mounted solar PV systems¹⁰ stipulates (within the section on Ecology) that the material consideration of impacts on ground nesting birds, bats, dormice, reptiles and [REDACTED] should be considered.

The EUMP cites infrastructure development as a threat. Although it does not specifically mention solar farms and the ancillary infrastructure, this would be too specific, it does mention that roads are avoided by lapwings. It seems that lapwings are particularly sensitive to roads as nests could be lower than expected up to 2000m from a road, with the number of breeding pairs also negatively affected. The proposed construction of the solar farm is likely to have a significant negative impact on the lapwings breeding efficacy. Furthermore, lapwings have been recorded as colliding with power lines. The cumulative effect of these

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http://ec.europa.eu/environment/nature/conservation/wildbirds/hunting/docs/Lapwing%20EU_MP.pdf

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http://ec.europa.eu/environment/nature/conservation/wildbirds/hunting/docs/Golden%20Plover%20EU_MP.pdf

¹⁰ https://www.bre.co.uk/filelibrary/pdf/other_pdfs/kn5524_planning_guidance_reduced.pdf

threats could seriously compromise the lapwings continuing use of Graveney Marshes as a preferred location for breeding and feeding which could in turn negatively impact the integrity of the adjacent SPA, SSSI and Ramsar areas.

The EUMP (golden plover) report lists the wintering habitat should be managed in accordance to observed scientific evidence favouring winter survival. Specifically, nature-friendly agriculture is promoted to preserve and encourage earthworms and other invertebrates, biodiversity, conservation and appropriate management of permanent pasture.

Page 47. 132. The report states that *'56,023 lapwing bird-days will therefore require 56 ha and 28,802 golden plover bird-days will require 18.5 ha of functionally linked land... These areas are not additional to each other.'* It seems here that CHS are reluctant to afford mitigation land for each species separately and would prefer to 'lump' them all together possibly as a cost saving exercise. It is prudent to highlight counts used at face value may under-represent the importance of the site and may give misleading results. (Musgrove *et al* 2007) Species distribution is not the same across a site and certain areas of the Marshes, for instance, may be particularly important for one species and not others. One can never be sure how many birds were hiding in reeds, for example, and so cannot be sure if the counts included all birds present.

The methodologies adopted for the bird counts and subsequent peak mean bird days, could have a different outcome if a different method of counting was adopted. For instance, Musgrove *et al* (2007) states; *'... (some birds may use adjacent non-wetland habitat), and as a statutorily designated site for nature conservation (which may be constrained by the need to follow boundaries easily demarcated in planning and legal terms). It should be recognised that the boundary of a site for counting may even differ between different water bird surveys, particularly where different methodologies are employed.'*

Natural England (NE) in their letter dated 26 January 2017, recommend that construction take place outside of the wintering period. However, that would then clash with the bird nesting season, in particular the lapwing, especially vulnerable being a ground nesting bird. Furthermore, the marsh harrier's nests are located in dense, marshy vegetation or crops. Raptors: a field guide for surveys and monitoring, comment that desertion is very likely when marsh harriers are incubating or when there are chicks. Marsh harriers find nesting sites as early as January and their defence territory, in East Anglia for example, can range from 569 ha to 1,407 ha during nesting and up to 7km for hunting. The females are slightly less. The offer by CHS of 8m either side of the ditches is clearly less than adequate when taking the large foraging area required by the marsh harrier into consideration. Plus, the activity that will ensue during the construction stage is likely to have a significant negative impact on this SPA species.

Further evidence

The Swale Designated sites NE.

Light pollution

The Swale SPA, dark-bellied brent goose and dunlin assessment on threats¹¹ cites the introduction of light as a perceived threat. The pressure description comments as follows *'Direct inputs of light from anthropogenic activities. ...attraction to light sources can result in birds directly colliding with structures...'*

For both SPA species the attraction to light is cited as a threat. The risk of collision, disorientation, exhaustion, and predation are a few of the negative effects of light pollution from security lighting or maybe even reflection at night of the moon on the panels. No research has been done to date on the effect of night-time illumination of solar panels, so this could be potentially catastrophic with the proposed solar farm intending to cover such a vast area, in close proximity to waterbodies, the Swale SPA, Ramsar, SSSI and MCZ.

The Environmental Statement. Chapter 5, development description, point 141 states *'Visible lighting, which will be manually controlled and switch on only when activated by passive infra-red (PIR) sensors for security/emergency purposes, will be deployed around the electrical compound and at the transformers within the fields of the solar PV arrays.'* The BRE Planning guidance for the development of large scale ground mounted solar PV systems¹² states, developers should minimise the use of security lighting – and any lighting should use passive infra-red (PIR) technology and installed minimising glare, light pollution and impacts on biodiversity, particularly bats, they advise that lighting is not used unless absolutely necessary. CHS fail to supply a map detailing the position of all the lighting. They fail to consider the effects of lighting on winged insect behaviour such as moths which are attracted to light, and in turn the effect that will have on predators such as bats. Bats can also be negatively affected by the presence of light (Stone *et al* 2009)¹³. Furthermore is it likely that bats may trigger the lights to come on?

Noise pollution

Maria Kravchenko & Igor Nosov 2011 state *'wild animals are very sensitive to noise because their survival totally depends on the ability to focus on the sounds.'* They go on to say *'Since motocross as a sport is a non-natural phenomenon and is organised by people, the pollution resulting from it can be classified as man-made. Consequently, nature does not have an adequate capability to absorb the emissions in a way that will not disturb the balance in the ecosystems.'* Whilst this development is not a motocross it will, during construction, inevitably have vehicle movement on site and personnel, and during operation there will be noise from inverters, corona noise from overhead powerlines and loud noise from the

¹¹ <http://publications.naturalengland.org.uk/publication/6270737467834368>

¹² https://www.bre.co.uk/filelibrary/pdf/other_pdfs/kn5524_planning_guidance_reduced.pdf

¹³ <https://www.sciencedirect.com/science/article/pii/S0960982209011932>

switch. This cumulative effect is highly likely to cause disturbance to sensitive fauna including both farmland birds, mammals and water birds.

NE's Landscape Character Assessment identified 159 National Character areas in England, providing a national level database.

NCA Profile: 81 Greater Thames Estuary (NE473) is as follows:

'The Greater Thames Estuary National Character Area (NCA) is predominantly a remote and tranquil landscape of shallow creeks, drowned estuaries, low lying islands, mudflats and broad tracts of tidal salt marsh and reclaimed grazing marsh that lies between the North Sea and the rising ground inland.'

Were this solar farm to go ahead then this tranquillity that NE describes will be lost with a likely negative effect on the fauna.

Visual Disturbance

The Swale SPA, dark-bellied brent goose and dunlin assessment on threats, cites visual disturbance as a perceived threat.

For both species visual disturbance can greatly disturb taxa in a number of ways, such as human activity, personnel movements, taking flight as a consequence of visual stimuli, loss of roosting and feeding habitat. The paper notes that brent geese numbers doubled in non-disturbed areas, which one would expect.

Government Policy

The publication: A Green Future: Our 25 Year Plan to Improve the Environment states that the Government intends to *'set gold standards in protecting and growing natural capital... We will take into account, the often hidden additional benefits in every aspect of the environment for national wellbeing, health and economic prosperity, with scientific and economic evidence to the fore.'*

Building a large-scale solar farm, battery storage area and ancillary infrastructure adjacent to internationally designated areas and on established functionally linked land, does not fit with the Government's 25 Year Environment Plan. The available evidence clearly demonstrates that the solar farm should not be built within such a sensitive biodiversity opportunity area, environmentally sensitive area and a high landscape area. However, the EA's MEASS project for a managed retreat does fulfil these criteria. Natural Capital Committee requires *'solid foundations: comprehensive, reliable data...'* No such data currently exists, as research is in its infancy in regard to traditional solar farms and non-existent in regard to solar farms of this scale, in this location type and of this orientation, with the use of battery storage.

The EA's plans for Graveney Marshes completely fit with Point 5. Of the Governments 25 Year Plan: Reducing risks from flooding and coastal erosion; i. Expanding the use of natural flood management solutions. This is exactly what the EA plans for this area and what Graveney Marshes should naturally be, a salt marsh.

Chapter 2; *Recovering nature and enhancing the beauty of landscapes.*

1. *Protecting and recovering nature*
 - i. *Publishing a strategy for nature*
 - ii. *Developing a Nature Recovery Network*

The proposed solar farm does not fit with either of the above criteria, whereas the EA's plans do.

2. *Respecting nature in how we use water*
 - i. *Reforming our approach to water abstraction*

CHS stated their intention to consider water extraction from the ditch network and surrounding waterbodies. This does not fit with the Government's policy above.

Chapter 6; *Protecting and improving our global environment*

1. *Providing international leadership and leading by example*
 - i. *Tackling climate change*
 - ii. *Protecting and improving international biodiversity*

The proposed solar farm does not fit with the above criteria due to the effect on protected species and biodiversity existing on site now and the rising sea levels, coastal squeeze and loss of internationally important habitat. Graveney Marshes is the EAs preferred choice for managed retreat.

Other reports and publications

The implementation of the development of large-scale solar farms as a sustainable and environmentally friendly alternative to usual utility sources, could increase environmental degradation locally and regionally (Lovich and Ennen 2011)¹⁴. The overall number of peer-reviewed research on renewable energy per se has increased since 1991. However only 7.6 per cent of all research papers covered environmental impacts and only 4 per cent included discussions of ecological consequences and fewer than 1 per cent contained information pertaining to environmental risks and no information is available on the effects of solar energy development on wildlife. Since Lovich and Ennen wrote their paper, there has been some research on solar farms and their effect on wildlife which are cited in this written representation. Furthermore, all research reviewed for this written representation, up to 2011 and since 2011, state that more research and study is urgently required.

Hotker *et al* (2005)¹⁵ state in their publication; 'Impacts on biodiversity of exploitation of renewable energy sources: the example of birds and bats'; '*the focus is on wind energy as there is only little information on the impact on birds and bats of other sources of renewable energy.*' They go on to say that there is a need for more research into renewable energy, which is especially applicable for solar farms. They specifically mention the negative effect on breeding and migrating birds and other flora and fauna and that any effect is unknown. They comment that there is no data available on the disturbance, displacement or on

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https://www.researchgate.net/publication/281120784_Wildlife_Conservation_and_Solar_Energy_Development_in_the_Desert_Southwest_United_States

¹⁵ https://eolien-biodiversite.com/IMG/pdf/englischemwindkraftstudie_1252510701.pdf

collision mortality, which is especially concerning, due to water birds mistaking solar cells for water surfaces at night. They reiterate this by stating *'Studies analysing the extent of impacts on solar parks on bird populations (and on other taxa) are urgently needed...The populations must be observed at least over two years before and at least two years after the installation of the solar power plant. In addition, a control site should be set up which is similar to the solar power plant, but without solar cells...the area should also be searched for collision victims.'* They also recommend that before and after studies of breeding and non-breeding bird populations be carried out. CHS have carried out no such research.

NE's commissioned publication 'Evidence review of the impact of solar farms on birds, bats and general ecology (NEER012)¹⁶' 2017, concludes *'When considering site selection for utility scale solar developments it is generally agreed that protected areas should be avoided. This is reflected in the scientific literature where modelling approaches include many factors such as economic considerations and visual impact but also often avoid protected areas such as SPAs. This is echoed by organisations such as NE and the RSPB that recommend that solar PV developments should not be built on or near protected areas. As sensitive species and habitats are not necessarily restricted to the geographical boundaries of protected areas.'* They go on to say how *'imperative'* that research is undertaken into the potential interactions between solar PV arrays and biodiversity, especially sensitive habitats and species. The publication stipulates the importance of further research into the placing of panels in close proximity to protected areas and functionally linked land in order informed decisions can be made and to understand the impacts of solar farms on ecologically functionally connected land and other habitats.

Another commissioned report by NE (Functional linkage: How areas that are functionally linked to European sites have been considered when they may be affected by plans and projects – a review of authoritative decisions)¹⁷ is used as a referencing bar to aid decisions on case work. The publication states clearly that once functionally linked land has been identified and established (Graveney Marshes has been both identified and established as functionally linked) it must be afforded the same material considerations as if it were the designated area, such as a SPA, for example. The publication states that where effects are likely to have a major effect and there is little or no data to be sure there would be no harmful and negative effect on the integrity of a site, regarding population of site designated protected species, authorisation has been denied.

The publication makes reference to the importance of case law to the decision making process and warns that too lenient an interpretation in considering potential harm to designated areas and the likely subsequent deterioration of protected habitats and species, could pave the way for a legal challenge through domestic or European Courts for failure to comply with The Habitats Regulations.

¹⁶ <http://publications.naturalengland.org.uk/publication/6384664523046912>

¹⁷ <http://publications.naturalengland.org.uk/publication/6087702630891520>

Several case studies refused development because of being functionally linked. These include SPA functionally linked areas refused due to displacement, potential loss of roosting area outside of an SPA and the development site considered to be prime winter feeding grounds for dark bellied brent geese from a nearby SPA, which found - an adverse effect on integrity (AEOI) existed.

The Department for Communities and Local Government's publication Planning practice guidance for renewable and low carbon energy states at point 11. *'The expectation should always be that an application should only be approved if the impact is (or can be made) acceptable'*

With a solar farm on such a vast scale as this, with unproven technology, directly adjacent to internationally designated areas, on a site itself designated as environmentally sensitive, a biodiversity opportunity area, of high landscape value and functionally linked and with lack of scientific evidence on the effects on the surrounding internationally protected flora and fauna, we fail to see how can be made to be or is acceptable on any level.

Point 15 states *'..., it is important to be clear that:*

- *The need for renewable or low carbon energy does not automatically override environmental protections*
- *Cumulative impacts require particular attention, especially the increasing impact that wind turbines and large-scale solar farms can have on landscape and local amenity as the number of... solar arrays in an area increases*
- *Local topography is an important factor in assessing whether wind turbines and large-scale solar farms could have a damaging effect on landscape and recognise that the impact be as great in predominately flat landscapes as in hilly or mountainous areas*
- *Great care should be taken to ensure heritage assets are conserved in a manner appropriate to their significance, including the impact of proposals on views important to their setting*

Point 16 states *'Distance plays a part, but so does the local context including factors such as topography, the local environment and near-by land uses.*

Point 25 States...*'factors to bear in mind include:*

- *The effect on a protected area such as an Area of Outstanding Natural Beauty or other designated areas*
- *The colour and appearance of the modules, particularly if not a standard design.*

Point 26 states *'The deployment of large-scale solar farms can have a negative impact on the rural environment...However, the visual impact of a well-planned and well-screened solar farm can be properly addressed within the landscape if planned sensitively.*

Point 27 states concerning factors locally:

- *'The effect on landscape of glint and glare...and on neighbouring uses and aircraft safety*
- *Great care should be taken to ensure heritage assets are conserved in a manner appropriate to their significance, including the impact of proposals on views important to their setting.... careful consideration should be given to the impact of large-scale solar farms on such assets. ...a large-scale solar farm within the setting of a heritage asset may cause substantial harm to the significance of the asset.'*

All the way through this planning guidance it warns of the negative effect and cumulative negative effect of not considering protected areas, the topography of the land and the heritage. Heritage can often be the landscape rather than buildings, though in this case it's both, and landscape type is important to fauna when considering predation, nesting sites and feeding/roosting sites.

BRE Planning guidance for the development of large-scale ground mounted solar PV systems is industry 'best practice guidance' document supported by the EU and BRE National Solar Centre and founded by 24 independent solar energy providers.

They all recommend that ground mounted solar PV projects, over 50kWp, should use brown field sites, contaminated land, industrial land or extremely poor farmland of grade 3B or below. Graveney Marshes is grade 3 and 2. They go on stating land selected should aim to avoid affecting the visual aspect of landscape and maintain the natural beauty. The publication talks about soil stripping and says the soil removed due to construction of compounds, access roads, cable trenching etc. should be retained and replaced once works have concluded. We understand that soil on site is to be excavated and used for the bund encircling the battery storage, thus removing valuable topsoil and altering the environment considerably.

Chapter 5 of the Environmental Statement, Development description point 136. States *'The fence will incorporate mammal gates at regular (every 50m (164')) intervals to avoid the fence acting as a barrier to the movement of mammals through the development site. The BRE Planning guidance for the development of large-scale ground mounted solar PV systems recommend '...so as to minimise landscape and visual impact on the rural scene, to minimise the use and height of security fencing, and that a gap is left around the whole perimeter of the fencing to allow the immigration and emigration of small mammals and reptiles, and large mammal gaps should be installed ensuring continued access by large mammals such as foxes and [REDACTED].'*

CHS, whilst allowing for mammal traps within the perimeter deer fencing, fail to acknowledge the need for smaller mammals to be able migrate back and forth across the site as recommended by BRE Planning guidance for the development of large-scale ground mounted solar PV systems. Furthermore, we feel 50m intervals for larger mammals to be too infrequent and thus the fencing will serve only to further fragment the habitat and reduce connectivity.

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Appendix 1. Natural dormouse nest found on Graveney Marshes 2019



Appendix 3. Fig. 1. Reptile survey, illustrating the placing of refugia.

