CLEVE HILL SOLAR PARK

OTHER DEADLINE 5 SUBMISSIONS
WRITTEN REPRESENTATION BY THE APPLICANT ON MISCELLANEOUS ENVIRONMENTAL ISSUES

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CLEVE HILL
SOLAR PARK

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1 INTRODUCTION

1. This document forms a written representation (WR) by Cleve Hill Solar Park Ltd ("the Applicant") in relation to the Development Consent Order ("DCO") application process for Nationally Significant Infrastructure Projects ("NSIPs") in support of its application for a DCO for the Cleve Hill Solar Park ("the Application"). This document has been prepared on behalf of the Applicant by Arcus Consultancy Services Ltd.

2. Miscellaneous oral and written submissions to the examination by interested parties received prior have been addressed in this document, including:

- Ivermectin content of farmyard manure;
- Leaching of steroids from farmyard manure;
- Further eel/elver considerations;
- Further dormouse considerations; and
- Leaching of chemicals from solar photovoltaic modules.

2 IVERMECTIN CONTENT OF FARMYARD MANURE

2.1 Background

3. Kent Wildlife Trust (KWT) in its written representation at Deadline 2 [REP2-092], and in submissions since, has requested that the Applicant source the farmyard manure proposed to be spread on the Arable Reversion Habitat Management Area (AR HMA) from Ivermectin free cattle.

4. The Applicant subsequently amended the Outline Landscape and Biodiversity Management Plan (Outline LBMP) at Deadline 4 [REP4-007] (e.g., paragraph 336) to refer to the sourcing of Ivermectin-free farmyard manure, where possible.

5. The qualification, "where possible", is necessary as through dialogue with the land owner's agricultural consultants, it is not necessarily viable to fully commit to Ivermectin-free farmyard manure as the use of such treatments is widespread in the industry and availability of the necessary volumes from a feasible source could be very limited.

6. KWT provided a reference in its written representation to evidence that Ivermectins are harmful to invertebrates[1]. The Applicant does not disagree with this assertion, however there is some additional context which is helpful, as set out below:

- The harmful effects on invertebrates are relevant as the Applicant is expecting greater numbers of invertebrates as a result of the application of farmyard manure to be beneficial for lapwing and golden plover, encouraging their use of the AR HMA. It is therefore relevant which invertebrates are preyed upon by lapwing and golden plover, and what the effects of Ivermectins are on those species. It is also relevant that the Applicant's latest calculations show potential over-provision for lapwing and golden plover, based on the AR HMA grassland having at least as much capacity to support lapwing and golden plover as that recorded on mostly arable habitat in the study by Gillings (2007).
- The existing baseline situation includes the spreading of significant volumes of agricultural chemicals on the land [REP4-050], including insecticides, molluscicides and fungicides. It is the existing use of the land by birds (as measured by the 'peak-mean' metric of baseline use) whilst under this baseline land management that the Applicant is seeking to replace.

[1] For example, Foster, G., Bennett, J. & Bateman, M. (2014). Effects of Ivermectin residues on dung invertebrate communities in a UK farmland habitat. Insect Conservation and Diversity. 7. 10.1111/icad.12030.

2.2 Literature Review

2.2.1 Lapwing (L) and Golden Plover (GP) Prey Items

7. Gillings, S. and Fuller. R. J. (1999). Winter Ecology of Golden Plovers and Lapwings: A Review and Consideration of Extensive Survey Methods. British Trust for Ornithology. No. 224. [Online]. Available at: https://www.bto.org/sites/default/files/shared_documents/publications/research-reports/1999/rr224.pdf [Accessed 17 September 2019]. This notes that:

- Abundance and availability of prey is an important factor for the distribution and habitat selection of L and GP, where both consume invertebrates found in topsoil;
- They prefer grassland-vegetated fields due to microclimates caused by vegetation insulation; earthworm (dominant prey) biomass increases proportionally to time since last ploughing, meaning L and GP prefer permanently untilled soils - GP distribution positively correlated with earthworm biomass and field age;
- L and GP prefer medium-length swards, where fully mown grass and entirely unmaintained areas are avoided; and
- Potential for regional habitat differentiation, depending on available selection.

8. Fuller, R. and Youngman, R. (1979). The utilisation of farmland by Golden Plovers wintering in southern England. Bird Study, 26(1), 37-46. [Online]. Available at: https://doi.org/10.1080/00063657909476615 [Accessed 17 September 2019]. This notes that:

- Large flocks of GP are very versatile, and regularly divide in smaller groups to search different fields; the main field types are permanent [v-high prey biomass, winter] and non-permanent grassland, ploughed land, and winter crops [high prey biomass, spring]; L also prefer permanent grassland in winter, but do not decline in its use in February like GP; and
- Specific environmental conditions impact invertebrate biomass in specific fields, and L and GP sought out those that could support their large flock size during the winter – the authors suggest these conditions are challenging to replicate. Ploughed fields are generally preferred for roosting - perhaps an anti-predator device or relating to microclimate.

9. Thompson, D. and Barnard, C. (1984). Prey selection by plovers: Optimal foraging in mixed-species groups. Animal Behaviour, 32(2), 554-563. [Online]. Available at: https://doi.org/10.1016/S0003-3472(84)80293-6 [Accessed 17 September 2019]. This notes that:

- During the study period, birds fed almost entirely on earthworms (GP = 94%, L = 96%);
- Ls choose pastures based on earthworm biomass density, and GP follow the locations of L – they have a close species relationship; and
- Kleptoparasitic (food stealing) nature of Black-headed gulls (where some are present in the South East of England) means that earthworm selection is a function of several factors (availability, time, inter- and intra-species interactions, and kleptoparasitic activities). The study finds small worms to be most profitable for L and GP due to the fact that large worms, despite giving more energy, are located deeper, take longer to obtain, and are more likely to be stolen. This shifts when there is no gull presence, and L have lower energy intake when gulls join the flock; GP were less affected as gulls are twice as likely to steal from L.

2.2.2 Ivermectin Effects

10. Liebig, M. Fernandez, A, Blübaum-Gronau, E. et al. (2010). Environmental risk assessment of Ivermectin: A case study. Integrated Environmental Assessment and

Management, 6(1), 567-587. [Online]. Available at: https://doi.org/10.1002/ieam.96 [Accessed 16 September 2019]. This notes that:

- Avermectins such as Ivermectin are often used in the protection of agriculture and horticulture, as they are effective against a wide range of nematodes, mites, insects, and (most importantly) livestock parasites - faeces are known to act as microhabitats which give space for rapid reproduction;
- Sorbed-in-soil Ivermectin transfers most effectively in lowest crop coverage (e.g. postharvest and preseeding), which can coincide with when large numbers of animals are treated. The study suggests that Ivermectin can translocate terrestrially through movement of soil by erosion. Soil is most mobile during the time just before planting or after harvesting in arable farms (lowest crop coverage, most roots to hold soil in place); this can coincide with when pastoral farms treat livestock with Ivermectin;
- Risk was indicated for all species in the sediment Environmental Risk Assessment where more significant risk is presented to dung beetles (in line with current literature understanding); the overall conclusion suggests Ivermectin is of "high concern" - more severe risk for dung beetles and existing risk for aquatic invertebrates found in this study vs. literature;
- Ivermectin is highly persistent in dung, and showed no degradation over the 38-day span; and
- The risk characterisation for sediment organisms was significantly lower than aquatic ones, indicating that Ivermectin presents a very potent risk to aquatic invertebrates - weighted by its very high toxicity to daphnids.

11. Förster, B. Boxall, A. Coors, A. et al. (2011). Fate and effects on Ivermectin on soil invertebrates in terrestrial model ecosystems. Ecotoxicology, 20(1), 234-245. [Online]. Available at: https://doi.org/10.1007/s10646-010-0575-z [Accessed 16 September 2019]. This notes that:

- This is the first use of Terrestrial Model Ecosystems (TME) to investigate Ivermectin, after other single-species studies showed high toxicity; typical meadow site species used;
- Ivermectin has poor soil mobility (<1.2% concentration in the top 1 cm was detected, and did not significantly change over time periods 7 - 96 days);
- Species:
  - Nematode (Roundworms) numbers did not follow a consistent dose-response pattern;
  - Enchytraeids numbers did not follow a consistent dose-response pattern, despite the Ivermectin dose being statistically significant;
  - Earthworm numbers did not follow a consistent dose-response pattern, despite the Ivermectin dose being only marginally statistically insignificant;
  - Micro-arthropod collembolan numbers were significantly influenced by Ivermectin treatment and increased irrespective of time, however in the case of mites neither time nor dose had significant influence;
- The Principal Response Curve (PRC) indicates treatment is responsible for 44.3% of total variance, compared to just 14.4% due to time; and
- Recovery of most affected collembolan species occurred within the 96-day period, which was surprising as recolonization is not possible in TMEs - this means that the community recovered internally (e.g. migrating from lower levels, reproduction of surviving individuals).

12. Scheffczyk, A. Floate, K. Blanckenhorn, W. et al. (2015). Nontarget effects of Ivermectin residues on earthworms and springtails dwelling beneath dung of treated cattle in four countries. Environmental Toxicology and Chemistry, 35(8), 1959-1969. [Online].

Available at: https://doi.org/10.1002/etc.3306 [Accessed 16 September 2019]. This notes that:

- Study of effects on Earthworms and Springtails (Collembolan); Earthworms can remove up to 60% of cattle dung from surface and lab studies show an "intermediate chronic sensitivity towards Ivermectin"; Springtails were selected on similar criteria but have lower ecological relevance on grassland sites due to their characteristically low abundance;
- Found "no consistent relationship between Ivermectin treatments and earthworm abundance"; the opposite to lab studies which suggested chronic sensitivity towards Ivermectin; and
- Found "no discernible consistent relationship or effect attributable to Ivermectin" as springtail abundance was highly variable; when compared with laboratory tests which suggested an effect of Ivermectin on springtails, this research found inconsistent results and no long-term adverse effects.

13. Sutton, G. Bennett, J. and Bateman, M. (2013). Effects of Ivermectin residues on dung invertebrate communities in a UK farmland habitat. Insect Conservation and Diversity, 7(1), 64-72. [Online]. Available at: https://doi.org/10.1111/icad.12030 [Accessed 16 September 2019]. This notes that:

- The levels of Ivermectin in cowpats were high and remained detectable throughout the 47-day trial. Residue breakdown occurred, but levels persisted above those lethal to some invertebrates. Sward structure had no significant effect on Ivermectin levels;
- Ivermectin residues affected cowpat colonisation. Diptera were present in significantly lower numbers in treated cowpats. Dung Beetles (Coprophagous Coleoptera) were less affected by Ivermectin residues, although some species were present in significantly higher numbers in treated cowpats in the long sward environments; and
- It is likely that Ivermectin remains above levels toxic to some invertebrates throughout the entire grazing season, as persistence was recorded even after 47 days in the field; this can significantly alter cowpat colonisation patterns.

14. Römbke, J. Krogh, K. Moser, T. et al. (2009). Effects of the Veterinary Pharmaceutical Ivermectin on Soil Invertebrates in Laboratory Tests. Archives of Environmental Contamination and Toxicology, 58(2), 332-340. [Online]. Available at: https://doi.org/10.1007/s00244-009-9414-8 [Accessed 17 September 2019]. This notes that:

- Results correspond with other studies, but this time tested under laboratory conditions (i.e. artificial soil, controlled moisture-content and carbon percentage, dissolved using acetone);
- Residue analysis also corresponded with previous studies, and Ivermectin was potent for over 28 days; and
- Springtail production most sensitive, predatory mite and earthworm not negligibly affected but less severe; study suggests the effects of Ivermectin should not be ignored.

15. Jensen, J. Diao, X. and Hansen, A. D. (2009). Single- and two-species tests to study effects of the anthelmintics Ivermectin and Morantel and the Coccidiostatic Monensin on soil invertebrates. Environmental Toxicology and Chemistry, 28(2), 316-323. [Online]. Available at: https://doi.org/10.1897/08-069.1 [Accessed 17 September 2019]. This notes that:

- Tri-anthelmintic analysis where Ivermectin is the only significantly potent threat to soil invertebrates; and

- Affected reproduction of predatory mites (-45%), and was highly toxic to springtails, however in two-species tests no significant relationship between control and concentration could be found. Adult predatory mite survival was unaffected by Ivermectin.

16. Suarez, V. Lifschitz, A. Sallovitz, J. et al. (2003). Effects of Ivermectin and doramectin faecal residues on the invertebrate colonization of cattle dung. Journal of Applied Entomology, 127(8), 481-488. [Online]. Available at: https://doi.org/10.1046/j.0931-2048.2003.00780.x [Accessed 17 September]. This notes that:

- Total number of arthropods in Ivermectin-dosed pats declined significantly against control;
- Study done in outdoor field to research in-situ properties of Ivermectin.
- Beetles, Springtails, dung-specific nematodes, and Acari populations were significantly decreased, whilst Scarabaeidae remained unchanged; and
- Ivermectin still remained in a potent concentration after the 27-day trial period, meaning the effect of being in a field did not impact the concentration enough to remove risk.

2.3 Conclusions

17. The evidence reported suggests that earthworms are the dominant prey item for lapwing and golden plover.

18. The evidence is clear that Ivermectins are potentially harmful to invertebrates, however, the degree to which earthworms (lapwing and golden plover predominant prey items) are affected by Ivermectins is not categorical. Certain studies Scheffczyk *et al.* (2015) and Foster *et al* (2011) found respectively no consistent relationship between Ivermectin treatments and earthworm abundance, and that earthworm numbers did not follow a consistent dose-response pattern.

19. There is evidence to suggest that Ivermectin content of farmyard manure could reduce the benefit of the farmyard manure to provide food resources for lapwing and golden plover, but does not eliminate its benefits.

20. There is evidence that application of manure fertiliser increases earthworm and other invertebrate densities and increases lapwing/plover use of fertilised fields. The literature evidence in those studies does not indicate that this was only related to Ivermectin-free manure application, therefore it is expected that application of manure from treated animals will still increase invertebrate availability, providing more attractive foraging conditions for lapwing and golden plover. The Applicant is confident that the management of the AR HMA will have benefits for earthworms through the cessation of agricultural activities such as the cessation of application of agricultural chemicals, the cessation of ploughing and soil compaction, and the subsequent ability of the soil to 'rest' and regain its structure.

21. The Applicant will therefore include in the next iteration of the Outline LBMP at Deadline 6, provision for testing and reporting of Ivermectin content of farmyard manure, so that this can be measured as a variable, and any measured detrimental impact can be remediated, for example through the sourcing of farmyard manure with lower Ivermectin content, which could be possible by procuring manure sources at different times of year.

3 LEACHING OF STEROIDS FROM FARMYARD MANURE

3.1 Background

22. At Issue Specific Hearing 6 (a written summary is provided as Deadline 5 document reference 13.1.3), an interested party requested more information on how the Applicant

intends to deal with steroid leaching from livestock and / or farmyard manure utilised onsite.

3.2 Evidence

23. DEFRA has published guidance on beef cattle and dairy cows: health regulations (https://www.gov.uk/guidance/cattle-health#hormonal-treatments-and-antibiotics-for-cattle).

24. This guidance includes a section on hormonal treatments and antibiotics for cattle and sets out the controls that exist in the UK.

25. The Applicant notes that sheep and cows graze on land within and adjacent to the Development site, on land designated as part of The Swale Site of Special Scientific Interest, Special Protection Area and Ramsar site, and the Applicant has not been made aware of any additional restrictions placed on the managers of those livestock other than complying with applicable legislation.

3.3 Conclusions

26. The Applicant considers that the contents of imported farmyard manure and livestock dung are adequately regulated under other guidance and legislation and additional controls on this are not necessary as part of the Development.

4 FURTHER EEL / ELVER CONSIDERATIONS

4.1 Background

27. At Issue Specific Hearing 6, an interested party requested that a variety of measures be implemented in respect of eel/elver populations on the Development site. These suggestions included baseline surveys, monitoring and mitigation.

4.2 Evidence

28. The Eels Regulations[2] (as amended) require at Part 4 12(1)(c) that the Environment Agency is notified in respect of:

"the construction or maintenance of a structure in or near waters that amounts to, or is likely to amount to, an obstruction."

29. And at Part 4 12(2) that:

"Any person who constructs, alters or maintains a dam or structure must first notify the Agency".

30. Following the notification under 12(2), the Environment Agency (the EA) may require through the serving of a notice that the Applicant undertakes actions as set out in Part 4, 14(2), and if necessary, further actions following a further notice under Part 4, 14(3).

31. In order to capture these requirements, the Outline Landscape and Biodiversity Management Plan (LBMP) [REP4-007] incorporates the requirements of the Eels Regulations in Table 1, Table 2 and section 13.6.2 through text requiring that water control structures are eel / elver friendly. In addition, the EA is required to be notified prior to the removal of the ditch to facilitate the construction of the electrical compound and although this is a legal requirement under the Eels Regulations, this will also be added to the updated Outline LBMP at Deadline 6.

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[2] The Eels (England and Wales) Regulations 2009. Available at: https://www.legislation.gov.uk/uksi/2009/3344/contents [accessed on 20/09/2019].

32. Section 8.5.1.1 of the Environmental Statement (ES) Chapter 8 – Ecology [APP-038] provides an assessment of indirect effects on designated sites outside the ecology core study area and refers to the long-term beneficial effects of the Development on the ditch network onsite through the cessation of agricultural inputs and associated improvements in water quality.

4.3 Conclusions and Actions

33. The construction and operation of the Development will be undertaken in compliance with the Eels Regulations 2009 (as amended).

34. The Applicant is content that the Eels Regulations, and the measures incorporated in the Outline LBMP to reflect the requirements of the Eels Regulations, are sufficient to ensure that the Applicant complies with the necessary legal protections afforded to eels and elver, and that the beneficial effects predicted for water quality will deliver benefits for the local eel population. The Applicant therefore does not believe it is necessary to provide additional baseline survey information and corresponding post-construction monitoring relating to eel/elver.

5 FURTHER DORMOUSE CONSIDERATIONS

5.1 Background

35. A submission by CPRE Kent at Deadline 2 included the details of a dormouse record identified by a CPRE representative within the Application site boundary (although not within the area proposed for development itself) [REP2-065].

36. Having reviewed the information provided, the Applicant is strongly of the opinion that the nest is unlikely to be a dormouse nest and has provided further evidence to the examination to support this assertion.

5.2 Evidence

37. The Applicant contacted CPRE Kent on 5 September 2019 to obtain further information on the record made. The Applicant's ecologist asked the CPRE representative to:

- Confirm the location of the recorded dormouse nest and a description of the location was provided; and
- Provide clarification on the specifics of the nest to inform applicant agreement or otherwise with the identification.

38. The Applicant undertook a desk-based search of the National Dormouse Database / National Biodiversity Network (NBN) Gateway which confirms the next nearest dormouse records to the Development site as being approximately 5 km to the south-west and 5.5 km to the south-east.

39. The Applicant visited the location provided by CPRE Kent on 10 September 2010. Photographs are provided in Appendix A of this document. Field observations are provided below.

- The habitat is sparse, patchy and substantially isolated (by water to the north, west and south) from other known offsite records (the closest record is 5 km away);
- The area where the nest was recorded is of insufficient diversity of foraging sources to provide habitat suitable for sustaining dormouse year-round;
- The habitat is of insufficient size to sustain a dormouse population had it been present; and

- The photo of the recorded nest contained a significant proportion of moss and little evidence of shredded material, the only similar nests that usually contain significant proportions of moss belong to either wren or shrew.

40. The location where the nest was recorded (as described by CPRE Kent) is in an area of the Application site which will not be affected by the Development, within Work No. 9, Flood Defences, as shown on the Works Plan [APP-007].

5.3 Conclusions and Actions

41. The location of the recorded nest is outside the area of the Development site which would be affected by the construction and operation of the Development.

42. Notwithstanding this, the Applicant's conclusion is that the nest recorded as a dormouse nest is very unlikely to be a dormouse nest.

43. The Applicant does not believe that any further action is necessary, beyond the usual pre-construction checks for protected species, as necessitated by Requirement 14 - Protected Species of the DCO.

6 LEACHING OF SUBSTANCES FROM SOLAR PHOTOVOLTAIC MODULES

6.1 Background

44. During Issue Specific Hearing 6 on Environmental Matters, an interested party requested further information on the potential for harmful substances to leach from solar photovoltaic modules onto the ground.

45. The Applicant notes that much of the current research is centred on emerging solar technologies and notably 'perovskite' panels (synthetic compounds with orthorhombic crystal structure identical to the naturally occurring mineral - emerging organic-inorganic hybrid panel).

46. Results can at least to some extent, be generalised, however studies directly concerned with silicon (Si) panel environmental impacts during the use cycle phase are limited (as noted in Celik, I. et al. – see below). Organic panels (also noted as polymer, plastic, and similar to perovskite) are much less stable, and should the Cleve site be undertaken using standard crystalline silicon panels, there is a negligible risk of any environmental impacts even after module damage.

47. Lifecycle assessments for crystalline silicon cells do not consider operational emissions as most focus on greenhouse gas emissions - it is assumed the glass encapsulation is weather-resistant and, even when broken, there is no harmful discharge from the crystalline structure.

48. The type, age, chemical composition, and damage significance of the module are all variables that are relevant when considering the use-case environmental impacts of PV arrays, although in a situation where PVs remain intact and do not lose protection of the encapsulating material (glass, polymer), it is generally accepted that no environmental negativities will occur from array operation.

6.2 Evidence

49. Fthenakis, V. (2012). Overview of Potential Hazards. In Practical Handbook of Photovoltaics: fundamentals and applications. McEvoy, A. Markvart, T. and Castañer, L. (Eds). [Online]. Available at: https://doi.org/10.1016/C2011-0-05723-X [Accessed 16 September 2019]. This notes that:

- "The operation of PV systems does not produce any emissions" (p.1093);

- The only method of toxic substances used in the manufacturing and decommissioning of panels is to inhale dust or fumes. Under normal working conditions, panels do not leak any toxic substance due to the thick layer of glass or plastic that holds material layers stable; and
- Where the panel is damaged significantly (i.e. ground to a fine dust), it is possible to incur health problems; equally if panels are consumed in fires, the resulting smoke and fumes present a real risk - however Fthenakis notes that even residential fires are unlikely to amount the required temperature to vaporise the dangerous chemicals used in panels. Externally-fed industrial fires are recognised to pose a risk if engulfing PV modules, however Fthenakis notes the scale of the fire would be so great that any contamination from PV leaking would be incidental in comparison. (Examination for panels made from x-SI, a-Si, CdTe, CIS, CGS, or GaAs).

50. Celik, I. Song, Z. Phillips, A. et al. (2018). Life cycle analysis of metals in emerging photovoltaic (PV) technologies: A modeling approach to estimate use phase leaching. Journal of Cleaner Production, 186, pp. 632-639. [Online]. Available at: https://doi.org/10.1016/j.jclepro.2018.03.063 [Accessed 16 September 2019]. This notes that:

- Assert the lack of consideration for emissions in the 'use' lifecycle phase, especially in consideration to moisture contact and breakages. The study estimates the dissolve and diffuse rate of different metals in moisture, should a module become damaged;
- For materials CdS, PbS, and SnO2, loss factor (LF - ratio of input material to lost material) is negligible. NiO and ZnO have marginal LF, and CuSCN and PbI2 had high LF;
- ZnO: the leakage of material is proportional to the size of the damage to the module;
- PbS: with severe damage, ~70% of PbI2 potentially leaches into the environment;
- In the case of damage, such significant amounts of PbI2 and CuSCN would be lost from a damaged device that it would stop functioning, and rapidly replacing the affected module significantly reduces the environmental material leaching; and
- The toxicity of Pb and Cu in perovskite PVs can be greater than the mining and extraction lifecycle phase (i.e. high).

51. Hailegnaw, B. Kirmayer, S. Edri, E. et al. (2015). Rain on Methylammonium Lead Iodide Based Perovskites: Possible Environmental Effects of Perovskite Solar Cells. The Journal of Physical Chemistry, 6(9), pp. 1543-1547. [Online]. Available at: https://doi.org/10.1021/acs.jpclett.5b00504 [Accessed 16 September 2019]. This notes that:

- In a worst-case scenario, damaged encapsulation of perovskite-based solar leads to decomposition of the absorption layer from moisture contact. The moderate solubility of PbI2 causes much of the material content leaching into the environment; unless this lead concentrates in a limited groundwater volume, the total environmental impact of this leaching is thought to be small compared to the natural occurrence of lead.

52. Espinosa, N. Zimmermann, Y-S. Benatto, G.A.d.R. et al. (2016). Outdoor fate and environmental impact of polymer solar cells through leaching and emission to rainwater and soil. Energy & Environmental Science, 5, pp. 1674-1680. [Online]. Available at: https://doi.org/10.1039/C6EE00578K [Accessed 16 September 2019]. This notes that:

- Inorganic photovoltaics (OPV): "*OPV are well packaged in a thin plastic barrier that is designed to be impervious to liquid water. When in operation (i.e. when*

producing electricity), no leaching or emission to the environment should thus take place, even when the solar cells are deployed outdoors";
- Current research has not quantified the ecotoxicity of OPV material release into air, soil, water, or biota;
- Ag release was highest soonest after damage (in the research, this was achieved through delamination), and the need to act quickly on replacement or repairs is highlighted. If left unattended, Ag concentrations could become harmful to both human health and freshwater toxicity; and
- Zn concentrations never exceeded even close to any drinking water or environmental limits, and as such is not a concern.

6.3 Conclusions and Actions

53. The available evidence shows that the type of crystalline solar PV modules proposed for use at the Development, even when broken, are unlikely to result in any pollution. The UK's installed solar capacity of over 13 GW is deployed in a wide range of locations, including the roofs of residential properties, on nature reserves[3] and floating on reservoirs[4] without such pollution issues.

54. The Applicant's control and maintenance systems would ensure that any damaged panels are removed well in advance of any potential pollution occurring.

55. The Applicant has provided two additional Design Principles at Deadline 5 (document reference 7.1, Revision D) to address these points and provide further reassurance on these issues. These are:

- Crystalline silicon solar PV modules will be used; and
- Physically damaged solar panels will be removed within one week of the damage being detected.

[3] https://www.rspb.org.uk/our-work/rspb-news/news/stories/triodos/
[4] https://corporate.thameswater.co.uk/media/News-releases/Thames-Water-rewarded-for-its-commitment-to-sustainability

APPENDIX A - PHOTOGRAPHS OF THE AREA WHERE THE DORMOUSE NEST WAS RECORDED CLOSE TO SAXON SHORE WAY IN WEST OF APPLICATION SITE AREA

Plate 1 - Habitat at Dormouse Nest Location (looking west)

Plate 2 - Habitat at Dormouse Nest Location (looking northwest)

Plate 3 - Habitat at Dormouse Nest Location (looking south west)