EAST YORKSHIRE SOLAR FARM

East Yorkshire Solar Farm
EN010143

Habitats Regulations Assessment

Document Reference: EN010143/APP/7.12

Regulation 5(2)(g)
Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

~~November 2023~~
June 2024
Revision Number: ~~00~~01

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Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

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Regulation Reference	Regulation 5(2)(g)
Planning Inspectorate Reference	EN010143
Application Document Reference	EN010143/APP/7.12
Author	East Yorkshire Solar Farm Team

Version	**Date**	**Status of Version**
Rev 00	November 2023	DCO submission
Rev 01	27 June 2024	Deadline 2

Prepared for:

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1. Introduction

1.1 Overview

1.1.1 This Habitats Regulations Assessment (HRA) report has been commissioned by East Yorkshire Solar Farm Limited (hereafter referred to as 'the Applicant') in relation to an application for a Development Consent Order (DCO) for East Yorkshire Solar Farm (hereafter referred to as the 'Scheme').

1.1.2 The Applicant is seeking development consent for the construction, operation and maintenance and decommissioning of a photovoltaic (PV) electricity generating facility with a total capacity exceeding 50 megawatts (MW) and export connection to the national grid, at National Grid's Drax Substation. Refer to **Chapter 2: The Scheme** of the **Environmental Statement (ES), Volume 1 [EN010143/APP/6.1**] for full details of the proposal.

1.1.3 Due to its proposed generating capacity being more than 50 (megawatts) MW, the Scheme is classified as a Nationally Significant Infrastructure Project (NSIP) and will therefore require consent via a DCO under the Planning Act 2008 ('PA2008'; Ref. 1). The decision whether to grant a DCO will be made by the Secretary of State for the Department for Energy Security and Net Zero (hereafter referred to as the 'Secretary of State') following the Examination and Recommendation by the Planning Inspectorate.

1.1.4 The scope and extent of this HRA have been determined by a combination of the Scoping Opinion adopted by the Planning Inspectorate (PINS) on behalf of the Secretary of State, ongoing engagement with consultees such as Natural England (NE), and professional judgement. This HRA has evolved through various iterations via continuous engagement with Natural England, which involved a series of meetings and writing of evidence packs (particularly in relation to wintering bird survey methodology and provision of mitigation regarding functionally linked habitat loss). As a result, a Statement of Common Ground (**SoCG [EN010143/APP/8.12]**) between the Applicant and Natural England was developed, which sets out the mutually agreed approach to key HRA issues associated with the Scheme and a timetable of discussions between Natural England and the applicant. The HRA is also in accordance with PINS's Advice Note Ten: Habitats Regulations Assessment relevant to nationally significant infrastructure projects (Ref. 2).

1.2 Site Description

1.2.1 The 'Site' comprises approximately 1,445 hectares (ha) of land and is made up of the 'Solar PV Site', the 'Interconnecting Cable Corridor', and the 'Grid Connection Corridor'. The Solar PV Site and the Interconnecting Cable Corridor lie wholly within the East Riding of Yorkshire, whilst the Grid Connection Corridor which links the Solar PV Site to National Grid's Drax Substation lies within East Riding of Yorkshire and the unitary authority of North Yorkshire.

1.2.2 The Site consists predominately of agricultural fields mainly under arable production, with some areas of pasture, interspersed with individual trees, hedgerows, tree belts (linear) small woodland blocks and farm access tracks. The Grid Connection Corridor crosses and lies adjacent to The River Derwent, as well as crossing the River Ouse before connecting to the existing National Grid Drax Substation.

1.2.3 The Scheme is approximately centred on National Grid Reference (NGR) SE 756 330, as shown in **Figure 4** (**Appendix A**).

1.3 Description of the Scheme

1.3.1 The principal Scheme infrastructure components comprise:

a. Solar PV panels;

b. Solar PV panel mounting structures (collectively referred to as ‘tables’ or ‘strings’. Groupings of solar PV tables are referred to as ‘arrays’);

c. Field Stations (areas of hardstanding within the Solar PV Site that will house electrical infrastructure);

d. Electrical infrastructure at Field Stations:

   i. Transformers;

   ii. Centralised inverters (noting that string inverters, if used, will be located at the arrays); and

   iii. Switchgear, protection and control equipment.

e. String inverters as standalone within the array (parallel to or at end of frames), if central inverters are not used;

f. On-site cabling within the Solar PV Site – less than 1kV, typically above ground locally between the Solar PV panels and inverters, and underground elsewhere;

g. Interconnecting Cables – 33kV underground cabling between the Solar PV Areas which transmit electricity from the Field Stations to one of the two Grid Connection Substations;

h. Two (33kV/132kV) Grid Connection Substations;

i. Grid Connection Cables (two 132kV export circuits) connecting the Grid Connection Substations to the National Grid Drax Substation;

j. Underground link boxes (approximately 17 in total) – approximately every 900m of Grid Connection Cable routing;

k. Operations and maintenance hub with welfare facilities (Solar PV Area 1e);

l. Fencing and security measures (e.g., lighting and CCTV);

m. Accesses including tracks and visibility splays;

n. Construction and decommissioning laydown areas; and

o. Landscaping and biodiversity enhancement.

1.3.2 The terminology ‘solar PV panels’ is used throughout this HRA report, as this is the term in common usage; however, it is noted that the technical term for panels is ‘modules’.

1.3.3 The Scheme will also include 132kV export circuits (Grid Connection Cables) connecting the 132kV/33kV Grid Connection Substations to the National Grid Drax Substation.

1.3.4 During the construction phase, temporary construction compound(s) will be required as well as temporary roadways to facilitate access to all land within the Solar PV Site as well as the Grid Connection Corridor.

1.3.5 Subject to the Order being approved, and following a final investment decision, the earliest construction could start is in Q4 2025. Construction of the Grid Connection Cables is anticipated to require 12 months, whereas construction of the solar farm will require an estimated 24 months, with operation therefore anticipated to commence around 2027.

2. Legislative Framework

2.1 Introduction

2.1.1 As part of the assessment of a development, it is necessary to consider whether the Scheme is likely to have a ‘significant’ effect on areas that have been internationally designated for nature conservation purposes (i.e., ‘European sites’). European sites are protected under the Conservation of Habitats and Species Regulations 2017 (as amended; relevant to England and Wales) (Ref. 3).

2.1.2 The UK left the European Union (EU) on 31 January 2020 under the terms set out in the European Union (Withdrawal Agreement) Act 2020 (termed the ‘Withdrawal Act’). However, the most recent amendments to the ‘Habitats Regulations’ (i.e., Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 [Ref. 4]) make it clear that the need for HRA continues to apply. Whilst the 2019 Regulations make changes to the Habitats regime and terminology (e.g., by introducing the term ‘national site network’), this document continues to use the term ‘European sites’ to refer to all Natura 2000 sites in line with current standard practice (comprising Special Areas of Conservation [SAC], Special Protection Areas [SPA]) potentially affected by the Scheme. The National Planning Policy Framework (Ref. 5) requires proposed SACs and SPAs to be treated as European sites along with Ramsar (wetlands of international importance) sites.

2.1.3 Regulation 63 of the Habitats Regulations requires a ‘Competent Authority’, in this case the Secretary of State (who is informed by recommendations of the Planning Inspectorate as the appointed Examining Authority), to undertake an ‘Appropriate Assessment’ (AA) of any plan or project (alone or in-combination with other plans and projects) which is likely to have a significant effect on a European site unless the project is directly connected with the management of the site. In light of the conclusions of the assessment, the Competent Authority may proceed with or consent to the plan or project only after having ascertained that it will not adversely affect

the integrity of the European site, or if it will adversely affect the integrity of a European site, that there are imperative reasons of overriding public interest (IROPI) for the project in accordance with Regulation 64.

2.1.4 In accordance with the mitigation hierarchy, all plans and projects should identify any potential likely significant effects early in the plan/project making process and then either alter the plan/project to avoid them or introduce mitigation measures to the point where no adverse effects remain. In coming to a conclusion, the Competent Authority must consult with the Statutory Nature Conservation Body (in this case, Natural England) and have regard to their comments. They may also consult the general public if considered appropriate.

2.2 Relevant Case Law

2.2.1 Although the UK is no longer part of the EU, a series of rulings of the Court of Justice of the European Union (CJEU) are still relevant to HRA in the UK. The HRA is in accordance with the principles established through these precedence cases. The relevant rulings and their implications for this HRA are summarised in **Table 1** and this HRA is cognisant of these rulings.

Table 1. Case law relevant to the HRA of the Scheme

Case	Ruling	Relevance to HRA
People Over Wind and Sweetman v Coillte Teoranta (C-323/17)	The ruling of the CJEU in this case requires that any conclusion of 'no likely significant effect' on a European site at the screening stage must be made prior to any consideration of measures to avoid or reduce harm to the European site. The determination of likely significant effects at the screening stage should not in the opinion of the CJEU, constitute an attempt at detailed technical analyses. This should be conducted as part of the AA.	This ruling clarified that 'mitigation' (i.e., measures that are specifically introduced to avoid or reduce a harmful effect on a European site that would otherwise arise) should not be taken into account when forming a view on likely significant effects at the screening stage. Mitigation should instead only be considered at the AA stage. This HRA has been cognisant of that ruling.
Waddenzee (C-127/02)	The ruling in this case clarified that AA must be conducted using best scientific knowledge in the field, and that the Competent Authority must be satisfied that there is no reasonable doubt as to the absence of adverse effects on the integrity of a European site.	Adopting the precautionary principle, a 'likely' significant effect in this HRA is interpreted as one which is 'possible' and cannot be objectively ruled out. The test of significance of effects has been conducted with reference to the

Case	Ruling	Relevance to HRA
	The Waddenzee ruling also provided clarity on the definition of 'significant effect', specifically that any effect from a plan or project on the conservation objectives of any European site will be a significant effect.	conservation objectives of relevant European sites.
Holohan and Others v An Bord Pleanála (C-461/17)	The conclusions of the Court in this case were that consideration must be given during AA to: • Effects on qualifying habitats and/or species of a SAC or SPA, even when occurring outside of the boundary of a European site, if these are relevant to the site meeting its conservation objectives; and • Effects on non-qualifying habitats and/or species on which the qualifying habitats and/or species depend and which could result in adverse effects on the integrity of the European site.	This relates to the concept of 'functionally-linked habitat' (i.e., areas outside of the boundary of a European site which supports its qualifying feature(s)). In addition, consideration must be given to non-qualifying features upon which qualifying habitats and/or species rely. This HRA has taken the use of functionally linked habitats into account in relation to non-breeding birds, fish and otter.
T.C Briels and Others v Minister van Infrastructuur en Milieu (C-521/12)	The ruling of the CJEU in this case determined that compensatory measures cannot be used to support a conclusion of no adverse effect on site integrity.	Compensation can only be considered at the IROPI stage of HRA and not during AA. Compensation must be delivered when AA concludes that there will be adverse effects on site integrity.

3. Assessment Methodology

3.1 Introduction

3.1.1 This HRA has been undertaken with reference to the general European Commission (EC) guidance on HRA (Ref. 6), general guidance on HRA published by the UK Government in July 2019 (Ref. 7), and PINS Advice Note 10 (Ref. 2).

3.1.2 The assessment of a project under the Habitats Regulations can be split into four stages. **Figure 1** below outlines all the stages of HRA according to PINS Advice Note Ten (Ref. 2).

3.1.3 Whilst the HRA decisions must be taken by the Competent Authority (the Secretary of State, informed by the recommendations of the appointed Examining Authority), the information needed to support this decision-making must be provided by the Applicant. The information needed for the Competent Authority to establish whether there are any Likely Significant Effects (LSE) from the Scheme and to assist in carrying out its AA, is therefore provided in this HRA.

3.1.4 Paragraphs 5.3–5.7 of PINS Advice Note Ten (Ref. 2), as well as guidance from the Department for Business, Energy and Industrial Strategy (Ref. 8; noting that this Department is now the Department for Energy Security and Net Zero) requires an evaluation of the potential for the Scheme to require other consents which could also require HRA by different competent authorities, and a statement to identify whether significant effects are considered likely regarding European sites in devolved administrations or European Economic Area (EEA) States. It is confirmed that the Order limits do not overlap with areas of devolved administrations or with those of other EEA States. It is also the case that no parallel consents are required for the Scheme which would require additional HRA to be carried out. The entirety of the Scheme is within eastern England and there are no pathways arising from the Scheme that could results in LSE to European sites in devolved administrations or other EEA States.

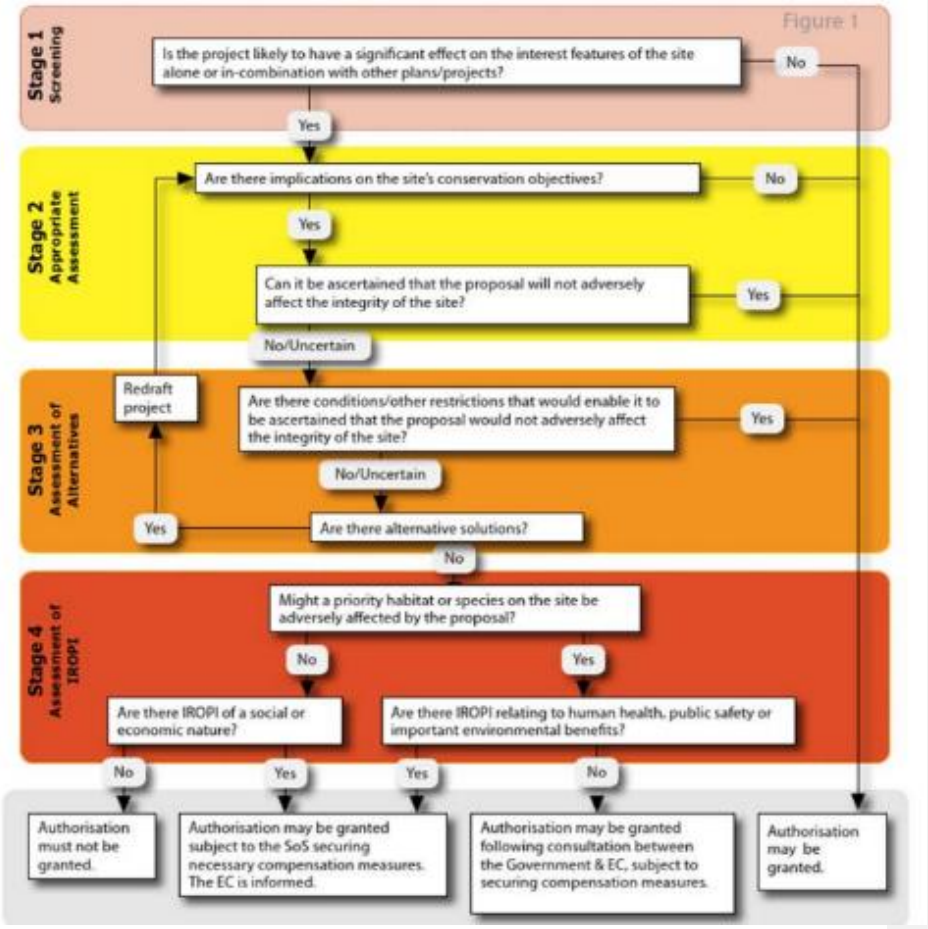

Figure 1. Four Stage Approach to HRA of Projects

3.2 HRA Stage 1: Screening for Likely Significant Effects

3.2.1 'HRA Stage 1: Screening for Likely Significant Effects' is the assessment of the likelihood of a plan or project having a LSE on the features of a European site. If the screening assessment concludes that there are likely significant effects, this is the trigger for an AA to be undertaken as set out in Regulation 63(1).

3.2.2 The objective of the LSE screening exercise is to screen out those aspects of a project and/or any European sites that can, without more detailed appraisal, be said to be unlikely to result in significant adverse effects upon European sites. This is usually because there is no mechanism for an adverse interaction (i.e., a pathway) with European sites. Any remaining aspects are then taken forward to AA. The assessment must also consider the potential for LSEs in combination with other plans and projects.

3.2.3 As shown in Table 1, this HRA has been prepared in accordance with all principles set out in relevant case law and guidance relating to the 2017 Regulations, the Habitats Directive (Ref. 9) and Birds Directive (Ref. 10). This includes the ruling by the CJEU in the case of People Over Wind and Peter Sweetman v Coillte Teoranta (C-323/17) (Ref. 11). This case held that: *"it is not appropriate, at the screening stage, to take account of the measures intended to avoid or reduce the harmful effects of the plan or project on that site"* (Paragraph 40). This establishes that mitigation measures cannot be taken into account at the screening stage, but they can be taken into account in an AA. The effect of this is that the screening stage must be undertaken on a precautionary basis with no regard to mitigation measures.

3.3 HRA Stage 2: Appropriate Assessment

3.3.1 Where it is determined that a conclusion of 'no Likely Significant Effect' cannot be drawn at the screening stage, the HRA assessment proceeds to the next stage of HRA known as 'HRA Stage 2: Appropriate Assessment'. Case law has clarified that 'Appropriate Assessment' is not a technical term. In other words, there are no specific technical analyses, or level of detail, that are classified by law as belonging to AA rather than the screening for LSEs. The AA constitutes whatever level of further assessment is required to determine whether an adverse effect on the integrity of a European site would arise as a result of the proposed development.

3.3.2 By virtue of the fact that HRA Stage 2 follows the screening process, there is an understanding that the analysis will be more detailed than that undertaken at the screening stage. One of the key considerations during HRA Stage 2 is whether there is available mitigation that would address the likely significant effect, allowing for a conclusion of no adverse effect on integrity. In practice, HRA Stage 2 takes any element of the proposed development that could not be excluded as having LSEs following HRA Stage 1 and assesses the potential for an effect in more detail, with a view to concluding whether that element would cause an adverse effect on the site integrity of a European site. Adverse effects on a European site's integrity include disruption of the coherent structure and function of the European site and the ability of the site to achieve its Conservation Objectives.

3.3.3 In 2018, the Holohan ruling (Ref. 12) was handed down by the CJEU. Paragraph 40 of the ruling states that: *"Article 6(3) of the Habitats Directive must be interpreted as meaning that an 'appropriate assessment' must, on the one hand, catalogue the entirety of habitat types and species for which a site is protected, and, on the other, identify and examine both the implications of the proposed project for the species present on that site, and for which that site has not been listed, and the implications for habitat types and species to be found outside the boundaries of that site, provided that those implications are liable to affect the conservation objectives of the site'* [emphasis added]. This HRA is in accordance with the Holohan ruling, particularly with regard to mobile qualifying species in the Humber Estuary SAC/SPA/Ramsar, Lower Derwent Valley SPA/Ramsar, Lower Derwent Valley SAC and River Derwent SAC.

3.3.4 This document covers both HRA Stage 1 (screening) and HRA Stage 2 (AA). Matrices required by PINS Advice Note 10 (Ref. 2) are included in **Appendix B** and **Appendix C** of this report.

3.4 In-Combination Scope

3.4.1 It is a requirement of the Habitats Regulations that the impacts and effects of any proposed development being assessed are not only considered in isolation but also in combination with other plans and projects that may also have effects on the European site(s) in question.

3.4.2 When undertaking this part of the assessment it is essential to consider the principal intention behind the legislation, i.e., to ensure that those projects or plans (which in themselves may have minor impacts) are not simply dismissed on that basis but are evaluated for any ~~cumulative~~ contribution they may make to an overall significant effect in-combination with other projects and plans. In practice, in-combination assessment is therefore of greatest relevance when a proposed development would otherwise be screened out because its individual contribution is inconsequential.

3.4.3 The plans and projects considered to have the potential to act in-combination with the Scheme are discussed in Chapter 7 of this HRA.

4. Scoping and Data Gathering

4.1 Impact Sources and Pathways

4.1.1 There is no guidance that dictates the physical scope of an HRA. Therefore, in considering the physical scope of the assessment of the Scheme, AECOM was guided primarily by the identified impact pathways (namely the 'source-pathway-receptor' approach).

4.1.2 Briefly defined, impact pathways are routes by which the implementation of a project or plan can lead to an effect upon a European site. For some impact pathways (notably air pollution) there is guidance that sets out distance-based zones required for assessment. For others, a professional judgment must be made based on the best available evidence.

Impact sources

4.1.3 Applying the source-pathway-receptor approach, the potential impacts that could arise from the Scheme were considered. The broad categories of impact sources which could arise are set out in **Table 2**.

Table 2. Impact pathways that could arise from the Scheme

Impact category	Brief description
Direct loss of habitat	The direct loss of habitat from within the boundary of a European site. This may include the loss of a habitat type which is itself a qualifying feature of a site, or the loss of habitat that is used by qualifying species for

Impact category	Brief description
	commuting, foraging and/or sheltering, which would pose implications for the site's conservation objectives.
Loss of functionally-linked habitat	The loss of habitat which is outside of the boundary of a European site, but which is critical to its functioning. For example, the loss of habitat outside of an SPA which is used for foraging purposes by qualifying bird species which nest within the SPA.
Waterborne pollution	Including, for example, suspended sediment or run-off of water containing other pollutants such as hydrocarbons or chemicals. Effluent discharges would also be included in this category.
Airborne pollution	This encompasses both dust (i.e., particles of sufficiently large size to coat vegetation and interfere with photosynthesis) and atmospheric pollutants that can be toxic to vegetation or contribute to nitrogen deposition and thus eutrophication. The latter mainly constitutes oxides of nitrogen (NOx) associated with combustion such as vehicle exhausts, and ammonia (NH_3) associated particularly with industrial processes and agriculture, but also with vehicle exhausts.
Hydrological changes	Impacts which alter the hydrological conditions either within a European site or in an area used by the qualifying features of a European site. For example, reduced flows in a watercourse due to impoundment, or changes to groundwater flows or volumes due to abstraction. These changes can have multiple effects on habitats and species.
Disturbance of qualifying species	This could be physical disturbance, for example, due to the movement of vehicles in proximity to qualifying species, or due to noise and/or vibration. The latter may occur at greater distances. Disturbance could arise either during the construction or operational phase of a development.
Barriers and/or disturbance displacement	Barriers to the movement of qualifying species, which can either be physical (for example, a dam in a river) or physiological (for example, the attraction of migratory fish towards the outflow of a hydro-electric scheme). Disturbance displacement may also occur due to the presence of new infrastructure, such as solar PV panels that interrupt open vistas preferred by some qualifying bird species.
Injury or mortality	The direct injury or mortality of a qualifying species, either during the construction or operation of a new development. For example, birds may suffer injury or mortality when colliding with solar infrastructure due to

Impact category	Brief description
	mistaking solar PV panels with waterbodies (although evidence on this is scant).
Spread of invasive non-native species	Invasive non-native species can have detrimental impacts on native species and habitats. Their spread can occur during construction and operation of a development, and via multiple pathways (for example via watercourses or on the treads of construction machinery).

Impact pathways

4.1.4 For an impact to have an effect on a qualifying feature of a European site, a pathway between the impact source and that feature must exist.

4.1.5 For each of the types of impact which could arise (as set out in Table 2) the maximum distance at which an effect could occur was assessed based on the pathway(s) by which such impact(s) could reach a European site or its qualifying feature(s). These 'impact pathway buffers' were based on published guidance or best available research, wherever possible. The adopted impact pathway buffers are set out in **Table 3**.

Table 3. Impact pathway buffer distances

Impact category	Buffer distance
Direct loss of habitat	Within European site boundary.
Loss of functionally linked habitat	Varies based on the species in question. NatureScot's (formerly Scottish Natural Heritage [SNH]) guidance on 'Assessing Connectivity with Special Protection Areas (SPAs)' (Ref. 13) suggest that certain species of geese may forage up to 15-20km from the boundary of SPAs for which they are qualifying features. This is likely to be the largest distance at which functionally linked habitat may be located from a European site. More generally, functionally linked habitat likely to be within maximum of 10km (though often considerably less than this) from European site boundary for most species.
Waterborne pollution	No buffer used – relies on their being a hydrological connection to a European site according to the source-pathway-receptor model.
Airborne pollution	50-500m for dust generation (Ref. 37) and 200m for emissions from road traffic (Ref. 36).
Hydrological changes	No buffer used – relies on their being a hydrological connection to a European site according to the source-pathway-receptor model.
Disturbance of qualifying species	500m for general noise and/or visual disturbance, based on professional judgment.

Impact category	Buffer distance
Barriers and/or displacement	Not possible to set buffer. Depends on movements of species, which may be very long-distance for those which migrate. However, the potential of solar farms to result in barriers to movement and displacement is minimal (discussed later).
Injury or mortality	Injury or mortality only likely to occur within European site boundary or when species are using functionally-linked habitat. Therefore, refer to criteria for 'Direct loss of habitat' and 'Loss of functionally-linked habitat'.
Spread of invasive non-native species	Generally within 100m, except where hydrological connectivity could result in spread further afield.

4.1.6 To identify which European sites should be scoped in to the HRA, the impact pathway buffers set out in **Table 3** and professional judgment were used It can be seen from **Table 3** that the impacts which could occur over the largest distance (excluding instances where there is a hydrological connection) are the loss of functionally-linked habitat used by foraging non-breeding goose species (up to 20 km).

4.2 Relevant European Sites

4.2.1 Guidance published by the Environment Agency (Ref. 14) recommends that for large power generation developments greater than 50MW[1], a radius search of 15km should be used as the screening distance for air emissions when identifying relevant European designated sites which may be affected by the development.

4.2.2 Additionally, a radius of 30km should be used for any European site for which bats are a qualifying feature (Ref. 15). It can be confirmed that, in this case, there are no European sites designated for bats within 30km of the Scheme.

4.2.3 Based on the impact pathway buffers set out in **Table 3**, Environment Agency guidance (Ref. 14) and professional judgement, a search radius of 20km has been used for this HRA. This distance also allows for the identification of European sites where there is a pathway by which hydrological impact might occur through river or stream connectivity. It is considered that any potential for an effect at greater distances is likely to be negligible and below the level of detection, due to the size of any dilution factors relative to the likely scale of any pollution event at source.

4.2.4 All European sites within 20km of the Scheme were identified using Geographic Information System data from datasets downloaded from the Joint Nature Conservation Committee (JNCC) and the Multi-Agency Geographic Information for the Countryside (MAGIC) website (Ref. 16).

[1] This applies to the following types of development: natural gas (or fuels with a similarly low sulphur content) fired combustion plants, with more than 500 MW thermal input, and larger combustion plants using more sulphurous fuels with more than 50 MW thermal input.

4.2.5 The following European sites lie within 20km of the Scheme, and are shown in ~~Figure 5~~**Figure 5** located in **Appendix A** of this report:

a. River Derwent SAC;
b. Lower Derwent Valley SPA;
c. Lower Derwent Valley Ramsar;
d. Lower Derwent Valley SAC;
e. Humber Estuary SPA;
f. Humber Estuary Ramsar;
g. Humber Estuary SAC;
h. Skipwith Common SAC;
i. Thorne & Hatfield Moors SPA; and
j. Thorne Moor SAC.

4.2.6 For each of the European sites identified the features were established and the conservation objectives for each feature were obtained. Information was also sought to understand the potential vulnerability of the features to any effects that might arise from the Scheme.

4.2.7 On the basis of this information, the following European sites have been scoped out from further assessment[2]:

a. Skipwith Common SAC – The site is 6.42km away from the Site with no hydrological connection. The closest main road that could be used by construction traffic is 380m to the south (A163); therefore, air quality impacts can be scoped out due to the lack of a pathway. For these reasons, plus the non-mobile nature of the qualifying features (i.e., wet and dry heath), this site can be scoped out.
b. Thorne & Hatfield Moors SPA – The site is 9.24km away from the Site with no hydrological connection. The closest main road is 1.7km to the east (A161); therefore, air quality impacts can be scoped out due to the lack of a pathway. The site is designated for its breeding population of nightjar *Caprimulgus europaeus* which, although known to fly long distances to feed (up to 6km from the nest site [Ref. 17]), favour deciduous woodland, open oak scrubland, young conifer plantations and heathland. These habitats are absent within the Scheme boundary. Moreover, Natural England internal guidance (Ref. 30) indicates that the zone of influence for these species is within 2km of the SPA boundary. For these reasons this site can be scoped out.
c. Thorne Moor SAC – The site is 9.24km away from the Site with no hydrological connection. The closest major road is over 1km to the west (M18); therefore, air quality impacts can be scoped out due to the lack

[2] Natural England were consulted on the draft HRA on 28 September 2023 and a Discretionary Advice Service response was received on 20 October 2023. No comments were made on scoping out the Skipwith Common SAC, Thorne & Hatfield Moors SPA and Thorne Moor SAC.

of a pathway. For these reasons, plus the non-mobile nature of the qualifying features (i.e., raised bog), this site can be scoped out.

4.2.8 A summary of the qualifying features for each of the European sites taken through to screening, and their distance from the Scheme is provided in **Table 4.**

4.2.9 The Conservation Objectives and currents threats/pressures to site integrity for each relevant European site are summarised in **Table 5**.

Table 4. European sites taken forward to HRA Screening

Name	Approx. distance from Order limits	European site description	Summary of qualifying features
River Derwent SAC	Grid Connection Corridor crosses this SAC	The Yorkshire Derwent is considered to represent one of the best British examples of the classic river profile. This lowland section, stretching from Ryemouth to the confluence with the River Ouse, supports diverse communities of aquatic flora and fauna. Fed from an extensive upland catchment, the lowland course of the River Derwent has been considerably diverted and extended as a result of glacial action in the Vale of Pickering. The river supports an aquatic flora uncommon in Northern Britain. Several species, including river water-dropwort *Oenanthe fluviatilis*, flowering rush *Butomus umbellatus*, shining pondweed *Potamogeton lucens*, arrowhead *Sagittaria sagittifolia*, opposite-leaved pondweed *Groenlandia densa* and narrow-leaved water-parsnip *Berula erecta* are more typically found in lowland rivers in southern England. The River Derwent is noted for the diversity of its fish communities, which include river lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus* populations that spawn in the lower reaches, as well as bullhead *Cottus gobio*. The diverse habitats also support otters *Lutra lutra.*	Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: • Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation. (Rivers with floating vegetation often dominated by water-crowfoot). Annex II species that are a primary reason for selection of this site: • River lamprey. Annex II species present as a qualifying feature, but not a primary reason for site selection: • Sea lamprey; • Bullhead; and • Otter.
Lower Derwent Valley SPA	The Order limits are 1.3km south-east of	The lower Derwent Valley covers an area of 1,089.4 ha, draining a catchment of 1,362km^2 before entering the River Humber system. It consists of extensive	The SPA site qualifies under Article 4.1 by regularly supporting nationally

Name	Approx. distance from Order limits	European site description	Summary of qualifying features
	the Lower Derwent Valley SPA	areas of traditionally managed species rich, alluvial flood-meadow, of a kind now highly restricted in the UK.	important winter numbers of the following Annex I species: • Bewick's swan *Cygnus columbianus bewickii*; • Golden plover *Pluvialis apricaria*; and • Ruff *Philomachus pugnax* (a significant number of this species is also present during spring migration). The site qualifies under Article 4.2 by regularly supporting a breeding population of: • Shoveler *Anas clypeata*. The site also qualifies under Article 4.2 as an area of international importance to waterfowl by regularly supporting over 20,000 waterfowl in winter. Within this number the site holds internationally important numbers of: • Teal *Anas crecca*; and • Wigeon *Anas Penelope*. The site also supports nationally important numbers of the following migratory species: • Shoveler;

Name	Approx. distance from Order limits	European site description	Summary of qualifying features
			• Pochard *Aythya ferina*; • Whimbrel *Numenius phaeopus*; and • Ruff *Philomachus pugnax*.
Lower Derwent Valley Ramsar	The Order limits are 1.3km south-east of the Lower Derwent Valley Ramsar	The Lower Derwent Valley represents one of the most important examples of traditionally managed species-rich alluvial flood meadow habitat remaining in the UK. These grasslands, which were formerly widespread, are now very restricted in distribution due to agricultural improvement. The river and these floodlands play a substantial role in the hydrological and ecological functioning of the internationally important River Humber basin.	The Ramsar site is designated for: **Ramsar Criterion 1:** The Ramsar site represents one of the most important examples of traditionally managed species-rich alluvial flood meadow habitat remaining in the UK. **Ramsar Criterion 2:** The Ramsar site has a rich assemblage of wetland invertebrates including 16 species of dragonfly and damselfly, 15 British Red Data Book wetland invertebrates as well as a leafhopper *Cicadula ornate* for which Lower Derwent Valley is the only known site in Great Britain. **Ramsar Criterion 4:** The Ramsar site qualifies as a staging post for passage birds in spring. Of particular note are the nationally important numbers of ruff and whimbrel *Numenius phaeopus.* **Ramsar Criterion 5:** Assemblages of international importance – Species with peak counts in winter. **Ramsar Criterion 6:** Species/populations occurring at levels

Name	Approx. distance from Order limits	European site description	Summary of qualifying features
			of international importance. Species with peak counts in winter: • Wigeon *Anas penelope*; and • Teal *Anas crecca*.
Lower Derwent Valley SAC	The Order limits are 1.3km south-east of the Lower Derwent Valley SAC	The Lower Derwent Valley SAC contains a greater area of high-quality examples of lowland hay meadows than any other UK site and encompasses the majority of this habitat type occurring in the Vale of York. The abundance of the rare narrow-leaved water-dropwort *Oenanthe silaifolia* is a notable feature. Traditional management has ensured that ecological variation is well-developed, particularly in the transitions between this grassland type and other types of wet and dry grassland, swamp and fen vegetation. Additionally there is an area of damp alder woodland at Thornton Ellers adjoining marsh and tall fen communities.	Annex I habitats that are a primary reason for selection of this site: • Lowland hay meadows (*Alopecurus pratensis, Sanguisorba officinalis*). Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: • Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*). Annex II species present as a qualifying feature, but not a primary reason for site selection: • Otter *Lutra lutra.*
Humber Estuary SPA	The Order limits are 3.4km north of the Humber Estuary SPA	The Humber Estuary SPA is located on the east coast of England and comprises extensive wetland and coastal habitats. The inner estuary supports extensive areas of reedbed, with areas of mature and developing saltmarsh backed by grazing marsh in the middle and outer estuary. On the north Lincolnshire coast, the saltmarsh is backed by low sand dunes with marshy slacks and brackish pools. Parts of the estuary are	The SPA site qualifies under Article 4.1 by regularly supporting the following Annex 1 species in any season: • Avocet (wintering and breeding); • Bittern (wintering and breeding); • Hen harrier *Circus cyanea* (wintering);

Name	Approx. distance from Order limits	European site description	Summary of qualifying features
		owned and managed by conservation organisations. The estuary supports important numbers of waterbirds (especially geese, ducks and waders) during the migration periods and in winter. In summer, it supports important breeding populations of bittern *Botaurus stellaris*, marsh harrier *Circus aeruginosus*, avocet *Recurvirostra avosetta* and little tern *Sterna albifrons.*	• Golden plover *Pluvialis apricaria* (wintering); • Bar-tailed godwit *Limosa lapponica* (wintering); • Ruff (passage); • Marsh harrier (breeding); and • Little tern (breeding). The site qualifies under article 4.2 of the Birds Directive (79/409/EEC) as it is used regularly by the following regularly occurring migratory species other than those listed in Annex I) in any season: • Shelduck *Tadorna tadorna* (wintering); • Knot *Calidris canutus* (wintering and passage); • Dunlin *Calidris alpina* (wintering and passage); • Black-tailed godwit *Limosa limosa* (wintering and passage); and • Redshank *Tringa tetanus* (wintering and passage). Assemblage qualification: The SPA site qualifies under article 4.2 of the Birds Directive (79/409/EEC) as it is used regularly by over 20,000 waterbirds

Name	Approx. distance from Order limits	European site description	Summary of qualifying features
			(waterbirds as defined by the Ramsar Convention) in any season such as dark-bellied brent goose *Branta bernicla bernicla,* shelduck, wigeon *Anas penelope*, teal *Anas crecca*, mallard *Anas platyrhynchos*, pochard *Aythya ferina,* scaup *Aythya marila,* goldeneye *Bucephala clangula*, bittern, oystercatcher *Haematopus ostralegus*, avocet, ringed plover *Charadrius hiaticula,* golden plover, grey plover *P. squatarola,* lapwing *Vanellus vanellus*, knot, sanderling *Calidris alba,* dunlin, ruff, black-tailed godwit, bar-tailed godwit, whimbrel *Numenius phaeopus*, curlew *N. arquata*, redshank, greenshank *Trimga nebularia* and turnstone *Arenaria interpres.*
Humber Estuary Ramsar	The Order limits are 3.4km north of the Humber Estuary Ramsar	The Humber Estuary is the largest macro-tidal estuary on the British North Sea coast. It drains a catchment of some 24,240 km^2 and is the site of the largest single input of freshwater from Britain into the North Sea. It has the second-highest tidal range in Britain (max 7.4m) and approximately one-third of the estuary is exposed as mud or sand flats at low tide. The inner estuary supports extensive areas of reedbed with areas of mature and developing saltmarsh backed in places by limited areas of grazing marsh in the middle	The Ramsar site is designated for: **Ramsar Criterion 1:** The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.

Name	Approx. distance from Order limits	European site description	Summary of qualifying features
		and outer estuary. On the north Lincolnshire coast the saltmarsh is backed by low sand dunes with marshy slacks and brackish pools. The estuary regularly supports internationally important numbers of waterfowl in winter and nationally important breeding populations in summer.	**Ramsar Criterion 3:** The Humber Estuary Ramsar site supports a breeding colony of grey seals *Halichoerus grypus* at Donna Nook. It is the second largest grey seal colony in England and the furthest south regular breeding site on the east coast. The dune slacks at Saltfleetby-Theddlethorpe on the southern extremity of the Ramsar site are the most north-easterly breeding site in Great Britain of the natterjack toad *Bufo calamita.* **Ramsar Criterion 5:** Assemblages of international importance – non-breeding season. **Ramsar Criterion 6:** Species/populations occurring at levels of international importance: • Golden plover (passage and wintering); • Knot (passage and wintering); • Dunlin (passage and wintering); • Black-tailed godwit (passage); • Redshank (passage and wintering); • Shelduck (wintering); and • Bar-tailed godwit (wintering).

Name	Approx. distance from Order limits	European site description	Summary of qualifying features
			Ramsar Criterion 8: The Humber Estuary acts as an important migration route for both river and sea lamprey between coastal waters and their spawning areas.
Humber Estuary SAC	The Order limits are 3.4km north of the Humber Estuary SAC	The Humber is the second largest coastal plain Estuary in the UK, and the largest coastal plain estuary on the east coast of Britain. The estuary supports a full range of saline conditions from the open coast to the limit of saline intrusion on the tidal rivers of the Ouse and Trent. The range of salinity, substrate and exposure to wave action influences the estuarine habitats and the range of species that utilise them; these include a breeding bird assemblage, winter and passage waterfowl, river and sea lamprey, grey seals, vascular plants and invertebrates.	Annex I habitats that are a primary reason for selection of this site: • Estuaries; and • Mudflats and sandflats not covered by seawater at low tide. Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: • Atlantic salt meadows *Glauco-Puccinellietalia maritimae*; • Coastal lagoons; • Dunes with *Hippophae rhamnoides*; • Embryonic shifting dunes; • Fixed dunes with herbaceous vegetation (`grey dunes`); • *Salicornia* and other annuals colonising mud and sand; • Sandbanks which are slightly covered by sea water all the time; and

Name	Approx. distance from Order limits	European site description	Summary of qualifying features
			• Shifting dunes along the shoreline with *Ammophila arenaria* (`white dunes').
			Annex II species present as a qualifying feature, but not a primary reason for site selection:
			• Grey seal;
			• River lamprey; and
			• Sea lamprey.

Table 5. Conservation Objectives and threats/pressures to the integrity of relevant European sites

Name	Conservation objectives	SSSI Condition Assessment summary (added at request of the ExA)	Threats/pressures to site integrity
River Derwent SAC	Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring: • The extent and distribution of qualifying natural habitats and habitats of qualifying species; • The structure and function (including typical species) of qualifying natural habitats; • The structure and function of the habitats of qualifying species; • The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely; • The populations of qualifying species; and • The distribution of qualifying species within the site.	22.54ha (5.53%) – Favourable 382.13ha (93.69%) – Unfavourable Recovering 3.17ha (0.78%) – Unfavourable No Change	The following threats/pressures to the integrity of the River Derwent SAC have been identified in Natural England's Site Improvement Plan (Ref. 18): • Physical modification; • Water pollution; • Invasive species; • Change in land management; and • Water abstraction.
Lower Derwent Valley SPA/Ramsar	Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring: • The extent and distribution of the habitats of the qualifying features; • The structure and function of the habitats of the qualifying features;	323.26ha (48.52%) – Favourable 279.42ha (41.94%) – Unfavourable Recovering 8.80ha (1.32%) – Unfavourable No Change 54.70ha (8.21%) – Unfavourable Declining	The following threats/pressures to the integrity of the Lower Derwent Valley SPA have been identified in Natural England's Site Improvement Plan (Ref. 19): • Hydrological changes; • Drainage; • Public access/ disturbance;

Inserted Cells

Name	Conservation objectives	SSSI Condition Assessment summary (added at request of the ExA)	Threats/pressures to site integrity
	• The supporting processes on which the habitats of the qualifying features rely; • The population of each of the qualifying features; and • The distribution of the qualifying features within the site.		• Invasive species; • Undergrazing; and • Inappropriate scrub control. The Information Sheet on Ramsar Wetlands (RIS) (Ref. 20) identifies the following factors (past, present or potential) adversely affecting the site's ecological character: • Water diversion for irrigation/domestic/ industrial use; and • Reservoir/ barrage/ dam impact: flooding.
Lower Derwent Valley SAC	Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring: • The extent and distribution of qualifying natural habitats and habitats of qualifying species; • The structure and function (including typical species) of qualifying natural habitats; • The structure and function of the habitats of qualifying species;	Covered by the Derwent Ings SSSI (see preceding row for summary condition)	The following threats/pressures to the site integrity of the Lower Derwent SAC have been identified in Natural England's Site Improvement Plan (Ref. 19): • Hydrological changes; • Drainage; • Invasive species; • Undergrazing; and • Air pollution: impact of atmospheric nitrogen.

Inserted Cells

Name	Conservation objectives	SSSI Condition Assessment summary (added at request of the ExA)	Threats/pressures to site integrity
	• The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely; • The populations of qualifying species; and • The distribution of qualifying species within the site.		
Humber Estuary SPA/Ramsar	Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring: • The extent and distribution of the habitats of the qualifying features; • The structure and function of the habitats of the qualifying features; • The supporting processes on which the habitats of the qualifying features rely; • The population of each of the qualifying features; and • The distribution of the qualifying features within the site.	2,254.42ha (6.09%) – Favourable 32,126.26ha (86.83%) – Unfavourable Recovering 82.20ha (0.22%) – Unfavourable No Change 2,537.70ha (6.86%) – Unfavourable Declining	The following threats/pressures to the site integrity of the Humber Estuary SPA have been identified in Natural England's Site Improvement Plan (Ref. 21): • Water pollution; • Coastal squeeze; • Changes in species distributions; • Undergrazing; • Invasive species; • Natural changes to site conditions; • Public Pressure Access/Disturbance; • Fisheries: Fish stocking; • Direct land take from development; • Shooting/ scaring;

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Name	Conservation objectives	SSSI Condition Assessment summary (added at request of the ExA)	Threats/pressures to site integrity
			• Direct impact from third-party; and • Inappropriate scrub control. The Information Sheet on Ramsar Wetlands (RIS) (Ref. 22) identifies the following factors (past, present or potential) adversely affecting the site's ecological character: • Disturbance to vegetation through cutting/clearing; • Vegetation succession; • Water diversion for irrigation/domestic/ industrial use; • Overfishing; • Pollution – domestic sewage; • Pollution – agricultural fertilisers; • Recreational/tourism disturbance (unspecified); and • Other factor – Coastal squeeze causing loss of intertidal habitats and

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Name	Conservation objectives	SSSI Condition Assessment summary (added at request of the ExA)	Threats/pressures to site integrity
			saltmarsh due to sea level rise and fixed defences. The Humber Flood Risk Management Strategy has been developed and is being implemented.
Humber Estuary SAC	Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring: • The extent and distribution of qualifying natural habitats and habitats of qualifying species; • The structure and function (including typical species) of qualifying natural habitats; • The structure and function of the habitats of qualifying species; • The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely; • The populations of qualifying species; and • The distribution of qualifying species within the site.	Covered by the Humber Estuary SSSI (see preceding row for summary condition)	The following threats/pressures to the site integrity of the Humber Estuary SAC have been identified in Natural England's Site Improvement Plan (Ref. 21): • Water pollution; • Coastal squeeze; • Changes in species distributions; • Undergrazing; • Invasive species; • Natural changes to site conditions; • Public Pressure Access/Disturbance; • Fisheries: Commercial marine and estuarine; • Direct land take from development;

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Name	Conservation objectives	SSSI Condition Assessment summary (added at request of the ExA)	Threats/pressures to site integrity
			• Air Pollution: impact of atmospheric nitrogen deposition; and • Direct impact from third-party.

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4.3 Existing Baseline Conditions

4.3.1 Following an extended Phase 1 habitat survey, extensive ecological surveys within the Order limits and appropriate zones of influence were undertaken. The surveys relevant to HRA were:

- Non-breeding and breeding birds; and
- Riparian mammals (notably otter).

4.3.2 The results of these surveys are presented in **Appendix 8-6 and Appendix 8-9, ES Volume 2 [EN010143/APP/6.2~~].~~] and Appendix D** of this report. Data relevant to this assessment are summarised below.

4.4 Summary

4.4.1 On the basis of the scoping and data gathering exercise documented earlier the following European sites and potential impact pathways, as shown in **Table 6**, are considered relevant to this HRA.

Table 6. Relevant European sites and associated impact pathways

European site	Potential impact pathway
River Derwent SAC	Noise and visual disturbance – fish and otter[3]. Water quality. Water quantity, level and flow. Atmospheric pollution (and dust deposition). Temporary loss of/damage to qualifying habitat. Introduction of invasive non-native species.
Lower Derwent Valley SPA/Ramsar	Noise and visual disturbance. Loss of functionally linked habitat. Water quality. Water quantity, level and flow. Atmospheric pollution (and dust deposition). Introduction of invasive non-native species.
Lower Derwent Valley SAC	Noise and visual disturbance – otter. Water quality. Water quantity, level and flow. Atmospheric pollution (and dust deposition). Introduction of invasive non-native species.
Humber Estuary SPA/Ramsar	Noise and visual disturbance. Loss of functionally linked habitat. Water quality. Water quantity, level and flow.

[3] While noise and visual disturbance to qualifying fish and otter is considered, the Scheme will not result in the permanent loss of freshwater and bankside habitat. Therefore, permanent habitat loss in relation to these qualifying features is not considered.

European site	Potential impact pathway
	Atmospheric pollution. Introduction of invasive non-native species.
Humber Estuary SAC	Noise and visual disturbance – fish. ~~Loss of functionally linked habitat.~~ Water quality. Water quantity, level and flow. Atmospheric pollution. Introduction of invasive non-native species.

5. Background to Potential Impact Pathways

5.1 Noise and Visual Disturbance

5.1.1 Development can result in noise or visual disturbance of qualifying species in European sites, during the construction, operational (including maintenance) and decommissioning phases. For example, noise and visual disturbance arising from construction or decommissioning may result in temporary behavioural changes in otter, such as disturbance in holts and displacement from specific stretches of the river. Furthermore, disturbance from construction or decommissioning may result in temporary behavioural changes in qualifying birds (e.g., interruption or cessation foraging, minor and major flight responses). During the operational period, noise emitted from industrial developments may permanently affect site usage of foraging and roosting birds, although this is not an issue for solar farms. Disturbance from site usage by operational site staff, road traffic and operational lighting might also arise. Three of the most important factors determining the magnitude of disturbance from proposed developments on ecological receptors are considered to be individual species sensitivity, proximity of the disturbance source and timing/duration of the disturbance.

5.1.2 Both noise and visual stimuli may elicit disturbance responses, potentially affecting the fitness and survival of qualifying birds. Noise is a complex disturbance parameter requiring the consideration of multiple factors, including its non-linear scale, non-additive effect and source-receptor distance. Professional judgment suggests that a high level of noise disturbance constitutes a sudden noise event of over 60dB (decibels) or prolonged noise of over 72dB. Bird responses to high noise levels include major flight or the cessation of feeding, both of which might affect the survival of birds, particularly if other stressors are also present (e.g., cold weather, food scarcity).

5.1.3 Generally, research has shown that above noise levels of 84dB waterfowl show a flight response, while at levels below 55dB there is no effect on their behaviour (Ref. 23). Therefore, these two thresholds are considered useful as defining two extremes. The same authors have advised that regular noise levels should remain below 70dB at bird receptors, which will habituate to noise levels below this level (Ref. 24). Generally, noise is attenuated by 6dB

with every doubling of distance from the source. Impact piling, the noisiest construction activity (approx. 110dB at 0.67m from source) will thus reduce to 67-68dB by 100m away from the source. This implies that the loudest construction noise should have fallen to below disturbing levels by 100m, and certainly by 200m, away from the source even without mitigation. Noise levels from less noisy construction activities, such as Horizontal Direct Drilling (HDD) (approximately 85dB at source), are expected to dissipate over considerably shorter distances. Note that this is a rule of thumb and does not obviate the need for application-level noise modelling. Comparison with baseline noise levels will also be important in any assessment rather than purely using comparison with the 70dB metric.

5.1.4 The following parameters for the assessment of noise disturbance impacts have been identified in discussions with Natural England on several projects[4]:

a. Changes of 3dB in noise level compared to the pre-construction baseline are perceptible (although not necessarily disturbing) and should be screened in for AA;

b. Noise levels below 55dB are unlikely to be disturbing, regardless of the difference to the baseline;

c. Noise levels between 55dB and 70dB may be disturbing depending on the degree of change (for example, a change in noise level of 10dB represents a doubling in loudness and, therefore, likely to be disturbing), nature of the sound (i.e., L_{Amax} or L_{Aeq}), duration of exposure and extent of habitat impacted; and

d. Noise levels above 70dB are likely to be disturbing unless qualifying birds are already subject to similarly high noise levels as part of their baseline soundscape.

~~5.1.4~~5.1.5 Generally, visual stimuli are considered to have a higher disturbance potential than noise stimuli as, in most instances, visual stimuli will elicit a disturbance response at much greater distances than noise ~~(Ref. 25).~~. For example, a flight response is triggered in most species when they are approached to within 150m across a mudflat. Visual disturbance can be exacerbated by workers moving across open habitats undertaking sudden movements and using large machinery. Several species are particularly sensitive to visual disturbance including curlew (taking flight at 275m), redshank (at 250m), shelduck (at 199m) and bar-tailed godwit (at 163m).

~~5.1.5~~5.1.6 While an increasing amount of research on visual and noise disturbance to waders and waterfowl from construction works (and other activities) is now available, no peer-reviewed experimental scientific evidence exists relating specifically to the ecological impacts of solar farms (Ref. 25).

~~5.1.6~~5.1.7 In terms of functionality and infrastructure, there are parallels between solar PV developments and onshore wind farms. For example, both require large areas of land to maximise energy yields, generate large amounts of

[4] Discussions over noise disturbance to SPA / Ramsar took place over several projects, including the Sea Link and Viking CCS Pipeline developments.

electricity and require ancillary infrastructure to transport electricity to where it is needed within the electricity grid.

~~5.1.7~~5.1.8 There are four broad types of impacts wind farms can have on birds: collision mortality; disturbance displacement; barrier effects; and habitat loss (Ref. 26). Wind turbines have the critical characteristics of large fast-moving parts and structures extending vertically from the ground. Such features are generally absent from solar PV developments, meaning that collision mortality, disturbance displacement and barrier effects are unlikely to be significant issues associated with the Scheme. Scientific and grey literature data based upon carcass searches around solar PV developments, suggest that bird collision risk from solar PV panels is very low and considerably lower than collision risk with other associated infrastructure, such as overhead power lines. There is no evidence in the peer-reviewed literature to demonstrate that ecological impacts of solar PV installations, such as glint and glare, are affecting the flight paths of birds, particularly where these are likely to move through the landscape along a broad front.

~~5.1.8~~5.1.9 Overall, specific regard should be given to assemblage composition when identifying threshold levels for both visual and noise disturbance. It is likely that different avian species are differently affected by solar PV developments, depending on the types of habitat present, spatial requirements of ecological receptor species (e.g. flocking species such as pink-footed goose *Anser brachyrhynchus* require large areas of supporting habitat), species-specific foraging behaviour and individual species sensitivity.

~~5.1.9~~5.1.10 Overall, the following European sites within the Zone of Influence (ZoI) of the Scheme are sensitive to potential noise and visual disturbance, and are taken forward into the following chapters:

a. **River Derwent SAC;**
b. **Lower Derwent Valley SAC/SPA/Ramsar**; and
c. **Humber Estuary SAC/SPA/Ramsar.**

5.2 Water Quality

5.2.1 The quality of the water that feeds a European site is an important determinant of the condition of the habitats and species it supports. Poor water quality can have a range of environmental impacts:

a. At high levels, toxic chemicals and metals can result in immediate death of aquatic life, and can have detrimental effects even at lower levels, including increased vulnerability to disease and changes in wildlife behaviour.
b. Construction activities that involve ground excavations and the stripping of topsoil are associated with a high risk of sediment release in surface runoff. Excessive sedimentation can smother aquatic habitats and plants, increase turbidity and accelerate eutrophication.
c. Eutrophication, the enrichment of water with nutrients, increases plant growth and consequently results in oxygen depletion. Algal blooms, which commonly result from eutrophication, increase turbidity and

decrease light penetration. The decomposition of organic wastes that often accompanies eutrophication deoxygenates water further, augmenting the oxygen depleting effects of eutrophication. In freshwater ecosystems, plant growth is primarily determined by phosphorus (P) concentrations, which are determined by a wide range of sources, including treated sewage effluent from Wastewater Treatment Works and urban surfaces such as roads.

d. Some pesticides, industrial chemicals, and components of sewage effluent are suspected to interfere with the functioning of the endocrine system, possibly having negative effects on the reproduction and development of aquatic life.

5.2.2 Under the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (Ref. 27), it is legally required to maintain and/or improve the ecological and chemical status of the water environment, which includes rivers, lakes, wetlands, groundwater, estuaries and coastal waters. There should be no deterioration or prevention of future improvement in the status of waterbodies. Water Framework Directive (WFD) assessments are directly linked to HRA in that consideration must also be given when undertaking a WFD assessment to the Conservation Objectives of designated sites, including SACs, SPAs and Ramsars.

5.2.3 The magnitude of water quality impacts primarily depends on the appropriate treatment of process water and/or surface runoff. Furthermore, the severity of potential construction and operational water quality impacts is partially determined by the distance between development sites and ecological receptor sites. In this instance, the Scheme adjoins the River Derwent SAC and lies at a relatively short distance from the Lower Derwent Valley SPA/Ramsar and Humber Estuary SPA/Ramsar, implying that there is little buffer distance for dilution or attenuation processes to take place.

5.2.4 Overall, the following European sites within the ZoI of the Scheme are sensitive to potential water quality impacts and are taken forward into the following chapters**:**

a. **River Derwent SAC**;

b. **Lower Derwent Valley SAC/SPA/Ramsar**; and

c. **Humber Estuary SAC/SPA/Ramsar**.

5.3 Water Quantity, Level and Flow

5.3.1 The water level, its flow rates and the mixing conditions are important determinants of the conditions present within European sites and the state of their qualifying features. Hydrological processes are critical in influencing habitat characteristics in coastal waters, including parameters such as current velocity, water depth, dissolved oxygen (DO) concentrations, salinity and water temperature. In turn these parameters determine the short- and long-term viability of plant and animal species, as well as overall ecosystem composition. Changes to the water flow rate within an estuary can be associated with a multitude of knock-on impacts, including substratum loss, smothering and changes in wave exposure.

5.3.2 The unique nature of wetlands combines shallow water and conditions that are ideal for the growth of organisms at the basal level of food webs, which feed many species of birds, mammals, fish and amphibians. Overwintering, migrating and breeding wetland bird species are particularly reliant on these food sources, as they need to build up enough nutritional reserves to sustain their long migration routes or feed their hatched chicks.

5.3.3 The proliferation of impermeable surfaces increases the volume and speed of surface water runoff. Traditional drainage systems often cannot cope with the volume of runoff, particularly during intense rainfall events, resulting in downstream flooding of ecological receptor sites.

5.3.4 Overall, the following European sites within the ZoI of the Scheme are sensitive to potential hydrological changes and are taken forward into the following chapters:

a. **River Derwent SAC**;

b. **Lower Derwent Valley SAC/SPA/Ramsar**; and

c. **Humber Estuary SAC/SPA/Ramsar**.

5.4 Loss of Functionally Linked Habitat

5.4.1 While most European sites have been geographically defined to encompass the key features that are necessary for coherence of their structure and function, and the support of their qualifying features, this is not necessarily the case. A diverse array of qualifying species including birds, bats and amphibians are not always confined to the boundary of designated sites.

5.4.2 According to BirdLife Europe (Ref. 28), the main conservation risks associated with solar PV arrays includes habitat loss and habitat fragmentation and/or modification.

5.4.3 Due to the highly mobile nature of waterfowl, it is inevitable that areas of habitat of crucial importance to the maintenance of their populations are outside the physical limits of the European site for which they are an interest feature. However, this area will still be essential for maintenance of the structure and function of the interest feature for which the site was designated and land use plans that may affect this land should still therefore be subject to further assessment. This has been underlined by a CJEU ruling C-461/17 (paragraphs 37 to 40), known as the Holohan ruling (Ref. 12) which confirms the need for an AA to consider the implications of a plan or project on habitats and species outside the European site boundary provided that those implications are liable to affect the conservation objectives of the site.

5.4.4 There is now an abundance of authoritative examples of HRA cases on plans affecting bird populations, where Natural England recognised the potential importance of functionally linked land (Ref. 29). For example, bird surveys in relation to a previous HRA established that approximately 25% of the golden plover population in the Somerset Levels and Moors SPA were affected while on functionally linked land, and this required the inclusion of mitigation measures in the relevant plan policy wording. Another important case study originates from the Mersey Estuary SPA/Ramsar, where

adjacently located functionally linked land had a peak survey count of 108% of the 5-year mean peak population of golden plover. This finding led to considerable amendments in the planning proposal to ensure that the site integrity was not adversely affected.

5.4.5 Natural England has published guidance on SSSI Impact Risk Zones (IRZs) (Ref. 30) associated with different types of development on various functional groups of birds (see **Table 7**). These IRZs provide a high-level screening tool for assessing the risk of planning applications affecting important habitats outside European site boundaries. The guidance identifies that functionally linked habitats may extend up to the maximum foraging distances from roost locations, although it also notes that the proportion of designated foraging birds will decrease with distance from the European site. Importantly, the IRZ guidance note does not define the required abundance threshold needed to meet the criterion of functional habitat linkage. However, Natural Resources Wales and Natural England generally advocate that usage of a land parcel by 1% of the qualifying SPA/Ramsar population is needed for that parcel to be defined as 'functionally linked habitat'. It should be noted that this is not the only metric of relevance, with frequency of use and proportion of the overall SPA/Ramsar bird species aggregation also being relevant.

5.4.6 With regards to birds, areas of functionally linked land typically provide habitat for foraging or other ecological functions essential for the maintenance of the designated population (e.g., high tide roosts for coastal populations). Functionally linked land may extend up to the maximum foraging distance for the designated bird species. However, the number of birds foraging will tend to decrease further away from the protected site and thus the importance of the land to the maintenance of the designated population will decrease.

Table 7. Impact Risk Zones for different functional groups of birds

Bird Group	Impact Risk Zone (foraging distance)
Wintering birds (except wintering waders and grazing wildfowl; and wigeon (*Anas penelope*) and geese)	Up to 500m.
Dabbling ducks such as teal, mallard and gadwall	Maximum home range of 500m at coastal sites, but less likely to extend beyond the designated site boundary at inland water bodies.
Wintering waders (except golden plover and lapwing), brent goose (*Branta bernicla*) and wigeon	Maximum foraging distance is 500m.
Wintering lapwing and golden plover	Maximum foraging distance is 15-20km. Golden plover can forage up to 15km from a roost site within a protected site. Lapwing can also forage similar distances. Both species use lowland farmland in winter, and it is difficult to

Bird Group	Impact Risk Zone (foraging distance)
	distinguish between designated populations and those present within the wider environment. Developments affecting functionally linked land more than 10km from the site are unlikely to impact significantly on designated populations.
Wintering white-fronted goose (*Anser albifrons),* greylag goose (*Anser answer*), Bewick's swan (*Cygnus columbianus bewickii*), whooper swan, pink-footed goose and wintering bean goose (*Anser fabalis*)	Maximum foraging distance of most goose/swan species is 10km, although studies have shown that pink-footed geese and barnacle geese will fly up to 20km from their roosting site to feed. The IRZs for this bird group are based on GIS foraging distribution records (pink-footed goose), British Trust for Ornithology work (barnacle goose), and Wetland Bird Survey (WeBS) and BirdTrack data (Bewick's swan, white-fronted goose and whooper swan).

5.4.7 The identification of an area as functionally linked habitat is not always a straightforward process. The importance of non-designated land parcels may not be apparent and thus might require the analysis of existing data sources (e.g., Bird Atlases or data from record centres) to be firmly established. In some instances, data may not be available at all, requiring further survey work. Generally, based on professional judgment, it is reasonable to assume that a site of under 2ha in size is unlikely to support a large enough population of birds to constitute 1% of an SPA/Ramsar population. This is because land parcels of under 2ha are likely to have limited carrying capacity, higher potential for disturbance and reduced sightlines.

5.4.8 **Table 8** lists the habitat preferences and diet of bird features of the Lower Derwent Valley SPA/Ramsar and Humber Estuary SPA/Ramsar.

Table 8. Habitat preferences and diet of qualifying bird species of the Lower Derwent Valley SPA/Ramsar and Humber Estuary SPA/Ramsar

Designated bird feature	Habitat preferences[5]	Diet
Bewick's swan	Lakes, ponds and rivers, also farmland and estuaries on migration	Plant material (e.g., tubers, shoots, leaves) in water or flooded pasture
Golden plover	Tundra, wet moor, on migration **pasture** and estuaries	Invertebrates, especially beetles, earthworms, feeds extensively at night
Ruff	Grassy tundra, lakes, **farmland**, on migration mudflat	Invertebrates, especially insects, some plant material (especially winter)

[5] Habitat types or foraging items that are likely to be present within the Site are marked in bold.

Designated bird feature	Habitat preferences[5]	Diet
Teal	Lakes, marshes, ponds and shallow streams	Omnivorous, mostly seeds in winter, feeds mostly at night in shallow water
Wigeon	Marsh, lakes, open moor, on migration also estuaries	Mostly leaves, shoots, rhizomes, also some seeds
Whimbrel	Tundra, moor, heath, on migration marsh and estuary	Invertebrates and plant material according to availability; rarely probes deeply
Shoveler	Shallow lakes, marsh, reedbed and wet meadow	Omnivorous, esp. small insects, crustaceans, molluscs, seeds; filters particles with sideways sweeping of bill
Pochard	Lakes and slow rivers on migration also estuaries	Mostly plant material, also small animals
Avocet	Mudflats, lagoons, sandy beaches	Invertebrates, especially insects, crustaceans, worms, but also small fish; sweeps bill from side to side, prey located by touch
Bittern	Reedbed and marshes	Mostly fish, amphibians, insects but wide variety, mostly in shallow water in or near cover
Hen harrier	Moor, marsh, steppe and **fields**	**Mostly, small birds, nestlings and small rodents**
Marsh harrier	Marsh and reedbeds; increasingly nests in **arable farmland**	Animals from ground, especially in marshy areas, preference for easily caught prey
Little tern	Seacoasts, rivers and lakes	Small fish and invertebrates, often hovers before plunge-diving
Bar-tailed godwit	Coastal tundra, on migration mudflats, flooded fields	Invertebrates, esp insects, molluscs, crustaceans and worms
Dark-bellied brent goose	Tundra, on migration marshes and estuaries	Eelgrass (*Zostera*), also vegetation by grazing on land or shallow water

Designated bird feature	Habitat preferences[5]	Diet
Ringed plover	Sandy areas with low vegetation, on migration estuaries	Summer, invertebrates, Winter primarily marine worms, crustaceans and molluscs
Grey plover	Tundra, on migration primarily estuaries and other coastal habitats	Summer, invertebrates, Winter primarily marine worms, crustaceans and molluscs

5.4.9 Overall, the following European sites within the ZoI of the Scheme are sensitive to the potential loss of functionally linked habitat and are taken forward into the following chapters:

a. **Lower Derwent Valley SPA/Ramsar**; and

b. **Humber Estuary SPA/Ramsar**.

5.5 Temporary Loss of/Damage to Qualifying Habitat

5.5.1 The purpose of the Conservation of Habitats and Species Regulations 2017 (as amended) (Ref. 3) is to protect the European sites which comprise the national site network, including some of the country's most important habitats and species.

5.5.2 Generally, the temporary (or permanent) loss of designated habitat must be avoided or mitigated, provided that the habitat in question is itself a designated feature or critical for the European site to meet its Conservation Objectives. However, temporary habitat loss within designated site boundaries is permissible where this solely encompasses habitat that is part of the 'site fabric'[6].

5.5.3 Any permanent, irreversible, habitat loss from a European site that involves the loss of qualifying features will be adverse, although to affect the integrity of the SAC (the coherence of its structure and function) the loss must be sufficient to materially impair the achievement of the European site's Conservation Objectives.

5.5.4 Various developments can result in the loss of habitat in European sites, either temporarily or permanently. Temporary habitat loss (e.g., such as that potentially resulting from usage of temporary access tracks and vegetation clearance for visibility splays) is typically reversible. Furthermore, there is the potential for deploying mitigation measures to avoid adverse effects on site integrity. In contrast, the permanent loss of designated habitat will result in a reduction of coverage of a potentially rare ecosystem, with potential knock-on impacts on dependent qualifying species.

[6] Site fabric is defined as habitat that falls within designated site boundaries, but is not required for respective sites to achieve their Conservation Objectives.

5.5.5 Plans or projects that result in the loss of land from a European site which is sufficient to result in adverse effects on site integrity, may be approved if three tests are met:

a. No feasible alternative solutions to the plan or project exist that are less damaging;

b. There are imperative reasons of overriding public interest (IROPI) for the plan or project; and

c. Any necessary compensatory measures are secured to ensure that the overall coherence of the European Site network is maintained.

5.5.6 Overall, the following European site within the ZoI of the Scheme is sensitive to the direct temporary loss of habitat (primarily due to the vegetation clearance required for visibility splays and usage of access tracks) and is taken forward into the following chapters:

a. **River Derwent SAC**.

5.6 Atmospheric Pollution

5.6.1 Construction and decommissioning of the proposed Scheme has the potential to affect air quality. This is primarily expected due to emissions associated with exhaust emissions from construction vehicles and equipment.

5.6.2 The main pollutants of concern for European sites are NOx, NH_3 and sulphur dioxide (SO_2) – see **Table 9**. NH_3 can have a directly toxic effect upon vegetation, particularly at close distances to the source such as near road verges (Ref. 31). NOx can also be toxic to vegetation at very high concentrations (far above the annual average Critical Level). Furthermore, high levels of NOx and NH_3 are likely to increase the total nitrogen (N) deposition, potentially leading to deleterious knock-on effects in recipient ecosystems. An increase in N deposition from the atmosphere is widely known to enhance soil fertility and to lead to eutrophication. This often has adverse effects on plant community composition and the overall quality of semi-natural, nitrogen-limited terrestrial and aquatic habitats (Ref. 32 and Ref. 33).

Table 9. Main sources and effects of air pollution on habitats and species

Pollutant	Source	Effects on habitats and species
SO_2	The main sources of SO_2 are electricity generation, and industrial and domestic fuel combustion. However, total SO_2 emissions in the UK have decreased substantially since the 1980s. Another origin of SO_2 is the shipping industry and high atmospheric concentrations of SO_2 have been documented in	Wet and dry deposition of SO_2 acidifies soils and freshwater and may alter the composition of plant and animal communities. The magnitude of effects depends on levels of deposition, the buffering capacity of soils and the sensitivity of impacted species. However, SO_2 background levels have fallen considerably since the 1970s and are now not regarded a

Pollutant	Source	Effects on habitats and species
	busy ports. In future years shipping is likely to become one of the most important contributors to SO_2 emissions in the UK.	threat to plant communities. For example, decreases in SO_2 concentrations have been linked to returning lichen species and improved tree health in London (Ref. 34).
Acid deposition	Leads to acidification of soils and freshwater via atmospheric deposition of SO_2, NOx, NH_3 and hydrochloric acid (HCl). Acid deposition from rain has declined by 85% in the last 20 years, with most of this contributed by lower sulphate levels. Although future trends in SO_2 emissions and subsequent deposition to terrestrial and aquatic ecosystems will continue to decline, increased N emissions may cancel out any gains produced by reduced SO_2 levels.	Gaseous precursors (e.g., SO_2) can cause direct damage to sensitive vegetation, such as lichen, upon deposition. Can affect habitats and species through both wet (acid rain) and dry deposition. The effects of acidification include lowering of soil pH, leaf chlorosis, reduced decomposition rates, and compromised reproduction in birds/plants. Not all sites are equally susceptible to acidification. This varies depending on soil type, bed rock geology, weathering rate and buffering capacity. For example, sites with an underlying geology of granite, gneiss and quartz rich rocks tend to be more susceptible.
Ammonia (NH_3)	Ammonia is a reactive, soluble alkaline gas that is released following decomposition and volatilisation of animal wastes and from some chemical processes and vehicle exhausts. It is a naturally occurring trace gas, but ammonia concentrations are directly related to the distribution of livestock. Ammonia reacts with acid pollutants such as the products of SO_2 and NOx emissions to produce fine ammonium (NH_4+) – containing aerosol. Due to its significantly longer lifetime, NH_4+ may be transferred much longer distances (and can therefore be a significant trans-boundary issue). While ammonia deposition may be estimated from its	The negative effect of NH_4^+ may occur via direct toxicity when uptake exceeds detoxification capacity and via N accumulation. Its main adverse effect is eutrophication, leading to species assemblages that are dominated by fast-growing and tall species. For example, a shift in dominance from heath species (lichens, mosses) to grasses is often seen. As emissions mostly occur at ground level in the rural environment and NH_3 is rapidly deposited, some of the most acute problems of NH_3 deposition are for small relict nature reserves located in intensive agricultural landscapes.

Pollutant	Source	Effects on habitats and species
	atmospheric concentration, the deposition rates are strongly influenced by meteorology and ecosystem type.	
NOx	Nitrogen oxides are mostly produced in combustion processes. Half of NOx emissions in the UK derive from motor vehicles, one quarter from power stations and the rest from other industrial and domestic combustion processes.	Direct toxicity effects of gaseous nitrates are likely to be important in areas close to the source (e.g., roadside verges). A critical level of NOx for all vegetation types has been set to 30 µg/m^3 (micrograms per cubic metre). Deposition of nitrogen compounds (nitrates (NO_3), NO_2 and nitric acid (HNO_3)) contributes to the total N deposition and may lead to both soil and freshwater acidification. In addition, NOx contributes to the eutrophication of soils and water, altering the species composition of plant communities at the expense of sensitive species.
N deposition	The pollutants that contribute to the total nitrogen deposition derive mainly from oxidized (e.g., NO_X) or reduced (e.g., NH_3) N emissions (described separately above). While oxidized nitrogen mainly originates from major conurbations or highways, reduced nitrogen mostly derives from farming practices. The N pollutants together are a large contributor to acidification (see above).	All plants require nitrogen compounds to grow, but too much overall N is regarded as the major driver of biodiversity change globally. Species-rich plant communities with high proportions of slow-growing perennial species and bryophytes are most at risk from N eutrophication. This is because many semi-natural plants cannot assimilate the surplus N as well as many graminoid (grass) species. N deposition can also increase the risk of damage from abiotic factors, e.g., drought and frost.
Ozone (O_3)	A secondary pollutant generated by photochemical reactions involving NOx, volatile organic compounds (VOCs) and sunlight. These precursors are mainly released by the combustion of fossil fuels (as discussed above). Increasing anthropogenic emissions of ozone precursors in the UK have led to an	Concentrations of O_3 above 40 ppb can be toxic to both humans and wildlife and can affect buildings. High O_3 concentrations are widely documented to cause damage to vegetation, including visible leaf damage, reduction in floral biomass, reduction in crop yield (e.g., cereal grains, tomato, potato), reduction in the number of flowers, decrease in forest production and altered species

Pollutant	Source	Effects on habitats and species
	increased number of days when ozone levels rise above 40 ppb (parts per billion) ('episodes' or 'smog'). Reducing ozone pollution is believed to require action at international level to reduce levels of the precursors that form ozone.	composition in semi-natural plant communities.

Source: Air Pollution Information System (www.apis.ac.uk)

5.6.3 SO_2 emissions overwhelmingly derive from power stations and industrial processes that require the combustion of coal and oil, as well as shipping (particularly on a local scale). There will be no material release of SO_2 in the construction, operational or decommissioning phases of the Scheme. Therefore, this atmospheric pollutant is not considered further in this HRA.

5.6.4 NOx emissions are dominated by the output of vehicle exhausts (more than half of all emissions) and some vehicles also emit NH_3. The main air quality impact of the Scheme is likely to occur in the construction and decommissioning phases, when construction traffic will lead to the temporary emission of NOx, NH_3 and, likely, an overall increase in total N deposition. According to the World Health Organisation (WHO), the Critical Level for NOx for the protection of vegetation is 30 μgm^{-3} (micrograms per cubic metre) and the Critical Level for NH_3 when lower plants are present is 1 μgm^{-3}[33] (Ref. 35). In addition, ecological studies have determined Critical Loads[7] for atmospheric nitrogen deposition (NOx combined with NH_3).

5.6.5 The Department of Transport's Transport Analysis Guidance (Ref. 36) states that beyond 200m, the contribution of vehicle emissions from the roadside to local pollution levels is insignificant (refer to **Figure 2**). This is the distance that is used in this HRA to screen for potential atmospheric pollution impacts associated with the Scheme.

[7] The critical load is the rate of deposition beyond which research indicates that adverse effects can reasonably be expected to occur.

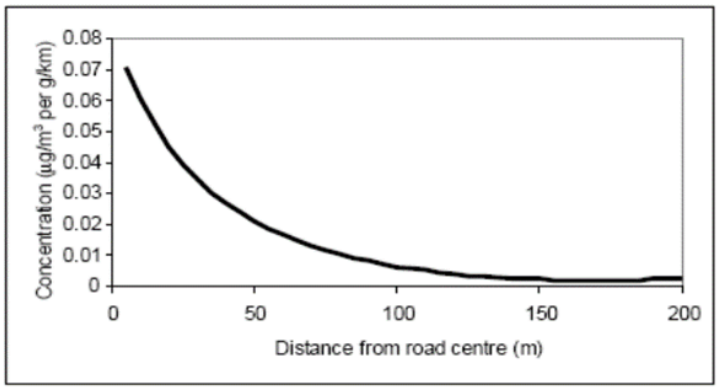

Figure 2. Traffic contribution to concentrations of pollutants at different distances from a road

5.6.6 Overall, the following European sites within the ZoI of the Scheme are sensitive to atmospheric pollution and are taken forward into the following chapters:

a. **River Derwent SAC**;

b. **Lower Derwent Valley SAC/SPA/Ramsar**; and

c. **Humber Estuary SAC/SPA/Ramsar**.

Dust Deposition

5.6.7 Construction and decommissioning activities can generate dust emissions from operating machinery that can cause localised smothering of vegetation or potential health issues in fauna. The effects of dust will depend on the prevailing wind direction, and the transport distance is related to particle size. Dust particle size and chemical composition is important as smaller particles can enter or block stomata and thus interfere with gas exchange, while sufficient coverage may prevent light penetration to the chloroplasts.

5.6.8 Fauna is exposed to air pollutants via three pathways: 1) inhalation of gases or small particles; 2) ingestion of particles suspended in food or water; or, 3) absorption of gases through the skin. It is likely that birds are even more susceptible to gaseous pollutant injury than mammals due to their higher respiratory rates.

5.6.9 For the purposes of screening, according to guidance from the Institute of Air Quality Management (IAQM) (Ref. 37), with respect to possible effects due to dust, "…*an assessment will normally be required where there is…an 'ecological receptor' within: 50 m of the boundary of the site; or 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s)*". In their advice regarding this HRA, Natural England indicated that the potential for dust impacts should be considered up to 200m from dust-generating activities.

5.6.10 Overall, the following European sites within the ZoI of the Scheme are sensitive to dust emissions and are taken forward into the following chapters:

a. **River Derwent SAC**; and

b. **Lower Derwent Valley SAC/SPA/Ramsar**.

5.7 Introduction of Invasive Non-Native Species (INNS)

5.7.1 An 'invasive species' is a species that is: 1) non-native (or alien) to the ecosystem under consideration, and 2) whose introduction causes or is likely to cause economic or environmental harm, or harm to human health. They can be introduced to an area by (e.g.,) ship ballast water, accidental release, and most often, by people. Invasive species can lead to the extinction of native plants and animals, destroy biodiversity, and permanently alter habitats. Any construction project can introduce INNS if inadequate biosecurity protocols are followed, particularly when working in the riverine environment.

5.7.2 Overall, the following European sites within the ZoI of the Scheme are sensitive to the introduction of INNS and are taken forward into the following chapters:

a. **River Derwent SAC;**

~~a.~~b. **Lower Derwent Valley SAC/SPA/Ramsar**; and

~~b.~~c. **Humber Estuary SAC/SPA/Ramsar**.

6. HRA Stage 1: Screening for Likely Significant Effects

6.1 Introduction

6.1.1 This section evaluates whether the Scheme will result in LSEs on the qualifying features of the River Derwent SAC, Lower Derwent Valley SAC, Lower Derwent Valley SPA/Ramsar and Humber Estuary SPA/Ramsar/SAC. This section only considers impact pathways for which any or all of these European sites have been identified to lie within the ZoI of the Scheme.

6.2 Construction and Decommissioning Phases

Noise and Visual Disturbance (Within Site Boundaries and Functionally Linked Habitats)

6.2.1 A range of construction and decommissioning activities will be required for the Scheme, which will involve the presence of site staff and usage of heavy machinery within the Site. These activities have the potential to result in noise and visual disturbance to sensitive ecological receptors, both within European sites and functionally linked habitats outside European site boundaries. The Site Improvement Plan (SIP) for the Lower Derwent Valley SPA/Ramsar (Ref. 19) specifies disturbance as a threat to the integrity of the site, although mainly due to recreational access along floodbanks. The

accompanying Supplementary Advice on Conservation Objectives (SACO) (Ref. 38) expands on the site's sensitivity to disturbance caused by human activity. It specifies that "…*disturbance associated with human activity may take a variety of forms including noise, light, sound, vibration, trampling, and presence of people, animals and structures".* Disturbance is also highlighted as a key threat to the Conservation Objectives of the Humber Estuary SPA/Ramsar in its SIP and SACO. Most of the disturbance elements can be introduced or exacerbated by construction and decommissioning activities, carried out in proximity to key foraging or roosting habitats of SPA/Ramsar bird species.

6.2.2 The Site comprises extensive tracts of agricultural land, which lie within the maximum foraging ranges of some of the qualifying species in the Lower Derwent Valley SPA/Ramsar and Humber Estuary SPA/Ramsar. **Therefore, LSEs of the Scheme on the Lower Derwent Valley SPA/Ramsar and Humber Estuary SPA/Ramsar regarding noise and visual disturbance in functionally linked habitats in the construction or decommissioning periods cannot be excluded. This impact pathway is screened in for AA.**

6.2.3 The Lower Derwent Valley SAC, River Derwent SAC and Humber Estuary SAC are designated for a range of aquatic and/or semi-aquatic species, including sea lamprey, river lamprey, bullhead and otter. All these species are mobile and likely to be frequently using functionally linked habitats beyond the designated site boundary. Otter are known to have extensive home ranges, having been recorded between 12 and 80km for males (Ref. 39), while both lamprey species are anadromous and expected to use the entire continuum of watercourses from the Humber Estuary to the upper reaches of the River Derwent.

6.2.4 The habitat use of otter is largely limited to river water channels and adjoining banks, where holts and couches represent the most sensitive features. It is expected that a high proportion of otter activity within the wider area will occur along the River Derwent and River Ouse, and not within the network of streams and drainage ditches permeating the Solar PV Areas. As such, the highest potential for the Scheme to result in noise and visual disturbance impacts to qualifying otter will be in the Grid Connection Corridor, specifically at the crossing points of the River Derwent and River Ouse, as well as Featherbed Drain in the Solar PV Area. Due to the sensitivity of watercourses to open-cut trenching construction methods, it has been confirmed that cable installation at these locations will be through trenchless methods (i.e., HDD). Directional bore machines are associated with loud grinding noise that can reach sound levels of up to 85dB at source. While otter are known to be relatively tolerant to noisy environments, **LSEs of the Scheme on the Lower Derwent Valley SAC and River Derwent SAC regarding noise and visual disturbance in the construction period cannot be excluded. This impact pathway is screened in for AA.**

6.2.5 Qualifying fish from the River Derwent SAC and Humber Estuary SAC can be impacted by underwater sound which can either be impulsive or continuous in nature and can cause a variety of impacts to fish, ranging from severe physical injury (e.g., rupture of the swim bladder), physical damage to the auditory system (e.g., temporary shifts in hearing thresholds) to

behavioural changes, such as disruption of migratory behaviours. ~~All~~Bottom-dwelling species that spend a large proportion of time near substrate are most likely to be negatively impacted by vibration-inducing construction activities. However, all lamprey species and bullhead lack swim bladders and are considered to be low hearing sensitivity fish. Generally, they are less susceptible to barotrauma because they detect particle motion rather than sound pressure. Notwithstanding this, vibration disturbance to bullhead and sea and river lamprey is considered here, ~~due~~both in relation to ~~potential impacts on the migratory route via~~qualifying individuals of populations in the River ~~Ouse and River~~ Derwent ~~used by these species~~SAC as well as those occurring in habitat that is functionally linked to the Humber Estuary SAC. The two lamprey species differ in their core migratory periods, the times during which they are most sensitive to vibration impacts. Following metamorphosis, both lamprey species undertake their seaward migration from early autumn to late winter (September to February). The return of reproductively active river lamprey to upstream spawning migrations occurs between October and December, whereas upstream movement of sea lamprey takes place in April and May. Bullheads are sedentary and remain in their freshwater habitats throughout the year, indicating that their sensitivity to noise/vibration disturbance shows no temporal variation.

6.2.6 The Scheme will not involve in-river works, which are considered to have the largest potential for altering the underwater soundscape. Trenchless technologies (i.e., HDD) will be used for crossing the Featherbed Drain, River Derwent and River Ouse. All cables will be installed a minimum of 1.5m below the bed of watercourses (excluding the River Ouse and River Derwent). Cables will be installed by HDD a minimum of ~~5 m~~5m below the bed of the River Ouse and River Derwent. Furthermore, the respective send and receive pits will be located a minimum of 30m from the watercourse edge. ~~A literature review of the vibration disturbance risks associated with HDD was undertaken by AECOM.~~

~~6.2.6~~6.2.7 A literature review of the vibration disturbance risks associated with HDD was undertaken by AECOM. This indicates that while there is some evidence for behavioural impacts and physical injury from underwater noise generated by construction activities (typically from pile driving, dredging and seismic surveying – construction activities with much larger noise profiles that will not be undertaken for the Scheme), there is little to no evidence of harm from substrate vibration. Based on the likely acoustical energies associated with the Scheme, it is highly unlikely to result in any material substrate vibration or associated noise in the water column that would result in behavioural or physical impacts to bullhead and lamprey given the large volumes of substrate between the HDD and the river using a 30m setback and a minimum 5m depth below the bed (as specified in Table 3 of the **Framework CEMP [EN010143/APP/7.7]**). It should also be noted that the actual drilling activity associated with HDD will be temporary, with the entire drilling process typically completed within several days.

~~6.2.7~~6.2.8 Therefore, it is concluded that there is no potential for the Scheme to result in LSEs on the River Derwent SAC and Humber Estuary SAC regarding noise disturbance to qualifying fish in the construction or decommissioning phases.

6.2.9 Furthermore, as set out in **Framework CEMP [EN010143/APP/7.7]**, any HDD beneath the River Ouse and River Derwent will avoid the core fish migration season of September to February and May where practicable.

Water Quality

~~6.2.8~~6.2.10 The construction or decommissioning of the Scheme will encompass staggered works across the Site with varying distances to nearby European site receptors. For example, at its closest point, the River Derwent SAC adjoins the Grid Connection Corridor to the east of Hemingbrough. The Lower Derwent Valley SAC/SPA/Ramsar (which essentially comprises the floodplain adjoining parts of the River Derwent) lies approximately 1.3km from the Solar PV Areas (Solar PV Area 2a) at its closest point.

~~6.2.9~~6.2.11 All aquatic ecosystems are sensitive to water pollution from a wide range of substances, including toxic contaminants, non-toxic contaminants (e.g., nutrients) and sediments. Negative changes in water quality have the potential to directly impact on SAC habitats and species, as well as resulting in cascading effects on SPA/Ramsar wildfowl. The SIP for the River Derwent SAC (Ref. 18) specifies water pollution as one of the main threats to site integrity and states that "…*the agricultural soils of the Derwent Catchment are highly erodible and are thought to be the dominant source of sediment input to the system, entering via run-off and directly supplied by agricultural drainage systems*". The River Derwent SAC SACO (Ref. 41) provides further background on the sensitivity of its qualifying features to water pollution, particularly sedimentation. For example, the excessive delivery of fine sediment from the wider catchment can cause siltation of egg-laying sites and juvenile/adult refugia for sea lamprey, river lamprey and bullhead. Furthermore, it should be noted that high sedimentation rates also increase the organic matter content, which in turn accelerates oxygen depletion in the water column.

~~6.2.10~~6.2.12 Direct water quality impacts on qualifying waterfowl and waders in the Lower Derwent Valley SPA/Ramsar are unlikely. Water pollution impacts on birds are primarily mediated indirectly through impacts on foraging resources. For example, sedimentation of the riverbed can decrease interstitial flows, reducing oxygen availability for sediment-dwelling invertebrates and, potentially, the pool of foraging resources to non-breeding birds. Furthermore, most bird species are visual predators, meaning they must visually locate their prey in the riverbed and/or water column.

~~6.2.11~~6.2.13 Two of the most important factors influencing the likelihood of potential water quality impacts of developments are the presence of a hydrological connection with and flowpath distance to European sites. Clearly, there is a definitive hydrological connection to European sites for some elements of the Scheme, such as the Grid Connection Corridor that adjoins the River Derwent SAC. Furthermore, the Scheme is permeated by a large number of agricultural ditches and drains, many of which are ephemeral/intermittent in nature. As highlighted in **Chapter 9: Flood Risk, Drainage and Water Environment, ES Volume 1 [EN010143/APP/6.1]**, many of these drainage ditches were dry when visited in November 2022. However, some ditches and drains are known to carry significant volumes of water at times and hydrological connectivity with the River Derwent SAC, Lower Derwent Valley

SAC/SPA/Ramsar and Humber Estuary SAC/SPA/Ramsar is assumed as a precautionary measure in line with PINS' Advice Note Nine: Rochdale Envelope (Ref. 42).

~~6.2.12~~6.2.14 Due to the geographic proximity of the Scheme to the River Derwent SAC, Lower Derwent Valley SAC/SPA/Ramsar and Humber Estuary SAC/SPA/Ramsar, the corresponding flowpath distances are also short (particularly in relation to the Grid Connection Corridor across the River Derwent SAC). This means there is virtually no potential for attenuation and/or dilution processes that would provide a natural buffer against aquatic contaminants. There is a risk for the direct input of water quality contaminants into aquatic ecosystems with the potential knock-on effects outlined above. **Overall, LSEs of the Scheme on the River Derwent SAC, Lower Derwent Valley SAC/SPA/Ramsar and Humber Estuary SAC/SPA/Ramsar regarding water quality impacts in the construction period cannot be excluded. This impact pathway is screened in for AA.**

Water Quantity, Level and Flow

~~6.2.13~~6.2.15 Being a riverine ecosystem, the River Derwent SAC and its 'water courses' feature are sensitive to changes in flow regime beyond natural limits. Natural flow regimes are important in sustaining its characteristic biotope mosaic through prevailing abiotic conditions, including riverbed hydraulics, water depth, wetted area, temperature and DO concentrations. Natural England's SACO (Ref. 41) highlight a target to "…*restore the natural flow regime of the river, with daily flows as close to what would be expected in the absence of abstractions and discharges (the naturalised flow)".* Maintaining a natural flow regime is also critical to all aspects of the life cycle of designated fish (i.e., sea lamprey, river lamprey and bullhead) and otter. Adequate river flows are particularly important for anadromous sea lamprey, which spawn in freshwater habitats and complete their life cycle at sea. Significantly reduced or increased river flows may impede sea lamprey from reaching their historic spawning grounds in upstream river stretches, potentially affecting reproductive success. Natural England's SIP (Ref. 18) refers to the SAC's sensitivity towards changes in flow, particularly due to water abstraction.

~~6.2.14~~6.2.16 The Lower Derwent Valley SAC/SPA/Ramsar encompasses the floodplain surrounding the River Derwent, implying it receives freshwater input in times of flooding. The SPA/Ramsar is designated for non-breeding and breeding waterfowl and waders with varying dependencies on flooded grassland. For example, wigeon and teal rely on extensive areas of standing water for successful foraging. Natural England's SACO (Ref. 38) specifies a target of standing water of <0.3m and <0.1m in depth for these species respectively, over at least 50% of the standing water area. Golden plover feed on invertebrates in areas of soggy or flooded ground, and inadequate foraging conditions are present when substrate dries out or is excessively flooded. Natural England's SIP (Ref. 19) identifies hydrological changes as the main pressure to the integrity of the SPA, with prolonged spring and summer flooding threatening both its botanical and bird features. Abiotic conditions in the Humber Estuary SAC/SPA/Ramsar depend on a complex interplay of freshwater and seawater input. For example, the volume of

freshwater input influences the salinity of estuarine habitats, with knock-on implications for plant and invertebrate community composition.

~~6.2.15~~6.2.17 The Scheme is associated with a range of requirements/activities with potential impacts on local hydrology:

a. Meeting the potable water supply requirements for site staff and construction processes may result in the drawdown of local water levels;

b. Some structures required in the construction period (e.g., launching and receiving pits for HDD) have the potential to affect local groundwater and surface water flows by altering prevailing hydrological conditions; and

c. Access tracks crossings of watercourses introduce a temporary net increase in impermeable surfaces, with the potential to increase runoff rates.

~~6.2.16~~6.2.18 To meet the potable water demand in the construction period, a temporary water supply for the Scheme of approximately 35,000m^3 of potable water will be provided to support welfare facilities. This water supply will either be met through an existing licensed private water supply borehole (provided this is available) or transported from an existing licensed water abstraction source in Intermediate Bulk Containers (IBC). Furthermore, the Scheme is wholly situated in the supply area of Yorkshire Water, which has a statutory obligation to deliver potable water to new developments without negatively impacting the environment (including European sites).

~~6.2.17~~6.2.19 Overall, since no additional water supplies beyond existing consents and licensed volumes will be required to meet the potable water demand, there is no potential for the Scheme to result in LSEs on the River Derwent SAC, Lower Derwent Valley SAC/SPA/Ramsar and Humber Estuary SAC/SPA/Ramsar regarding water supply in the construction and decommissioning phases.

~~6.2.18~~6.2.20 For purposes of the HRA, it has been assumed that the HDD launching and receiving pits will be dug to indicative dimensions of ~~8 m~~8m length, ~~5 m~~5m width and ~~1 m~~1m depth as a worst case. Where water-bearing strata are intercepted, any groundwater in saturated sections of adjoining geologies or superficial deposits would naturally drain towards the HDD pits. Therefore, in principle, any HDD operations have the potential to result in the drawdown of local groundwater sources, thereby reducing freshwater supply to the River Derwent and River Ouse (or other watercourses in hydrological connectivity).

~~6.2.19~~6.2.21 As indicated in **Chapter 9: Flood Risk, Drainage and Water Environment, ES Volume 1 [EN010143/APP/6.1]**, borehole logs indicate that groundwater levels across the Site are variable, with the shallowest groundwater in any bedrock being less than ~~3 m~~3m below the ground. Alluvial deposits in the proximity of watercourses also carry groundwater at shallow depths. However, the shallow depth of HDD pits (maximum of ~~1 m~~1m) makes any material interaction with groundwater sources unlikely. Therefore, it is concluded that the HDD operations will not result in changes to the groundwater baseflow supplying the River Derwent and River Ouse. In

addition, any freshwater abstractions of more than ~~20 m^3~~20m^3/d needed to drain the HDD pits for operational purposes would require a license from the Environment Agency. Therefore, even if the volume of groundwater being drawn in by the HDD pits were significant, the statutory consenting process would prevent any significant impacts on water resources.

~~6.2.20~~6.2.22 There is potential for increased volumes and rates of surface runoff from temporary impermeable surfaces within the Scheme, such as compacted access tracks and watercourse crossings. While the risk of material hydrological effects from each individual surface is likely to be small, the cumulative increase in runoff from all surfaces is considered here as a precautionary measure.

~~6.2.21~~6.2.23 **Chapter 9: Flood Risk, Drainage and Water Environment, ES Volume 1 [EN010143/APP/6.1]** indicates that construction and decommissioning site runoff will be minimised through a range of standard construction and/or decommissioning practices secured in the **Framework Construction Environmental Management Plan (CEMP) [EN010143/APP/7.7]** and **Framework Decommissioning Environmental Management Plan (DEMP) [EN010143/APP/7.9]**, such as adherence to principles identified in CIRIA report C532 (Control of water pollution from construction sites) (Ref. 43). Furthermore, a temporary Sustainable Drainage System (SuDS) will be deployed to reduce runoff rates. Collectively, these measures ensure that there will be no potential for the Scheme to result in a material increase in flow or flooding volumes in the River Derwent SAC, Lower Derwent Valley SAC/SPA/Ramsar and Humber Estuary SAC/SPA/Ramsar. Overall, there will be no LSEs of the Scheme on these European sites in relation to increased flow volumes/rates in the construction phase.

~~6.2.22~~6.2.24 Importantly, the SuDS measures referenced here are introduced to protect the wider water environment from pollution impacts, rather than specifically being targeted at protecting water levels in the River Derwent SAC, Lower Derwent Valley SAC/SPA/Ramsar and Humber Estuary SAC/SPA/Ramsar. There is a statutory obligation for projects to consider water quality impacts. There are strict obligations under the Environmental Damage (Prevention and Remediation) (England) Regulations 2015 (Ref. 44) and the Environmental Permitting (England and Wales) Regulations 2016 (Ref. 45), to prevent pollution of watercourses. Due to this, SuDS measures can be considered at the LSEs stage and are not deemed to be HRA-relevant mitigation.

Temporary Loss of/Damage to Qualifying Habitat

~~6.2.23~~6.2.25 Most SACs are designated for habitats of international conservation importance, many of which have been subject to encroachment from development and gradual loss. Therefore, the SACOs for most European sites include a target to maintain or restore the extent of qualifying habitats to achieve favourable conservation status. Any construction activities associated with the temporary and/or permanent loss of designated habitat, by definition, would result in LSEs on a SAC. The following two elements of the construction or decommissioning stages of the Scheme with the potential for damage to and temporary loss of designated habitat have been identified:

a. Use of an existing track off the A63 (Hull Road) at approximate grid reference SE 70325 30168 for access by construction or decommissioning traffic; and

b. Underground cable routing in the Grid Connection Corridor connecting to National Grid Drax substation.

~~6.2.24~~6.2.26 During the construction and/or decommissioning phases, various tracks will be needed across the Site to enable staff and construction equipment/machinery to have access as required. One such track to the east of Hemingbrough is proposed to enable access to the Grid Connection Corridor at Hagthorpe House. Part of this track, which also adjoins the Grid Connection Cables, falls within the boundary of the River Derwent SAC. It is proposed that this track will be used by Heavy Goods Vehicles (HGVs), delivering construction materials to this part of the Grid Connection Corridor.

~~6.2.25~~6.2.27 It has been confirmed that the existing track is of sufficient width to accommodate the anticipated vehicular usage without trespassing on the verges, thus preventing any potential damage to adjoining habitat from wheel rutting and compaction. Furthermore, for safety reasons, a controlled access system will be in place to ensure that construction or decommissioning vehicles do not meet on the access track at the same time. Excess traffic will be held on an existing layby on the A63 further west prior to gaining confirmation that the Site can be accessed safely. This will further reduce the likelihood of damaging impacts on road verge vegetation.

~~6.2.26~~6.2.28 While there will be no requirements for road widening or highway improvements at the junction with the A63, temporary access into the field to the north in the form of a bell mouth would require the temporary removal of a section of verge habitat within the designated site boundary. **Overall, given that the temporary loss of habitat within the designated site boundary of the River Derwent SAC is involved, LSEs on the SAC regarding damage to/temporary loss of qualifying habitat cannot be excluded as a precautionary measure. This impact pathway is screened in for AA.**

~~6.2.27~~6.2.29 The cable in this part of the Grid Connection Corridor in the vicinity of the access track off the A63 will be routed in relatively close proximity to the River Derwent SAC. Three options for cable routeing are currently being explored:

a. Routeing north of the SAC – this option would take the cable towards a field to the north of the River Derwent SAC, before crossing another agricultural parcel and the A63 via HDD (**Figure 3**);

b. HDD from field to access track – this would involve drilling from within the agricultural field to the north of the SAC (send pit) towards the western end of the existing track (receive pit)[8], minimising/preventing any cable routing underneath the SAC; or

[8] It should be noted that the drill pit will not exceed the extent of the access track, drilling will be done at least 2 metres below ground level (m bgl) to avoid damage to tree roots and soil/excavated material would be stored within the temporary compound/laydown area in the agricultural field to the north-east.

c. Cable installation along the existing track – this would involve breaking out the sub-base and cable trenching along the track using handheld tools and potentially a soil vacuum to protect SAC vegetation. It is considered that the ditch to the south of the access track is likely to act as a partial barrier to northward growth of SAC tree roots.

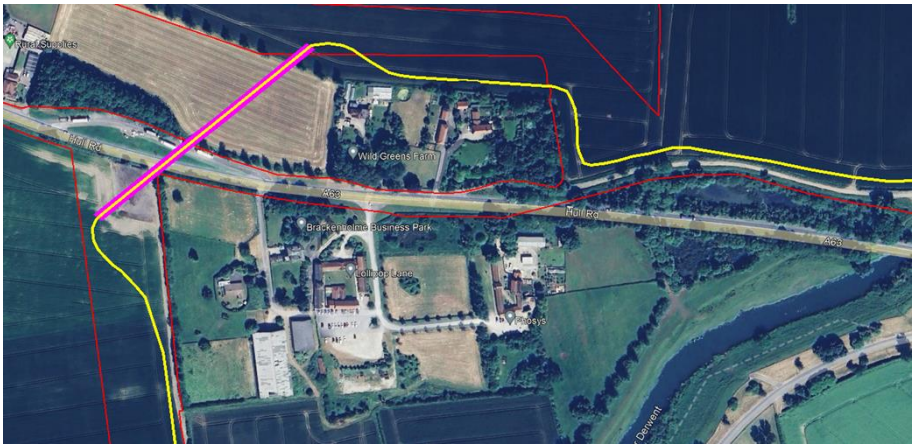

Figure 3: Cable routeing option away from the River Derwent SAC, showing a potential HDD crossing in pink

~~6.2.28~~6.2.30 All routing options would avoid the need for any clearance of terrestrial woodland within the SAC boundary, including wet woodland which is considered to be functionally linked to the SAC. This would avoid impacts on habitats that are functionally linked to qualifying habitat and species in the River Derwent SAC.

~~6.2.29~~6.2.31 In summary, there will be no temporary loss of qualifying habitat or functionally linked habitat within the River Derwent SAC boundary due to any of the cable routeing under consideration. Therefore, LSEs of the Scheme on the River Derwent SAC regarding the temporary loss of or damage to qualifying habitat in the construction period can be excluded.

Atmospheric Pollution

~~6.2.30~~6.2.32 The construction and decommissioning phases of the Scheme are likely to lead to a small increase in the number of vehicles on the local highway network for the duration of the works (refer to **Chapter 2: The Scheme** and **Chapter 13: Transport and Access, ES Volume 1 [EN010143/APP/6.1]**). IAQM guidance (Ref. 32) sets out criteria to establish the need for an air quality assessment for the construction or decommissioning phase of a development as being a change of HDV (Heavy Duty Vehicle) flows of more than 100 Annual Average Daily Traffic (AADT) outside an Air Quality Management Area (AQMA). In the case of the Scheme, HDV are equivalent to HGVs (as referred to in **Chapter 13: Transport and Access, ES Volume 1 [EN010143/APP/6.1]**), as construction vehicles will not include large buses or coaches.

~~6.2.31~~6.2.33 At this stage, it is anticipated that, as a worst-case, during the peak construction or decommissioning phases of the Scheme there would be up to 25 HGV deliveries (including waste removal) per day (equating to 50 two-way movements). This will translate into an AADT well below 25 AADT as the figures cited are peak rather than annual average. This includes all HGVs associated with the construction of the Solar PV Site, Interconnecting Cables and the Grid Connection Cables. These HGV movements are well below the threshold criteria (for HDV) specified in the aforementioned IAQM guidance. Furthermore, a preliminary assessment of the proposed routing of HGVs (also known as the 'Affected Road Network' [ARN]) indicates that none of the routes lie within 200m of any European site. Given that the contribution of traffic emissions to local pollution levels are insignificant beyond 200m, it is concluded that there will be no LSEs of the Scheme on the River Derwent SAC ~~and~~, Lower Derwent Valley SAC/SPA/Ramsar and Humber Estuary SAC/SPA/Ramsar regarding atmospheric pollution in the construction period. This impact pathway is screened out from AA.

Dust Deposition

~~6.2.32~~6.2.34 Operating machinery and techniques employed in the construction or demolition phases of the Scheme have the potential to increase local dust levels with knock-on effects on ecological receptors. Dust deposition is of particular concern for plants, due to its direct interference with gaseous exchange by blocking stomata. The closest European sites with sensitivity to dust deposition are the River Derwent SAC (crossed by the Grid Connection Corridor) and the Lower Derwent Valley SAC/SPA/Ramsar (approximately 1.3km from the Order limits).

~~6.2.33~~6.2.35 IAQM guidance (Ref. 36) states that an assessment of dust impacts is usually required where there is an ecological receptor within 50m of the boundary of a construction (or decommissioning) site or within 50m of the ARN used by construction or decommissioning vehicles. Furthermore, Natural England advised in their recent consultation response that the potential impact zone for dust deposition should extend up to 200m from construction/decommissioning works. The qualifying habitats in the Lower Derwent Valley SAC lie beyond these dust impact distances and, therefore, no dust-related impacts will occur in the SAC. While it is likely that birds from the Lower Derwent Valley SPA/Ramsar forage in functionally linked habitats beyond the designated site boundary, such supporting habitats are approx. 60m from the Order limits. Furthermore, it is also considered that SPA/Ramsar birds foraging in functionally linked terrestrial habitats are not particularly sensitive to dust deposition (whereas birds associated with aquatic habitats within the designated site boundary would be). Based on IAQM/Natural England guidance and the rationale set out above, LSEs of the Scheme on the Lower Derwent Valley SAC/SPA/Ramsar through dust deposition will not arise. Therefore, the Lower Derwent Valley SAC/SPA/Ramsar is screened out from AA in relation to this impact pathway.

~~6.2.34~~6.2.36 The River Derwent SAC is traversed by and adjoins the Grid Connection Corridor in the south-west portion of the Site, and clearly falls within the 50m and 200m screening distances for potential dust-related ecological impacts. In the absence of mitigation measures, any construction or decommissioning activities carried out within 200m of the SAC,

particularly those requiring earthworks and the use of construction materials, may result in increased dust deposition to floating aquatic vegetation (e.g., water crowfoot *Ranunculion fluitantis*) and the water column. **Therefore, LSEs of the Scheme on the River Derwent SAC regarding dust deposition in the construction or decommissioning phases cannot be excluded. This impact pathway is screened in for AA.**

Introduction of INNS

~~6.2.35~~6.2.37 There are several legislative instruments relating to INNS. The purpose of this legislation is to prevent and reduce the negative economic and environmental impacts of these species. Key legislation identifies species for which mitigation is required, specifically:

a. Species listed in Schedule 9 of the Wildlife and Countryside Act 1981 (as amended) (WCA) (Ref. 46); and

b. Species of special concern and Schedule 2 species as per the Invasive Alien Species (Enforcement and Permitting) Order 2019 (as amended) (IASO) (Ref. 47).

~~6.2.36~~6.2.38 Taken together, the relevant legislation makes it an offence to plant, or otherwise cause to grow (including allowing to spread) listed species in the wild. If transported off-site, there is a duty of care with regards to the disposal of any part of the plant that may facilitate establishment in the wild and cause environmental harm (as per the Environmental Protection Act 1990 (Ref. 48)).

~~6.2.37~~6.2.39 While it is not illegal to have any of the identified INNS on a property, even when growing on managed land, the spread of Schedule 9 WCA species should be kept under control such that the species is not having an appreciable adverse impact on habitats and their native biodiversity.

~~6.2.38~~6.2.40 Therefore, appropriate biosecurity measures will be implemented during works carried out during the construction and decommissioning phases of any scheme to prevent the spread of INNS, irrespective of whether there are European sites in the vicinity. Overall, LSEs of the Scheme during construction and decommissioning on any European sites regarding the introduction of INNS can be screened out from AA.

6.3 Operational Phase

Loss of Functionally Linked Habitat

6.3.1 The Lower Derwent Valley SPA/Ramsar and Humber Estuary SPA/Ramsar are designated for mobile, non-breeding bird species. These species, to varying degrees, will forage or roost beyond their respective designated site boundaries. The SACO for the Lower Derwent Valley SPA/Ramsar (Ref. 38) specifies that food availability for all qualifying species within supporting habitat, both within and outside the SPA/Ramsar, is "…*critically important for successful breeding, adult fitness and survival and the overall sustainability of the population".* For example, a key target for golden plover is to maintain the availability of key prey items, such as earthworms, leatherjackets, beetles and spiders. The qualifying species in the Humber Estuary

SPA/Ramsar have similar requirements for off-site roosting or foraging habitats.

6.3.2 The Order limits are approximately 1.3km from the Lower Derwent Valley SPA/Ramsar and 3km from the Humber Estuary SPA/Ramsar, placing it within the core foraging ranges for some of the qualifying species. This implies that some of the habitat within the Site could be regularly used by significant proportions of the relevant qualifying populations. **Therefore, LSEs of the Scheme on the Lower Derwent Valley SPA/Ramsar and Humber Estuary SPA/Ramsar regarding the potential loss of functionally linked habitat in the operational phase[9] cannot be excluded. This impact pathway is screened in for AA.**

Visual Disturbance (Within Functionally Linked Habitats)

6.3.3 The operational phase of the Scheme, including any maintenance activities required, has the potential to result in visual disturbance to mobile qualifying birds overflying or utilising functionally linked habitats adjoining the Solar PV Areas. For example, the presence of solar PV panels may visually disturb birds that are foraging in close-by arable fields, particularly where species have a known preference for expansive open vistas. In turn, such disturbance may lead to reduced foraging times or, if sufficiently great, individuals abandoning formerly suitable foraging plots (known as 'disturbance displacement'). However, unlike wind turbines, solar PV panels have much shorter heights (maximum height at maximum tilt of up to 3.5 m; and maximum height when panels are horizontal [night-time storage position] of 2.3 m) and, therefore, are unlikely to be regarded as disturbing elements in the landscape. Furthermore, the height of the solar PV panels falls within that of existing habitat features in the landscape, such as hedgerows, trees and more extensive woodland. Therefore, it is considered that the solar PV panels will not result in any material impacts on qualifying birds through obstruction of flight corridors and disturbance in adjoining functionally linked habitat parcels.

6.3.4 It is anticipated that there will be three permanent staff in the operational phase, based at the operations and maintenance hub at Johnson's Farm. Additional staff and/or visitors will be present on an *ad hoc* basis when needed. Maintenance works would include vegetation management, equipment maintenance and periodic repair works. Any potential for visual disturbance from maintenance works would be minimal and at or below the level of disturbance from farming practices pre-construction, particularly along the edge of the Order limits. Overall, therefore, maintenance activities

[9] Technically it should be noted that the loss of functionally linked habitat commences in the construction phase when site staff and construction plant is likely to lead to noise and visual disturbance to birds using arable habitat within the Site (assessed as a separate impact pathway). Furthermore, emerging development structures will lead to the physical disappearance of the usable habitat area. Some degree of functionally linked habitat loss will also continue into the decommissioning phase, when activities within the Scheme would continue to lead to the loss of usable habitat. However, any loss of functionally linked habitat will not be permanent outside the operational phase and this impact pathway is, therefore, not assessed for the construction/decommissioning phases.

required for the Scheme would not result in visual disturbance impacts to functionally linked habitats.

6.3.5 Cumulatively, the solar PV panels associated with the Scheme comprise an extensive surface with the potential to reflect sunlight. There is some indication that PV panels may be associated with several ecological knock-on effects. For example, in specific conditions, reflected polarised light is attractive to some polarotactic insects, which may attempt to lay eggs on what they perceive as a water surface (Ref. 49). In turn, this may impact qualifying bird species that forage on these insects (although it is to be noted that neither golden plover or pink-footed goose are birds that feed on the wing), resulting in increased energy expenditure and injury/death through collision with the solar PV panels. Furthermore, there is evidence that some birds may be at heightened collision risk as they approach reflective surfaces to drink (Ref. 50).

6.3.6 **Chapter 2: The Scheme, ES Volume 1 [EN010143/APP/6.1]** provides background on the design specifications of the Scheme. It identifies that the tilted solar PV technology is designed to maximise the absorption of sunlight rather than reflecting it. The Scheme will incorporate solar PV panels on an east-west single axis tracker with a tilt range of +/- 60 degrees from horizontal. This allows for mobility of solar PV panels in relation to position of the sun and optimal power generation. Given that reflection from the solar PV panels will be minimal due to the technology utilised, will further reduce any glint and glare effects on overflying birds.

6.3.7 Furthermore, it is considered that qualifying birds are likely to transit through the landscape surrounding the Scheme on a broad front, as there are no topographical and geographical features that would concentrate bird movements in particular corridors. The exposure time to any potential glint and glare from polarised light will be extremely low and this impact pathway has been scoped out from further assessment in the ES.

6.3.8 A **Glint and Glare Assessment (Appendix 16-3, ES Volume 2 [EN010143/APP/6.2])** has been undertaken to evaluate the potential of the Scheme to result in undesirable solar reflections at a range of receptors (e.g., residential, road, rail and Public Right of Ways). The results of the assessment indicate that there is no potential for solar reflections at any of these receptors, providing corroborating evidence for the low impact potential to qualifying birds.

6.3.9 Overall, there will be no LSEs of the Scheme regarding visual disturbance impacts in the operational phase, including obstruction of flight movements, disturbance displacement, from maintenance activities and glint and glare. Therefore, this impact pathway is screened out from AA.

Water Quality

6.3.10 The sensitivity of the River Derwent SAC and Lower Derwent Valley SPA/Ramsar to water quality impacts was established in the relevant LSEs section on the construction and decommissioning phases (paragraph 6.2.11 and following paragraphs). Furthermore, it was also identified that the Site is very likely to be hydrologically linked to both these European sites and that

there is relatively little scope for attenuation processes to buffer against potential water pollution.

6.3.11 Water quality impacts may arise from several sources in the operational phase of the Scheme, including:

a. Runoff from hardstanding associated with the Scheme, including field station/substations, central inverters, permanent access roads, link boxes and solar PV panels;

b. Maintenance activities, such as the routine cleaning operations required for solar PV panels; and

c. Sewage generated by operational site staff.

6.3.12 As highlighted above, various elements of the operational Scheme will encompass impermeable surfaces that may lead to the accumulation and runoff of water containing toxic or non-toxic contaminants. Due to the hydrological link between the Site and the River Derwent SAC, Lower Derwent Valley SPA/Ramsar and Humber Estuary SAC/SPA/Ramsar, any surface runoff has the potential to result in water pollution in these European sites. **Overall, LSEs of the Scheme on the River Derwent SAC, Lower Derwent Valley SAC/SPA/Ramsar and Humber Estuary SAC/SPA/Ramsar regarding water quality impacts in the operational phase cannot be excluded. Therefore, this impact pathway is screened in for AA.**

6.3.13 It is anticipated that there will be between one to three permanent site staff during the operational phase, implying that the total volume of sewage generated will be correspondingly low. Sewage will be directed towards a septic tank at Johnson's Farm (the main welfare hub for site staff located in Solar PV Area 1e) and self-contained portable welfare units in more distant parts of the Site, all of which will be emptied by specialist licensed contractors. Overall, it is concluded that there will be no LSEs of the Scheme regarding water quality impacts from sewage effluent in the operational period. Therefore, this impact pathway is screened out from AA.

6.3.14 Solar PV panel cleaning in the operational period as part of maintenance activities will be undertaken using a tractor-mounted systems with a rotating 'car-wash' type brush, assuming a worst-case, two-year cleaning cycle. The cleaning water will not contain chemical cleaning products due to the risk of damage to solar PV panels. Overall, therefore, it is concluded that there will be no LSEs of the Scheme regarding water quality impacts from cleaning of solar PV panels in the operational phase. Therefore, this impact pathway is screened out from AA.

Water Quantity, Level and Flow

6.3.15 The sensitivity of the River Derwent SAC, Lower Derwent Valley SAC/SPA/Ramsar and Humber Estuary SAC/SPA/Ramsar to hydrological changes is described in paragraphs 6.2.15 and 6.2.16 and applies equally to the operational phase. Several characteristics of the Scheme could result in hydrological impacts during operation:

a. Increased coverage of impermeable surfaces, resulting in higher surface runoff rates/volumes; and

b. Potential potable water requirements with knock-on effects on local or regional freshwater resources.

6.3.16 One of the main hydrological risks associated with the operational phase of the Scheme are increased runoff rates/volumes from impermeable surfaces. In order to minimise water discharge rates, a detailed **Framework Surface Water Drainage Strategy** (**Appendix 9-4, ES Volume 2 [EN010143/APP/6.2]**) has been submitted as part of the DCO application. The Scheme design specifies that individual solar PV panels will be held on mounting structures above ground, which will prevent creating an impermeable surface across the Site. This implies that permeability levels across a large proportion of the Site will remain unchanged compared to pre-development conditions. Notwithstanding, the solar PV panels will alter the existing routing dynamics of surface runoff. To prevent pooling of water around the solar PV panels and limit potential impacts on receiving watercourses, boundary and routing swales will be developed that help maintain runoff to greenfield rates. As highlighted in the LSEs section on hydrological impacts in the construction and decommissioning phases, these SuDS measures are deployed to protect the quality of the wider aquatic environment, rather than specifically protecting hydrological flows within European sites. Overall, it is concluded that the Scheme will not result in LSEs on the River Derwent SAC, Lower Derwent Valley SAC/SPA/Ramsar and Humber Estuary SAC/SPA/Ramsar regarding operational impacts on hydrology. Therefore, this impact pathway is screened out from AA.

6.3.17 During the operational phase, there will be no residential requirement for potable water. There will be between one to three permanent staff present on-site during working hours, with additional short-term staffing and visitors as needed. The overall requirements for potable water during the operational phase will, therefore, be negligible. Overall, since no additional water supplies beyond existing consents will be required to meet the water demand in the operational phase, there is no potential for the Scheme to reduce water supply to the River Derwent SAC, Lower Derwent Valley SAC/SPA/Ramsar and Humber Estuary SAC/SPA/Ramsar in the operational phase. Therefore, this impact pathway is screened out from AA.

7. In-combination Assessment

7.1 Introduction

7.1.1 Whilst there is no legal definition of what constitutes a ‘plan’ or ‘project’ for the purposes of the Habitats Regulations, PINS advises in paragraph 3.12 of Advice Note 10 (Ref. 2) that the following developments should be considered for the HRA in-combination assessment:

a. Projects that are under construction;

b. Permitted application(s) not yet implemented;

c. Submitted application(s) not yet determined;

d. All refusals subject to appeal procedures not yet determined;

e. Projects on the PINS' National Infrastructure Programme of Projects (Ref. 51); and

f. Projects identified in the relevant development plan (and emerging development plans – with appropriate weight being given as they move closer to adoption) recognising that much information on any relevant proposals will be limited and the degree of uncertainty which may be present.

7.1.2 The relevant plans and projects with a potential for in-combination effects are shown in **Table 10**.

Table 10. Plans and projects with the potential for in-combination effects

Application reference, name and description	Approx. distance from Order limits	Construction programme	Status of project	Assessment[10]
EN010140 **Helios Renewable Energy Project** The installation of ground mounted solar arrays, energy storage and associated development comprising grid connection infrastructure and other infrastructure integral to the construction, operation, and maintenance of the development for the generation of over 50 MW of electricity.	Overlap with Grid Connection Cable and partially development area to east of National Grid Drax Substation.	Construction anticipated for 2025 spanning 12 months to 2026.	Pre-application~~— EIA scoping~~. Scoping Opinion has been submitted. Preliminary Environmental Information (PEI) Report has been published. DCO application expected in ~~2023. Opinion states EIA required.~~2024.	~~No~~ HRA ~~has been produced at~~ Screening undertaken as part of the ~~time of writing this report~~PEI Report. The development may impact on the following European ~~designated~~ sites, primarily in terms of loss of functionally linked habitat (operational phase) and noise/visual disturbance (construction/decommissioning phases) for non-breeding bird species: • Humber Estuary SPA/Ramsar; and • Lower River Derwent SPA/Ramsar. ~~There is~~ Extensive non-breeding bird surveys were undertaken to evaluate usage of the ~~potential for~~ proposed development and a 600m buffer zone by waterbird assemblages. No evidence of regular usage by significant

[10] The qualifying habitats and species for which in-combination LSEs cannot be excluded in relation to the identified impact pathways are identified in Appendix B Screening Matrices (Table 14 to Table 27) and are not repeated here individually.

Application reference, name and description	Approx. distance from Order limits	Construction programme	Status of project	Assessment[10]
				numbers of birds was found. However, Natural England's outstanding concerns regarding this development imply that residual in-combination effects with the Scheme regarding ~~loss of~~ functionally linked habitat loss and noise ~~/~~ /visual disturbance~~. The development will need to~~ cannot be ~~supported by its own HRA.~~excluded.
22/01990/STPLFE **Scotland England Green Link 2 (SEGL2)** Construction of sub-surface cable route from National Grid Drax Substation to Fraisthorpe Coastline with associated accesses and temporary construction compounds in association with the Scotland to England Green Link.	Overlap of Grid Connection Corridor with the AC Cable route and temporary construction compound and possibly permanent attenuation pond.	Installation start date expected late 2024, commissioned by end of 2029.	Application approved 03.03.23	HRA concluded no adverse effects on the integrity of the European sites assessed with appropriate mitigation in place where required. This has been agreed by Natural England, subject to appropriate mitigation being in place (ref: 418271) and is recorded on the East Riding of Yorkshire Council planning portal. However, the potential for residual in-combination effects with the Scheme is considered in relation to noise/visual disturbance, water quality, atmospheric pollution (dust deposition; all

Application reference, name and description	Approx. distance from Order limits	Construction programme	Status of project	Assessment[10]
				construction/decommissioning phases) and loss of functionally linked habitat (operational phase) on the following European sites: • Lower Derwent Valley SAC/SPA/Ramsar; • River Derwent SAC; and • Humber Estuary SAC/SPA/Ramsar.
EN010120 **Drax Carbon Capture** Drax Power Limited proposes to install post-combustion capture technology that would capture carbon dioxide emissions from up to two of the existing biomass units at Drax Power Station. The proposal includes the construction and operation of carbon capture technology and associated equipment, and the integration of the units into the existing Common Services at Drax Power Station. The proposal includes associated development.	Overlap of Grid Connection Corridor with construction compound, construction access and habitat protection area.	Construction to begin part way through the demolition of the Flue Gas Desulphurisation (FGD) Plant, taking place between 2022 and 2027.	~~Examination~~Application approved in 2024.	HRA concluded that the Proposed Scheme would not have an adverse effect on the integrity of any of the European sites assessed with agreement to this recorded between the Applicant and Natural England in the relevant Statement of Common Ground (SoCG) (Examination Library Reference REP8-018). However, the potential for residual in-combination effects with the Scheme is considered in relation to noise/visual disturbance, water quality, atmospheric pollution (dust deposition; all construction/decommissioning

Application reference, name and description	Approx. distance from Order limits	Construction programme	Status of project	Assessment[10]
				phases) and loss of functionally linked habitat (operational phase) on the following European sites: • Lower Derwent Valley SAC/SPA/Ramsar; • River Derwent SAC; and • Humber Estuary SAC/SPA/Ramsar.
EN070006 **Humber Low Carbon Pipelines** Construction of carbon dioxide (to facilitate CCUS) and hydrogen (H2) transportation pipelines between Drax in North Yorkshire and Easington in East Riding of Yorkshire, connecting various emitters and generators in the Humber. The application will include associated infrastructure comprising pipeline internal gauge (PIG) traps, a multi-junction, block valves, a compressor station and associated works. Other projects in the region linked to this project include: Hydrogen Production at Saltend (Equinor); Carbon Capture (Drax); Blue & Green Hydrogen Hub (Killingholme (Uniper)); Keadby Clean Power Hub (SSE Thermal); and ZCH Enabling Paths to Sustainable	Grid Connection Corridor overlaps the EIA scoping route corridor.	Construction period approx. 44 months. It is estimated to enter commercial operations in 2026, suggesting that construction would have begun in early 2023.	Pre-application – EIA scoping. No Scoping Opinion has been provided at the time of writing this report.	No HRA produced. Natural England identified wintering birds and the Humber Estuary to be the main considerations. Natural England advised that in relation to wintering birds, in-combination effects with other developments across the Humber Estuary needed the greatest consideration. Potential for in-combination effects in terms of noise/visual disturbance, water quality, atmospheric pollution (dust deposition) and loss of functionally linked habitat.

Application reference, name and description	Approx. distance from Order limits	Construction programme	Status of project	Assessment[10]
~~Steel Making (British Steel). There is also the Zero Humber project (VPI Immingham and P66) and the Gigastack Green H2 project (Orsted and ITM Power) in the Humber. Both of these are separate to the ZCH consortium at present however the NGC pipeline affords the opportunity for them to ultimately connect to the pipeline system.~~				
EN010091 **Drax Re-power** Drax Power Ltd is proposing to modify up to two of the coal-fired generating units (known as Units 5 and 6) at Drax Power Station, Selby, to become gas-powered generating plant. The proposed Project comprises up to four new combined cycle gas turbines (CCGT) (up to two for Unit 5 and up to two for Unit 6), each powering a dedicated generator of up to 600MW in capacity. Each Unit would provide steam to the existing steam turbine for that Unit which would generate up to 600MW per Unit. Once re-powered, Unit 5 would have a gross electrical output capacity of up to 1,800 megawatts and Unit 6 would have a	Overlaps the Grid Connection Corridor.	Commencement expected 2019/20 and "ready" by 2022/23. If two units to be built, construction of unit 2 would begin in 2024 and span until 2027.	Application approved in 2019.	HRA concluded that the Proposed Scheme would not have an adverse effect on the integrity of any of the European Sites assessed, with agreement to this recorded between the Applicant and Natural England in the relevant SoCG (Examination Library Reference APP-004). However, the potential for residual in-combination effects is considered regarding loss of functionally linked habitat~~,~~ (operational phase), water quality, atmospheric pollution and visual / noise disturbance~~.~~ (all construction/decommissioning phases) on the following European sites:

Application reference, name and description	Approx. distance from Order limits	Construction programme	Status of project	Assessment[10]
gross electrical output capacity of up to 1,800 megawatts. The repowered units would have a new combined capacity of up to 3,600MW. It is also proposed to construct a battery storage facility with capacity of up to 200MW. The proposal includes associated development.				• Lower Derwent Valley SAC/SPA/Ramsar; • River Derwent SAC; and • Humber Estuary SAC/SPA/Ramsar..
2020/1357/FULM **Lakeside Energy Storage** Development of an energy storage facility including battery storage containers; substations; power conversion systems; transformers and associated switchgear; HVAC equipment; communications and grid compliance equipment; temporary construction compound; CCTV; fencing; infrared lighting; access, drainage and landscaping works and associated development.	Grid Connection Corridor overlap with existing northern power grid easement and access.	Construction not yet begun, predicted 12-month construction phase.	Application approved.	No HRA provided. No objection from Natural England. Potential for in-combination effects in terms of loss of functionally linked habitat~~,~~ (operational phase), water quality, atmospheric pollution and visual / noise disturbance (all construction/decommissioning phases) on the following European sites: • Lower Derwent Valley SAC/SPA/Ramsar; • River Derwent SAC; and • Humber Estuary SAC/SPA/Ramsar.
22/02118/STPLFE	1.37km	Work on the commercial element is anticipated to be	~~Pending consideration.~~Application approved in 2024.	No geographic overlap with the Site, but off-site habitat borders with the Order limits.

Application reference, name and description	Approx. distance from Order limits	Construction programme	Status of project	Assessment[10]
Relief Road and Residential development at Land South Of Thorpe Hall Thorpe Road Howden Hybrid Planning Application comprising of: a) Full Planning Permission for the construction of a Relief Road from Thorpe Road to Station Road with drainage and landscaping, erection of an industrial unit (Use Class B2/B8 with associated parking, drainage, creation of a bund with fencing and landscaping; Continued use of the temporary construction access onto Thorpe Road (planning application 22/02029/STPLF) and b) Outline Permission for erection of a residential development (Use Class C3), community facilities including a supermarket, small retail units and small business/employment space (Use Class E), a medical centre (Use Class F2), public house and restaurant with accommodation (Use Class Sui Generis/C1), elderly care home accommodation (Use Class C2/C3), a two-form entry primary school (Use Class F1), community park, car parks, sports pitches and pavilion, open space, a habitat area, drainage and landscaping (All Matters Reserved		complete by October 2025. The residential aspect partially being delivered by 2025, with remaining land parcels being completed by the end of the Local Plan update period – some dwellings are even anticipated to not be built until 2039.		The Environmental Impact Assessment for the development indicates that "*Extensive Breeding Bird and Autumn, Winter & Spring Passage Bird Surveys have been undertaken at the Site by an experienced Ornithologist with Brooks Ecological. These surveys encompassed all land within the red line boundary and established a robust baseline for the Site in terms of its Bird Interest.* *This is summarised in the 'Baseline Information' section on Page 4 of this report, and these reports can be seen in full at Appendices 1 & 2.* *From these surveys, it was found that habitat within the site supported only one Humber Estuary SPA and Lower Derwent SPA qualifying species, Lapwing. However, there were few registrations of this species during the survey period, with records of Lapwing on site most likely a transient flock perhaps wintering on farmland locally, and*

Application reference, name and description	Approx. distance from Order limits	Construction programme	Status of project	Assessment[10]
				two pairs recorded in March and April most likely birds returning to breed on open arable fields. *It was ultimately concluded that there would be no significant impacts on any of the qualifying bird species associated with the Humber Estuary SPA or Lower Derwent SPA, and that the site cannot be considered to be supporting habitat to these SPA's.*" The report to inform the HRA concluded that, with appropriate mitigation in place (secured through suitably worded planning conditions), there will not be a significant effect on the habitats or species associated with the Humber Estuary SAC/SPA, Lower Derwent Valley SAC/SPA, River Derwent SAC, both alone or in-combination with other residential developments. However, the potential for residual in-combination effects regarding loss of functionally linked habitat~~,~~ (operational phase), water quality,

Application reference, name and description	Approx. distance from Order limits	Construction programme	Status of project	Assessment[10]
				atmospheric pollution (dust deposition) and visual/noise disturbance (all construction/decommissioning phases) is considered in relation to the following European sites: • Lower Derwent Valley SAC/SPA/Ramsar; • River Derwent SAC; and • Humber Estuary SAC/SPA/Ramsar.
22/30298/CONDET **Residential development at Land West Of Howden Parks** Submission of details required by Condition 14 (design measures to ensure internal noise levels specified are achieved) of planning permission 17/02265/STOUT | Land West Of Howden Parks Selby Road Howden East Riding Of Yorkshire.	0.96km	Under construction.	Application approved.	Relates to the submission of a Noise Impact Assessment to ensure internal habitable spaces are in accordance with building regulations in support of DC/17/02265/STOUT. No in-combination effects, due to the development already being under construction and the submission including good practice measures outlined by a Noise Impact Assessment.
20/01043/STPLFE **Poultry buildings at Old Rush Farm Spaldington Road** Erection of four poultry buildings with associated feed bins, concrete apron,	0.01km	Unknown.	Application approved.	No HRA provided. No objection from Natural England who stated (ref: 314089) *"Based on the plans submitted, Natural England considers that*

Application reference, name and description	Approx. distance from Order limits	Construction programme	Status of project	Assessment[10]
gate house, gas tanks, water tank, water treatment building and rainwater harvesting lagoon				*the proposed development will not have significant adverse impacts on designated sites and has no objection."* However, the potential for residual in-combination effects with the Scheme is considered in relation to noise/visual disturbance, water quality, atmospheric pollution (dust deposition; all construction/decommissioning phases) and loss of functionally linked habitat (operational phase) on the following European sites: • Lower Derwent Valley SAC/SPA/Ramsar; • River Derwent SAC; and • Humber Estuary SAC/SPA/Ramsar.
2020/0784/SCN **Solar Farm at and Land Off Camela Lane** EIA screening request for a proposed development of a ground mounted solar farm and associated infrastructure on land north and south of Camela Lane	0.76km	Unknown.	Pre-application EIA screening.	No HRA provided at the time of writing this report. Potential for in-combination effects due to loss of functionally linked habitat, (operational phase), noise/visual disturbance to SPA/Ramsar species, atmospheric pollution (dust

Application reference, name and description	Approx. distance from Order limits	Construction programme	Status of project	Assessment[10]
				deposition) and water quality~~.~~ (all construction/decommissioning phases) is considered in relation to the following European sites: • Lower Derwent Valley SAC/SPA/Ramsar; • River Derwent SAC; and • Humber Estuary SAC/SPA/Ramsar.
2022/0358/FULM **Horticultural Facility at Brigg Lane** Resubmission of planning application 2021/0120/FULM for the development of an existing horticultural facility for indoor farming and agri-tech, including the construction of 3 no. halls with associated process, service and administration buildings, landscaping, access improvements, an additional car park access and associated infrastructure following partial demolition of existing buildings.	0.94km	Unknown.	Application approved.	No HRA provided. Development involves existing structure therefore unlikely to result in in-combination effects.
2022/0107/NYSCO **Recovery of Ash at Drax Power Station**	0.7km	Unknown.	Pre-application EIA scoping.	No information available at the time of writing this report. There is the potential for in-combination effects with the Scheme regarding loss of functionally linked habitat

Application reference, name and description	Approx. distance from Order limits	Construction programme	Status of project	Assessment[10]
Request for EIA Scoping Opinion for the proposed additional recovery of ash resource				(operational phase) and noise/visual disturbance, atmospheric pollution (dust deposition) and water quality. ~~The development will need to be supported by its own HRA.~~ (construction/decommissioning phases) on the following European sites: • Lower Derwent Valley SAC/SPA/Ramsar; • River Derwent SAC; and • Humber Estuary SAC/SPA/Ramsar.
22/00037/STOUT OUTLINE - Erection of Units (Use Classes E(g)(iii), B2 and/or B8) and associated infrastructure including parking and landscaping following demolition of an existing dwelling (Access to be considered)	1.77km	Construction period could be over 10 years.	Application approved.	HRA concluded that no impact pathways were identified that could give rise to significant effects impacting either the Humber Estuary SAC/SPA/Ramsar site or the species which it supports, and an AA was not required. This was agreed by Natural England (ref: 397189) who states: *"Based on the plans submitted, Natural England considers that the proposed development will not have significant adverse*

Application reference, name and description	Approx. distance from Order limits	Construction programme	Status of project	Assessment[10]
				impacts on designated sites and has no objection." However, the potential for residual in-combination effects with the Scheme is considered in relation to noise/visual disturbance, water quality, atmospheric pollution (dust deposition; all construction/decommissioning phases) and loss of functionally linked habitat (operational phase) on the following European sites: • Lower Derwent Valley SAC/SPA/Ramsar; • River Derwent SAC; and • Humber Estuary SAC/SPA/Ramsar.
22/01005/PLF **Industrial units at Land East Of The Knoll Booth Ferry Road** Erection of two buildings to form three industrial units with ancillary external works including new yard area and access	0.5km	Unknown.	Application approved.	No HRA available. No objection from Natural England (ref: 392585) whose response states that they have no objections regarding impact on any statutory protected sites. However, the potential for residual in-combination effects with the Scheme is considered in relation to noise/visual

Application reference, name and description	Approx. distance from Order limits	Construction programme	Status of project	Assessment[10]
				disturbance, water quality, atmospheric pollution (dust deposition; all construction/decommissioning phases) and loss of functionally linked habitat (operational phase) on the following European sites: • Lower Derwent Valley SAC/SPA/Ramsar; • River Derwent SAC; and • Humber Estuary SAC/SPA/Ramsar.
HOW F (East Riding of Yorkshire Local Plan) Employment Allocation Land at Ozone Business Park 8.1ha	2.14km	Unknown.	Local plan allocation – appears to have been constructed from aerial	Local Plan will have its own HRA, although this is not available at the time of writing this report. Potential for in-combination effects with the Scheme regarding loss of functionally linked habitat~~,~~ (operational phase), water quality and noise/visual disturbance and atmospheric pollution (dust deposition; all construction/decommissioning phases) is considered in relation to the following European sites: • Lower Derwent Valley SAC/SPA/Ramsar;

Application reference, name and description	Approx. distance from Order limits	Construction programme	Status of project	Assessment[10]
				• River Derwent SAC; and • Humber Estuary SAC/SPA/Ramsar).
19/04161/STPLF **Holiday Park at Yoke Gate Farm Holme Road** Change of use of existing buildings and land to provide a holiday park, artisan workshops with associated retail, artisan bakery, delicatessen, boulangerie, offices, craft pods, workshop, café/ tearooms, farm shop, tackle shop display, exhibition and fishing lake including associated alterations to farmhouse and buildings, operational development, landscaping, vehicular access and drainage	0.9km	Approved in October 2020 so may be constructed already, although does not appear so from aerial imagery.	Application approved.	No HRA provided. Natural England response (ref: 304491) states *"…the application is not likely to result in significant impacts on statutory designated nature conservation sites or landscapes."* However, the potential for residual in-combination effects with the Scheme is considered in relation to noise/visual disturbance, water quality, atmospheric pollution (dust deposition; all construction/decommissioning phases) and loss of functionally linked habitat (operational phase) on the following European sites: • Lower Derwent Valley SAC/SPA/Ramsar; • River Derwent SAC; and • Humber Estuary SAC/SPA/Ramsar.

Application reference, name and description	Approx. distance from Order limits	Construction programme	Status of project	Assessment[10]
MJP45 (Joint Minerals and Waste Plan) **MJP45 Minerals Allocation** Extraction of clay.	2km	Approx. start date of 2026-2035.	Minerals allocation.	Will have been subject to its own HRA. However, the potential for residual in-combination effects with the Scheme is considered in relation to noise/visual disturbance, water quality, atmospheric pollution (dust deposition; all construction/decommissioning phases) and loss of functionally linked habitat (operational phase) on the following European sites: • Lower Derwent Valley SAC/SPA/Ramsar; • River Derwent SAC; and • Humber Estuary SAC/SPA/Ramsar.
HOW-G (East Riding of Yorkshire Local Plan Update) Between Station Road and Thorpe Road 1400 Dwellings, Employment, Retail, Community Uses and POS. Application brought forward under 22/02118/STPLFE (see previously in table).	0.17km	Unknown.	Local Plan allocation (emerging).	HRA provided. No objection from Natural England (ref 428331) due to mitigation being specified against impacts from recreational disturbance and historic and targeted bird survey data that rule out the use of land as Humber Estuary functionally linked habitat.

Application reference, name and description	Approx. distance from Order limits	Construction programme	Status of project	Assessment[10]
				However, the potential for residual in-combination effects with the Scheme is considered in relation to noise/visual disturbance, water quality, atmospheric pollution (dust deposition; all construction/decommissioning phases) and loss of functionally linked habitat (operational phase) on the following European sites: • Lower Derwent Valley SAC/SPA/Ramsar; • River Derwent SAC; and • Humber Estuary SAC/SPA/Ramsar.
HOW-A (East Riding of Yorkshire Local Plan Update) North of Shelford Avenue 653 residential dwellings.	1km	Unknown.	Local Plan allocation (emerging).	Local Plan will have its own HRA. Potential for in-combination effects with the Scheme regarding loss of functionally linked habitat~~,~~ (operational phase), water quality, noise/visual disturbance and atmospheric pollution (dust deposition~~)~~,; all construction/decommissioning phases) on the following European sites:

Application reference, name and description	Approx. distance from Order limits	Construction programme	Status of project	Assessment[10]
				• Lower Derwent Valley SAC/SPA/Ramsar; • River Derwent SAC; and • Humber Estuary SAC/SPA/Ramsar.
HOW-H (East Riding of Yorkshire Local Plan Update) North of Ozone Business Park 10.76ha employment use.	1.77km	Unknown.	Local Plan allocation (emerging).	Local Plan will have its own HRA. Potential for in-combination effects with the Scheme regarding loss of functionally linked habitat~~,~~ (operational phase), water quality, noise/visual disturbance and atmospheric pollution (dust deposition~~),~~; all construction/decommissioning phases) on the following European sites: • Lower Derwent Valley SAC/SPA/Ramsar; • River Derwent SAC; and • Humber Estuary SAC/SPA/Ramsar.
22/03606/CM **Anaerobic Digestion Plant at Spaldington Airfield** Installation of Oil Separation Unit, Oil Separation Storage Tank, Boiler, Battery Unit, Transformer, Motor Control Kiosk,	0.29km	Unknown.	~~Decision pending.~~Application approved in 2023.	HRA concluded that the proposals would have no adverse effect on the integrity of the Lower Derwent Valley SAC/SPA/Ramsar site or the Humber Estuary SPA/Ramsar

Application reference, name and description	Approx. distance from Order limits	Construction programme	Status of project	Assessment[10]
Liquified Natural Gas Tank and Compound and Pressure Reduction System within existing Anaerobic Digestion Plant facility.				site either alone or in-combination with other projects. Natural England have yet to provide a formal decision as they have requested further information about the composition of the natural gas (or biogas). However, the potential for residual in-combination effects with the Scheme is considered in relation to noise/visual disturbance, water quality, atmospheric pollution (dust deposition; all construction/decommissioning phases) and loss of functionally linked habitat (operational phase) on the following European sites: • Lower Derwent Valley SAC/SPA/Ramsar; • River Derwent SAC; and • Humber Estuary SAC/SPA/Ramsar.
22/03575/EIASCO **Warehousing at Land South East Of Boothferry Lodge** EIA Scoping Opinion - Warehousing and distribution with ancillary office	2.2km	Unknown.	Pre-application – EIA scoping.	No HRA provided at the time of writing this report. Natural England have flagged the following potential impact pathways:

Application reference, name and description	Approx. distance from Order limits	Construction programme	Status of project	Assessment[10]
accommodation; ground remodelling, access, parking, drainage, landscaping and associated works.				loss of functionally linked habitat; changes in water quality and supply; and changes in air quality. Potential for in-combination effects with the Scheme regarding loss of functionally linked habitat~~,~~ (operational phase), water quality, noise/visual disturbance and atmospheric pollution (dust deposition~~),~~; all construction/decommissioning phases) on the following European sites: • Lower Derwent Valley SAC/SPA/Ramsar; • River Derwent SAC; and • Humber Estuary SAC/SPA/Ramsar.
2022/1257/FULM **Battery Energy Storage System at Home Farm Barlow Road** Erection of battery energy storage system and associated external works.	2.9km	Unknown.	Decided – refused. ~~Potential for appeal~~Resubmitted in 2023 under application reference ZG2023/0720/FULM and pending decision.	No HRA provided at the time of writing this report. Potential for loss of functionally linked habitat~~,~~ (operational phase), noise / visual disturbance, water quality and atmospheric pollution (dust deposition; all construction/decommissioning phases) in-combination with the

Application reference, name and description	Approx. distance from Order limits	Construction programme	Status of project	Assessment[10]
				Scheme is considered in relation to the following European sites: • Lower Derwent Valley SAC/SPA/Ramsar; • River Derwent SAC; and • Humber Estuary SAC/SPA/Ramsar.
2021/0788/EIA **Solar Farm at Land North And South Of Camela Lane** Development of a ground-mounted solar farm including associated infrastructure.	0.65km	Unknown.	Application approved.	The HRA for this planning application could not be located. Wintering bird surveys have been carried out and did not reveal SPA/Ramsar species to be utilising the area. However, the potential for residual in-combination effects with the Scheme is considered in relation to noise/visual disturbance, water quality, atmospheric pollution (dust deposition; all construction/decommissioning phases) and loss of functionally linked habitat (operational phase) on the following European sites: • Lower Derwent Valley SAC/SPA/Ramsar; • River Derwent SAC; and

Application reference, name and description	Approx. distance from Order limits	Construction programme	Status of project	Assessment[10]
				• Humber Estuary SAC/SPA/Ramsar.
2022/0358/FULM **Horticultural Facility at Brigg Lane** Resubmission of planning application 2021/0120/FULM for the development of an existing horticultural facility for indoor farming and agri-tech, including the construction of 3 no. halls with associated process, service and administration buildings, landscaping, access improvements, an additional car park access and associated infrastructure following partial demolition of existing buildings.	0.83km	Unknown.	Application approved.	No objection from Natural England (ref: 389204) who stated: "*Based on the plans submitted, Natural England considers that the proposed development will not have significant adverse impacts on statutorily protected nature conservation sites or landscapes.*" However, the potential for residual in-combination effects with the Scheme is considered in relation to noise/visual disturbance, water quality, atmospheric pollution (dust deposition; all construction/decommissioning phases) and loss of functionally linked habitat (operational phase) on the following European sites: • Lower Derwent Valley SAC/SPA/Ramsar; • River Derwent SAC; and • Humber Estuary SAC/SPA/Ramsar.

Application reference, name and description	Approx. distance from Order limits	Construction programme	Status of project	Assessment[10]
2018/1122/REMM **Residential development at Morello Garth Park Lane** Reserved matters application including appearance, landscaping, layout and scale of approval 2015/0775/OUT Outline planning permission for residential development including access (all other matters reserved for future consideration).	2.3km	Unknown	Application approved.	No HRA provided. Natural England had no comments to make on the application (ref: 260743), stating: *"The lack of comment from Natural England does not imply that there are no impacts on the natural environment, but only that the application is not likely to result in significant impacts on statutory designated nature conservation sites or landscapes."* However, the potential for residual in-combination effects with the Scheme is considered in relation to noise/visual disturbance, water quality, atmospheric pollution (dust deposition; all construction/decommissioning phases) and loss of functionally linked habitat (operational phase) on the following European sites: • Lower Derwent Valley SAC/SPA/Ramsar; • River Derwent SAC; and

Application reference, name and description	Approx. distance from Order limits	Construction programme	Status of project	Assessment[10]
				• Humber Estuary SAC/SPA/Ramsar.
2019/0345/FULM **Employment Use development at Land Adjacent To A63 And East Common** Application for proposed B1, B2 and B8 employment use, landscaping works, car parking and vehicular, pedestrian circulation and other associated works at Access 63 Business Park, Selby.	5km	Unknown.	Application approved.	No HRA provided. Preliminary Ecological Appraisal (document ref: SF 2857) concluded *"No designated nature conservation sites are anticipated to be adversely impacted as a result of the proposed development."* However, the potential for residual in-combination effects with the Scheme is considered in relation to noise/visual disturbance, water quality, atmospheric pollution (dust deposition; all construction/decommissioning phases) and loss of functionally linked habitat (operational phase) on the following European sites: • Lower Derwent Valley SAC/SPA/Ramsar; • River Derwent SAC; and • Humber Estuary SAC/SPA/Ramsar.

Application reference, name and description	Approx. distance from Order limits	Construction programme	Status of project	Assessment[10]
2023/0128/EIA **Solar Farm at Land South Of A645** Development of a ground-mounted solar farm including associated infrastructure	0.56km	Unknown.	~~Decision pending.~~Application approved in 2024.	While the HRA for this planning application could not be located, Natural England have made no objection (ref 425552), stating: *"Based on the plans submitted, Natural England considers that the proposed development will not have a likely significant effect on the Humber Estuary Special Protection Area (SPA), Special Area of Conservation (SAC), Ramsar and Site of Special Scientific Interest (SSSI) and has no objection."* However, the potential for residual in-combination effects with the Scheme is considered in relation to noise/visual disturbance, water quality, atmospheric pollution (dust deposition; all construction/decommissioning phases) and loss of functionally linked habitat (operational phase) on the following European sites: • Lower Derwent Valley SAC/SPA/Ramsar; • River Derwent SAC; and

Application reference, name and description	Approx. distance from Order limits	Construction programme	Status of project	Assessment[10]
				• Humber Estuary SAC/SPA/Ramsar.
2021/1089/FULM **Battery Storage Facility at Land Off Hales Lane** Development of a battery storage facility, associated infrastructure, access and grid connection	0.05km	Unknown.	Application approved.	No HRA provided. Ecological Assessment concluded no likely significant effects on the River Derwent SAC or any potential adverse effects on any other statutory site. However, the potential for residual in-combination effects with the Scheme is considered in relation to noise/visual disturbance, water quality, atmospheric pollution (dust deposition; all construction/decommissioning phases) and loss of functionally linked habitat (operational phase) on the following European sites: • Lower Derwent Valley SAC/SPA/Ramsar; • River Derwent SAC; and • Humber Estuary SAC/SPA/Ramsar.

8. Appropriate Assessment

8.1 Noise and Visual Disturbance – Construction and Decommissioning Phases

Lower Derwent Valley SPA/Ramsar and Humber Estuary SPA/Ramsar

Noise Disturbance

8.1.1 Chapter 6 of this HRA identifies that LSEs of the Scheme on qualifying SPA/Ramsar birds utilising functionally linked habitats adjoining the Order limits regarding construction and decommissioning noise and visual disturbance could not be excluded. For example, the Scheme will encompass a wide range of construction activities for site preparation, solar PV facility construction and cable installation, each of which will generate different levels of noise at source depending on the precise methodology and equipment used. For example, the installation of the solar PV panels will comprise the piling and erection of solar PV frames, mounting of solar PV panels by hand and trenching/installation of electric cabling. Similarly, decommissioning activities (e.g., removal of all hard standing and reinstatement of the soil profile) will also require the use of plant and/or machinery associated with their own noise profile.

8.1.2 According to the construction programme available for the ES, activities will be carried out in a sequential manner over a period of 24 months, with teams responsible for a specific type of works moving from one Solar PV Area to the next upon completion. Therefore, during the construction and decommissioning phases, multiple areas of the Site are likely to be under construction or decommissioning at any given time, resulting in a complex mosaic of activities.

8.1.3 Piling is among the construction techniques to be used within the Site, an activity that is associated with some of the highest disturbance impact potential to waterbirds. ~~According to research undertaken by the Institute of Estuarine and Coastal Studies (Ref. 25), it is expected that even the most disturbing construction noise levels will likely have fallen to non-disturbing levels by 200m from the source.~~ Any noise disturbance is likely to occur in conjunction with visual disturbance, such as arising from the presence of the workforce or heavy machinery within a field. ~~Research indicates that visual stimuli trigger behavioural responses in birds up to 300m from source (Ref. 25).~~ The existing evidence clearly indicates that areas of agricultural land adjoining the Site could be temporarily subject to visual disturbance or construction noise levels of 70dB or above due to construction and/or decommissioning activities associated with the Scheme. However, the potential exceedance of the noise disturbance threshold does not necessarily mean that material disturbance will occur, especially if high pre-construction noise levels are present (such as due to ongoing farming works or road traffic). Therefore, predicted noise modelling data are placed in the context of measured noise baselines for adequate context.

8.1.4 During the PEI Report stage, daytime, evening and night-time baseline noise monitoring was undertaken at 16 locations within and adjoining the Order limits. Typical ambient ($L_{Aeq, 1h}$) and background ($L_{A90, 1h}$) arithmetic averaged sound levels were calculated for all locations. ~~The baseline data indicate that noise levels at all monitoring locations were significantly lower than the commonly accepted disturbance threshold of 70dB (as identified in Ref. 25)~~ The lowest ambient noise level was calculated at location N6 near the centre of the Site at Old Hall Farm (41dB), whereas the highest record was found at location N10 on the eastern edge of the Order limits along the A614 (58dB). During the surveys, the dominant noise source at most monitoring locations was road traffic, train movements (locations N11 and N12 only), Drax Power Station, local wind farms and agricultural farming activities. Despite some variation in the degree of baseline noise across the Site, it is important to note that the existing noise disturbance in the wider area is relatively low, particularly when compared to highly urbanised or industrialised conurbations.

8.1.5 Three Noise Generating Activities (NGAs) were assessed, including NGA1 (construction of the Grid Connection Substations, Field Station Units and ground-mounted solar PV panel arrays), NGA2 (cable installation – general works at the Grid Connection Corridor and the Interconnecting Cable Corridor) and NGA3 (cable installation – HDD activities at the Grid Connection Corridor and Interconnecting Cable Corridor). Due to their specific characteristics, different types of noise are associated with different disturbance potentials. L_{Amax} is reflective of irregular noise spikes arising from construction activities, which stand out more against the background soundscape experienced by birds than time-averaged L_{Aeq}. The loudest activity carried out within each NGA was considered as a worst-case noise impact scenario. Tracked excavators are associated with the highest sound pressure level at source (i.e., L_{Amax} of 89dB at 10m from the NGA) and will be required for NGA1 and NGA3. Similar noise levels are likely to be associated with the decommissioning phase of the Scheme.

8.1.6 To estimate the extent of functionally linked habitat potentially subjected to temporary noise disturbance, noise contours were modelled for NGA1 and NGA2. In consultation over an earlier draft of this HRA, Natural England agreed that there is little observable effect on birds from L_{Amax} noise below 55dB~~.~~, regardless of the difference to the pre-construction baseline noise level. Since L_{Aeq} is always lower than the L_{Amax}, 55dB L_{Amax} was used as the noise threshold to determine the extent of functionally linked habitat potentially subjected to significant temporary disturbance from construction works. Due to the similar decay of noise with distance outward from the Order limits, only data for NGA1 are discussed here as a representative example. Noise contours for L_{Aeq} (time-averaged noise) and L_{Amax} (maximum noise levels) are presented in ~~**Figure 6**~~**Figure 6** and **Figure 7** respectively (**Appendix A**). Baseline noise measurements were not available for ecological receptor locations (and would not be particularly meaningful, given the high mobility of SPA/Ramsar birds~~)~~).

8.1.7 ~~**Figure 6**~~**Figure 6** indicates that there is some variability in the decay of L_{Aeq} noise levels across the Scheme, predominantly due to the precise location where different construction plant were modelled, overlaps in contours between different sections of the Scheme and topography. Generally, where

large arable fields (the fields most likely to be selected by golden plover and geese) adjoin the Order limits, L_{Aeq} is predicted to fall to non-disturbing levels (i.e. 55dB or below) by approximately 400-500m from the Order limits. Disturbing noise levels in most instances do not extend beyond the first row of arable fields surrounding the Order limits, as shown by the noise contours surrounding Solar PV Areas 1a, 1b, 1e, 1f, 2a, 2b, 2c, 2d, 3b and 3c. This clearly indicates that, while temporary noise disturbance due to construction works is likely, the geographic extent of disturbance will be limited.

8.1.8 In several areas of the Scheme, disturbing L_{Aeq} noise levels will extend beyond 500m from the Order limits and/or the first line of arable fields. Examples of this occur in the central area of the Scheme where noise contours from different Solar PV Areas (e.g., Solar PV Areas 1c, 1d, 1e, 1f, 2b and 2e) overlap, and on arable fields to the west of Solar PV Areas 2e, 2f and 2g. However, it is considered that the increased scale of noise disturbance in these areas is immaterial for the following reasons:

a. Where arable fields in the second or third distance tiers from the Order limits are predicted to be subject to potentially disturbing noise levels, these are generally small fields, bounded by hedgerows, and therefore less likely to be visited by golden plover/geese (particularly in significant numbers) than larger fields. For example, a typical size for the smaller arable fields likely to be affected by noise is approximately 7ha, compared to the approximate 16ha and 17.5ha sizes of fields in which pink-footed goose and golden plover were recorded in the non-breeding bird survey;

b. In addition to their relatively small size, many of the relevant fields (particularly in the centre of the Scheme) lie in proximity to housing, adding an additional disturbance element; and

c. In the central part of the Scheme where the extent of potentially disturbed area is greatest (both in terms of distance from the Order limits and the number of rows of fields affected), construction within the different Solar PV Areas will be undertaken sequentially, such that simultaneous works in multiple Solar PV Areas are very unlikely. Therefore, the geographic extent of the 55dB contour adjoining this part of the Scheme will in practice be considerably smaller than shown.

8.1.9 A representative location for L_{Amax} noise levels arising from NGA1 was modelled at the border between Solar PV Area 1e and the Ecology Mitigation ~~Zone~~Area (**Figure 7**, in **Appendix A**). Similar decays in L_{Amax} noise levels would occur at other locations along the Order limits. The plot indicates that a non-disturbing noise level of 55dB L_{Amax} would be reached by approx. 120m from the Order limits. As was discussed in relation to L_{Aeq} noise, this implies that L_{Amax} disturbance would generally not extend beyond the first-tier fields, except where these fields are small which would make them less suitable to golden plover and pink-footed goose in any event. It is important to consider that potential noise effects do not operate in isolation. Visual stimuli may override noise impacts as incoming birds spot construction staff/plant working near the edge of the Order limits (see following section on visual disturbance).

~~8.1.10 Importantly, when using a different disturbance threshold, non-disturbing noise levels are attained considerably closer to the Order limits. For~~

~~example, the frequently accepted noise tolerance threshold of 69dB would be reached by 100m or less from the Order limits (both in terms of L_{Aeq} and L_{Amax}), with land beyond that distance falling below that threshold.~~

~~8.1.11~~8.1.10 In addition to L_{Aeq} and L_{Amax}, the character of the sound is relevant to whether it is likely to be disturbing. In this report it has been established that the most frequently and widely used construction plant with the highest noise at source will be the excavators. In character, these are very similar to the mechanised plant that farmers use routinely on the fields during ploughing, sowing, spraying and harvesting operations.

Visual Disturbance

~~8.1.12~~8.1.11 Waders and waterfowl, including the qualifying species in the Lower Derwent Valley SPA/Ramsar and Humber Estuary SPA/Ramsar, have varying degrees of sensitivity to visual disturbance from human activities. Various parameters are used to measure disturbance responses, with Flight Initiation Distance (FID) being the most important one. This is defined as the distance at which a bird or group of birds starts to escape (such as by walking, swimming or flying away) when approached by a disturbance agent. The FID is meaningful because it reflects the trade-off between costs of escape (energetic cost of flight and the temporary loss of calorific intake) and the inferred risk of being predated upon.

~~8.1.13~~8.1.12 A recent NatureScot Research Report undertook a literature review of disturbance distances for selected bird species and recommended buffer zones for visual disturbance (Ref. 52). This report includes FIDs for two of the species likely to be encountered within the Site, namely golden plover and pink-footed goose. Several FIDs for golden plover were recorded in the non-breeding season, ranging from 281m on mudflats in Scotland to a maximum of 450m on mudflats in Denmark. Overall, golden plover were assigned a visual disturbance sensitivity rating of Medium and a non-breeding buffer zone of 200-500m.

~~8.1.14~~8.1.13 Pink-footed goose disturbance FIDs of 350 to 500m were obtained in a hunting study in a nearshore habitat in Denmark (based on a total of 600 observations). Anecdotally, the report also indicates that geese foraging in arable farmland were highly responsive to disturbance from surrounding roads, with a change in flow of more than 20 cars per day displacing geese at 500m distance. Overall, this species was given a visual disturbance sensitivity rating of High and a recommended non-breeding buffer zone of 500-1,000m. It should be noted that many of the reported studies were in estuarine and intertidal environments where sensitivity might be expected to be greater, rather than inland fields used for agriculture.

~~8.1.15~~8.1.14 Clearly, different noise and visual disturbance elements are likely to operate on bird receptors simultaneously, whereby it is likely that visual override aural stimuli. While construction noise is likely to have fallen to non-disturbing levels by 200m from source, visual stimuli will likely exert impacts up to 500m from source. It is also noted that most species would notice the presence of construction machinery/personnel on approach to arable fields adjoining the Scheme. Therefore, it is probable that most individuals would avoid foraging in arable fields immediately adjacent to the Order limits, instead opting to forage in agricultural parcels that are clearly visually buffered from the construction works. This is similar to the routine

displacement that will occur when fields are being tilled or otherwise mechanically worked by the farmer, with birds likely relocating to other fields. This is why the key factor in ensuring no adverse effect on the integrity of SPAs through loss of functionally linked farmland is less about the maintenance of individual fields and more about ensuring that a sufficient proportion of farmland within the core foraging ranges of target species is suitable in any given season.

Conclusion

8.1.15 Surveys for the Scheme have confirmed the opportunistic nature of bird use of the fields in this landscape. This indicates that the birds are not particularly wedded to specific fields but rather use fields throughout the large functionally-linked land zone around the SPAs as and when they are available and suitable, moving to other fields if a given field is unsuitable at a particular time.

8.1.16 Inevitably, there will be some temporary noise and visual disturbance to SPA/Ramsar birds, particularly in the first tier of fields adjoining the Order limits. However, the potential noise and visual disturbance arising from the Scheme needs consideration in the context of wider farming operations in the active farming landscape of East Yorkshire. Tractors and other agricultural machinery, with similar noise levels than tracked excavators (the noisiest type of plant used in the construction period), will be frequently used as part of routine farming operations in arable plots adjoining the Site. (e.g. ploughing, fertilising, spraying and harvesting). Individual fields in a landscape also go temporarily out of suitability (e.g. being put fallow, or having their crop changed) as part of routine farming use of the landscape. This implies that sound levels may, at any time, increase beyond the 55dB threshold above which disturbance may (though not necessarily will) occur, as discussed above. In practice, elevated noise levels in sub-sections of adjacent fields are considered to be part of the 'normal' baseline soundscape associated with the existing agricultural use. The fields in which cable installation or adjacent to which PV construction will occur would be subject to comparable disturbance through normal farming operations in adjacent land.

~~8.1.16~~8.1.17 During times of elevated noise exposure, qualifying birds are likely to move to less disturbed parts of affected fields or different fields. Furthermore, qualifying birds that have historically been using particularly disturbed areas or fields, **may** be habituated to higher noise levels and have significantly higher tolerance thresholds.

~~8.1.17~~8.1.18 It should also be noted that only a very small proportion of the overall arable foraging resources surrounding the Lower Derwent Valley SPA/Ramsar and Humber Estuary SPA/Ramsar will be affected by elevated noise levels at any one time. Moreover, the data reported in this section are worst-case because they reflect the occasions when works will be undertaken at the edge of the Order limits. In practice only a small fraction of the overall construction/decommissioning works would be undertaken close to the Order limits, with any works carried out towards the centre of the Scheme having little disturbance potential for functionally linked habitats outside the Order limits. All NGAs carried out for the Scheme would be temporary, with works in a given area typically to be completed in a matter of

weeks. As such, much of the construction will occur during the summer/autumn when pink footed goose and golden plover are generally absent.

8.1.19 Moreover, the opportunistic use of these fields surrounding the PV area indicates that it would be difficult to identity where acoustic fencing (for example) would need to be located as the birds are only present on some occasions and absent on others, and this is not predictable.

~~8.1.18~~8.1.20 Furthermore, mitigation habitat for golden plover and pink-footed goose will be in place prior to the start of construction works (see AA of functionally linked habitat loss further below). As construction commences, this mitigation habitat will be adding to the foraging value of the local agricultural landscape and provide additional foraging opportunities for any birds that are temporarily displaced from around the Order limits. Moreover, construction works in the parts of the Scheme closest to the Ecology Mitigation Area (i.e. Solar PV Area 1e) will be undertaken first to minimise disturbance and maximise its functionality as a refuge, as specified within the **Framework Landscape and Ecological Management Plan [EN010143/APP/7.14]**.

~~8.1.19~~8.1.21 Overall, therefore, it is concluded that the Scheme will not result in adverse effects on the integrity of the Lower Derwent Valley SPA/Ramsar and Humber Estuary SPA/Ramsar regarding noise and visual disturbance in functionally linked habitats~~.~~ and that no specific mitigation is required. A sufficiently large extent of farmland in the general area will remain undisturbed.

Lower Derwent Valley SAC and River Derwent SAC

~~8.1.20~~8.1.22 As concluded in Chapter 6 of this report, LSEs of the Scheme on otter that form part of the qualifying populations of the Lower Derwent Valley SAC and River Derwent SAC (i.e., qualifying otter) cannot be excluded. Otter, particularly males, have extensive home ranges and can travel tens of km beyond designated site boundaries. Generally, they will forage on fish and crustaceans within linear watercourses and travel, rest or breed along riverbanks. The Scheme crosses the River Derwent SAC and lies 1.3km from the Lower Derwent Valley SAC, and it is assumed that qualifying otter may regularly use the water column, bankside tracks, couches and holts of or alongside waterbodies within the boundary of the Site. Any watercourse within the Site has the potential to be functionally linked to the Lower Derwent Valley SAC and River Derwent SAC regarding roaming otter. The Grid Connection Corridor runs alongside the River Derwent SAC and crosses the River Derwent and River Ouse via HDD. Potential noise and visual disturbance arising from the construction and decommissioning phases of the Scheme must, therefore, be assessed further.

~~8.1.21~~8.1.23 Otter are likely to be most prevalent along the corridors of the River Derwent and River Ouse, although they may also be present along the streams and drainage ditches permeating the Solar PV Areas of the Scheme. To establish the presence of otter along the main river corridors potentially impacted by the Scheme, a Phase 1 otter survey was undertaken in March and April 2023 at two sections of the Rivers Derwent and Ouse, where the Grid Connection Corridor would traverse the respective watercourses by means of HDD. The target survey area along the River

Derwent was immediately north of the A63, adjoining Loftsome Bridge. The second survey area followed the River Derwent to its confluence with the River Ouse at Barmby on the Marsh.

8.1.24 Field signs of otter were recorded at 17 locations along the River Derwent and eight locations along the River Ouse, all of which were spraints, slides and prints. A single lay-up resting place (also known as a 'couch') was recorded along a large unnamed ditch (DE53) north of the River Derwent just outside the Order limits. ~~The~~Other drainage ditches and streams in proximity to the River Derwent SAC that are traversed by the Grid Connection Corridor (e.g., DE03, DE52, OU13, OU20 and OU24) were identified as potentially suitable for dispersal only and not for foraging and/or resting. Moreover, there was no actual evidence for otter presence. The crossing works will also be of very short duration (completed within several days). Given this, there is no requirement for mitigation measures in the form of considering noise barriers at HDD crossings DE03, DE52, OU13, OU20 and OU24.

~~8.1.22~~8.1.25 Importantly, the surveys did not detect any holts within the Survey Area, the otter features that are most sensitive to noise and visual disturbance. Surveys of the linear streams and ditches within the Solar PV Areas yielded no signs of otter. Many of these ditches are ephemeral and typically isolated from suitable watercourses (e.g., River Foulness) with no adequate foraging opportunities. Therefore, habitats in the Solar PV Areas are considered low quality regarding otter and there is thus no material risk of construction/decommissioning disturbance to otter in this part of the Site.

~~8.1.23~~8.1.26 It is to be noted that there are existing factors that must be considered in evaluating the noise and visual disturbance potential associated with the Scheme. There is existing disturbance to qualifying otter from visitors using the bank top footpaths for recreational activities, such as walking and dog walking. The riverbank itself and other habitat features (e.g., hedges) are likely to provide a degree of natural noise attenuation. Furthermore, the cable works will be restricted to daytime, meaning that otter, which are predominantly nocturnal, are unlikely to be travelling along the rivers. Notwithstanding, ~~to minimise otter disturbance~~as stated in the ~~construction and decommissioning phases,~~**Framework CEMP [EN010143/APP/7.7],** a minimum standoff of 30m between all works areas (including HDD pits and cable-laying routes) and the top of banks of Rivers Derwent and Ouse will be implemented. This will include the HDD crossing of drainage ditch DE53 near which an otter couch was recorded, ensuring that this habitat feature will be adequately protected from disturbance. Maintaining an adequate buffer distance between construction works and riverbanks and ensuring the HDD is undertaken over a short time period (completed within several days) will minimise construction/decommissioning noise disturbance to otter. Additionally, otter-proof fencing, trench covers and escape routes will be utilised where necessary to help exclude otter from works areas with the highest potential for disturbance and injury, while maintaining habitat permeability for roaming otter.

~~8.1.24~~8.1.27 Regarding specific construction activities undertaken for the Scheme, three HDD crossings have been identified as being associated with the highest disturbance potential for otter. The HDD launch and receiving pits will be a minimum of 30m from the Rivers Derwent and Ouse respectively. Noise

contours, including both L_{Aeq} and L_{Amax}, were modelled outward from the HDD launch pits to establish the distances at which construction noise would have dropped to lower than disturbing levels.

~~8.1.25~~8.1.28 A metric that is commonly used for the assessment of noise impacts in animals is that of 'decibels above the hearing threshold' (dB_{ht}). This is species-specific, requiring knowledge of the hearing threshold of the species in question, and has been most widely investigated for marine fish species, although more data are becoming available on freshwater fish and terrestrial species.

~~8.1.26~~8.1.29 There is no available research into the hearing thresholds of the European otter. However, research undertaken into the North American otter enabled a probable hearing threshold for the European otter to be determined by Bureau Veritas (Ref. 53). Otters have very acute high frequency hearing sensitivity (16 kilohertz [kHz]) but much poorer hearing sensitivity than humans at frequencies below 4kHz. This is likely to be the reason why they utilise 'noisy' environments, such as roads, industrial buildings, quarries and other sites impacted by anthropogenic activities (Ref. 54). Overall, otters appear to be flexible in their habitat usage and do not avoid areas impacted by human disturbance.

~~8.1.27~~8.1.30 Bureau Veritas identified that a sound pressure level below 50 dB_{ht} (*Lutra lutra*) would probably result in a low likelihood of disturbance for otters as it does for humans and many marine species (Ref. 53). Furthermore, the report established that most construction activities involving ground penetration or noise would not result in disturbance (i.e., noise levels above 50 dB_{ht} impacting on European otter) if undertaken over 30m from a watercourse. However, other types of construction activities (e.g., piling) may disturb up to 80m from source. Therefore, as a precautionary approach, highly disturbing construction noise (e.g., from driven/impact piling) is assumed to impact up to 100m from where it is carried out.

~~8.1.28~~8.1.31 Any noise assessment should relate overall noise levels generated to the duration and frequency of occurrence and the pre-construction noise baseline. Exceedance of the dB_{ht} threshold does not necessarily mean an adverse ecological impact will occur. Provided that the otter population in a particular catchment is stable, it can reasonably be concluded that a level of noise that does not (or only marginally) exceeds the existing pre-construction background noise level is unlikely to negatively impact otters, even if it does exceed the $50dB_{ht}$. Given that otter are nocturnal animals and only very limited works will be undertaken outside daylight hours (e.g., occasional evening works in winter and HDD), visual disturbance is unlikely to be an issue for this species.

~~8.1.29~~8.1.32 Irish guidelines (Ref. 55) for site works in the vicinity of active otter holts stipulate that no works should be undertaken within 150m of such breeding sites. However, works may be undertaken closer to breeding holts provided that active mitigation measures are in place, such as restricted working hours and visual/noise screening. There is no formal guidance on the accepted construction noise levels at otter couches or holts. Otter have a similar hearing capacity to that of humans, but there are no known noise disturbance thresholds that are proven to lead to adverse ecological impacts on this species.

~~8.1.30~~8.1.33 Noise disturbance from construction works is likely to pose the highest risks where these are carried out close to major watercourses. Two HDD locations were identified for noise modelling due to their proximity to habitats used by otter, including HDD Location 1 (crossing the River Derwent, west of Station Road to the south of Wressle) and HDD Location 2 (crossing drain DE53 to the north of the River Derwent near Barmby on the Marsh). Input data were based on time-averaged L_{Aeq} HDD noise, adding ~~5 dB~~5dB to give an L_{Amax} based on professional judgment. All noise levels were modelled for 1.~~5 m~~5m above ground. To reflect a realistic scenario, the noise models also included ground height data to account for noise attenuation arising from environmental features (e.g., river banks).

~~8.1.31~~8.1.34 At HDD Location 1, approximately 450m of bankside habitat to the west of the River Derwent would be subject to L_{Amax} noise levels between 60 and ~~65 dB~~65dB (**Figure 8**, in **Appendix A**). At HDD Location 2, approximately ~~150 m~~150m of bankside habitat would be subject to L_{Amax} noise levels above ~~70 dB~~70dB (**Figure 9**, in **Appendix A**). At the recorded otter couch along DE53 adjoining the Order limits, the forecast L_{Amax} noise level is 65 to ~~70 dB~~70dB. Overall, the noise level due to the HDD works is expected to be well above the pre-construction baseline noise at both modelling locations. However, even at source, the forecast L_{Amax} noise level arising from the HDD operations (over ~~85 dB~~85dB) lies in the range of sound levels recorded for highly urbanised areas, where otter are frequently observed. For example, research indicates that average street-level noise in a highly urbanised setting is 73.~~4 dB~~4dB, with substantial spatial variation between 55.8 to ~~95 dB~~95dB (Ref. 56). The forecast noise levels for HDD, therefore, lie within the observed noise tolerance range for otter. Furthermore, HDD operations will be temporary, with drilling operations typically proceeding at 100m per day and, therefore, the river/ditch crossings anticipated to be completed within several days.

~~8.1.32~~8.1.35 Notwithstanding this, the foraging otter associated with the River Derwent SAC and Lower Derwent Valley SAC are habituated to lower rural noise background levels. Furthermore, as identified above, noisy construction techniques can lead to disturbance up to ~~100 m~~100m from works, particularly at sensitive locations (e.g., couches and holts). While such features were not recorded within the Order limits, otter may utilise new couches at any time. Therefore, to minimise any potential for noise disturbance, noise fencing will be utilised surrounding the HDD entry points, which will attenuate noise levels by approximately ~~10 dB~~10dB. This is particularly important because HDD may be undertaken at night for operational and safety reasons, when otter show peak activity.

~~8.1.33~~8.1.36 ~~Construction~~Given that otter are nocturnal animals and only very limited works will be undertaken outside daylight hours (e.g., HDD as set out in Section 2.3 of the **Framework CEMP** [**EN010143/APP/7.7**]), visual disturbance is unlikely to be an issue for this species. However, construction and decommissioning works could be associated with visual disturbance potential where lighting is used. Generally, the lighting requirements of the Scheme will be minimal as works will be limited to daylight hours. Exceptions to this are the HDD crossings and early morning/late evening lighting requirements at temporary compounds in winter. As described above in relation to noise disturbance, it should also be noted that there will be a

minimum stand-off distance of 30m between any lighting installations and the top of riverbanks.

~~8.1.34~~8.1.37 Any lighting required in the construction and decommissioning phases of the Scheme will be directional to minimise the potential for light spillage onto sensitive habitats and associated species (including otter). The measures to be implemented for minimising visual disturbance are secured in the **Framework CEMP [EN010143/APP/7.7]** and include the following:

a. Minimum brightness/power rating to perform the required function;

b. Light fittings that reduce light spillage above the horizontal axis;

c. Direction of light to avoid light spillage on nearby watercourses; and

d. Passive Infra-Red (PIR) controlled lights (motion sensors) will be deployed except where task-specific lighting is required.

~~8.1.35~~8.1.38 The AA considered potential noise and visual disturbance on qualifying otter in the Lower Derwent Valley SAC and River Derwent SAC in the construction and decommissioning phases of the Scheme. In addition to the minimum distance of ~~30 m~~30m to be adhered to between all works areas (including the cable routing and HDD launch pits) and the top of riverbanks, noise fencing around the HDD locations will be deployed to minimise any potential noise disturbance impacts to otter. The piling required for the construction of the Main Substation lies further than ~~100 m~~100m from any waterbody likely to be used by commuting otter. Furthermore, given that the majority of works will be restricted to daytime hours, motion sensors will be used where possible and task-specific lighting would encompass directional controls, visual disturbance impacts on otter are not considered likely to arise based on professional judgment. Overall, given that noise fencing will be utilised at HDD locations, there will be no adverse effects on the integrity of the Lower Derwent Valley SAC and River Derwent SAC from the Scheme regarding noise and visual disturbance to otter.

In-Combination Assessment

~~8.1.36~~8.1.39 All development proposals have their own impact potential regarding noise and visual disturbance to qualifying birds and/or otter. Provided that they lie within the 300m ~~(the~~ precautionary screening distance for disturbance effects~~)~~ from the Lower Derwent Valley SPA/Ramsar, Humber Estuary SPA/Ramsar or habitats that are functionally linked to these sites, there is a potential for ~~cumulative~~in-combination disturbance impacts with the Scheme on the same qualifying ~~animal~~bird populations. Disturbance impacts from multiple developments have the potential to exacerbate deleterious effects, such as by rendering larger areas of functionally linked habitat temporarily unsuitable.

~~8.1.37~~8.1.40 There are several NSIPs that overlap with the Grid Connection Corridor of the Scheme that are approved, at the pre-application stage, or currently undergoing DCO submission. Construction works for other developments have the potential for in-combination visual and noise disturbance impacts, where they are undertaken at the same time as those for the Scheme. Construction of the Grid Connection Corridor is anticipated to commence in 2025 at the earliest and last approximately 12 months. Based on the ~~cumulative~~ projects list presented in **Table 10**, the following developments

would have the potential for ~~cumulative~~in-combination visual and noise disturbance impacts (based on geographic and temporal overlap):

a. Helios Renewable Energy Project (construction anticipated for 2025);
b. SEGL 2 (installation start date predicted for 2024, but with the potential to stretch into 2025);
c. Drax Carbon Capture (construction to take place between 2022 and 2027);
d. Humber Low Carbon Pipelines (DCO grant and commencement of works expected for 2025);
e. Drax Re-power (construction works on unit 2 expected to span between 2024 and 2027); and
f. Lakeside Energy Storage (planning consent granted, but the 12-month construction phase has not started).

8.1.41 It is noted that the construction works in the Grid Connection Corridor of the Scheme and the overlapping NSIPs, particularly the Helios Renewable Energy Project, primarily relate to the temporary burial of cables and/or pipelines. The burial of utilities is limited to relatively narrow bands of land, only undertaken in relatively short stretches of cable/pipe at any given time and temporary in nature (i.e., individual sections are likely to be completed in a matter of weeks). Helios Renewable Energy Project is identified in Table 1, Shortlist of Cumulative Schemes (**Appendix 17-1: Shortlist of Cumulative Schemes, ES Volume 2 [EN010143/APP/6.2])** but no significant in-combination effects are identified in **Chapter 11: Noise and Vibration, ES Volume 1 [EN010143/APP/6.1]**.

8.1.42 A review of the DCO Scoping Report and PEI Report submitted for the Helios Renewable Energy Project indicates that there is a small section of overlap of the Underground Grid Connection for this development with the Grid Connection Corridor of the Scheme to the east of Drax Substation. It should be noted that noise is non-additive, meaning that noise levels from construction activities with similar noise profiles of two projects undertaken simultaneously would not increase the overall disturbance experienced by birds in adjoining fields. Of note is also that arable parcels immediately adjoining Drax Substation are small and subject to existing high levels of disturbance. No SPA/Ramsar birds were recorded in these fields in wintering bird surveys and they are not considered functionally linked.

8.1.43 Notwithstanding this, the Helios Renewable Energy Project comprises 757.46ha of predominantly agricultural land and, therefore, there is the potential for temporary displacement of birds due to noise and visual disturbance surrounding the site boundary of that development. If construction of this project were to occur at the same time as that of the Scheme, temporary displacement of SPA/Ramsar birds may occur across a wider area. However, it is noted that the PEI Report submitted for the Helios Renewable Energy Project concludes that arable fields adjoining the scheme are not regularly used by significant aggregations of SPA / Ramsar birds.

8.1.44 Surveys for the Scheme have confirmed the opportunistic nature of bird use of the fields in this landscape. This indicates that the birds are not particularly wedded to specific fields but rather use fields throughout the large

functionally linked habitat zone around the SPAs as and when they are available and suitable, moving to other fields if a given field is unsuitable at a particular time. The fields in which cable installation or adjacent to which PV construction will occur would be subject to comparable disturbance through normal farming operations in adjacent land (e.g. farm machinery ploughing, fertilising, spraying and harvesting) or go temporarily out of suitability (e.g. being put fallow, or having their crop changed) as part of routine farming use of the landscape.

8.1.45 Considering the sequential nature of cable installation works (short stretches being installed at a time), large tracts of arable land being available, natural inter-annual variation in suitability, comparable disturbance profile of the cable installation activities to conventional farming activities, and highly mobile nature of dependent bird species, mitigation is not considered necessary for the East Yorkshire Solar Farm Scheme. For the same reasons, the potential for material in-combination effects between the East Yorkshire Solar Farm Scheme and other project such as Helios is inherently limited. irrespective of the impact of those other projects. Therefore, no residual significant disturbance effect is expected to arise and it is concluded there would be no adverse effect on integrity in-combination.

~~8.1.38~~8.1.46 Furthermore, as undertaken for the Scheme, each proposal (such as the Helios Renewable Energy Project) will need to assess its own potential for noise and visual disturbance, as well as employing satisfactory mitigation measures to avoid adverse effects on site integrity if required. For example, all developments with the potential for significant in-combination temporary noise disturbance will need to ensure that noise levels within functionally linked habitats do not exceed the established noise threshold for SPA/Ramsar birds agreed upon with Natural England (i.e., either in absolute terms or comparison to the pre-construction baseline). Other projects impacting functionally linked habitats will also need to deliver adequate mitigation habitat, which would act as a refuge for temporarily displaced birds.

~~8.1.39 Given that each proposal is legally required to mitigate its own impact, ensures that the Scheme will have no adverse effects in-combination with other projects and plans. While it is noted that individual habitat parcels may be subject to residual noise from multiple schemes, this noise is non-additive and would remain below the disturbance threshold even in-combination.~~

8.1.47 The HDD crossings of ditch DE53, River Derwent and River Ouse were identified as the main potential sources of disturbance for roaming SAC otter. However, with adequate noise fencing being deployed around the HDD entry points and a 30m stand-off distance being maintained, any noise and visual disturbance to otter will be sufficiently mitigated. Any adjoining developments with the potential to result in disturbance to bankside habitats would also need to undertake noise modelling and deliver mitigation such as noise fencing, preventing any in-combination disturbance impacts from occurring. Furthermore, the temporary nature of the HDD crossing works (to be completed within several days) will make it extremely unlikely that there will be a temporal overlap with disturbing works undertaken for other nearby developments (e.g. Helios Renewable Energy Project). Therefore, it is concluded that no material in-combination disturbance impacts to otter will

remain and it is concluded there would be no adverse effect on integrity in-combination.

8.2 Water Quality – Construction, Operational and Decommissioning Phases

River Derwent SAC, Lower Derwent Valley SAC/SPA/Ramsar and Humber Estuary SAC/SPA/Ramsar

8.2.1 Chapter 6 of this report concluded that LSEs on the River Derwent SAC, Lower Derwent Valley SAC/SPA/Ramsar and Humber Estuary SAC/SPA/Ramsar cannot be excluded. The River Derwent SAC is designated for its water courses of plain to montane levels, as well as a range of aquatic and semi-aquatic (otter) species. All these qualifying features require adequate water quality for retaining favourable conservation status. Natural England's SIP (Ref. 18) specifies that water pollution is one of the main threats to the integrity of the SAC. It states that *"…the agricultural soils of the Derwent Catchment are highly erodible and are thought to be the dominant source of sediment input into the system, entering via run-off and directly supplied by agricultural drainage systems… Discharges vary in nature with some not being treated, which can have implications for the water quality required to support the interest features"*. Due to the water quality pressures on the SAC, particularly from sedimentation, Natural England have published a Diffuse Water Pollution Plan (Ref. 57), which aims at reducing the volume of sediment entering the river catchment.

8.2.2 Fine sediment supply becomes a particular problem at lower river flows or when the total sediment loading is too high, with sedimentation affecting the role of the riverbed in providing habitat, shelter and foraging resources. Sediment deposition is a particular concern in the lower reaches of the River Derwent, where continuous accumulation has resulted in the elevation of the bed level by 0.4m on average since 1998. Sedimentation may lead to detrimental impacts on the qualifying watercourses feature (including *Ranunculion fluitantis* vegetation) by diminishing light availability, smothering existing plants and knock-on effects on invertebrate/fish communities. Due to this existing pressure on the water quality in the River Derwent, Natural England have published a River Restoration Plan (RRP) for the Yorkshire Derwent (Ref. 58), which sets out a range of measures for reducing fine sediment input to the river system (which would include unwanted surface runoff from construction sites). Clearly, in order not to counteract the targets of the RRP, any surface runoff from the Scheme in the construction, operational and decommissioning phases will need to be carefully managed.

8.2.3 The Lower Derwent Valley SPA/Ramsar is designated for individual qualifying species of waterfowl and waders, as well as its overarching non-breeding waterbird assemblage. All qualifying species roost or forage in aquatic habitats or terrestrial habitats with strong hydrological linkages. As specified in Natural England's SACO for the Lower Derwent Valley SPA (Ref. 38), poor water quality can negatively impact the availability and suitability of breeding, foraging and roosting habitats. To ensure that the necessary abiotic conditions for qualifying species are maintained, the SACO also specify target levels for DO, total NH_3 and P.

8.2.4 Waterbodies in the south-west portion of the Scheme, such as in the Grid Connection Corridor, lie within the Derwent Lower Yorkshire Operational Catchment. The Environment Agency Catchment Data Explorer (Ref. 59) identifies the 'Derwent from Elvington Beck to River Ouse' waterbody to be in moderate ecological condition. This is due to the failure of the waterbody in relation to several priority hazardous substances (e.g., mercury and polybrominated diphenyl ethers [PBDE]) as well as a moderate score for macrophytes. Waterbodies in the eastern section of the Site, such as those permeating the majority of the Solar PV Areas, lie within the Hull and East Riding Management Catchment, specifically the Foulness Operational Catchment. The 'Foulness from Black Beck to Market Weighton Canal' waterbody is identified as having moderate ecological status on the Catchment Data Explorer, primarily due to a moderate score for macrophytes and DO. It also fails the assessment of chemical quality elements, such as mercury and PBDE.

8.2.5 **Chapter 2: The Scheme, ES Volume 1 [EN010143/APP/6.1]** provides an overview of the Site, the infrastructure that will be provided and indicative construction/decommissioning phase activities. As a broad overview, the main construction stages encompass site preparation, solar PV facility construction and cable installation. A wide range of construction activities will be undertaken as part of each of these construction stages, not all of which are associated with similar potential for water quality impacts. Generally, it is considered that the majority of water quality risks are likely to arise from activities that involve the excavation of topsoil, use of heavy plant and machinery or implementation of specialised crossing methodologies, such as:

a. Importing of construction materials/plant/equipment;
b. Establishing construction compounds;
c. Upgrading existing or constructing new site tracks/access roads;
d. Upgrading or constructing crossing points over drainage ditches;
e. Erecting panel mounting structures in Solar PV Areas;
f. Stripping of topsoil and trenching in sections for cable installation;
g. Implementing HDD crossing methodologies; and
h. Reinstating the Site (including topsoil reinstatement).

8.2.6 It should be noted that the change in land use associated with the Scheme from agriculture to solar PV arrays and areas of hardstanding, has the potential to reduce soil, pesticide and fertiliser wash-out into the aquatic environment. This has the potential to reduce some of the existing pressures on water quality, such as sedimentation issues. Notwithstanding this, negative water quality impacts could arise from any of the above construction activities and it is considered essential that the Scheme adopts measures to minimise the risk to the qualifying features of the River Derwent SAC and Lower Derwent Valley SAC/SPA/Ramsar. **Chapter 9: Flood Risk, Drainage and Water Environment, ES Volume 1 [EN010143/APP/6.1]** indicates that the construction of the Scheme will take place in accordance with the **Framework CEMP [EN010143/APP/7.7]**. The Framework CEMP encompasses a wide range of best practice methods that are established

and proven measures to protect environmental water quality. Importantly, the CEMP is a fluid document that is continually reviewed, revised and updated as the Scheme progresses towards construction, meaning that water quality mitigation responds to changes in the adopted construction methodology and other emerging evidence.

8.2.7 Mitigation secured through the CEMP and accompanying Water Management Plan (WMP) is built on a range of pillars, including Good Practice Guidance (GPPs) published on the NetRegs website (Ref. 60), key CIRIA documents and guidance from the British Standards Institute. It is considered that the most important interventions to protect the qualifying features in the River Derwent SAC and Lower Derwent Valley SAC/SPA/Ramsar relate to the reduction of site runoff (particularly the mobilisation of fine sediment, one of the dominant pressures in the River Derwent), spillage risk and water pollution risk from the trenchless crossings within the Site. The most important measures to address each of these risk items are discussed in the following paragraphs.

8.2.8 To protect watercourses within the Site from fine sediment runoff, earthworks will be undertaken during the drier months where practical. However, since some work in wet weather will be unavoidable, a suite of further measures is required to reduce sediment runoff. A temporary drainage system will be installed to prevent the entry of particulates into surface water drains. All land drains and water features will be adequately protected using drain covers, sandbags, earth bunds and geotextile silt fences. Furthermore, any excavated topsoil will be stored a minimum of 20m from water features and for no more than two weeks. Wash-down areas for equipment and plant will be designated to allow for the retention and adequate disposal of sediment-enriched water. The WMP, which will be produced following the DCO, will provide for water quality monitoring pre-, during and post-construction.

8.2.9 The CEMP will secure a suite of measures to minimise the risk of accidental spillages and leakages of toxic contaminants, including fuels, oils, solvents, paints and other substances. These encompass the following:

a. All toxic chemicals will be stored in self-bunded leak-proof containers or in impermeable bunded areas (with an additional 10% capacity);

b. Any construction plant, machinery and vehicles will undergo daily inspections to ensure they are in good working order and without oil/fuel leaks;

c. Refuelling, oiling and greasing of plant will take place above drip trays or impermeable surfaces to prevent untreated runoff to surface watercourses;

d. All mobile plant to be used will be kept clean, in good working order, fitted with plant ‘nappies’ and carry spill kits;

e. Spill kits and oil-absorbent material will be available in all mobile plant at sensitive locations across the Site, with all construction workers receiving spill response training;

f. Facilities for concrete wash water will be adequately contained and contents prevented from entering any drains; and

g. Water quality data will be collected at potentially impacted watercourses and compared to baseline conditions.

8.2.10 At the three trenchless HDD crossing points under the River Ouse, River Derwent and Featherbed Drain, there is a potential risk for direct water quality contamination through the 'frac-out' of drilling muds containing bentonite. Pollution incidents associated with HDD, although rare, could have severe consequences for the River Derwent SAC and Lower Derwent Valley SPA/Ramsar, because contaminants could be released directly into designated sites without any potential for natural attenuation. The risk of frac-out of drilling fluid is higher where HDD crossings are poorly planned and geological strata are unconsolidated.

8.2.11 However, the Scheme will employ measures to minimise environmental risks associated with trenchless technologies. For example, the HDD will be installed at a minimum of ~~5 m~~5m below the bed of the River Ouse and River Derwent. Maximising the distance between the riverbed and the channel reduces the likelihood that significant amounts of drilling mud would be washed into the river following an incident. An in-depth assessment of geological conditions in the proposed crossing areas prior to commencement of the HDD will inform the precise location/depth of the high voltage cable crossing. Importantly, prior to the HDD taking place, a site-specific hydraulic fracture risk assessment will be conducted to estimate the degree of risk and identify additional mitigation. If encountering specific issues (e.g., lower than expected drilling mud returns), the HDD operations will be suspended, remedial action implemented and crossing methodology re-evaluated.

8.2.12 Further potential water quality impacts are associated with the ancillary infrastructure required for the HDD, such as installation and maintenance of launch and reception pits. These pits are also a potential source of contaminants, including any returned drilling fluid, sediments and leakages/spillages. However, as a precautionary measure, these pits will be dug at least 30m from the edge of the watercourses to minimise the potential for surface runoff, as well as encompassing shoring systems appropriate to the ground conditions (e.g., timber structures, sheet piling or modular systems).

8.2.13 Surface run-off from areas of hardstanding could introduce toxic and non-toxic pollutants to the aquatic environment in the operational phase of the Scheme. Several key elements of the Scheme comprise impermeable surfaces that will contribute surface run-off to the environment, including the Solar PV Panels, Field Stations, operations and maintenance hub at Johnson's Farm and two Grid Connection Substations. However, for most of these elements the potential for surface run-off is minimised through the design approach. For example, the single-axis tracker Solar PV Panels do not comprise a single drip track and, therefore, will not focus surface run-off in specific locations. The Field Stations will be set down on gravel or aggregate, which will promote the dispersal of water under the structures. Furthermore, the operations and maintenance hub will redevelop existing buildings for use, such that no water quality changes would be expected due to the Scheme. The only element that requires further consideration regarding surface run-off are the two Grid Connection Substations, which will at least partially convert existing arable fields (i.e. greenfield sites) to impermeable surfaces.

8.2.14 A **Framework Surface Water Drainage Strategy [EN010143/APP/6.2]** has been developed for the Scheme. This has modelled the required attenuation volume to mitigate surface run-off impacts from the two Grid Connection Substations in Solar PV Area 1c. The strategy proposes three differently sized attenuation storage areas across the Solar PV Area 1c. These attenuation ponds will be vegetated with a layer of dense vegetation underlain by a soil type with good contaminant removal capacity of at least 300mm in depth. The **Framework Surface Water Drainage Strategy [EN010143/APP/6.2]** identifies that the water quality treatment index of this type of vegetation exceeds the pollution hazard index associated with the impermeable surfaces of the Scheme in Solar PV Area 1c.

~~8.2.13~~8.2.15 Given the wide range of mitigation measures that will be deployed to address the risk of water quality impacts from construction, operational and decommissioning activities, it is concluded that there will be no adverse effects of the Scheme on the water quality in the River Derwent SAC, Lower Derwent Valley SAC/SPA/Ramsar and Humber Estuary SAC/SPA/Ramsar in the construction, operational and decommissioning phases.

In-Combination Assessment

~~8.2.14~~8.2.16 The interconnected nature of aquatic ecosystems means that in-combination water quality impacts are particularly important. Waterbodies flow past numerous conurbations, roads and development sites, thereby collecting a range of toxic and non-toxic pollutants. Due to the transport and retention times of pollutants in water (potentially many decades if bound to sediment), pollution events can impact European sites many kilometres downstream. **Table 10** lists the ~~cumulative~~ projects that have the potential for in-combination effects with the Scheme. A geographic overlap of the Scheme with other NSIPs is likely to be the most important factor in determining the potential for in-combination water quality effects because any pollutants would be contributing to the same hydrological catchment (the Derwent Lower Yorkshire Operational Catchment~~).~~), potentially triggering in-combination impacts in the River Derwent SAC, Lower Derwent Valley SAC/SPA/Ramsar and Humber Estuary SAC/SPA/Ramsar. Therefore, the potential for in-combination water quality impacts is likely to arise from the following projects that overlap with the Grid Connection Corridor of the Scheme:

a. Helios Renewable Energy Project;
b. SEGL 2;
c. Drax Carbon Capture;
d. Humber Low Carbon Pipelines;
e. Drax Re-power; and
f. Lakeside Energy Storage.

~~8.2.15~~8.2.17 All development proposals with potential impacts to European sites will be accompanied by bespoke HRAs, addressing any linking pathways to the water environment. This will include any developments in the Derwent Lower Yorkshire Operational Catchment, for which sedimentation impacts from construction/decommissioning are a major threat. As discussed in this HRA

for the Scheme, a CEMP detailing adequate and robust water quality protection measures will need to accompany all planning applications. CEMPs and the mitigation measures secured therein, are designed to keep overall water quality parameters at levels that preserve the ecological integrity of the environment (including that of European sites). For example, measures that are introduced to minimise water quality impacts will completely exclude or keep sediment to an agreed minimum concentration, in line with environmentally acceptable tolerance thresholds. These water quality thresholds are set by the Environment Agency, consider impacts from multiple developments and designed to preserve the ecological integrity of watercourses. It is considered that the mitigation measures delivered to protect aquatic European sites will entirely avoid any adverse effects of the Scheme on prevailing water quality, to the standard specified by the Environment Agency, the statutory stakeholder for the water environment.

~~8.2.16~~8.2.18 Overall, given that the Scheme and all other developments will mitigate their own water quality impacts ~~and~~by adhering to the legal thresholds set by the Environment Agency and these permissible thresholds for water quality parameters consider effects from multiple developments, there is no potential for the Scheme to result in water quality impacts in-combination with other projects and plans~~.~~ and it is concluded there would be no adverse effect on integrity in-combination.

8.3 Atmospheric Pollution (Dust Deposition) – Construction and Decommissioning Phases

River Derwent SAC

8.3.1 Chapter 6 of this report concluded that LSEs on the River Derwent SAC regarding dust deposition cannot be excluded. All qualifying features of the SAC are either directly (i.e., water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation) or indirectly (i.e., river lamprey, sea lamprey, bullhead and otter) sensitive to impacts from the excessive release of dust.

8.3.2 As highlighted in paragraphs 8.2.6 to 8.2.9 of the previous section on water quality, a comprehensive CEMP is being developed to minimise the environmental impacts associated with the Scheme. Many of the measures included in the CEMP will be effective in minimising dust release. For example, the following good practice guidelines such as Guidance for Pollution Prevention (GPP), CIRIA documents and British Standards Institute (BSI) documents will be adhered to, which will contribute towards minimising the release of dust from construction activities:

a. GPP 5: Works and maintenance in or near water (Ref. 61);

b. GPP 13: Vehicle washing and cleaning (Ref. 62);

c. GPP 26: Safe storage (Ref. 63);

d. BSI (2009) BS6031:2009: Code of Practice for earth works (Ref. 64);

e. C532 (2001): Control of water pollution from construction sites – Guidance for consultants and contractors (Ref. 65); and

f. C741 (2015) – Environmental good practice on site guide (fourth edition) (Ref. 66).

8.3.3 **Chapter 9: Flood Risk, Drainage and Water Environment, ES Volume 1 [EN010143/APP/6.1]** identifies specific mitigation measures included in the CEMP that will reduce dust release into the air. For example, while earthworks will be undertaken in the drier months where practicable (to reduce runoff-associated contamination), earthworks and temporary storage sites for excavated materials will be dampened to minimise dust release in dry weather. Any topsoil/subsoil requiring temporary storage will be stored at least 20m from watercourses (including the River Derwent) and covered with geotextile mats or seeded to promote vegetation growth. The adequate covering of stockpiles or encouraging that soils are bound within root systems of vegetation will considerably reduce the potential for dust release. The regular washdown of equipment and plant in designated areas where runoff is isolated for treatment prior to discharge, further reduces the likelihood of dust release in dry weather.

8.3.4 Overall, given that adequate protective mechanisms are secured in the **Framework CEMP [EN010143/APP/7.7]** accompanying the DCO application, it is concluded that the residual negative impact potential associated with dust release from the construction and decommissioning phases is negligible. The Scheme will not result in adverse effects on the integrity of the River Derwent SAC regarding dust deposition.

In-Combination Assessment

8.3.5 The buffer distances for potential dust impacts from construction/ decommissioning activities are relatively small and it is, therefore, unlikely for many other development proposals to affect the stretch of the River Derwent SAC that runs alongside the Grid Connection Corridor. Notwithstanding this, dust released onto other stretches of the SAC also has the potential to impact on qualifying habitat/species. ~~HRAs accompanying planning applications within the SAC's dust impact zone will~~It is considered that the mitigation measures to be delivered and secured in the CEMP will entirely avoid adverse dust impacts resulting from the Scheme and, therefore, any potential for in-combination effects with other developments. Furthermore, it is noted that none of the in-combination projects listed in **Table 10** fall within the 200m impact zone for dust deposition surrounding the River Derwent SAC. While there is spatial overlap between the Scheme and several other developments (e.g. Helios Renewable Energy Project, SEGL2, Drax Carbon Capture and Drax Re-power), this occurs in the Grid Connection Corridor to the south of the River Ouse and outside said 200m buffer zone. It is also to be noted that, even if other developments in the dust impact zone were coming forward, HRAs accompanying other planning applications within the SAC's dust impact zone will also need to identify measures to minimise atmospheric dust release, such as by following the relevant good practice guidance documents, dampening of excavated materials and others.

8.3.6 Due to the requirement of adopting measures to minimise dust deposition that applies to all developments within the relevant impact buffer, any residual potential for dust impacts is likely to be minimal, highly localised and immaterial. Given that each proposal ~~is required to absorb~~will avoid its own

impact, the Scheme will have no adverse effects on integrity regarding atmospheric pollution in-combination with other projects and plans.

8.4 Loss of Functionally Linked Habitat – Operational Phase

Lower Derwent Valley SPA/Ramsar and Humber Estuary SPA/Ramsar

8.4.1 Chapter 6 of this report identified that LSEs of the Scheme on the Lower Derwent Valley SPA/Ramsar and Humber Estuary SPA/Ramsar regarding the potential loss of functionally linked habitat in the operational phase could not be excluded. Both European sites are designated for mobile overwintering bird species that routinely forage or roost beyond the designated site boundaries. In the following, these sites are discussed together because they both fall within the ZoI of the Scheme and any mitigation requirements within the Site, where necessary, would be delivered as a package.

8.4.2 The Lower Derwent Valley SPA/Ramsar, at 1.3km from the Order limits and the closer of the two sites, is designated for a suite of qualifying species comprising waterfowl and waders. Of its qualifying species, Bewick's swan and golden plover are most heavily linked to functionally linked habitats. Bewick's swan are particularly reliant on partially inundated wet grassland and inland waterbodies, where their preferred food plants are found (e.g. *Lolium perenne, Glyceria fluitans, Phleum pratense* and others). While it is noted that the population of Bewick's swan in the Lower Derwent Valley SPA/Ramsar has fallen to its lowest point in 40 years (the mean winter count between 2012/13 and 2016/17 was two individuals), the target for supporting habitat is to *"…maintain the extent and distribution of suitable habitat (either within or outside the site boundary)"* to restore the population of this species to previous levels. Natural England's SACO (Ref. 38) highlights that qualifying golden plover from the SPA/Ramsar are known to roost and forage in arable land adjoining the European site boundary. They are reliant on an adequate supply of invertebrates at preferred prey sizes, including earthworms, leatherjackets, beetles and spiders.

8.4.3 The Humber Estuary SPA/Ramsar, 3km from the Order limits, is designated for a diverse suite of individual qualifying species, including waterfowl, waders and birds of prey. Natural England's SACO for the SPA/Ramsar (Ref 52) specifies that hen harrier, golden plover, ruff, black-tailed godwit and redshank at least partially depend on inland areas of wet grassland and agricultural land (both arable land and permanent pasture), both of which may lie outside the designated site boundary. Furthermore, in addition to the species listed on the formal SPA citation (Ref. 67), Natural England has recommended considering further 'main component species' that occur at site levels of more than 1% of the national population (according to the most recent Wetland Bird Survey (WeBS) 5-year average count) or for which more than 2,000 individuals are present. Importantly, this encompasses a range of further species requiring consideration that are known to use non-wetland habitats, including pink-footed goose, greylag goose, white-fronted goose and little egret.

8.4.4 Overall, both European sites are designated for mobile overwintering bird species that rely on habitats potentially affected by the Scheme. However, the distance that individual bird species will travel from designated site boundaries for foraging and/or roosting differs considerably. Natural England have published guidance (Ref. 30) on the maximum foraging distances typically commuted by qualifying species. Based on this evidence, only some of the qualifying species are likely to be impacted by potential loss of functionally linked habitat associated with the Scheme.

8.4.5 ~~**Table 13**~~**Table 11** summarises a range of information on the qualifying species of the Lower Derwent Valley SPA/Ramsar and Humber Estuary SPA/Ramsar, including preferred prey species, supporting habitat, maximum off-site foraging distance and potential impact of the Scheme regarding functionally linked habitat loss. While functionally linked habitat was concluded to be potentially present within the Site in relation to seven SPA/Ramsar species, impacts were excluded in relation to Bewick's swan, wigeon, ruff, greylag goose, little egret, mallard and white-fronted goose for the following reasons~~:~~ (noting that not all points apply to each of the species):

a. No significant presence of suitable supporting habitat within the Site upon closer investigation; and/or

b. No records obtained in non-breeding bird surveys (paragraph ~~8.1.43~~8.4.6 and following paragraphs); and/or,

c. Biogeographic population patterns or maximum foraging distances (paragraph ~~8.1.46~~8.4.9 and following paragraphs).

Non-breeding bird survey data

8.4.6 Non-breeding bird surveys within the Site were undertaken in 2022/2023 to establish the usage of the Site by non-breeding bird species, including any occurrences of qualifying bird species. These comprised monthly walkover surveys between September 2022 and March 2023 covering all agricultural land parcels within the Order limits. A summary of non-breeding bird survey data is provided in ~~**Table 14**~~**Table 12** and shown in **Figure 10** (**Appendix A**). These surveys provide a robust baseline. However, in response to comments received from Natural England during statutory consultation, the Applicant repeated the non-breeding bird surveys between September 2023 and March 2024 to verify the findings of the 2022/2023 non-breeding bird surveys submitted with the DCO Application. The results of these surveys are also presented in **Table 12** and **Appendix D**.

8.4.7 The qualifying species with the highest abundance of individuals recorded on the ground in the 2022/23 surveys (i.e., not flying over the Site) were greylag goose (100 individuals), pink-footed goose (80 individuals) and lapwing (51 individuals). Regarding the proportion of individuals as a percentage of the relevant qualifying populations, golden plover had recorded levels of close to the 1% threshold in December 2022 (36 individuals, amounting to ~~0.9~~1.1% of the ~~4,120~~3,131 population in the Lower Derwent Valley SPA/Ramsar, based on WeBS five year peak mean data for 2017/18 – 2021/22). Most of these individuals were found on field 3b of the Solar PV Area (**Figure 10**) with slowly permeable, seasonally waterlogged soils. According to cropping data for winter 2022/2023, winter wheat and oil seed rape was planted in this field

at the time of survey. Furthermore, during December 2022, a peak count of 80 pink-footed goose was recorded in field 1a of the Solar PV Area (**Figure 10**), which is well below 1% of the qualifying population in the Humber Estuary SPA/Ramsar of 25,332 individuals~~.~~ (based on WeBS five year peak mean data for 2017/18 – 2021/22). This plot is also characterised by slowly permeable and seasonally waterlogged soils. It was planted with winter wheat at the time of survey.

8.4.8 ~~Greylag goose amounting to 5.6% of the Humber Estuary SPA/Ramsar population were recorded during the non-breeding bird survey.~~The species composition recorded in the 2023/24 surveys was similar to that recorded in 2022/23 with greylag goose, pink-footed goose, lapwing and golden plover the species recorded with highest abundances. Within the proposed Solar PV areas, pink-footed goose were only recorded on two occasions (58 individuals in area 1e and 515 individuals in area 2a; the latter equating to 2% of the qualifying population in the Humber Estuary SPA/Ramsar, based on WeBS five year peak mean data for 2017/18 – 2021/22), both times relating to flocks feeding in stubble in October 2023. These flocks were not recorded on subsequent visits and indeed the flock recorded in 1e was only present during a rain shower in the morning and had moved on by the afternoon, suggesting these flocks were recently arrived birds into the UK dropping down briefly to feed and/or rest before continuing on to wintering grounds elsewhere. A ploughed field in 1e was favoured by Golden Plover between late September 2023 and January 2024 (peak count of 460 individuals in October 2023), although numbers had dropped markedly by December 2023. Birds were recorded both feeding and roosting during this period. Away from 1e, Golden Plover were only recorded on two occasions, both in low numbers (15 individuals in 3c and 4 individuals in 2e), within the Solar PV Areas. Notably, records of lapwing, in the 2022/23 surveys below the 1% threshold of the populations in the Lower Derwent Valley SPA/Ramsar and Humber Estuary SPA/Ramsar, showed a marked increase to 5% and 1.8% of the 5-year population averages respectively (based on WeBS five year peak mean data for 2017/18 – 2021/22). In 2022/23 records of lapwing were sporadic and widely distributed across the survey area, often off small flocks (<10) or a couple of individuals, with many observed just flying over the survey area. In 2023/24 a field in deep plough in 1e was observed supported roosting lapwing between October and December.

~~8.4.8~~8.4.9 Greylag goose amounting to 5.6% and 27.8% of the Humber Estuary SPA/Ramsar population were recorded in the 2022/2023 and 2023/2024 non-breeding bird surveys (based on WeBS five year peak mean data for 2017/18 – 2021/22). Records of this species occurred widely throughout the Survey Area (including the Grid Connection Corridor), particularly in close proximity to waterbodies (e.g., the River Derwent). Generally, for this species it is impossible to distinguish between Icelandic non-breeding and separate resident native or re-established individuals. For example, resident greylag goose were frequently recorded during breeding bird surveys of the Survey Area. Greylag goose is a common and widespread resident species across the UK, occurring on most waterbodies in East Yorkshire throughout the year. According to British Trust for Ornithology (BTO) population data, the greylag goose population in the Humber Estuary increased from 1,614 in 2017/18 to 2,474 in 2020/21, with the most recent population count for 2021/22 given as 2,147 (Ref. 68). In 2001/02, twenty years ago, the

population in the Humber Estuary was 648, illustrating that greylag goose are showing a long-term upward trend at this site. At the UK scale, the greylag goose wintering population has increased by 8.4.9 8.4.10 Overall, the survey results indicate that parts of the Site may on occasions, provide functionally linked habitat to SPA/Ramsar bird populations. Only golden plover reached abundances over the commonly adopted 1% of the qualifying population threshold during this the 2022/23 survey season and only on a single occasion., however, as demonstrated by the 2023/24 surveys it is likely that the usage of the surveyed fields will show some inter-annual variation. Depending on the cropping scheme deployed by the farmers/landowners, abundances and/or species assemblages may be higher or more diverse in some years or lower and less diverse in others. However, upon review of the cropping regime, the 2022/2023 and 2023/2024 survey seasons did not represent an unusual or 'less suitable' yearyears for non-breeding birds in terms of itstheir cropping pattern (see

8.4.10 8.4.11 **Table** 13). In other words, the 2022/2023 both seasons of non-breeding bird surveys were undertaken during a suitably representative seasoncropping years, typical for this part of Yorkshire. The cropping forecastdata for 2023 and 2024 indicatesindicate that suitable crops (e.g., winter wheat, oil seed rape) will continue continued to be planted on the arable parcels of the Site, similar to the fields for which peak counts of golden plover and pink-footed goose were obtained. in 2022/2023. Generally, as a precautionary measure, it has been assumed that any of the agricultural fields within the Site could support populations of golden plover and pink-footed goose associated with the Lower Derwent Valley SPA/Ramsar and Humber Estuary SPA/Ramsar at or approaching the 1% population threshold, in any given year and therefore, constitute functionally linked habitat.

Reasons for excluding little egret and mallard from mitigation requirements.

8.4.11 8.4.12 Numbers of little egret and mallard within the Site reached or exceeded 1% of the qualifying population of the Humber Estuary SPA/Ramsar. HoweverHowever, while the presence of these species clearly indicates that suitable supporting habitats are present within the Site, it is considered that the recorded individuals of both species are not associated with populations from European sites because the Site lies beyond the core foraging ranges reported for these species (Ref. 30) of 500m for Bird Group 2 (which encompasses mallard) and 2km for Bird Group 3 (which encompasses little egret). Therefore, little egret and mallard within the Site are not considered to be part of the qualifying population of the Humber Estuary SPA/Ramsar and are not considered to contribute to its Conservation Objectives.

Table 11. Summary of maximum foraging distances, supporting habitats and preferred foraging resources of qualifying bird species in the Lower Derwent Valley SPA/Ramsar and Humber Estuary SPA/Ramsar

*Orange = indicates respective species **may** be impacted by functionally linked habitat loss associated with the Scheme.*

*Green = indicates respective species **would not** be impacted by functionally linked habitat loss associated with the Scheme.*

European site (distance from Order limits)	Qualifying species	Maximum foraging distance	Type of supporting habitat[11]	Preferred foraging resources	Potential presence of functionally linked habitat within the Order limits
Lower Derwent Valley SPA/Ramsar (1.3km)	Bewick's swan	10km (Bird Group 6)	Overwintering grounds close to permanent waterbodies, including **permanent pasture**, **arable land** and **wet grassland**	Preferred food plants include *Lollium perenne*, *Glyceria fluitans*, *Phleum pratense*, *Rorippa amphibia*, *Alopecurus geniculatus*. Also forage on cereal grains, rape, potatoes and sugar beet.	Yes
	Wigeon	2km (Bird Group 3)	**Wet grassland** and **standing/running inland waterbodies**	A range of food plants associated with wet habitats, including *Agrostis stolonifera*, *Polygonum*, *Eleocharis*, *Rumex* and *Ranunculus*.	Yes
	Teal	500m (Bird Group 2)	Wet grassland and standing/running inland waterbodies	A range of food plants associated with wet habitats, including *Agrostis stolonifera*, *Polygonum*, *Eleocharis*, *Rumex* and *Ranunculus*.	No

[11] Supporting habitats that are found within the Site are marked in **bold**. Note that this is only marked for species for which the Site falls within the maximum foraging distance. All other species are shown for completeness.

European site (distance from Order limits)	Qualifying species	Maximum foraging distance	Type of supporting habitat[11]	Preferred foraging resources	Potential presence of functionally linked habitat within the Order limits
				Cereal grains may be locally important for sustaining feeding flocks, but arable land is not considered to be of principal importance for this species.	
	Northern shoveler	500m (Bird Group 2)	Wet grassland and standing/running inland waterbodies	A range of food plants associated with wet habitats, including *Scirpus*, *Eleocharis*, *Carex*, *Potamogeton*, *Glyceria* and surface plankton. Shoveler also forage on a wide range of invertebrate prey associated with aquatic habitats, such as *Hydrobia*, crustaceans, caddisflies, *Diptera* and beetles of preferred prey size.	No
	Golden plover	15-20km (Bird Group 5)	**Arable fields** and **permanent pasture**	Variety of invertebrate prey of preferred size, including earthworms, leatherjackets, beetles and spiders.	Yes
	Ruff	2km (Bird Group 3)	Wide distribution across **wet grassland**, but will leave for coastal habitats in periods of cold weather	Variety of invertebrate prey of preferred prey size, including dipteran flies, beetles, earthworms, crustaceans and molluscs	Yes

European site (distance from Order limits)	Qualifying species	Maximum foraging distance	Type of supporting habitat[11]	Preferred foraging resources	Potential presence of functionally linked habitat within the Order limits
	Mallard	500m (Bird Group 2)	All types of wetland habitat, including permanent waterbodies (e.g. marshes, bogs, ponds, lakes, estuaries) and ephemeral features, such as seasonally wet ditches, drains and pastures	Generalist forager, dabbling to eat seeds and aquatic vegetation. During the breeding season mainly feed on invertebrates (aquatic insect larvae, earthworms and snails), switching to agricultural seeds and grains on migration.	Yes
Humber Estuary SPA/Ramsar (3km)	Avocet (breeding and overwintering)	2km (Bird Group 3)	Supporting habitats include coastal lagoons and intertidal sand/mudflats	Forages on a variety of aquatic and terrestrial prey items of preferred size, including *Gammarus*, *Corophium*, *Nereis*, *Hydrobia*, *Cardium*, gobies, flies and beetles.	No
	Bar-tailed godwit	2km (Bird Group 3)	Found in a range of coastal supporting habitats, including intertidal mud, coastal lagoons, freshwater and coastal grazing marsh, saltmarsh and intertidal sand	Forages on a variety of marine prey items of preferred size, including *Arenicola* and *Nereis*.	No
	Bittern (breeding and overwintering)	2km (Bird Group 3)	Supporting habitats include freshwater and tidal reedbeds	Forages on a variety of aquatic and amphibious prey items of preferred size, including eel, rudd, roach, frogs and toads	No

European site (distance from Order limits)	Qualifying species	Maximum foraging distance	Type of supporting habitat[11]	Preferred foraging resources	Potential presence of functionally linked habitat within the Order limits
	Black-tailed godwit	2km (Bird Group 3)	Utilise a wide range of supporting habitats, including intertidal flats, coastal lagoons, saltmarsh and inland areas of wet grassland, arable land and permanent pasture	Forage on a wide range of aquatic and terrestrial invertebrate prey species, including earthworms, leatherjackets, chironomids, *Macoma*, *Cardium* and *Nereis*.	No
	Dunlin	2km (Bird Group 3)	Found in a range of supporting habitats, including intertidal flats, coastal lagoons, saltmarsh and inland areas of wet grassland, arable land and permanent pasture	Forages on a variety of aquatic and terrestrial prey items of preferred size, including *Nereis*, *Macoma*, *Hydrobia*, *Crangon*, *Carcinus*, dipteran flies, beetles, caddisflies, wasps, sawflies and mayflies.	No
	Golden plover	See description in relation to the Lower Derwent Valley SPA/Ramsar above.			
	Hen harrier	500m (Bird Group 2)	Relies on a wide variety of supporting habitats, including reedbeds, saltmarsh, intertidal sediments and inland habitats (wet grassland, rough grassland, arable land and permanent pasture)	Feeds on a range of mammal and bird prey items, including pipits, gamebirds, voles and young rabbits)	No
	Knot	2km (Bird Group 3)	Found in a range of coastal supporting habitats, including intertidal flats, coastal lagoons,	Foraging resources include *Macoma*, *Mytilus*, *Cerastoderma* and *Hydrobia* of preferred sizes	No

European site (distance from Order limits)	Qualifying species	Maximum foraging distance	Type of supporting habitat[11]	Preferred foraging resources	Potential presence of functionally linked habitat within the Order limits
			saltmarsh, sand/shingle drift lines and artificial structures		
	Little tern (breeding)	NA	Linked to a range of coastal and marine habitats during the breeding season, including sand dunes, intertidal sediments, coastal lagoons and the open water column	Feeds exclusively on a marine diet encompassing crustaceans, annelids, sandeels, herring and clupeids.	No
	Marsh harrier (breeding)	2km (Bird Group 3)	Relies on a wide variety of supporting habitats during the breeding season, including reedbeds, intertidal sediments, freshwater wetlands and inland habitats (wet grassland, rough grassland, arable land and permanent pasture)	Feeds on a range of mammal and bird prey items, including pipits, gamebirds, voles, mice and rabbits)	No
	Ruff	See description in relation to the Lower Derwent Valley SPA/Ramsar above[12].			
	Redshank	2km (Bird Group 3)	Utilise a wide range of supporting habitats, including intertidal flats, coastal lagoons, saltmarsh, supralittoral	Forage on a wide range of aquatic and terrestrial invertebrate prey species, including earthworms,	No

[12] No potential for impact because the Site lies beyond the maximum foraging distance of 2km for qualifying ruff of the Humber Estuary SPA/Ramsar.

European site (distance from Order limits)	Qualifying species	Maximum foraging distance	Type of supporting habitat[11]	Preferred foraging resources	Potential presence of functionally linked habitat within the Order limits
			sand/shingle, artificial structures and inland areas of wet grassland, arable land and permanent pasture.	leatherjackets, *Hydrobia*, *Macoma*, *Corophium* and *Nereis*.	
	Shelduck	500m (Bird Group 2)	The primary supporting habitats of this species are intertidal sand- and mudflats, coastal lagoons, saltmarsh and inland freshwater bodies.	Forage on a wide range of aquatic prey species, including *Hydrobia*, *Corophium*, *Nereis* and hatching midges.	No
Species not listed on the citation for the Humber Estuary SPA, but occurring at site levels of more than 1% of the national population	Green sandpiper	2km (Bird Group 3)	Supporting habitats of green sandpipers include freshwater bodies (e.g. streams, ditches) and flooded grassland	Primary foraging resources are aquatic invertebrates from the surface of sediments	No
	Greylag goose	10km (Bird Group 6)	Greylag goose rely predominantly on freshwater bodies (e.g. ponds, lakes, meres, reservoirs), **linear watercourses** and **agricultural grassland**.	Feed on a variety of plant material, such as roots of rushes and sedges, cereal stubble and grassland.	Yes
	Little egret	2km (Bird Group 3)	Associated with a range of estuarine and freshwater habitats, including intertidal flats, saltmarsh, reedbeds,	Feed on a range of aquatic and semi-aquatic prey items, such as insects, crustaceans, frogs, eels and small fish.	~~No~~Yes

European site (distance from Order limits)	Qualifying species	Maximum foraging distance	Type of supporting habitat[11]	Preferred foraging resources	Potential presence of functionally linked habitat within the Order limits
			lakes, reservoirs, streams and ditches.		
	Pink-footed goose	15-20km (Bird Group 7)	Found in a range of supporting habitats, including saltmarsh, freshwater bodies and **agricultural land** (winter stubbles, sugar beet).	Feed on a wide range of foraging resources, including plant material in spring (e.g. leaves, stems and grasses) and cultivated fields in winter (cereal crops, grains and root crops).	Yes
	Northern shoveler	See description in relation to the Lower Derwent Valley SPA/Ramsar above.			
	White-fronted goose	10km (Bird Group 6)	Supporting habitats for this species include freshwater bodies, **wet grassland** and **inland plots of arable land**.	Grazes on a diverse range of plant materials, including roots, tubers, shoots and leaves. Popular food items encompass grasses, clover, spilt grain, winter wheat and potatoes.	Yes

Table 12. Non-breeding bird survey data for 2022/2023~~.~~ and 2023/24

Common name (*scientific name*)	Monthly survey total							Peak ~~Non-breeding~~ Count	WeBS 2017/18 – 2021/22 Average Humber Estuary SPA/Ramsar	WeBS 2017/18 – 2021/22 Average Lower Derwent Valley SPA/Ramsar	Monthly survey total							Peak Count	WeBS 2017/18 – 2021/22 Average Humber Estuary SPA/Ramsar	WeBS 2017/18 – 2021/22 Average Lower Derwent Valley SPA/Ramsar
	Sep 2022	Oct 2022	Nov 2022	Dec 2022	Jan 2023	Feb 2023	Mar 2023				Sep 2023	Oct 2023	Nov 2023	Dec 2023	Jan 2024	Feb 2024	Mar 2024			
Curlew (*Numenius arquata*)	-	-	-	-	1	3	2	3	2,544 (0.1%)	NA	-	-	-	-	-	-	-	-	2,544	NA
Golden Plover (*Pluvialis apricaria*)	-	-	-	36	-[13]	-	-	36	20,812 (0.2%)	3,131 (1.1%)	48	460	179	209	4	-	72	460	20,812 (2.2%)	3,131 (14.
Greylag Goose (*Anser anser*)	1	-	-	100	81	52	33	100	1,796 (5.6%)	~~NA~~2,278 (4.4%)	232	500	-	24	7	30	-	500	1,796 (27.8%)	2,278 (21.9%)
Lapwing (*Vanellus vanellus*)	3	-	-	46	51	33	29	51	15,247 (0.3%)	~~NA~~5,487 (0.9%)	51	128	274	60	250	2	8	274	15,247 (1.8%)	5,487 (5%)
Little Egret (*Egretta garzetta*)	1	-	-	2	1	-	1	2	203 (1%)	NA	-	-	-	-	-	-	-	-	203	NA
Mallard (*Anas platyrhynchos*)	3	3	5	8	5	16	36	36	1,109 (3.2%)	NA	-	11	14	17	24	29	-	29	1,109 (2.6%)	NA
Oystercatcher (*Haematopus ostralegus*)	-	-	-	-	-	4	6	6	5,806 (0.1%)	NA	-	-	-	-	-	-	-	-	5,806	NA

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[13] 200 overflying golden plover were recorded, but not considered to use supporting habitat within the Site.

Common name (*scientific name*)	Monthly survey total							Peak ~~Non-breeding~~ Count	WeBS 2017/18 – 2021/22 Average Humber Estuary SPA/Ramsar	WeBS 2017/18 – 2021/22 Average Lower Derwent Valley SPA/Ramsar	Monthly survey total							Peak Count	WeBS 2017/18 – 2021/22 Average Humber Estuary SPA/Ramsar	WeBS 2017/18 – 2021/22 Average Lower Derwent Valley SPA/Ramsar
	Sep 2022	Oct 2022	Nov 2022	Dec 2022	Jan 2023	Feb 2023	Mar 2023				Sep 2023	Oct 2023	Nov 2023	Dec 2023	Jan 2024	Feb 2024	Mar 2024			
Pink-footed Goose (*Anser brachyrhynchus*)	-	-	-	80	-[14]	-[15]	-	80	25,332 (0.3%)	NA	58	515	150	800	54	2	-[16]	515	25,332 (2%)	NA
Teal (*Anas crecca*)	-	-	-	10	10	16	12	16	5,286 (0.3%)	7,327 (0.2%)	-	6	42	41	3	11	-	42	5,286 (0.8%)	7,327 (0.6%)
Wigeon (*Mareca penelope*)	-	-	-	-	-	15	2	15	3,669 (0.4%)	11,511 (0.1%)	-	-	-	-	-	-	-	-	3,669	11,511

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[14] 259 overflying pink-footed goose were recorded, but not considered to use supporting habitat within the Site.
[15] 500 overflying pink-footed goose were recorded, but not considered to use supporting habitat within the Site.
[16] Unknown number of individuals heard flying over but not seen.

Table 13. Cropping data for Solar PV Areas and the Ecology Mitigation ~~Zone~~Area within the Scheme for 2022, 2023 and 2024

General Solar PV Area/ Ecology Mitigation Area	Field Reference	2022[17]	2023	2024
1a[18]	1a.1 north and south	Not Specified	Summer Linseed (SL) and SL	Winter Wheat (WW) and WW
	1a.2	Not Specified	WW	WW
	1a.3	Not Specified	Summer Beans (SB)	WW
	1a.4	Not Specified	WW	WW
	1a.5	Not Specified	WW	Winter Beans (WB)
	1a.6	Not Specified	Fallow (F)	Summer Wheat (SW)
	1a.7	Arable - Wooded Copse	Not Specified	Not Specified
	1a.8	Not Specified	WW	SB
	1a.9	WW	WW	Winter Oil Seed Rape (WOSR)
	1a.10	WW	WW	WW
	1a.11	WW	WW	WOSR
	1a.12	OSR	WW	WOSR
	1a.13	Vining Peas (VP)	VP	WW
	1a.14	WW	WW	WOSR

[17] Winter in which non-breeding bird surveys for the Scheme were undertaken.
[18] 80 pink-footed goose (approx. 0.3% of the qualifying population of the Humber Estuary SPA / Ramsar) were recorded on Solar PV Area 1a in December 2022.

General Solar PV Area/ Ecology Mitigation Area	Field Reference	2022[17]	2023	2024
1b	1b.1 west and east	Unknown	WOSR and WW	WW and Summer Barley (SB)
	1b.2	Not Specified	WW	SB
1c	1c	WW	WW	SB
1d	1d	WW	WW	SB
1e	1e.1	Unknown	SB	F
	1e.2	Not Specified	WW	SB
	1e.3	Not Specified	F	WW
	1e.4	WW	WW	Borage (BG)
	1e.5	WW	WW	BG
	1e.6	WW	WW	BG
	1e.7	WW	WW	BG
	1e.8	WW	WW	BG
	1e.9	WW	WW	BG
	1e.10	SG	Grass (GS)	WW (or Countryside Stewardship Scheme [CSS])
	1e.11	OSR	WOSR	WOSR
	1e.12	CSS	CSS	CSS
	1e.13	CSS	CSS	CSS

General Solar PV Area/ Ecology Mitigation Area	Field Reference	2022[17]	2023	2024
	1e.14 west and east	WW	WW	VP
	1e.15	GS	GS	GS
	1e.16	OSR	WOSR	WW
	1e.17	WW	WW	VP
1f	1f.1	WW	WW – CSS	WW – CSS
	1f.2	CSS	WW – CSS	WW – CSS
1g	1g	WW + Spring Cereals (SC) – CSS[19]	WW + SC	WW + SC
1h	1h	Winter Barley (WB) + WW – CSS[20]	WB + WW	WB + WW
2a	2a.1	SB and WW	Winter Barley (WB)	OSR or WB
	2a.2	Arable: PP	GS	GS
	2a.3	Arable: PP	GS	GS
	2a.4	SB and WW	F	WW
2b	2b.1	Not Specified	WW	WW
	2b.2	Not Specified	WW	WB
2c	2c	Autumn Oil Seed Rape (AOSR)	WW	Over Winter Stubble (OWS)

[19] The CCS commenced on 01 January 2023 and will run to 31 December 2027. Mainly 6m margins around fields with AB8 (flower-rich margins and plots), AB9 (winter bird food) and GS4 (legume and herb-rich swards).
[20] The CCS commenced on 01 January 2023 and will run to 31 December 2027. AB15 (rotational two-year legume fallow) to help combat black grass.

General Solar PV Area/ Ecology Mitigation Area	Field Reference	2022[17]	2023	2024
2d	2d	AOSR	WW	OWS
2e	2e.1	Not Specified	WW	WW or WOSR
	2e.2	Not Specified	WW	GS
	2e.3	Not Specified	WW	WW
	2e.4	Not Specified	WW	WOSR
2f	2f east and west	Not Specified	WOSR and WB	WW and WW
2g	2g.1	Not Specified	WW	Summer Oats (SO)
	2g.2	Not Specified	WW	WOSR + Sugar Beet (SB)
	2g.3	Not Specified	WW	WOSR
	2g.4	Not Specified	WOSR	WW
	2g.5	Not Specified	WW	WW
	2g.6	Not Specified	WW	WOSR
3a	3a	Not Specified	Not Specified	Not Specified
3b[21]	3b.1	WW and OSR	Not Specified	Not Specified
	3b.2	WW and OSR	Not Specified	Not Specified
	3b.3	WW and OSR	Not Specified	Not Specified

[21] 30 golden plover (over 1% of the qualifying population of the Lower Derwent Valley SPA/Ramsar) were recorded on Solar PV Area 3b in December 2022.

General Solar PV Area/ Ecology Mitigation Area	Field Reference	2022[17]	2023	2024
	3b.4	WW and OSR	Not Specified	Not Specified
3c	3c.1	WW and OSR	WW	WB
	3c.2	Not Specified	Willow (WL)	WL
	3c.3	Short Rotation Coppice (SRC)	Not Specified	Not Specified
	3c.4	SRC	Not Specified	Not Specified
	3c.5	WW and OSR	Not Specified	Not Specified
	3c.6	WW and OSR	OWS	WW
	3c.7	WW and CP	WW	OWS
	3c.8	WW and CP	WW	OWS

Provision of mitigation land

~~8.4.13~~8.4.14 Based on the available survey data and an appraisal of the wider ecological importance of the Site, it is concluded that mitigation will be needed to offset the loss of functionally linked habitat associated with the Scheme. In defining an adequate area for mitigation, the sizes of plots where peak counts of golden plover ~~and~~, pink-footed goose and lapwing were recorded were used. Peak counts of golden plover and pink-footed goose in 2022/23 were obtained for plots of 15.7ha and 15ha in size respectively. In 2023/24 this was similar for pink-footed goose with a peak count obtained for a plot of 18ha, although noting the very brief usage of this field. Peak counts of golden plover in 2023/24 were obtained for a plot of 31ha. The peak count for lapwing in 2023/24 was recorded in a plot of 8.4ha. It is noted that the total field area (i.e., the field in its entirety as a functional unit bounded by hedgerow or fencing, rather than the occupied sub-area where birds were recorded) was used on the assumption that this represents a functional ecological unit.

~~8.4.14~~8.4.15 Greylag goose has been included in Natural England's list of 'main component species' for the Humber Estuary SPA/Ramsar and Lower Derwent Valley SPA/Ramsar. Ringing studies in the Lower Derwent Valley SPA between 1981-2022 have shown that individuals of this species move between the Lower Derwent Valley, parts of the Humber Estuary SPA and waterbodies/arable fields in the wider area. Greylag goose are highly mobile and widespread, making it difficult to determine whether they are part of a designated assemblage. However, given the evidence from ringing studies, Natural England advise that a precautionary approach should be applied when assessing impacts on this species. While there is the potential for functional linkage of the Solar PV Areas for greylag goose, this must be placed in the context of the foraging behaviour and habitat requirements of this species. As highlighted above, this species is highly mobile and exploits a wide range of foraging resources throughout winter. Therefore, its reliance on individual fields across the arable landscape of East Yorkshire is likely to be low. In a consultation response dated 18 August 2023, Natural England agreed that the presence of greylag geese within the Site is '*less of a conservation concern*' and should not be driving the mitigation provision. Furthermore, any habitats provided for pink-footed goose and golden plover will, in principle, also be suitable for greylag goose. Therefore, broad mitigation in relation to this species is included in the proposals that are set out below.

~~8.4.15~~8.4.16 The farming landscape of East Yorkshire is attracting qualifying non-breeding bird species from nearby European sites. Any mitigation should, therefore, focus on optimising the management of existing arable farmland for pink-footed goose and golden plover. Under normal circumstances, qualifying birds must move around the landscape to find agricultural fields in optimal foraging conditions depending on cropping regimes, sowing times and hydrological conditions. Improving land management techniques on selected arable plots ensures that a more consistent food source is permanently available throughout winter, thereby reducing the need for travel and energy expenditure. Additionally, by ensuring as little disturbance as possible, there will be fewer stressors on and foraging interruptions to birds.

~~8.4.16~~8.4.17 In exploring potential options for delivering appropriate and effective mitigation land, several principles were considered essential to facilitate long-distance views for and reduce disturbance potential to birds, based on professional judgment:

a. ~~A minimum of 30ha of mitigation~~Mitigation habitat should be provided (ideally contiguous) based on the combined size of fields ~~were~~where peak counts of SPA/Ramsar birds were recorded;

b. Individual mitigation plots should ~~have a minimum size of 15ha to~~ reflect the sizes of plots with peak bird counts;

c. Limited surrounding hedgerows and woodland to facilitate long-distance view for birds;

d. Situated as far away as practicable from roads and clusters of buildings; and

e. Minimum offset distance of ~~50m~~150m from any nearby solar infrastructure with material disturbance potential through the presence of people or noise generation, such as Field Stations.

~~8.4.17~~8.4.18 The currently proposed option for delivering mitigation is to provide an adequate amount of habitat ~~(~~, i.e. ~~no less than 30ha in total)~~ 28.75ha for golden plover/lapwing and 15ha for pink-footed goose in the north-west part of the Scheme, specifically in Ecology Mitigation Areas 1g and 1h (shown in **Figure 11**, in **Appendix A**). The mitigation approach would encompass the following key elements:

a. Provision of ~~at least 15ha~~28.75ha of wet grassland for golden plover and lapwing in the Golden Plover Mitigation Zone[22] adjoining the River Foulness in Ecology Mitigation Area 1h. Whilst, this is slightly less than the total field size where the peak counts of these species were recorded, the habitat quality will provide enhanced foraging opportunities and be contiguous with the land managed for pink-footed goose, which is also of value to golden plover and lapwing; and

b. Provision of at least 15ha of suitable arable habitat[23] within the Indicative Goose Mitigation Zone in Ecology Mitigation Areas 1g and 1h.

~~8.4.18~~8.4.19 The establishment and long-term management of the Ecology Mitigation Areas 1g and 1h are defined within and secured by the **Framework LEMP [EN010143/APP/7.14]**. This habitat will be established prior to the commencement of construction works to secure effective mitigation is in place timely. Furthermore, construction works in the closest parts of the Scheme (e.g., Solar PV Area 1e) will be undertaken first, to minimise any potential for disturbance in the Golden Plover and Goose Mitigation Zones. Delivering a large continuous mitigation area on the north-east border of the Site fulfils many of the principles set out in paragraph 8.4.17. A major advantage of delivering mitigation in this area is that a

[22] It is to be noted that mitigation for lapwing will also be provided in the Golden Plover Mitigation Zone due to the similar habitat preferences of the two species.

[23] A minimum of 15ha of sensitively managed arable farmland would be provided on a rotational basis to ensure that an adequate foraging resource is available to pink-footed goose in each overwintering period.

mosaic of habitats of arable land and wet grassland would be provided due to the geographic proximity to the River Foulness. Furthermore, this area of land is flat and open, which are important habitat characteristics for both species to enable early threat detection. Having a larger, contiguous area will also compensate for any potential ~~disturbance~~displacement from solar PV panels in adjoining fields, such as the remainder of Solar PV Area 1e~~. Both golden plover and~~ , although existing vegetation will also screen these areas. The Goose Mitigation Zone in 1h was used by pink-footed goose ~~have been recorded in~~ feeding on the stubble throughout December 2023 with up to 800 individuals present. However, the birds were not present beyond this period. The presence of pink-footed goose within 1h during December 2023 suggests that the location is suitable and can be cropped in a manner to yield suitable foraging habitat for the species and that with sympathetic management for pink-footed goose, i.e., spilling more grain at harvest and leaving stubble in the ground for longer, that the mitigation area ~~and~~can deliver longer term benefits for the species. There is also anecdotal evidence from a landowner to the east of the River Foulness which suggests that pink-footed goose are regular visitors to local arable fields. This indicates that both species are already present in the wider area and would be expected to utilise suitable habitat provided here.

~~8.4.19~~8.4.20 Based on professional judgment, it is considered that the extent of habitat provision is sufficient to mitigate the ~~relatively low~~ numbers of pink-footed goose ~~and~~, golden plover and lapwing recorded during the non-breeding ~~survey~~surveys. Additionally, the following key features of the mitigation proposals highlight that the value of the mitigation zone is greater than the sum of its parts:

a. The 1% population threshold for mitigation requirements has not been applied rigidly and mitigation is provided for species that may fall below the 1% threshold~~.~~ in any given year. Moreover, golden plover ~~and~~, pink-footed goose and lapwing that are the basis for the mitigation provision were ~~only recorded on a single occasion~~shown to demonstrate inter-annual variation in site usage suggesting an irregular pattern of occurrence influenced by cropping regime and ~~not consistently over the winter period~~wider environmental conditions;

b. The proposal encompasses a total mitigation area that exceeds the 15ha minimum for ~~both golden plover and~~ pink-footed goose~~, because each species is likely to use~~ and provides 28.75 ha of habitat ~~provided~~ for golden plover and lapwing, although noting that both of the ~~other (i.e., 30ha of suitable habitat~~ latter species will ~~be secured in a given season);~~also benefit from the area managed for pink-footed goose;

c. Devising the Golden Plover and Goose Mitigation Zones as a single contiguous area, increases their openness and attractiveness to birds;

d. Specific habitat management interventions (discussed further below; e.g., assuring goose-friendly cropping and wet habitat features ~~in perpetuity~~at least for the lifetime of the Scheme) ensure greater habitat suitability than simply setting aside arable land; and

e. The total area of land included in the Golden Plover and Goose Mitigation Zones exceeds ~~30ha.~~the minimum provisions for each

species. Therefore, there is scope to increase the amount of habitat provided in a given season, if subsequent monitoring identifies a need.

~~8.4.20~~8.4.21 It is of primary importance that the mitigation to be delivered in support of the Scheme is ecologically viable, functional and effective. Therefore, additional evidence was sought to document the suitability in principle of the proposed mitigation zones. The qualifying species requiring mitigation have contrasting habitat requirements. Golden plover and lapwing primarily depend on an abundant supply of invertebrates in damp/wet grassland, while pink-footed goose forage on grains and discarded root crops in arable fields. It is to be noted that some overlap in habitat usage between the two species will exist where farmland is on permanently wet soils or regularly flooded~~.~~, e.g., golden plover and lapwing will roost on arable stubbles and ploughs. Therefore, the provision of successful mitigation in Ecology Mitigation Areas 1g and/or 1h will partly depend on the prevailing flood dynamics of the River Foulness. While near surface water levels are required to create suitable foraging conditions in the Golden Plover Mitigation Zone, this is not required in the Goose Mitigation Zone.

Hydrodynamic conditions in the Golden Plover and Goose Mitigation Zones

~~8.4.21~~8.4.22 The Golden Plover Mitigation Zone partially lies in Flood Zone 3, implying there is a high probability of some regular inundation. This land has a 1% or greater annual probability of river flooding, meaning it is possible that wet conditions in this zone will be naturally present, particularly in winter. **Figure 12** (**Appendix A**) shows the historic maximum flooding outline extents adjoining the River Foulness[24], which includes the eastern section of the Golden Plover Mitigation Zone. However, it is noted that the western portion of the Golden Plover Mitigation Zone lies beyond the maximum historic flood extent. Importantly, the Goose Mitigation Zone has no flood events reported. This is crucial for its effectiveness as mitigation habitat, as waterlogged ground would render the arable fields unsuitable/inaccessible to pink-footed goose. It is noted that while grassland should be permanently wet to favour golden plover, actual 'flooding' (i.e. long periods of standing water several inches deep or more) is not desirable and the habitat will be designed to avoid this.

~~8.4.22~~8.4.23 AECOM has also requested anecdotal evidence on past flood events in agricultural parcels from the respective landowners within the two mitigation zones. Responses indicate that there has been no flooding on land encompassed in the Goose Mitigation Zone. Flooding events in the eastern portion of the Golden Plover Mitigation Zone are reported with waterlogged ground for up to a week. According to the landowner, this depends on weather patterns and whether the lock gates are open. Overall, the available historic and anecdotal evidence indicate it is very unlikely that regular, deep flooding would interfere with the effectiveness of mitigation provided in the Golden Plover and Goose Mitigation Zones. However, it is considered that habitat management interventions are required to reliably provide suitable habitat conditions for golden plover on a yearly basis (see following section). Any such measures would be agreed to with Natural England and secured in

[24] Based on flood data collated by Defra dating back to 1946.

the **Framework Landscape and Ecological Management Plan (LEMP) [EN010143/APP/7.14]**.

Habitat Management ~~In Perpetuity~~

~~8.4.23~~8.4.24 To ensure that the habitats provide effective mitigation ~~in perpetuity~~at least for the lifetime of the Scheme, detailed habitat management measures are set out in the LEMP accompanying the DCO submission. This includes a suite of measures to ensure that habitat patches are suitable for golden plover and pink-footed goose. A master spreadsheet would ~~detail~~be prepared as part of the detailed LEMP specifying the future cropping rotations within the Goose Mitigation Zone~~ and this will accompany a legal agreement with the relevant landowners.~~. This spreadsheet ~~details~~would detail the type of crop planted, location and responsible landowner of the 15ha of arable land that are under goose-friendly cropping every year in the rotation.

~~8.4.24~~8.4.25 For example, in any given year, 15ha of the arable land would be planted with the preferred crop types for pink-footed goose (e.g., spring-sown wheat or barley). Harvesting would be delayed as much as practically possible into late autumn, with any remaining stubble being retained into late spring. Prolonged retention of winter stubble is widely accepted to increase availability of arable plant seeds and spilt grain, with beneficial impacts for farmland birds (including geese). Arable land outside the 15ha rotational zone would continue to be operated under the existing farming practices (similar to those detailed in

~~8.4.25~~8.4.26 **Table** 13), with a variety of crops being sown and harvested according to schedules preferred by respective landowners. Notably, therefore, as highlighted by the current use of the Site by geese, the habitat beyond the rotationally managed 15ha in the Goose Mitigation Zone will also be suitable for geese and provide additional benefit.

~~8.4.26~~8.4.27 As highlighted in the previous section, it is considered that additional habitat management is needed to provide assurance of effective mitigation for golden plover. Scrapes are the most common habitat features deployed to support diverse invertebrate assemblages and create suitable habitat conditions for waders. They are shallow depressions with gently sloping edges, designed to hold water seasonally and potentially remaining damp throughout the year. The RSPB has published the following guidelines for scrape creation (Ref. 70):

a. Gently sloping and irregular edges for permitting access and maximising invertebrate habitat niches;

b. Varied water depths with shallow water around the edges and a maximum water depth of 50cm in the middle of the scrape;

c. Minimum size of 20m^2 to create a functional biotope and enable multiple birds to forage at the same time; and,

d. Good level of habitat provision of three scrapes per hectare of mitigation land delivered.

~~8.4.27~~8.4.28 Because both golden plover and lapwing will be most interested in edge habitat (i.e., the ecotonal boundary where the amount of water is sufficient to maintain dampness) rather than the deeper sections of scrapes,

the Scheme will deliver a network of 'blind' linear foot drains across ~~15ha of~~ the Golden Plover Mitigation Zone, designed to maintain shallow water levels and maximise edge habitat. Foot drains would be created using excavators or rotary ditchers to widths of 1-2m and depths of approximately 30cm (i.e., not extending beyond the depth of topsoil), ensuring a gently sloping edge profile that provides ideal conditions for tipulid populations. Any excavated topsoil would be redistributed on the surrounding land. There would be no outfalls and areas of downward sloping ground to the R. Foulness in the eastern section of the Golden Plover Mitigation Zone would be avoided, to minimise any potential for surface runoff to the river.

~~8.4.28~~8.4.29 Given that the soils within the Site are dominated by heavy clays, the foot drains would predominantly retain perched water and/or be fed by rainfall. To increase the likelihood that the linear drains reliably retain adequate volumes of water in winter, they could be focused along in-field ditch lines or in direct connection with water sources. The Golden Plover Mitigation Zone is traversed by several water features, including the Seller Dike, FO41, FO42 and FO45. Despite the ephemeral nature of some of these, all are likely to hold water in winter. Connecting the network of drains with any of these watercourses would very likely increase its overall value to golden plover.

~~8.4.29~~8.4.30 Based on the information described above, an indicative layout of the foot drains has been devised. **Figure 13** (**Appendix A**) shows the location of these drains in the western portion of the Golden Plover Mitigation Zone. It is noted that while foot drains will only be created in places, grassland will be sown throughout the entire Golden Plover Mitigation Zone. ~~Given the prevailing ground conditions, it is probable that all of this grassland will retain a degree of wetness, thereby increasing suitable habitat provision beyond 15ha.~~ Overall, delivering a network of linear foot drains in the Golden Plover Mitigation Zone will increase the likelihood of creating ideal conditions for the invertebrate assemblages on which golden plover and lapwing rely.

~~8.4.30~~8.4.31 To deliver long-term effective mitigation, habitat management will be required to prevent overgrowth and maintain open, muddy margins. Previous case studies have demonstrated that wader usage declines rapidly as muddy margins become inaccessible to due to vegetation growth. Wader habitats can be adequately managed through low-intensity livestock grazing and/or annual mowing of margins. The **Framework LEMP [EN010143/APP/7.14]** accompanying the DCO submission sets out the full details of foot drain provision and management that will be delivered in the Golden Plover Mitigation Zone.

Conclusions

~~8.4.31~~8.4.32 The Scheme will result in a net reduction of arable farmland that provides foraging opportunities for golden plover and pink-footed goose associated with the Lower Derwent Valley SPA/Ramsar and Humber Estuary SPA/Ramsar outside of the site boundaries (commencing in the construction phase, but only 'in full effect' in the operational phase). Therefore, mitigation will be delivered to offset a reduction in functionally linked foraging opportunities and avoid adverse effects on the integrity of these European sites. ~~A total minimum of 30ha of mitigation~~Mitigation land will be delivered in the north-east part of the Scheme, comprising ~~15ha~~a minimum of 28.75ha of

wet grassland in the Golden Plover Mitigation Zone and 15ha of arable fields in the Goose Mitigation Zone (the latter managed on a rotational basis). This proposal has been discussed with and agreed to in principle by Natural England. Therefore, with this mitigation secured at DCO submission, it is concluded that the Scheme will not result in adverse effects on the integrity of the Lower Derwent Valley SPA/Ramsar and Humber Estuary SPA/Ramsar regarding functionally linked habitat loss in the operational phase.

In-Combination Assessment

8.4.33 The potential loss of functionally linked habitats for SPA/Ramsar birds in the Lower Derwent Valley SPA/Ramsar and Humber Estuary SPA/Ramsar has an important strategic element. While preventing the loss of individual supporting habitats (e.g., single arable fields) is important, population-level impacts are most likely where many greenfield sites are being lost due to multiple developments. This severely limits site choice for birds, increases competitive foraging pressure within remaining land parcels and, potentially, reduces the ability of migrating birds to adequately replenish their critical nutritional reserves. Several projects identified in **Table 10**, particularly those that overlap with or lie close to the Scheme boundary (e.g., Helios Renewable Energy Project, Drax Carbon Capture, Humber Low Carbon Pipelines), are likely to result in their own quantum of functionally linked habitat loss. ~~Using~~Another potential implication of multiple developments coming forward in the wider foraging landscape of SPA/Ramsar birds and resulting in permanent habitat loss is a loss of openness. This determines habitat suitability for many qualifying species, such as by enabling the early detection of threats.

8.4.34 The mitigation proposals use 1% of the qualifying population as a threshold for establishing functional linkage, thereby explicitly ~~captures~~capturing the in-combination impact from several development projects across multiple land parcels. This HRA analyses the implications of the Scheme regarding functionally linked habitat loss, sets out mitigation requirements in detail and wholly addresses the contribution of the Scheme to any such habitat loss. Furthermore, by siting the Mitigation Zones on the edge of the Scheme adjoining other suitable foraging habitats, adequate openness is safeguarded. The large, contiguous nature of the Mitigation Zones also allows adequate foraging and roosting space for both species within the centre of fields, away from boundary features and adjoining Solar PV Areas. The proposals have been developed in consultation with Natural England to ensure that mitigation is delivered in an adequate and timely manner.

~~8.4.32~~8.4.35 Other planning applications that are likely to lead to the loss of arable land in East Yorkshire will need to undertake similar work. Furthermore, consultation with and feedback from Natural England will ensure that any mitigation proposals are tailored to the designated target species potentially impacted and adequate to avoid adverse effects on the integrity of the Lower Derwent Valley SPA/Ramsar and Humber Estuary SPA/Ramsar. Given that the Scheme fully mitigates its own impact in relation to functionally linked habitat loss and all other planning proposals ~~are~~will be required to ~~adequately mitigate their own habitat loss~~achieve the same, there is no potential for the Scheme to result in adverse effects regarding functionally linked habitat loss in-combination with other projects and plans~~.~~ irrespective

of the extent of functionally-linked land loss that may arise from those schemes. As such the losses due to other schemes do not need discussing in detail in this HRA, and in many cases would not be known definitively until a DCO for those projects was submitted. The threshold for determining whether the loss of an area of functionally linked land requires mitigation (i.e. the 1% of the SPA population criterion) is set so low specifically to capture the potential for multiple developments which all affect fields supporting only relatively small numbers of SPA birds to act in combination. There are no other projects that would result in significant loss of land for SPA birds which lie close to the PV area of the Scheme and therefore it is concluded there would be no adverse effect on the integrity of the SPA in-combination.

8.5 Temporary Loss of/Damage to Qualifying Habitat – Construction and Decommissioning Phases

River Derwent SAC

8.5.1 In Chapter 6 of the HRA, LSEs of the Scheme in relation to temporary loss of qualifying habitat in the River Derwent SAC could not be excluded. Temporary access into the field to the north of the A63 will be required in the construction phase, with a bell mouth that necessitates the temporary removal of a section of verge habitat within the designated site boundary. Verge soils would be stripped and stored separately within the Site and reinstated following the termination of construction and decommissioning activities to maintain the local seedbank.

8.5.2 The only habitat for which the River Derwent SAC is designated is the 'water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation' feature. This is an aquatic habitat, which is not directly dependent on the terrestrial vegetation found in this location. Consultation with Natural England on previous projects[25] indicates that the main terrestrial habitat components that are considered to be functionally linked to the River Derwent SAC are wet woodland and fen. The access track discussed here does not lie in proximity to any of these habitats. The vegetation that would be temporarily removed is considered to be part of the wider site fabric, which is not essential for the SAC to achieve its Conservation Objectives.

8.5.3 Otter, a qualifying species of the River Derwent SAC, may be travelling within verge habitat alongside ~~the~~ ditch DE21 to the south of the access track. Notably, the area of verge ~~in question~~habitat to be temporarily cleared is a small area to the north of the ~~ditch~~access track (as opposed to the section of verge that lies south of the track immediately adjacent to the ditch and woodland, and which is more likely to be used by otter). It is to be noted that a small number of trees to the south of the access track adjacent to DE21 (and, therefore, potentially within habitat used by otter) are likely to require management for safety reasons. However, any trees that need to be removed will be cut above ground level, therefore maintaining the bank.

8.5.4 A Phase 1 Otter Survey recorded no evidence (i.e., spraints, couches) of roaming otter along that section of ditch. Moreover, both the temporary verge

[25] E.g., in relation to the Selby Local Plan HRA.

habitat loss and any potential resulting impacts on otter (if present) would be temporary, ceasing upon reinstating of verge soils. It is also noted that this track is heavily used by recreational visitors which will inherently reduce its suitability to otter. There is no evidence to indicate any material otter presence along bankside vegetation of ditch DE21. The affected area comprises a grass verge on the southern boundary of the field, to the north of the track and therefore not forming part of the banks of the watercourse itself, which lies to the south of the track. As such, a separate habitat restoration plan for the area impacted by vegetation removal is not anticipated to be necessary. However, details of how the verge habitat will be restored is included within the Framework LEMP. This includes measures undertaken to reinstate full ecological functionality to this area of habitat within the River Derwent SAC.

~~8.5.3~~8.5.5 Overall, based on the available evidence and measures in the Framework LEMP with regards to the restoration of the habitat, it is concluded that the use of this access route will not result in adverse effects on the River Derwent SAC regarding temporary loss of qualifying habitat that may be used by otter.

In-Combination Assessment

~~8.5.4~~8.5.6 In the preceding assessment it was determined that the Scheme will not result in adverse effects on the River Derwent SAC regarding temporary loss of and damage to qualifying habitat alone. As highlighted in earlier in-combination assessments, several NSIPs overlap with the Grid Connection Corridor of the Scheme. However, it is considered that due to the highly localised nature of this impact (i.e., it is restricted to a short section of verge habitat along the access track off the A63), there is no scope for any adverse interaction with other projects. Specifically, no other project will require vegetation removal in this location and over the same timescale as the Scheme, which would have a potential for synergistic impacts to the SAC and therefore it is concluded there would be no adverse effect on the integrity of the SAC in-combination.

9. Conclusions

9.1 Overview

9.1.1 This HRA report assessed the potential for the Scheme to result in LSEs and, where relevant, adverse effects on the integrity of European sites within 15km of the Order limits. ~~A total of~~Overall, 10 European sites ~~was~~were determined to lie within the potential Zone of Influence of the Scheme, including the River Derwent SAC, Lower Derwent Valley SPA, Lower Derwent Valley Ramsar, Lower Derwent Valley SAC, Humber Estuary SPA, Humber Estuary Ramsar, Humber Estuary SAC, Skipwith Common SAC, Thorne & Hatfield Moors SPA and Thorne Moors SAC.

9.1.2 Based on their qualifying features, accompanying conservation objectives and the likely impact pathways resulting from the Scheme, the Skipwith Common SAC, Thorne & Hatfield Moors SPA and Thorne Moor SAC were excluded from further HRA assessment. LSEs of the Scheme were assessed

in the context of the remaining European sites in relation to the following impact pathways:

a. Noise and visual disturbance (in all phases of development; construction, operation and decommissioning);
b. Water quality (all phases of development);
c. Water quantity, level and flow (all phases of development);
d. Temporary loss of/damage to qualifying habitat (construction and decommissioning);
e. Atmospheric pollution (construction and decommissioning);
f. Introduction of INNS (construction and decommissioning);
g. Loss of functionally linked habitat (operation).

9.1.3 Upon closer review of the available evidence, LSEs of the Scheme, both alone and in-combination, could be excluded for several impact sources due to the effective absence of an effect. However, several impact pathways were screened in for a more detailed analysis in the AA. The main conclusions and any associated mitigation requirements for each impact pathway are set out under the following sub-headings.

9.2 Noise and Visual Disturbance – Construction and Decommissioning Phases

9.2.1 The AA assessed potential construction/decommissioning noise and visual disturbance impacts to qualifying birds associated with the Lower Derwent Valley SPA/Ramsar and Humber Estuary SPA/Ramsar. Noise modelling was undertaken to evaluate the noise levels associated with different NGAs and compare this to the threshold of 55dB, below which there are no material disturbance impacts on birds. According to noise modelling data and visual disturbance distances reported in the literature, the Scheme will inevitably result in temporary disturbance from construction and decommissioning works, particularly in the first 500m from the Order limits and primarily in the first tier of adjoining fields. However, the magnitude of this noise and visual disturbance needs to be viewed in the context of wider farming operations and the availability of suitably foraging habitat in this part of East Yorkshire. For example, routine agricultural activities, part of the normal baseline soundscape, will result in similar magnitudes of disturbance than the works undertaken for the Scheme. Furthermore, only an exceedingly small proportion of the overall foraging resources of SPA/Ramsar birds would be subjected to elevated noise levels at any one time. Notably, noise and visual stimuli from construction/decommissioning works will only be relevant where they are carried out close to the Order limits of the Scheme, with much of the works likely to be undertaken towards the centre of the Site. Additionally, land secured and suitably managed in the Golden Plover and Goose Mitigation Zones would have some capacity to provide foraging habitats that are temporarily displaced from around the Order limits. Overall, the AA concluded that the Scheme would not result in adverse effects on the integrity of the Lower Derwent Valley SPA/Ramsar and Humber Estuary SPA/Ramsar regarding noise and visual disturbance to qualifying birds.

9.2.2 Potential noise and visual disturbance effects of the Scheme were also considered in relation to qualifying otter, foraging and commuting along the banks of the Rivers Derwent and Ouse in the Grid Connection Corridor. Due to their associated noise levels and proximity to waterbodies, the HDD works were considered to have the largest disturbance potential to otter. Noise modelling undertaken at the respective entry points of two HDD crossings, indicates that several hundred meters of riverside habitat will be subjected to elevated noise levels (noting that a Phase 1 otter survey recorded no holts or natal dens within the Order limits). While otter are generally well adapted to habitats impacted by anthropogenic noise, noise fencing around HDD entry points will be deployed to minimise potential noise disturbance to foraging/commuting otter. As discussed in the AA, any lighting required in the construction/decommissioning phases of the Scheme will incorporate measures to reduce light spillage onto otter habitats. Overall, the AA concluded that the Scheme would not result in adverse effects on the integrity of the Lower Derwent Valley SAC and River Derwent SAC regarding noise and visual disturbance to qualifying otter.

9.3 Water Quality – Construction, Operational and Decommissioning Phases

9.3.1 Due to the proximity of the Scheme to the River Derwent and hydrological linkage to the Humber Estuary via the River Ouse, an AA of potential water quality impacts of the Scheme was undertaken. This identified non-toxic pollution through sedimentation as a primary threat to the qualifying features in this riverine continuum. Furthermore, potential negative ecological impacts from HDD operations were also discussed. As identified in the AA, comprehensive water quality protection measures are secured in the **Framework CEMP [EN010143/APP/7.7]**, including the adherence to Good Practice Guidance, use of temporary drainage systems, minimum distances between storage spaces for excavated materials and water features, and dedicated wash-down areas.

9.3.2 Potential negative water quality impacts from HDD operations are minimised by delivering precautionary drill depth, undertaking pre-works hydrogeological assessments (including a site-specific hydraulic fracture risk assessment) and distancing HDD pits a minimum of ~~30 m~~30m from the edge of ~~watercourses. Overall, the AA concluded that the Scheme would not result in adverse effects on the integrity of~~ the River Derwent~~ SAC, Lower Derwent Valley SAC, Lower Derwent Valley SPA/Ramsar~~, the River Ouse and ~~Humber Estuary SPA/Ramsar regarding water quality.~~unnamed drain DE53 watercourses.

9.3.3 Run-off from impermeable surfaces associated with the Scheme was identified as a potential water quality threat in the operational phase. The two Grid Connection Substations will at least partially convert arable fields to brownfield development, resulting in a net increase in run-off. However, as highlighted in the **Framework Surface Water Drainage Strategy [EN010143/APP/6.2]**, three adequately sized and densely vegetated attenuation storage areas will be delivered in support of the Scheme. The water quality treatment index of this type of vegetation exceeds the pollution hazard index associated with the impermeable surfaces of the Scheme in Solar PV Area 1c.

9.3.4 Overall, the AA concluded that the Scheme would not result in adverse effects on the integrity of the River Derwent SAC, Lower Derwent Valley SAC, Lower Derwent Valley SPA/Ramsar and Humber Estuary SAC/SPA/Ramsar regarding water quality.

9.4 Atmospheric Pollution (Dust Deposition) – Construction and Decommissioning Phases

9.4.1 Potential atmospheric pollution impacts on the River Derwent SAC through dust release were screened in for AA due to the proximity of the Grid Connection Corridor to the SAC and the nature of works to be undertaken in that section of the Scheme. However, any potential for adverse effects will be avoided through the measures secured in the **Framework CEMP [EN010143/APP/7.7]**, many of which are targeted at minimising dust release. For example, excavated soils will be regularly dampened in dry weather and covered adequately to prevent dust being mobilised by strong winds. Overall, the AA concluded that the Scheme would not result in adverse effects on the integrity of the River Derwent SAC regarding atmospheric pollution through dust release.

9.5 Loss of Functionally Linked Habitat – Operational Phase

9.5.1 The AA assessed the potential for the Scheme to result in the loss of arable land that is functionally linked to the Lower Derwent Valley SPA/Ramsar and Humber Estuary SPA/Ramsar. Data from non-breeding bird surveys indicate that several fields within the Site were used by SPA/Ramsar birds at levels approaching the critical 1% population threshold (typically used to identify functional linkage). Based on an assessment of habitat preferences, maximum foraging ranges and bird survey records, it was concluded that mitigation would be required to offset the permanent loss of supporting habitat for golden plover and pink-footed goose under the operational footprint of the Scheme.

9.5.2 A target area in the north-eastern part of the Scheme and approach for the delivery of mitigation was identified and broadly agreed upon in consultation with Natural England. Based on the size of fields within which peak counts for both species were obtained, a total of ~~30ha~~43.75ha of mitigation habitat will be provided. A total of ~~15ha~~28.75ha of wet grassland will be delivered in the Golden Plover Mitigation Zone adjoining the River Foulness through the delivery of a network of linear footdrains, designed to retain water and maximise foraging opportunities for overwintering golden plover. Furthermore, 15ha of arable land maintained under a suitable cropping regime and management practices (e.g., spring-sown wheat or barley with longer retention of winter stubbles) will be provided in the Goose Mitigation Zone on a rotational basis. Importantly, both zones have residual capacity for additional mitigation, should this be deemed necessary by future monitoring. The delivery of the respective mitigation zones is secured in the **Framework LEMP [EN010143/APP/7.14]**, which is part of the suite of documents submitted for the DCO Application. Overall, given the adequate mitigation framework that is in place, the AA concluded that the Scheme would not result in adverse effects on the integrity of the Lower Derwent Valley

SPA/Ramsar and Humber Estuary SPA/Ramsar regarding the loss of functionally linked habitat.

9.6 Temporary Loss of/Damage to Qualifying Habitat – Construction and Decommissioning Phases

9.6.1 The temporary impacts of the vegetation clearance required within the River Derwent SAC for the access track off the A63 were considered in the AA. However, the main terrestrial habitat components that are functionally linked to the River Derwent SAC are wet woodland and fen, neither of which are present along the access track. Therefore, the temporary removal of vegetation would only affect site fabric that is not considered critical for the SAC to achieve its Conservation Objectives.

9.6.2 While otter likely roam along any watercourses, including the habitat along the ditch to the south of the access track, it was determined that there would be no potential for impacts to otter for several reasons. An extended Phase 1 habitats survey (provided in **Appendix 8-3, ES Volume 2 [EN010143/APP/6.2]**) recorded no evidence of otter presence along the ditch, which is also heavily disturbed by recreational users. Furthermore, even if otter were present, any potential impedance of ranging behaviour would be temporary, ceasing upon the reinstating of the verge soils. Overall, based on the available evidence, it was concluded that the use of this access route will not result in adverse effects on the River Derwent SAC regarding temporary loss of or damage to qualifying habitat itself, or its ability to be used by roaming otter.

10. References

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Appendix A – Figures

Figure 4. Indicative Site Layout

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N

Sheet 1

Sheet 2

Sheet 3

Sheet 4

Sheet 5

Sheet 6

Sheet 7

1:50,000 @ A3

1 0.5 0 1 2 3 km

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East Yorkshire Solar Farm

CLIENT

East Yorkshire Solar Farm Limited

CONSULTANT

AECOM Limited
Midpoint,
Alencon Link
Basingstoke, RG21 7PP
www.aecom.com

LEGEND

- Order limits
- Land not included in the Order limits
- Sheet Extent with Reference to Sheet Number

NOTES

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FIGURE TITLE

Indicative Site Layout Overview Plan

FIGURE NUMBER

Figure 4

Version 4.3 Revision: 0 Drawn: CA Checked: JW Approved: HS Date: 2023-11-17

Willitoft

1a

1b

1c

1d

1e

2a

Grid Connection Substations Potential Development Area

bing

1:10,000 @ A3

200 100 0 200 400 600 m

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LEGEND

- Order limits
- Land not included in the Order limits
- XX — Solar PV Site (xx = Solar PV Area)
- Ecology Mitigation Area (xx = Ecology Mitigation Area)
- Grid Connection Corridor - Habitat to be Reinstated
- Interconnecting Cable Corridor - Habitat to be Reinstated
- Retained Habitat
- Existing Individual Tree
- Existing Hedgerow
- Existing Pond
- Operations and Maintenance Hub (Johnson's Farm)
- Solar PV Table
- Field Station
- Site Access
- Solar PV Site Perimeter Fencing
- Grid Connection Substation Fencing
- Overhead Electricity Line
- Gas Pipeline
- Hull to Selby Railway Line
- Public Right of Way
- Proposed Permissive Path
- Proposed Permissive Path (Allowing Travel on Horses)
- Howden 20 Circular Route
- Proposed Hedgerow
- Proposed Hedgerow with Trees
- Enhanced Line of Trees
- Enhanced Hedgerow
- Proposed Ecological Enhancement Area
- Proposed Flower Rich Grassland
- Proposed Hardstanding
- Proposed Internal Access Track
- Proposed Native Scrub with Trees Planting
- Proposed Native Woodland - Mixed
- Proposed Semi-Improved Grassland
- Proposed Species-Rich Grassland
- Proposed Species Rich Wet Grassland
- Proposed Traditional Orchard
- Proposed Woodland Edge Mixed

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FIGURE TITLE

Indicative Site Layout
Sheet 1 of 7

FIGURE NUMBER

Figure 4

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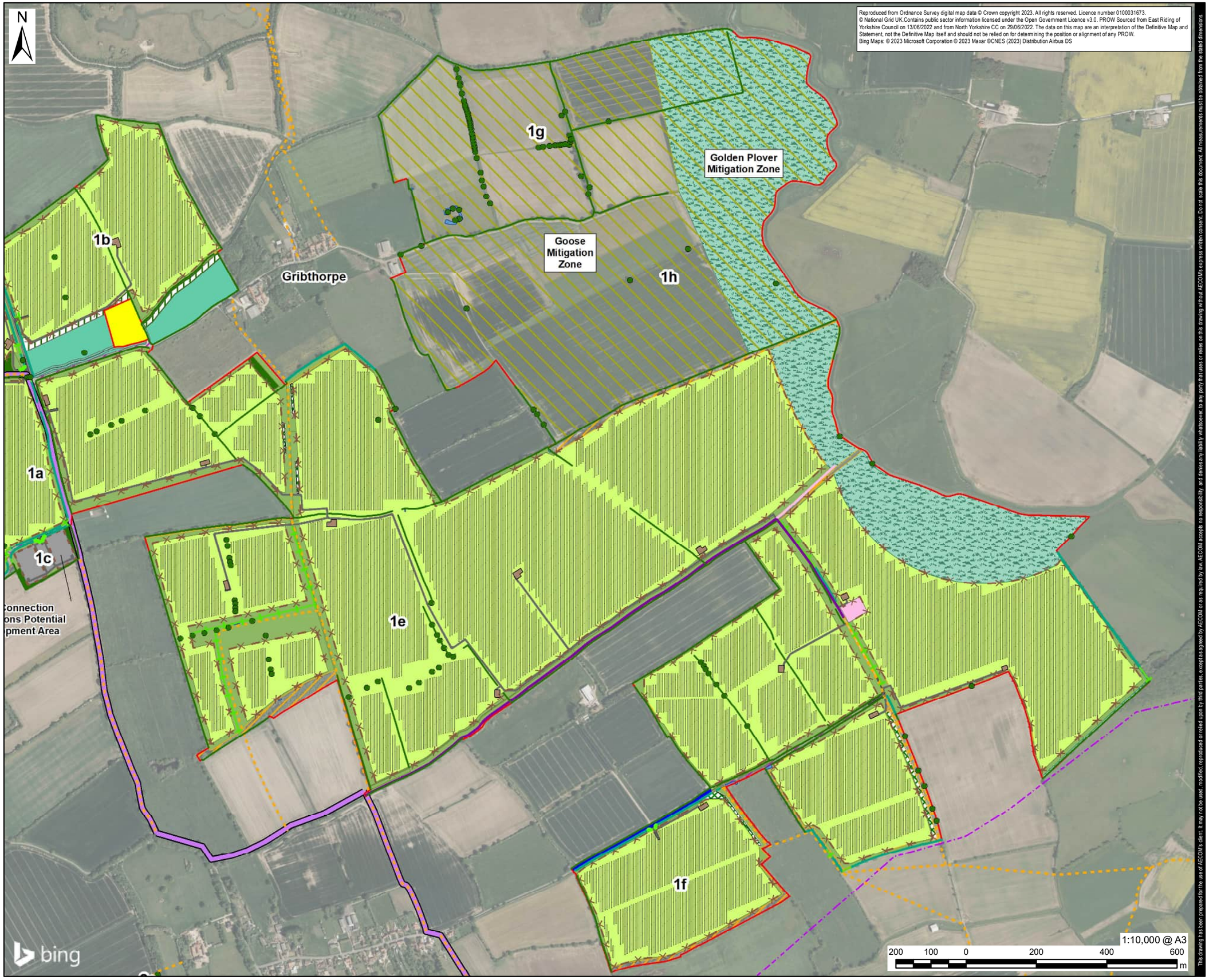

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FIGURE TITLE

Indicative Site Layout
Sheet 2 of 7

FIGURE NUMBER

Figure 4

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FIGURE TITLE

Indicative Site Layout
Sheet 3 of 7

FIGURE NUMBER

Figure 4

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Spaldington

1f

2e

2f

2d

2d

2g

1:10,000 @ A3

200 100 0 200 400 600 m

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FIGURE TITLE

Indicative Site Layout
Sheet 4 of 7

FIGURE NUMBER

Figure 4

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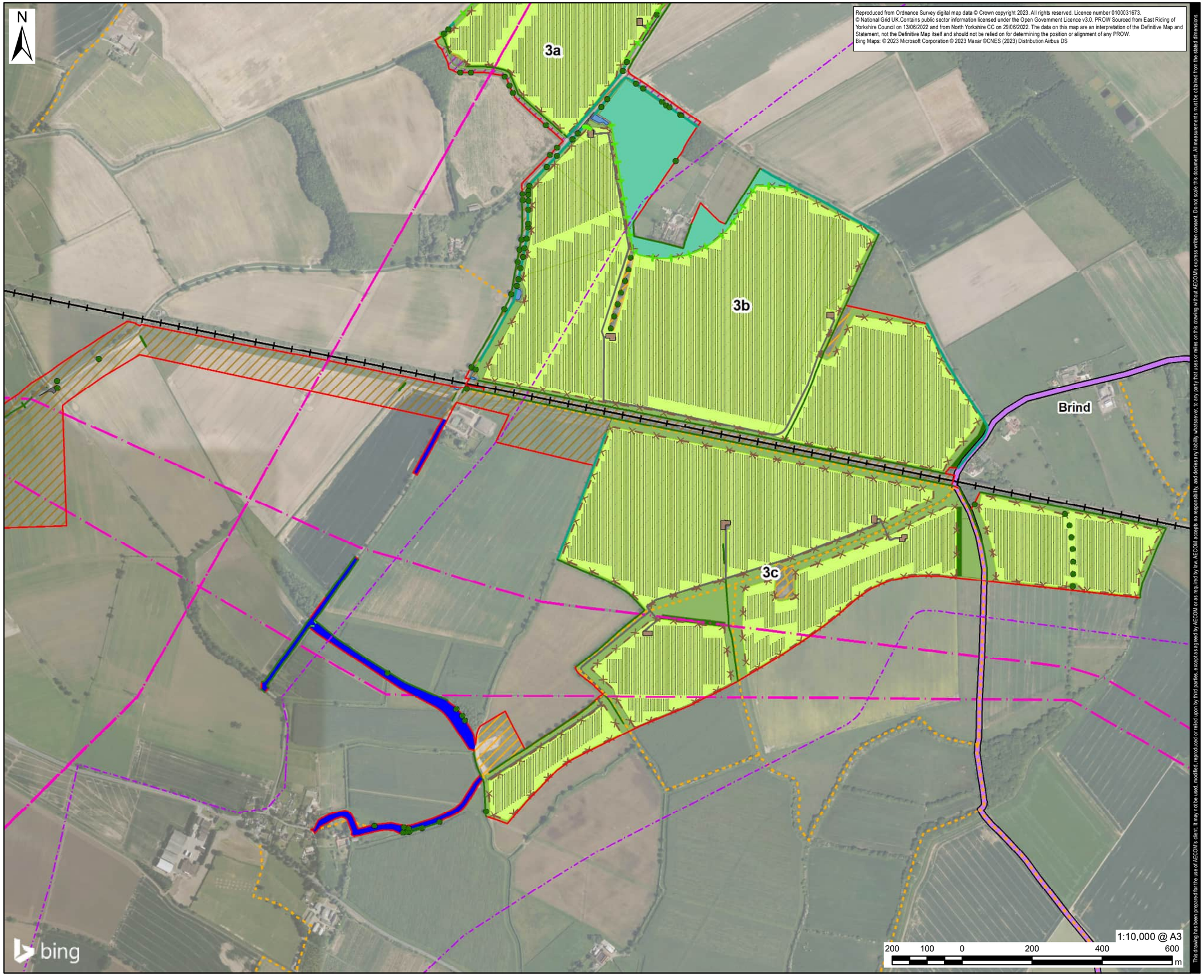

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FIGURE TITLE

Indicative Site Layout
Sheet 5 of 7

FIGURE NUMBER

Figure 4

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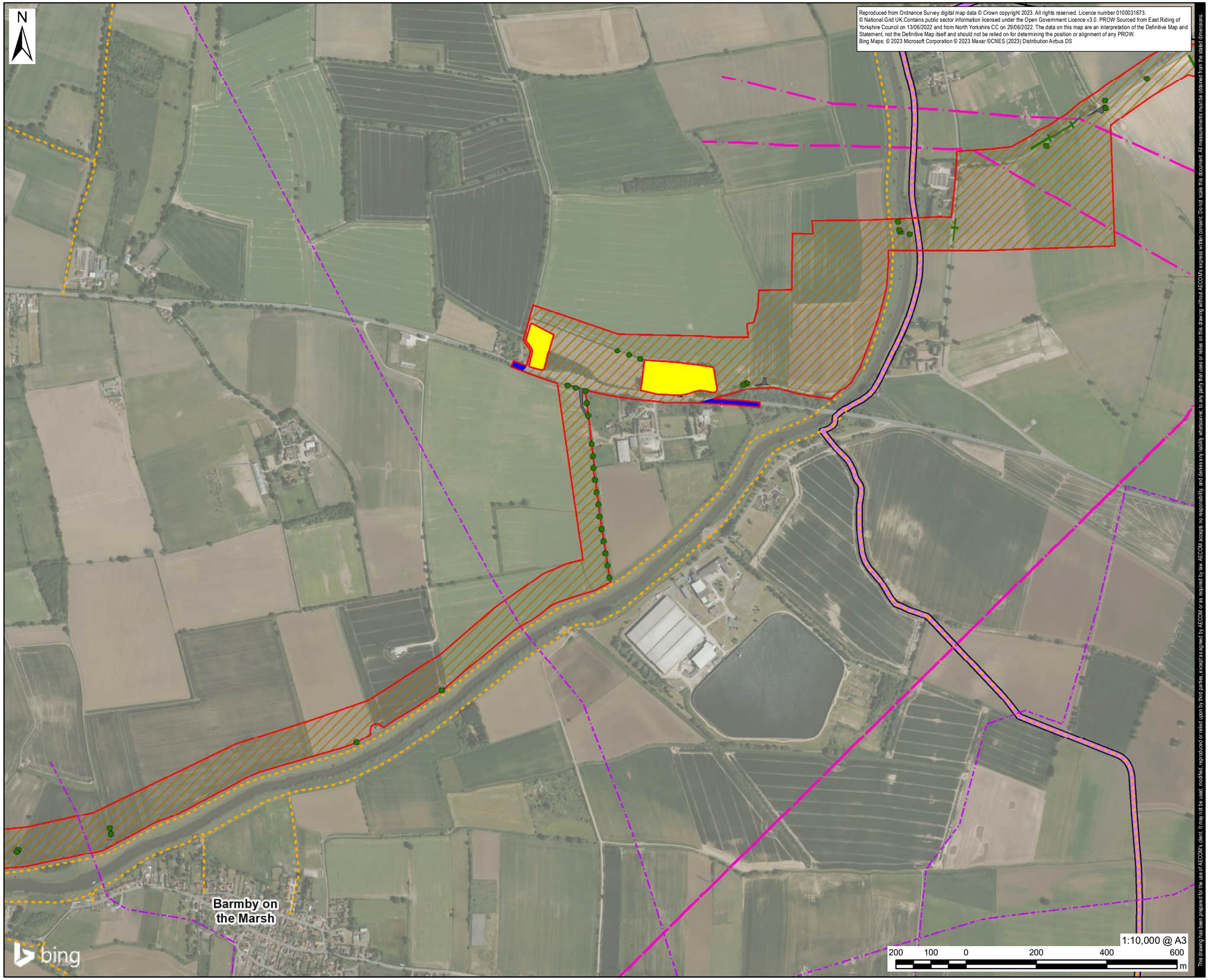

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FIGURE TITLE

Indicative Site Layout
Sheet 6 of 7

FIGURE NUMBER

Figure 4

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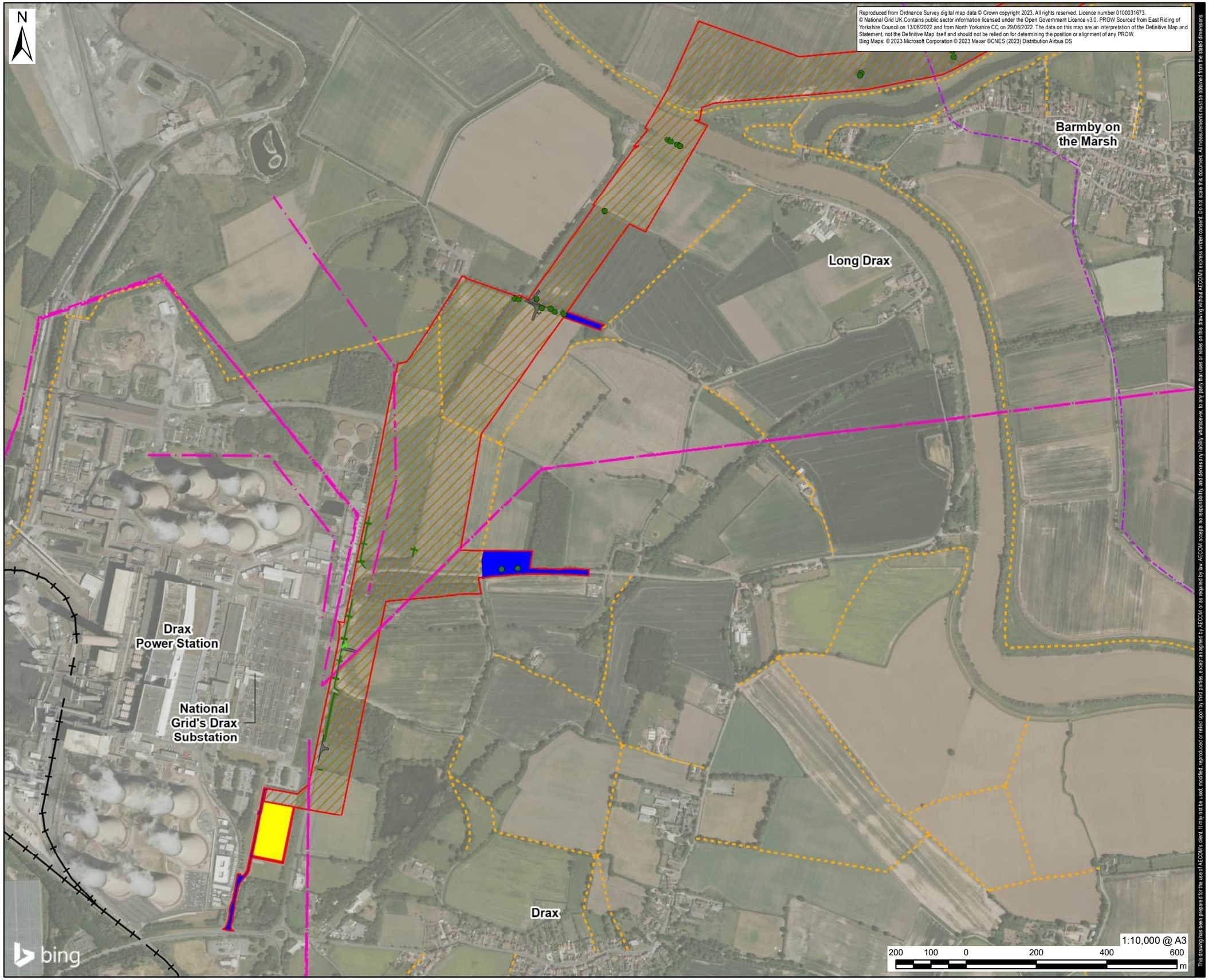

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CONSULTANT

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LEGEND

- Order limits
- Land not included in the Order limits
- Solar PV Site (xx = Solar PV Area)
- Ecology Mitigation Area (xx = Ecology Mitigation Area)
- Grid Connection Corridor - Habitat to be Reinstated
- Interconnecting Cable Corridor - Habitat to be Reinstated
- Retained Habitat
- Existing Individual Tree
- Existing Hedgerow
- Existing Pond
- Operations and Maintenance Hub (Johnson's Farm)
- Solar PV Table
- Field Station
- Site Access
- Solar PV Site Perimeter Fencing
- Grid Connection Substation Fencing
- Overhead Electricity Line
- Gas Pipeline
- Hull to Selby Railway Line
- Public Right of Way
- Proposed Permissive Path
- Proposed Permissive Path (Allowing Travel on Horses)
- Howden 20 Circular Route
- Proposed Hedgerow
- Proposed Hedgerow with Trees
- Enhanced Line of Trees
- Enhanced Hedgerow
- Proposed Ecological Enhancement Area
- Proposed Flower Rich Grassland
- Proposed Hardstanding
- Proposed Internal Access Track
- Proposed Native Scrub with Trees Planting
- Proposed Native Woodland - Mixed
- Proposed Semi-Improved Grassland
- Proposed Species-Rich Grassland
- Proposed Species Rich Wet Grassland
- Proposed Traditional Orchard
- Proposed Woodland Edge Mixed

ISSUE PURPOSE

Final HRA

PROJECT NUMBER

60683115

FIGURE TITLE

Indicative Site Layout
Sheet 7 of 7

FIGURE NUMBER

Figure 4

Version 4.3 Revision: 0 Drawn: CA Checked: JW Approved: HS Date: 2023-11-17
Filename: J:\02_Maps\DCO\Doc_7-12_HRA_Report\HRA_ES_Fig7-12-4_Indicative_Site_Layout_A3_20231117_R0.mxd

Figure 5. European sites within 15km of the Scheme

Revision: 0 Drawn: LP Checked: AK Approved: SE Date: 2023-11-08

Filename: I:\5004 - Information Systems\60683115_Boom Power\02_Maps\DCO\Doc_7-12_HRA_ReportHRA_ES_Fig7-12-5_European_Sites_Within_15km_A3_20231108_R0.mxd

River Derwent, SAC
Lower Derwent Valley, Ramsar
Lower Derwent Valley, SAC
Lower Derwent Valley, SPA
Skipwith Common, SAC
Lower Derwent Valley, Ramsar
Lower Derwent Valley, SPA
Humber Estuary, SPA
Humber Estuary, SAC
Thorne Moor, SAC
Thorne & Hatfield Moors, SPA
Humber Estuary, Ramsar

N

1:160,000 @ A3

5 2.5 0 5 10 15 km

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LEGEND

- Order limits
- Land not included in the Order limits
- 15km Buffer of the Order limits
- Special Area of Conservation (SAC)
- Special Protection Area (SPA)
- Ramsar

NOTES

ISSUE PURPOSE

Final HRA

PROJECT NUMBER

60683115

FIGURE TITLE

European Sites within 15km of the Scheme

FIGURE NUMBER

Figure 5

Figure 6. ~~Modelled~~Distribution of the non-breeding bird species golden plover, lapwing and pink-footed goose against modelled noise contours depicting time-averaged (L_{Aeq}) noise levels arising from NGA1

Revision: 0 Drawn: OB Checked: JW Approved: NG Date: 2024-06-27

Filename: I:\5004 - Information Systems\60683115_Boom Power\02_Maps\Post DCO Submission\Non-Breeding_Bird_Tech_Note\ECO_TECHNOTE_Non_Breeding_Birds.aprx

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LEGEND

Solar PV Site (xx = Solar PV Area)

Ecology Mitigation Area (xx = Ecology Mitigation Area)

Modelled LAeq Noise Contours

- <= 46.0 dB
- > 46.0 dB
- > 50.0 dB
- > 55.0 dB
- > 60.0 dB
- > 65.0 dB
- > 70.0 dB
- > 75.0 dB
- > 80.0 dB
- > 85.0 dB
- > 90.0 dB
- > 95.0 dB

NOTES

ISSUE PURPOSE

HRA

PROJECT NUMBER

60683115

FIGURE TITLE

Distribution of Non Breeding Bird Species: Golden Plover, Pink-footed Goose, and Lapwing against Modelled Noise contours Depicting Time-Averaged (LAeq) Noise Levels Arising from NGA1.

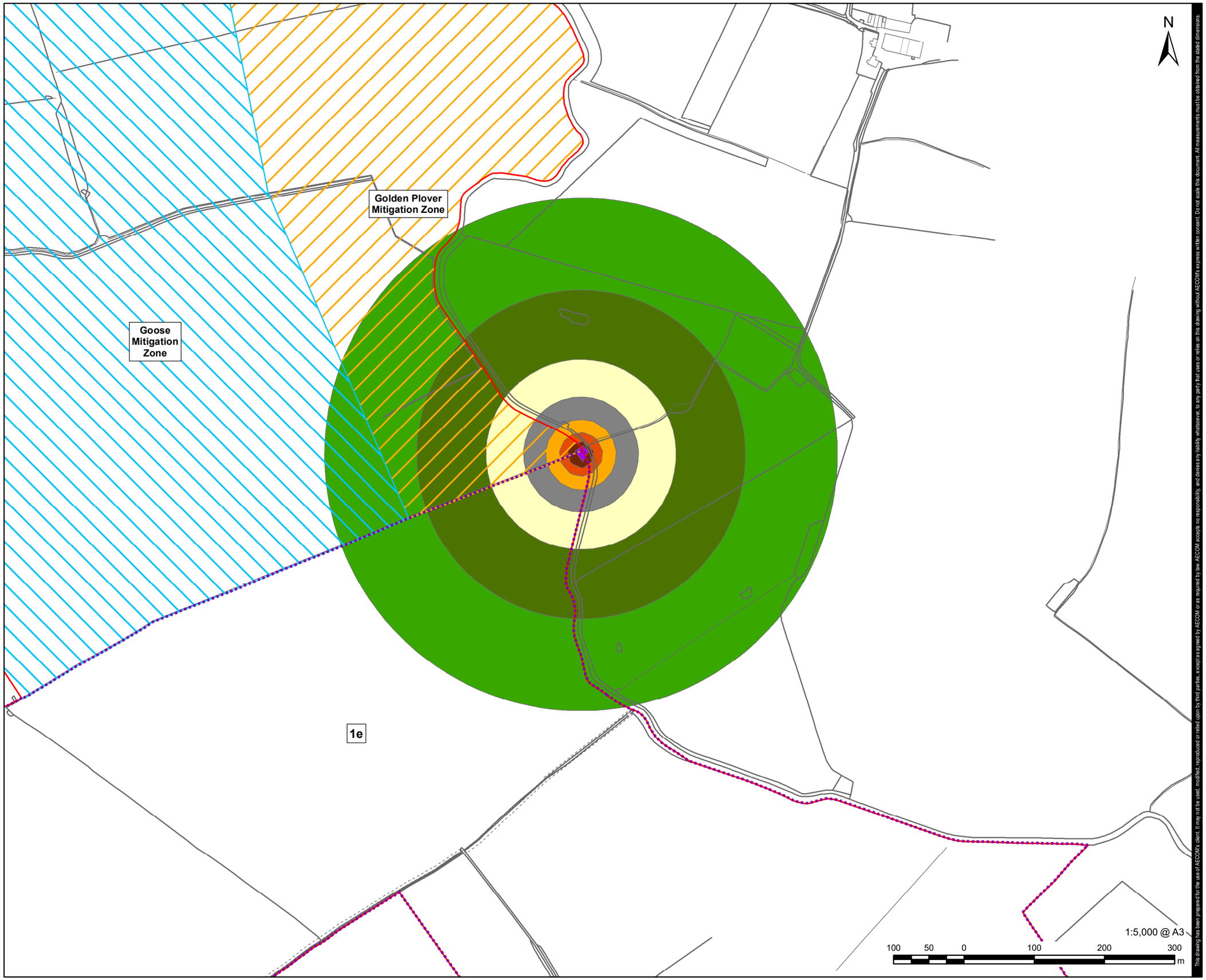
FIGURE NUMBER

Figure 6

Figure 7. Modelled noise contours depicting maximum (L_{max}) noise levels arising from NGA1 at a representative location between Solar PV Area 1e and the Ecology Mitigation ~~Zone~~Area

Revision: 0 Drawn: LP Checked: AK Approved: SE Date: 2023-11-08

Filename: E:\5004 - Information Systems\60683115_Boom Power\02_Maps\DCO\Doc_7-12_HRA_ReportHRA_ES_Fig7-12-7_NGA1_Modelled_Noise_Contours_LAmax_A3_20231108_R0.mxd



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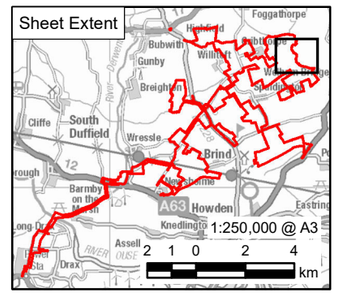
LEGEND

- Order limits
- Solar PV Site (xx = Solar PV Area)
- Golden Plover Mitigation Zone
- Goose Mitigation Zone

Modelled LAmax Noise Contours

- <= 46.0 dB
- > 46.0 dB
- > 50.0 dB
- > 55.0 dB
- > 60.0 dB
- > 65.0 dB
- > 70.0 dB
- > 75.0 dB
- > 80.0 dB
- > 85.0 dB
- > 90.0 dB
- > 95.0 dB



NOTES

ISSUE PURPOSE

Final HRA

PROJECT NUMBER

60683115

FIGURE TITLE

Modelled Noise Contours Depicting Maximum (LAmax) Noise Levels Arising from NGA1 at a Representative Location Between Solar PV Area 1e and the Ecology Mitigation Zone

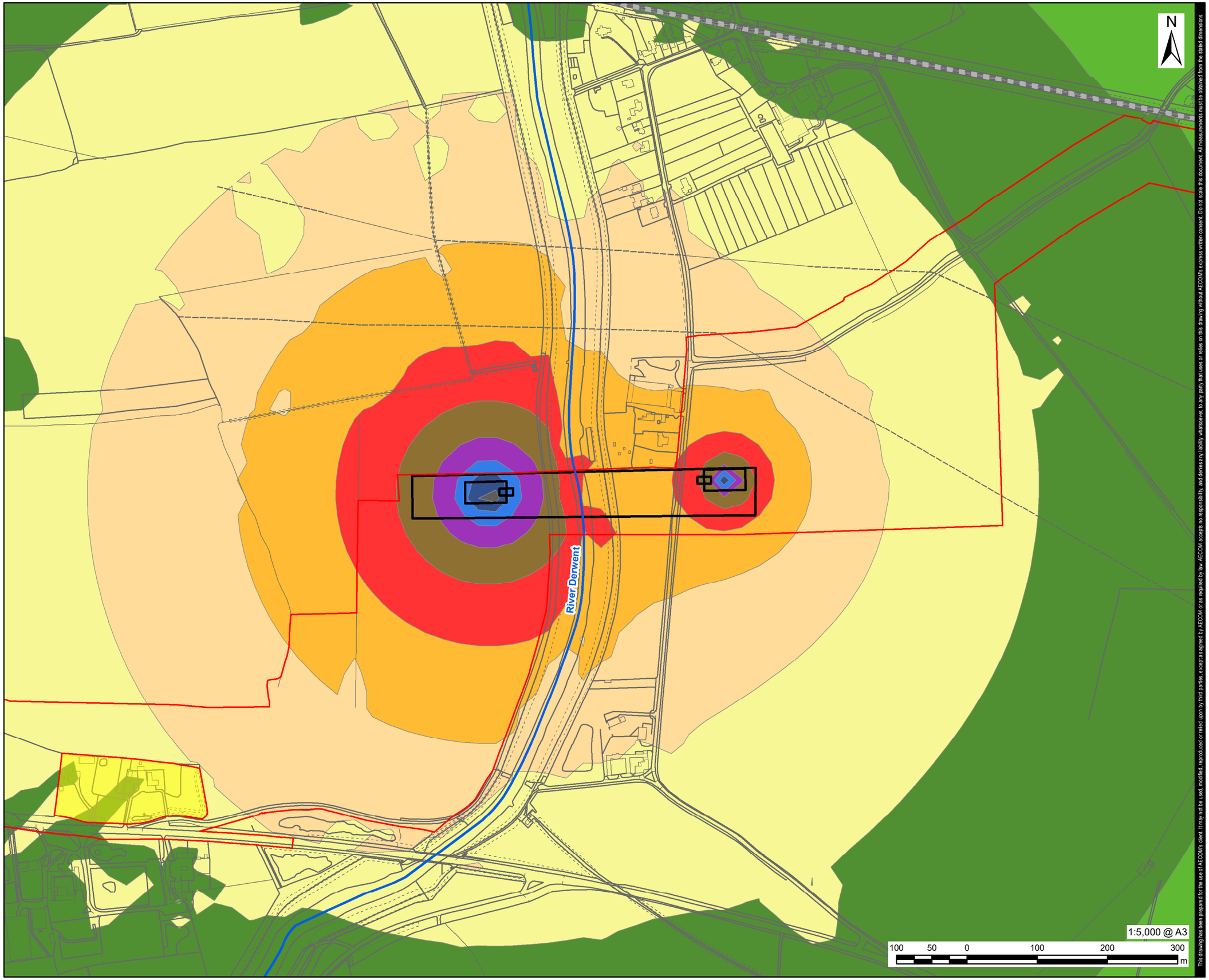
FIGURE NUMBER

Figure 7

Figure 8. Noise contours depicting maximum (LA_{max}) noise levels at HDD Location 1

Revision: 0 Drawn: LP Checked: AK Approved: SE Date: 2023-11-08

Filename: I:\5004 - Information Systems\60683115_Boom Power\02_Maps\DCO\Doc_7-12_HRA_ReportHRA_ES_Fig7-12-8_HDD_Location_1_LAmax_Noise_Contours_A3_20231108_R0.mxd



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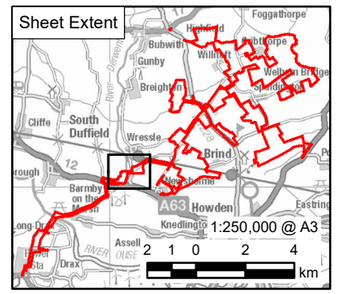
LEGEND

- Order limits
- Land not included in the Order limits
- Indicative HDD Area
- River Derwent

Maximum (LAmax) Noise Levels - 1.5m Above Ground

- > 35.0 dB
- > 40.0 dB
- > 45.0 dB
- > 50.0 dB
- > 55.0 dB
- > 60.0 dB
- > 65.0 dB
- > 70.0 dB
- > 75.0 dB
- > 80.0 dB
- > 85.0 dB



NOTES

ISSUE PURPOSE

Final HRA

PROJECT NUMBER

60683115

FIGURE TITLE

Noise Contours Depicting Maximum (LAmax) Noise Levels at HDD Location 1

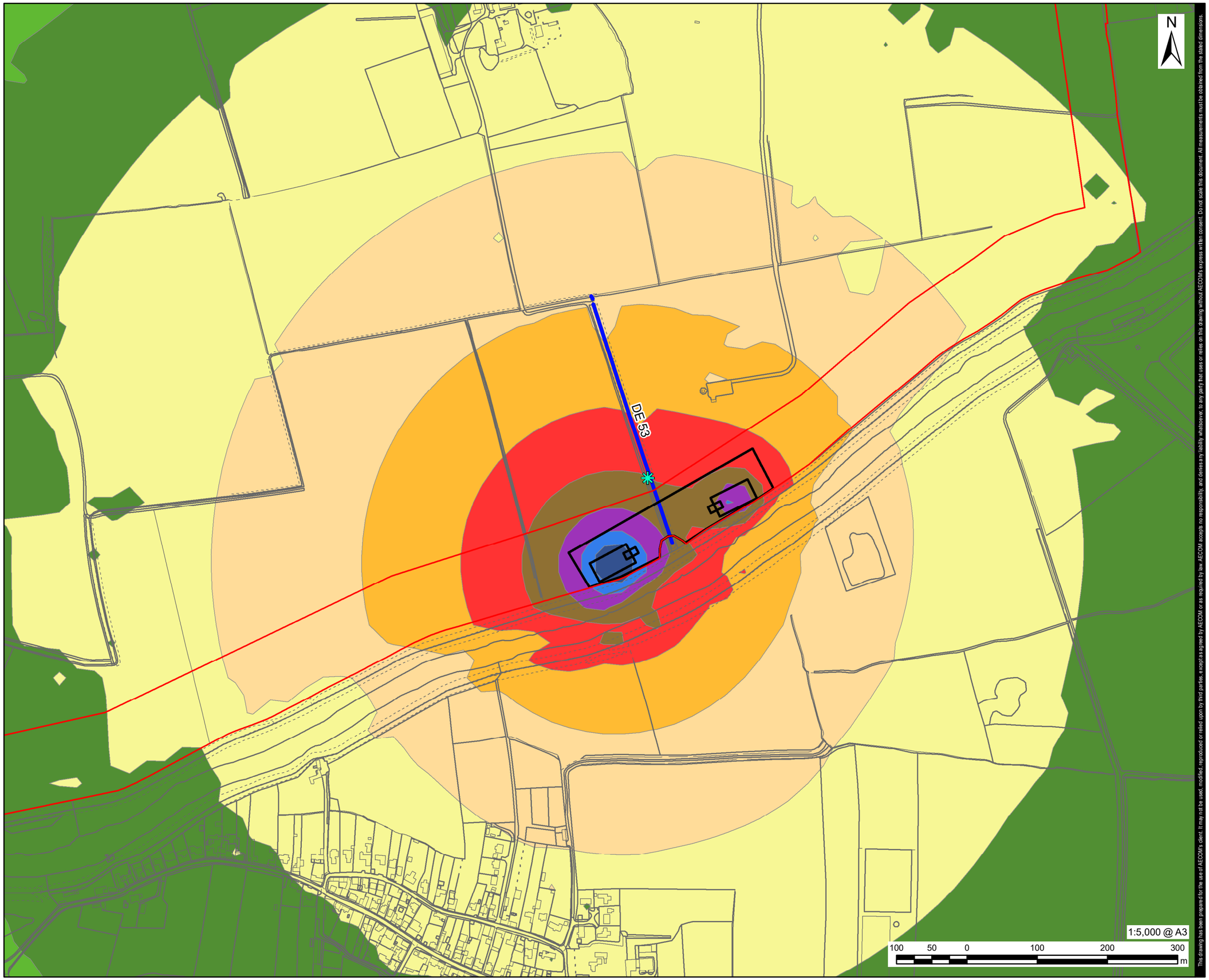
FIGURE NUMBER

Figure 8

Figure 9. Noise contours depicting maximum (LA_{max}) noise levels at HDD Location 2

Revision: 0 Drawn: LP Checked: AK Approved: SE Date: 2023-11-08

Filename: I:\5004 - Information Systems\60683115_Boom Power\02_Maps\DCO\Doc_7-12_HRA_Report\HRA_ES_Fig7-12-9_HDD_Location_2_LAmax_Noise_Contours_A3_20231108_R0.mxd



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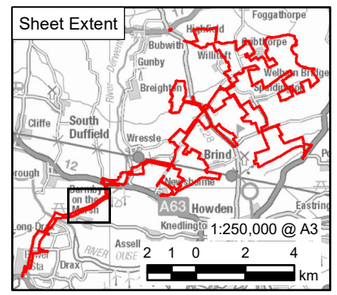
LEGEND

- Order limits
- Indicative HDD Area
- Otter Couch
- Ordinary Watercourse DE 53

Maximum (LAmax) Noise Levels - 1.5m Above Ground

- > 35.0 dB
- > 40.0 dB
- > 45.0 dB
- > 50.0 dB
- > 55.0 dB
- > 60.0 dB
- > 65.0 dB
- > 70.0 dB
- > 75.0 dB
- > 80.0 dB

Sheet Extent



NOTES

ISSUE PURPOSE

Final HRA

PROJECT NUMBER

60683115

FIGURE TITLE

Noise Contours Depicting Maximum (LAmax) Noise Levels at HDD Location 2

FIGURE NUMBER

Figure 9

Figure 10. Records of HRA-relevant non-breeding bird species from monthly walkover surveys undertaken in 2022/2023

Species

GJ. Greylag Goose *(Anser anser)*

L. Lapwing *(Vanellus vanellus)*

MA. Mallard *(Anas platyrhynchos)*

PG. Pink-footed Goose *(Anser brachyrhynchus)*

50P(3MA

2MA

18L

13L

50GJ

200PG

6GJ

80PG

GJ

6GJ

1a

1b

1c

1d

1e

3L

2MA

1:10,000 @ A3

0.2 0.1 0 0.2 0.4 0.6 0.8 1 km

Sheet Extents

Sheet 1 Sheet 2 Sheet 3 Sheet 4 Sheet 5 Sheet 6 Sheet 7 Sheet 8 Sheet 9

1:300,000@ A3

2 1 0 2 4 km

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LEGEND

Order limits

Land not included in the Order limits

Solar PV Site (xx = Solar PV Area)

1a
1b
1c
1d
1e

food Feeding

Flight

NOTES

Bird Species, activity symbol and flight line colour indicates conservation status (England, 2021). Black text indicates Annex 1 species. Labels give bird species based on species key. Where more than one bird is recorded the number is shown.

ISSUE PURPOSE

Final HRA

PROJECT NUMBER

60683115

FIGURE TITLE

2022 / 2023 Non-Breeding Bird Survey Data Relevant to HRA
Sheet 1 of 9

FIGURE NUMBER

Figure 10

Revision: 0 Drawn: LP Checked: AK Approved: SE Date: 2023-11-08

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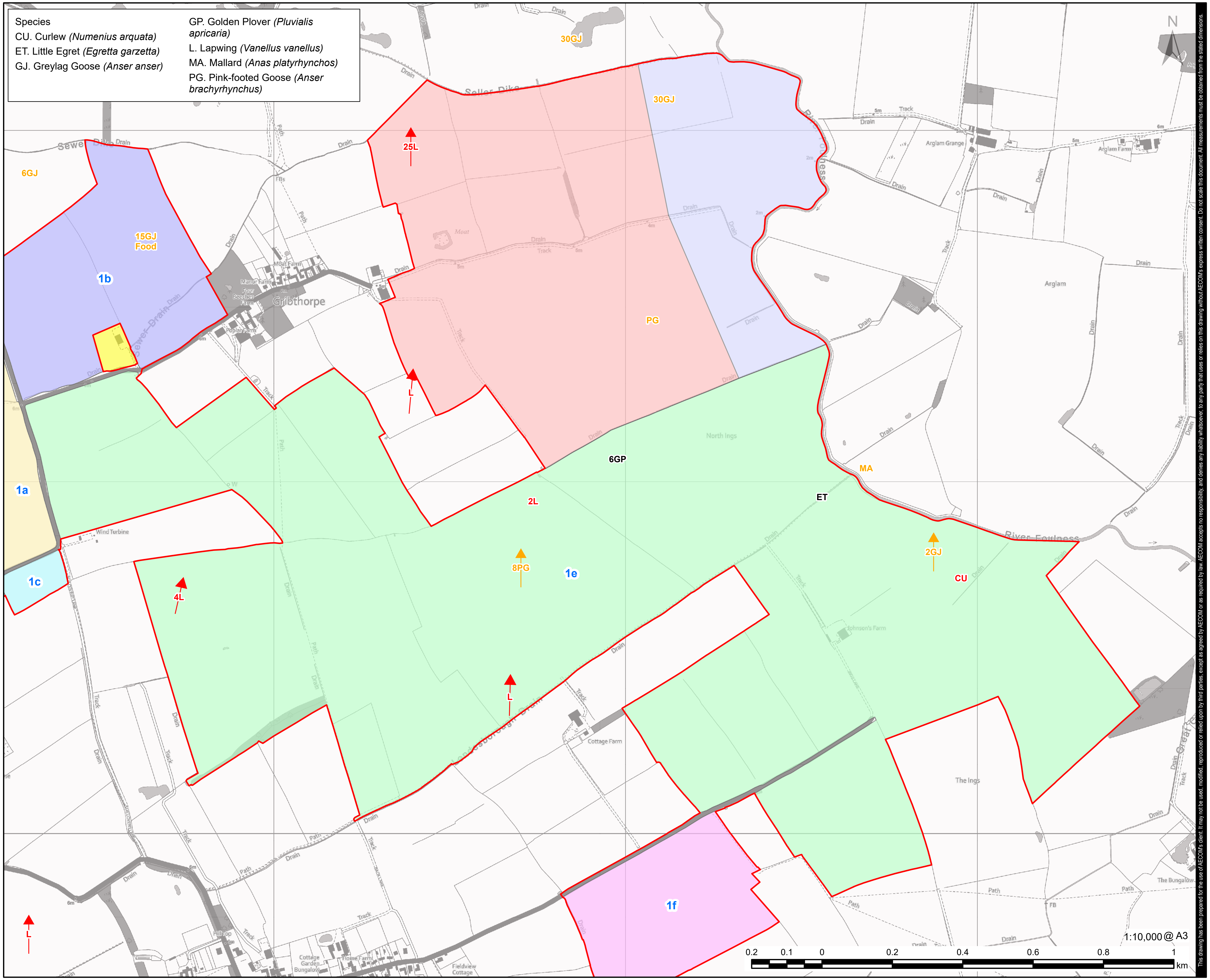

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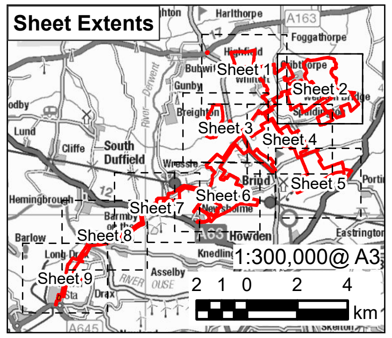
LEGEND

- Order limits
- Land not included in the Order limits
- Golden Plover Mitigation Zone
- Goose Mitigation Zone

Solar PV Site (xx = Solar PV Area)

- 1a
- 1b
- 1c
- 1e
- 1f
- food Feeding
- Flight

Sheet Extents



NOTES

Bird Species, activity symbol and flight line colour indicates conservation status (England, 2021). Black text indicates Annex 1 species. Labels give bird species based on species key. Where more than one bird is recorded the number is shown.

ISSUE PURPOSE

Final HRA

PROJECT NUMBER

60683115

FIGURE TITLE

2022 / 2023 Non-Breeding Bird Survey Data Relevant to HRA
Sheet 2 of 9

FIGURE NUMBER

Figure 10

Species
CU. Curlew *(Numenius arquata)*
L. Lapwing *(Vanellus vanellus)*
MA. Mallard *(Anas platyrhynchos)*

Longland Field
3L
Fleet Field
Vesci Field
Intake Farm
Waterloo Farm
Newsholme House
Dronne Villa
Thompson's Plantation
Webbwood House
Wind Turbine
Brind Leys Farm
Fleet Dike
1a
1d
2a
2b
2c
2d
3a
2MA
3MA
CU
2CU

1:10,000 @ A3
0.2 0.1 0 0.2 0.4 0.6 0.8 1 km

Revision: 0 Drawn: LP Checked: AK Approved: SE Date: 2023-11-08

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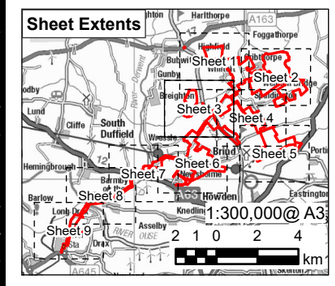
LEGEND
- Order limits
- Land not included in the Order limits

Solar PV Site (xx = Solar PV Area)
- 1a
- 1d
- 2a
- 2b
- 2c
- 2d
- 3a

food Feeding
Flight

Sheet Extents


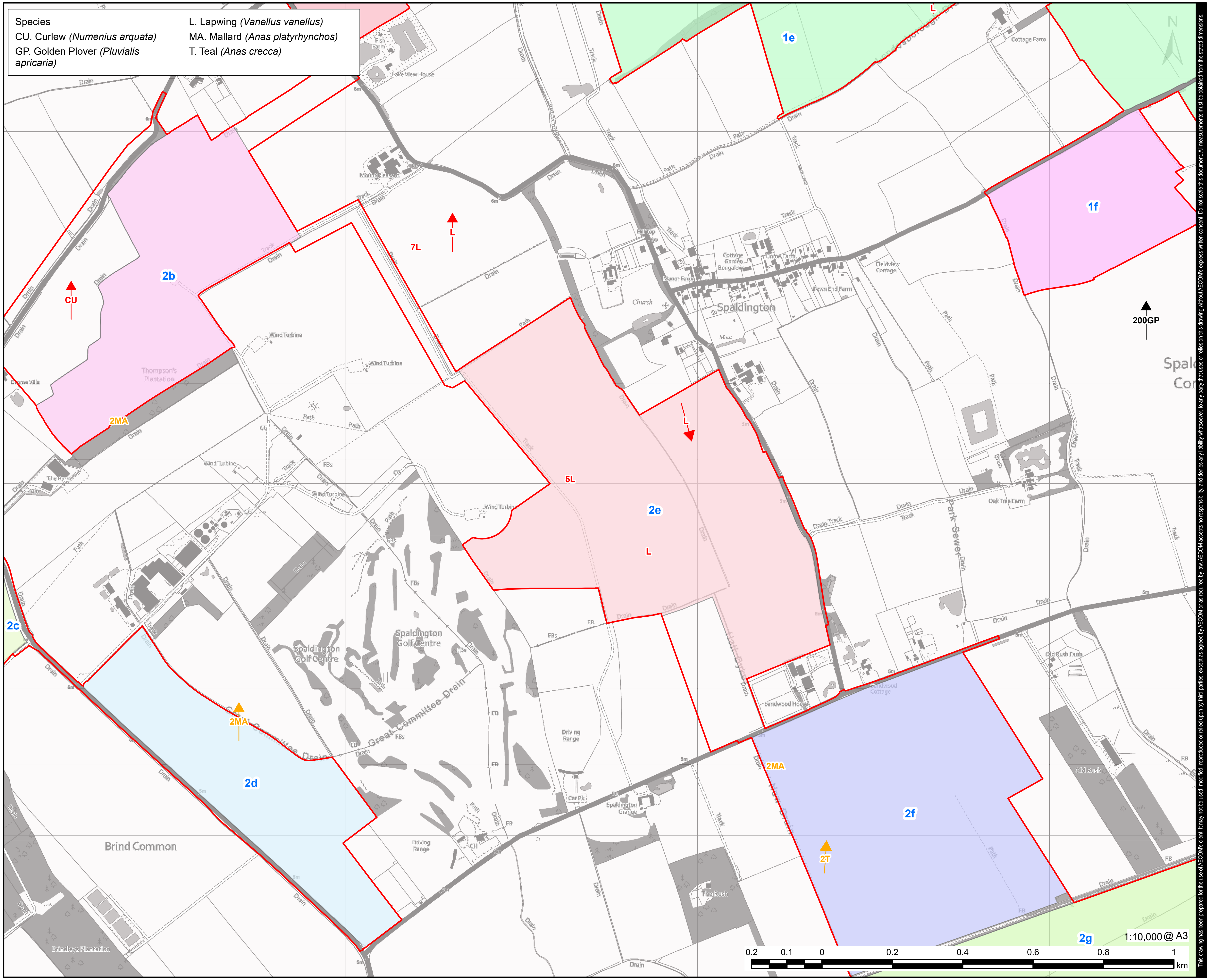
NOTES
Bird Species, activity symbol and flight line colour indicates conservation status (England, 2021). Black text indicates Annex 1 species. Labels give bird species based on species key. Where more than one bird is recorded the number is shown.

ISSUE PURPOSE
Final HRA

PROJECT NUMBER
60683115

FIGURE TITLE
2022 / 2023 Non-Breeding Bird Survey Data Relevant to HRA
Sheet 3 of 9

FIGURE NUMBER
Figure 10



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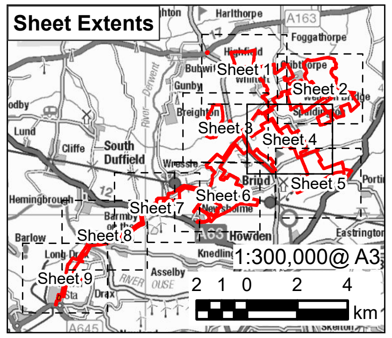
LEGEND

Order limits

Solar PV Site (xx = Solar PV Area)

1d
1e
1f
2b
2c
2d
2e
2f
2g
Feeding
Flight

Sheet Extents



NOTES

Bird Species, activity symbol and flight line colour indicates conservation status (England, 2021). Black text indicates Annex 1 species. Labels give bird species based on species key. Where more than one bird is recorded the number is shown.

ISSUE PURPOSE

Final HRA

PROJECT NUMBER

60683115

FIGURE TITLE

2022 / 2023 Non-Breeding Bird Survey Data Relevant to HRA
Sheet 4 of 9

FIGURE NUMBER

Figure 10

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Filename: I:\5004 - Information Systems\60683115_Boom Power\02_Maps\DCO\Doc_7-12_HRA_Report\HRA_ES_Fig7-12-10_2022_23_Non_Breeding_Bird_Data_Relevant_HRA_A3_20231108_R0.aprx

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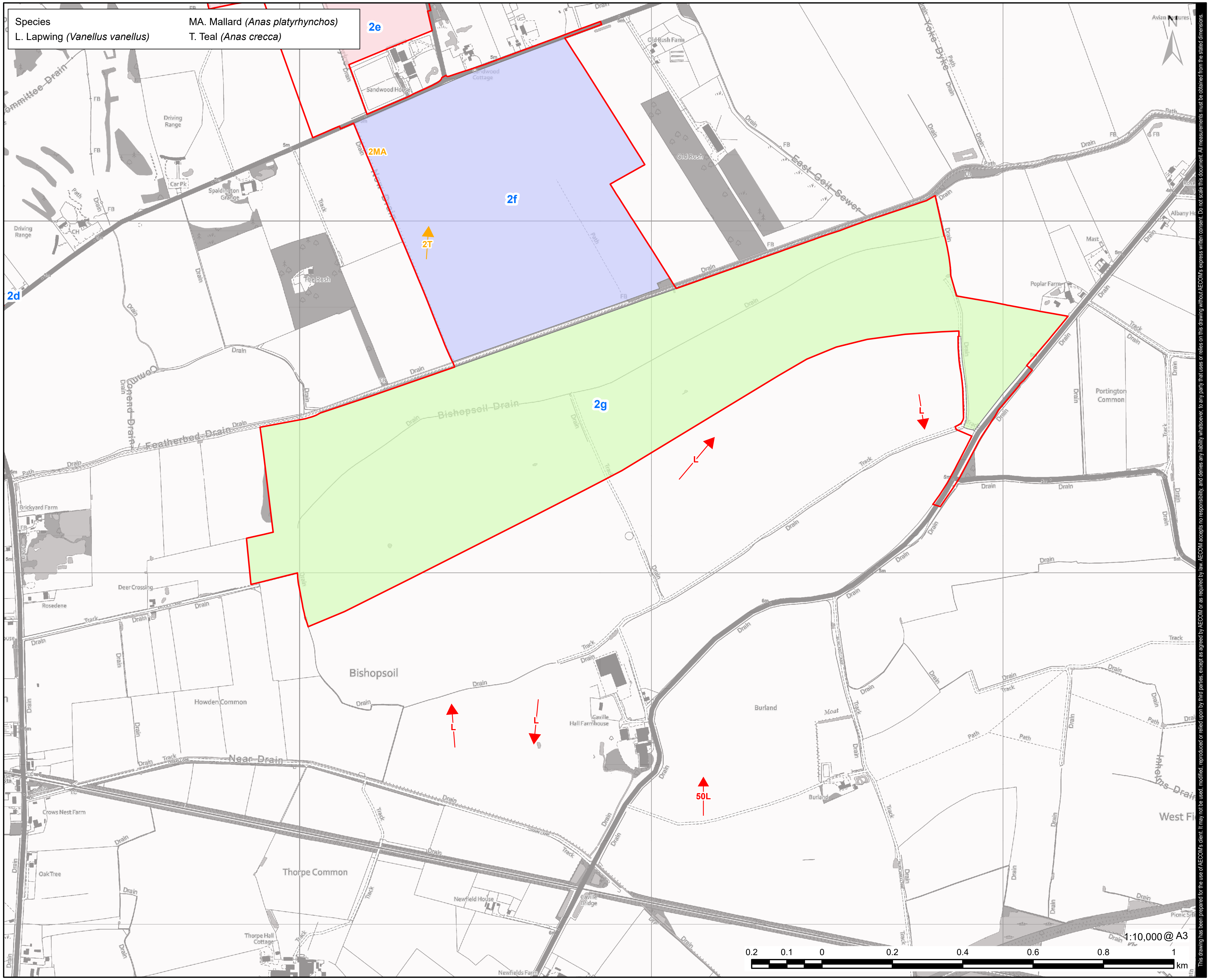

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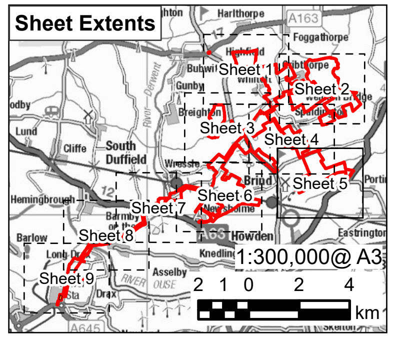
LEGEND

- Order limits
- Solar PV Site (xx = Solar PV Area)
  - 2d
  - 2e
  - 2f
  - 2g
- food Feeding
- Flight

Sheet Extents



NOTES

Bird Species, activity symbol and flight line colour indicates conservation status (England, 2021). Black text indicates Annex 1 species. Labels give bird species based on species key. Where more than one bird is recorded the number is shown.

ISSUE PURPOSE

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PROJECT NUMBER

60683115

FIGURE TITLE

2022 / 2023 Non-Breeding Bird Survey Data Relevant to HRA
Sheet 5 of 9

FIGURE NUMBER

Figure 10

Filename: I:\5004 - Information Systems\60683115_Boom Power\02_Maps\DCO\Doc_7-12_HRA_Report\HRA_ES_Fig7-12-10_2022_23_Non_Breeding_Bird_Data_Relevant_HRA_A3_20231108_R0.aprx

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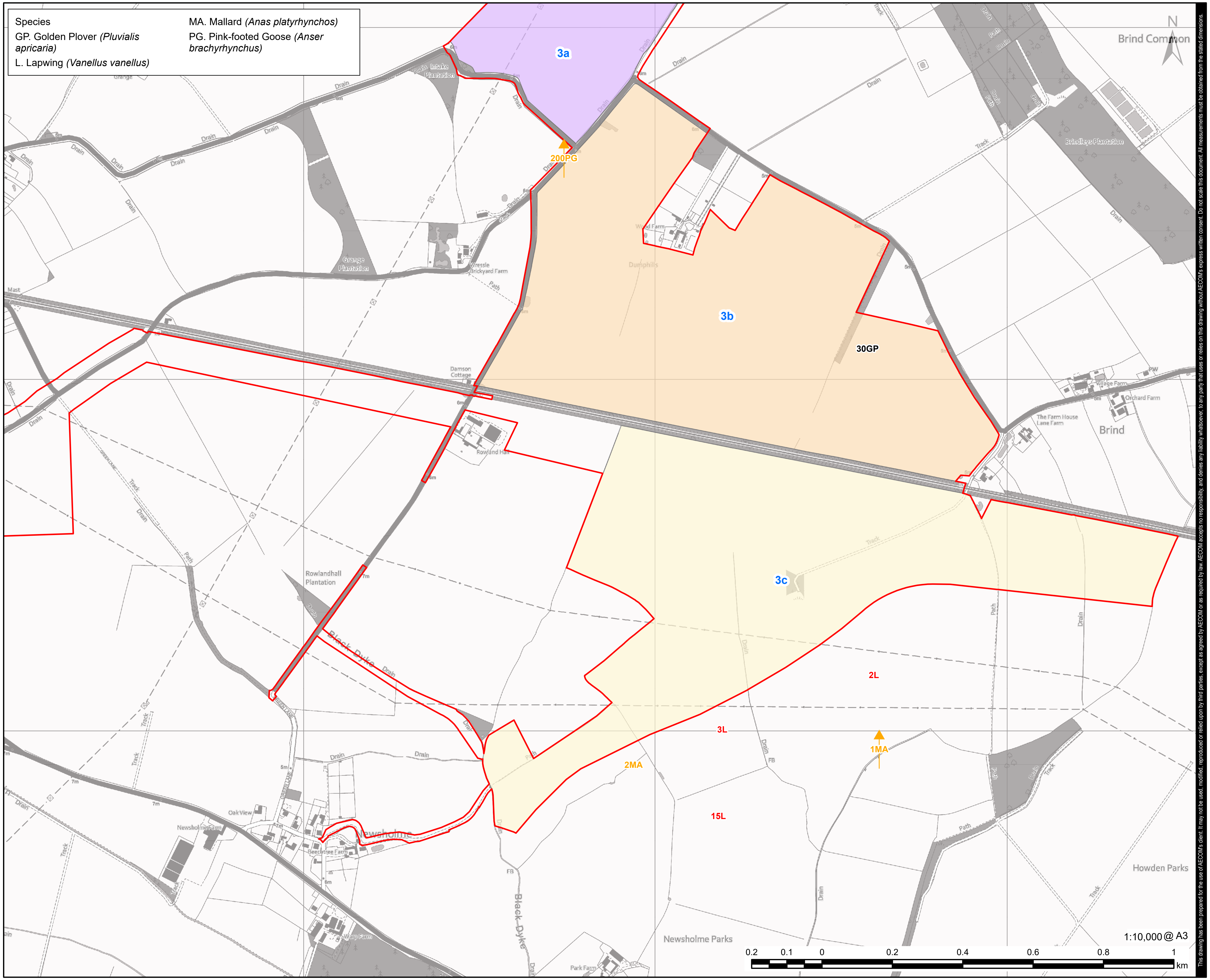

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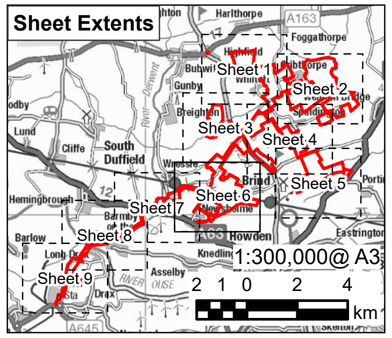
LEGEND

- Order limits
- **Solar PV Site (xx = Solar PV Area)**
- 3a
- 3b
- 3c
- food Feeding
- Flight



NOTES

Bird Species, activity symbol and flight line colour indicates conservation status (England, 2021). Black text indicates Annex 1 species. Labels give bird species based on species key. Where more than one bird is recorded the number is shown.

ISSUE PURPOSE

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PROJECT NUMBER

60683115

FIGURE TITLE

2022 / 2023 Non-Breeding Bird Survey Data Relevant to HRA
Sheet 6 of 9

FIGURE NUMBER

Figure 10

Filename: I:\5004 - Information Systems\60683115_Boom Power\02_Maps\DCO\Doc_7-12_HRA Report\HRA_ES_Fig7-12-10_2022_23_Non_Breeding_Bird_Data_Relevant_HRA_A3_20231108_R0.aprx

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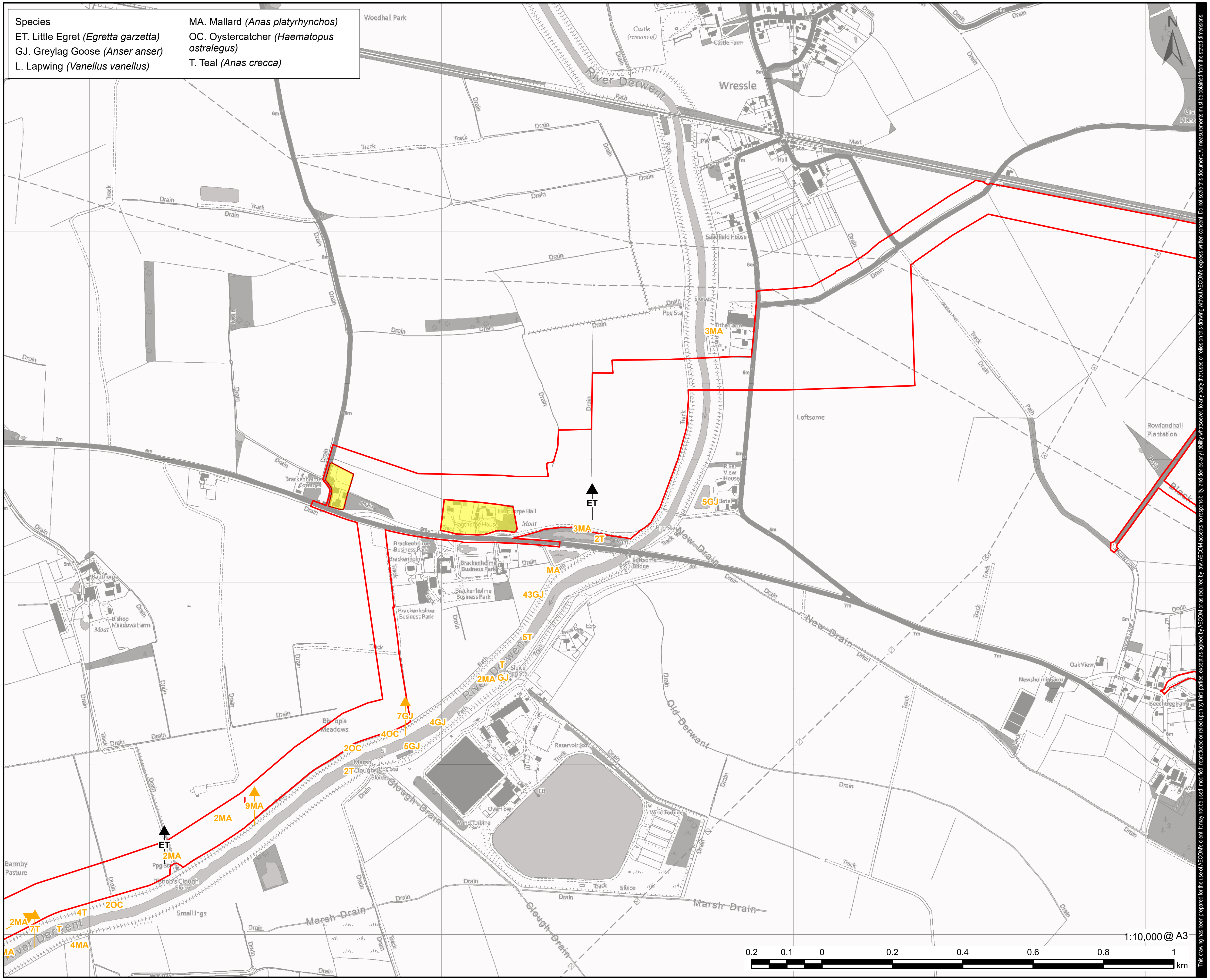

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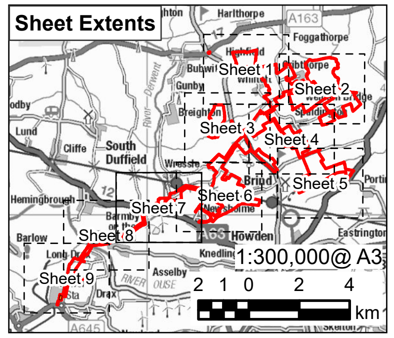
LEGEND
- Order limits
- Land not included in the Order limits
- food Feeding
- Flight



NOTES
Bird Species, activity symbol and flight line colour indicates conservation status (England, 2021). Black text indicates Annex 1 species. Labels give bird species based on species key. Where more than one bird is recorded the number is shown.

ISSUE PURPOSE
Final HRA

PROJECT NUMBER
60683115

FIGURE TITLE
2022 / 2023 Non-Breeding Bird Survey Data Relevant to HRA
Sheet 7 of 9

FIGURE NUMBER
Figure 10

Filename: I:\5004 - Information Systems\60683115_Boom Power\02_Maps\DCO\Doc_7-12_HRA_Report\HRA_ES_Fig7-12-10_2022_23_Non_Breeding_Bird_Data_Relevant_HRA_A3_20231108_R0.aprx

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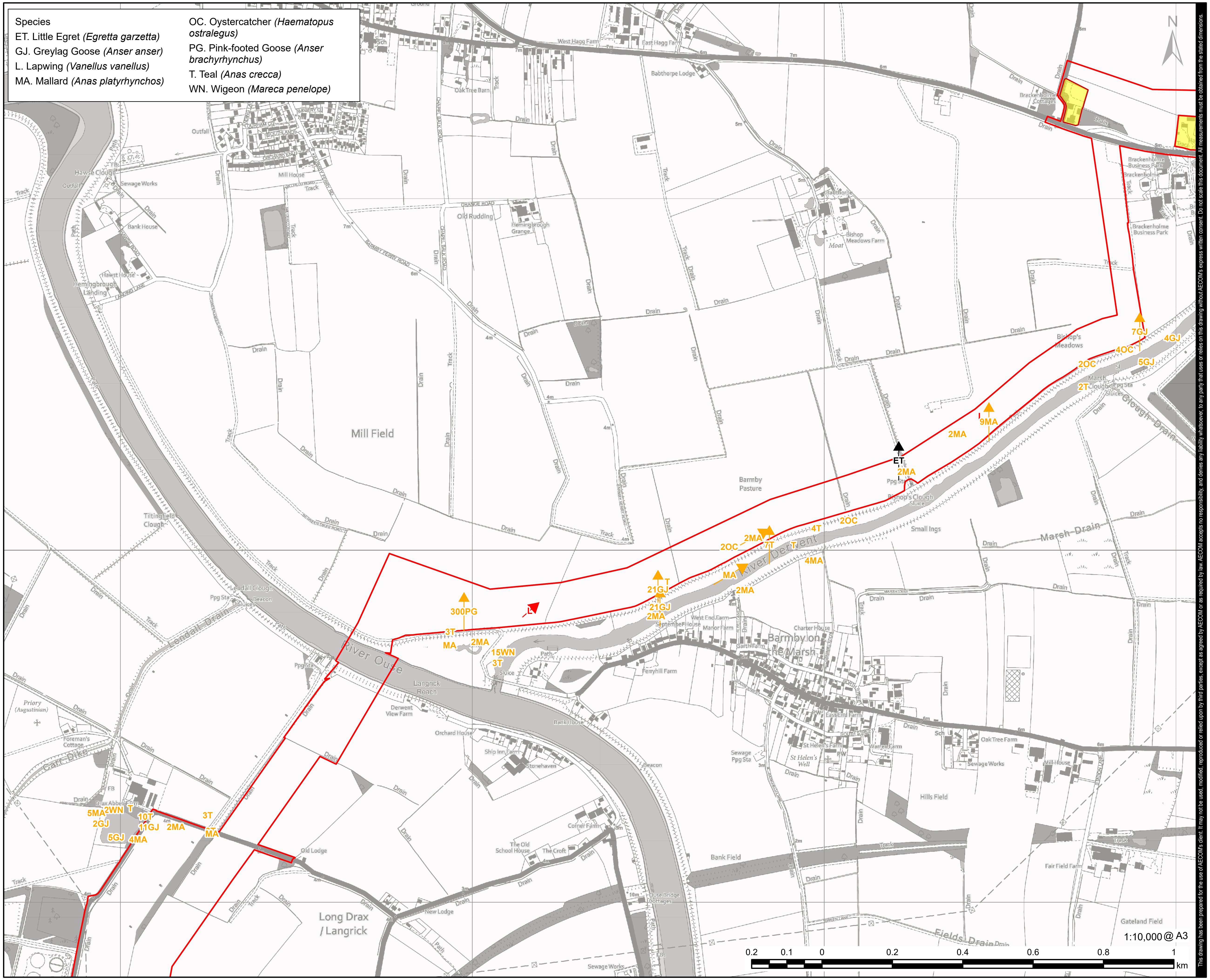

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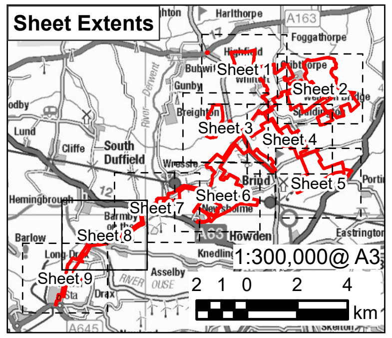
LEGEND

- Order limits
- Land not included in the Order limits
- Feeding
- Flight



NOTES

Bird Species, activity symbol and flight line colour indicates conservation status (England, 2021). Black text indicates Annex 1 species. Labels give bird species based on species key. Where more than one bird is recorded the number is shown.

ISSUE PURPOSE

Final HRA

PROJECT NUMBER

60683115

FIGURE TITLE

2022 / 2023 Non-Breeding Bird Survey Data Relevant to HRA
Sheet 8 of 9

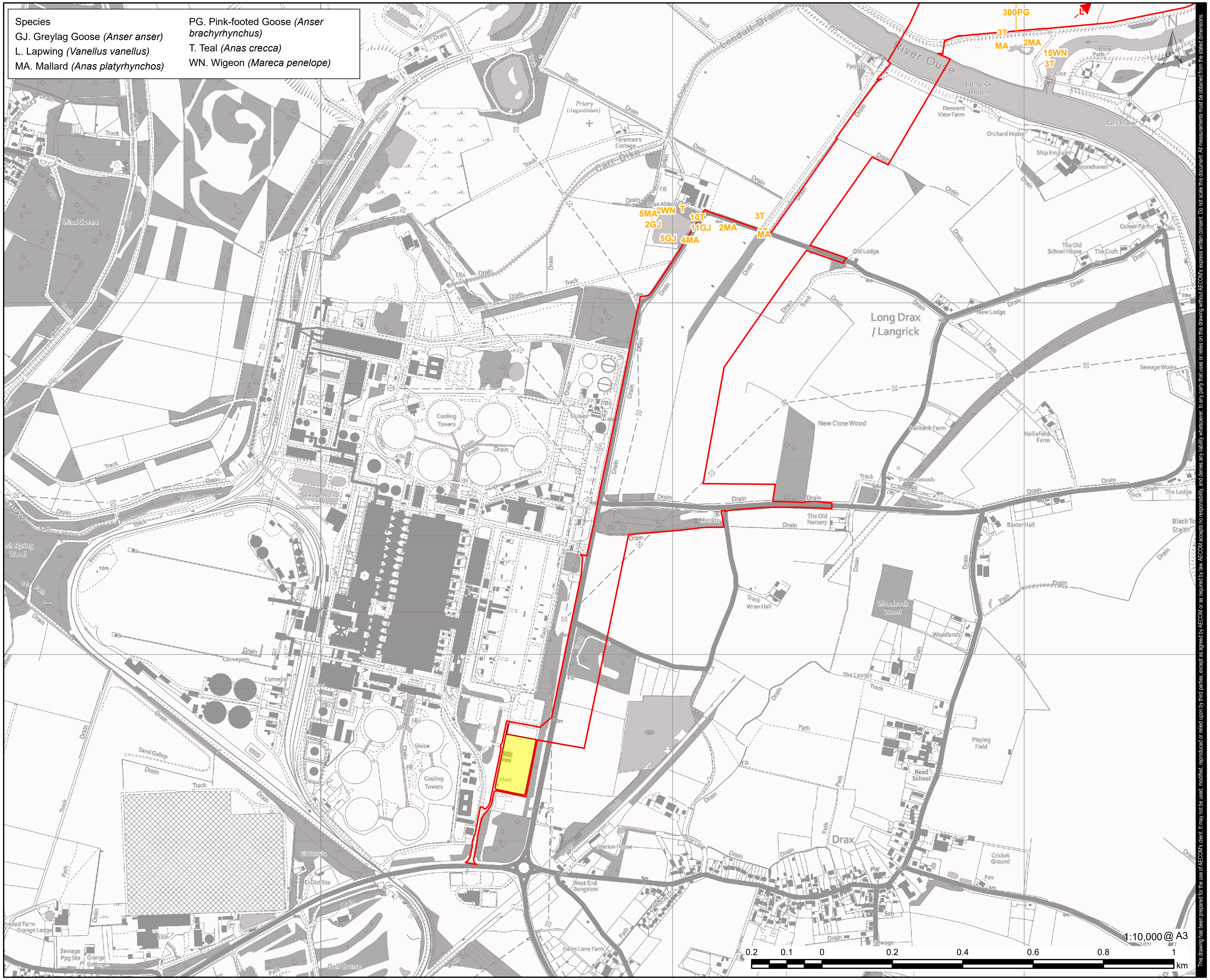
FIGURE NUMBER

Figure 10

Filename: I:\5004 - Information Systems\60683115_Boom Power\02_Maps\DCO\Doc_7-12_HRA_Report\HRA_ES_Fig7-12-10_2022_23_Non_Breeding_Bird_Data_Relevant_HRA_A3_20231108_R0.aprx

Revision: 0 Drawn: LP Checked: AK Approved: SE Date: 2023-11-08

Filename: I:\5004 - Information Systems\60683115_Boom Power\02_Maps\DCO\Doc_7-12_HRA_Report\HRA_ES_Fig7-12-10_2022_23_Non_Breeding_Bird_Data_Relevant_HRA_A3_20231108_R0.aprx



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LEGEND

- Order limits
- Land not included in the Order limits
- food Feeding
- Flight

Sheet Extents

1:300,000@ A3

NOTES

Bird Species, activity symbol and flight line colour indicates conservation status (England, 2021). Black text indicates Annex 1 species. Labels give bird species based on species key. Where more than one bird is recorded the number is shown.

ISSUE PURPOSE

Final HRA

PROJECT NUMBER

60683115

FIGURE TITLE

2022 / 2023 Non-Breeding Bird Survey Data Relevant to HRA
Sheet 9 of 9

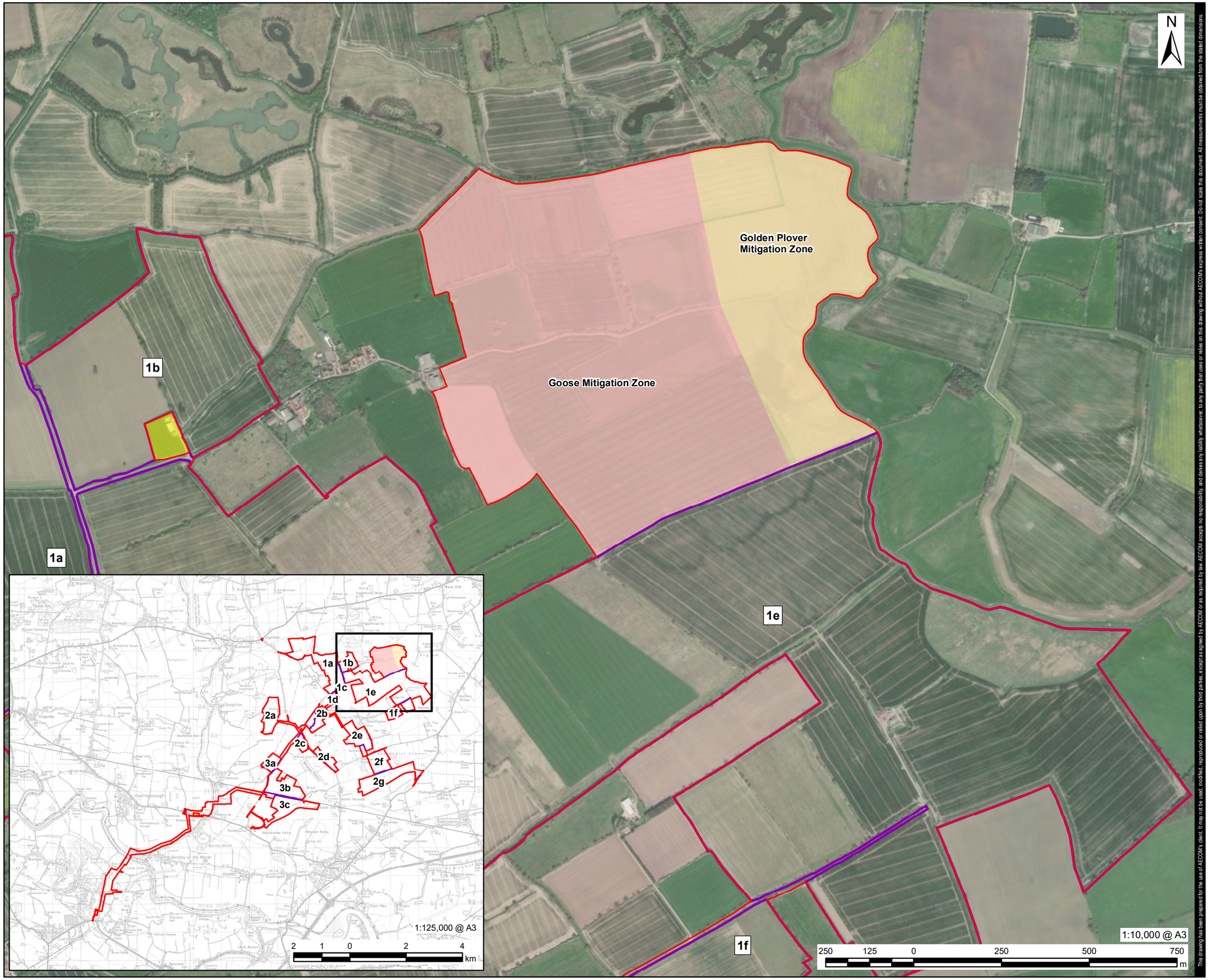
FIGURE NUMBER

Figure 10

Figure 11. Map showing a broad overview of the Scheme (left) and the areas identified for golden plover and goose mitigation

Revision: 0 Drawn: LP Checked: AK Approved: SE Date: 2023-11-08

Filename: I:\5004 - Information Systems\60683115_Boom Power\02_Maps\DCO\Doc_7-12_HRA_Report\HRA_ES_Fig7-12-11_Broad_Overview_and_Proposed_Bird_Mitigation_A3_20231108_R0.mxd



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LEGEND

- Order limits
- Land not included in the Order limits
- Solar PV Site (xx = Solar PV Area)
- Goose Mitigation Zone
- Golden Plover Mitigation Zone

NOTES

ISSUE PURPOSE

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PROJECT NUMBER

60683115

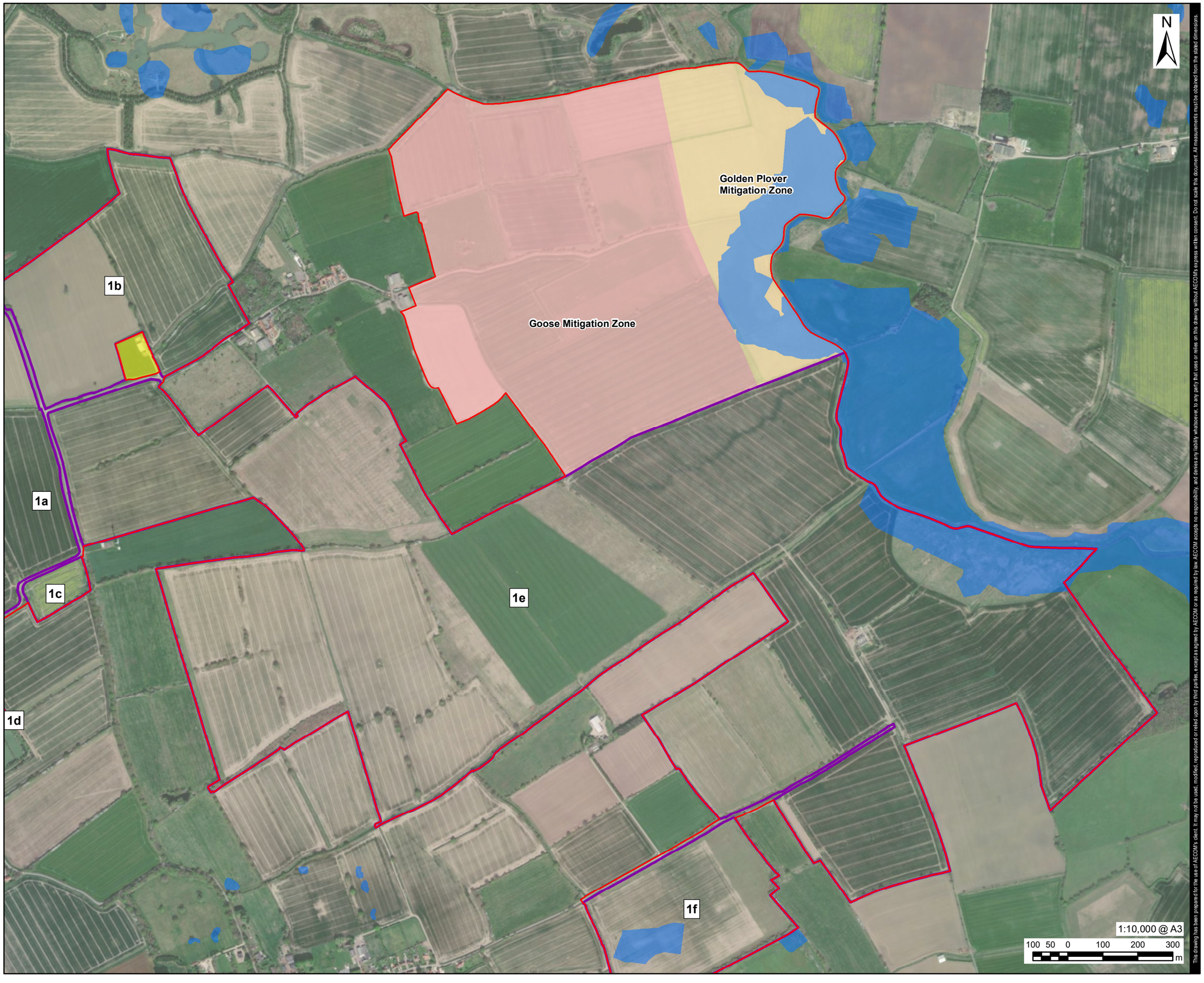
FIGURE TITLE

Broad Overview of the Scheme and Detailed Location of the Golden Plover Mitigation Zone and Goose Mitigation Zone

FIGURE NUMBER

Figure 11

Figure 12. Historic maximum flood extents for Ecology Mitigation Areas 1g and 1h adjoining the River Foulness



Revision: 0 Drawn: LP Checked: AK Approved: SE Date: 2023-11-08

Filename: I:\5004 - Information Systems\60683115_Boom Power\02_Maps\DCO\Doc_7-12_HRA_Report\HRA_ES_Fig7-12-12_Historic_Flood_Outlines_A3_20231108_R0.mxd

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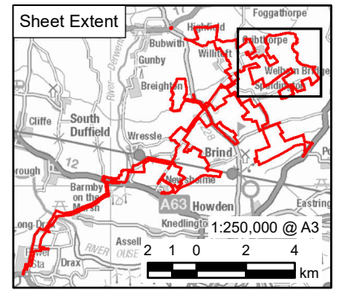
LEGEND

- Order limits
- Land not included in the Order limits
- Solar PV Site (xx = Solar PV Area)
- Goose Mitigation Zone
- Golden Plover Mitigation Zone
- Maximum Flood Extent



NOTES

ISSUE PURPOSE

Final HRA

PROJECT NUMBER

60683115

FIGURE TITLE

Historic flood outlines within the Golden Plover and Goose Mitigation Zones adjacent to the River Foulness

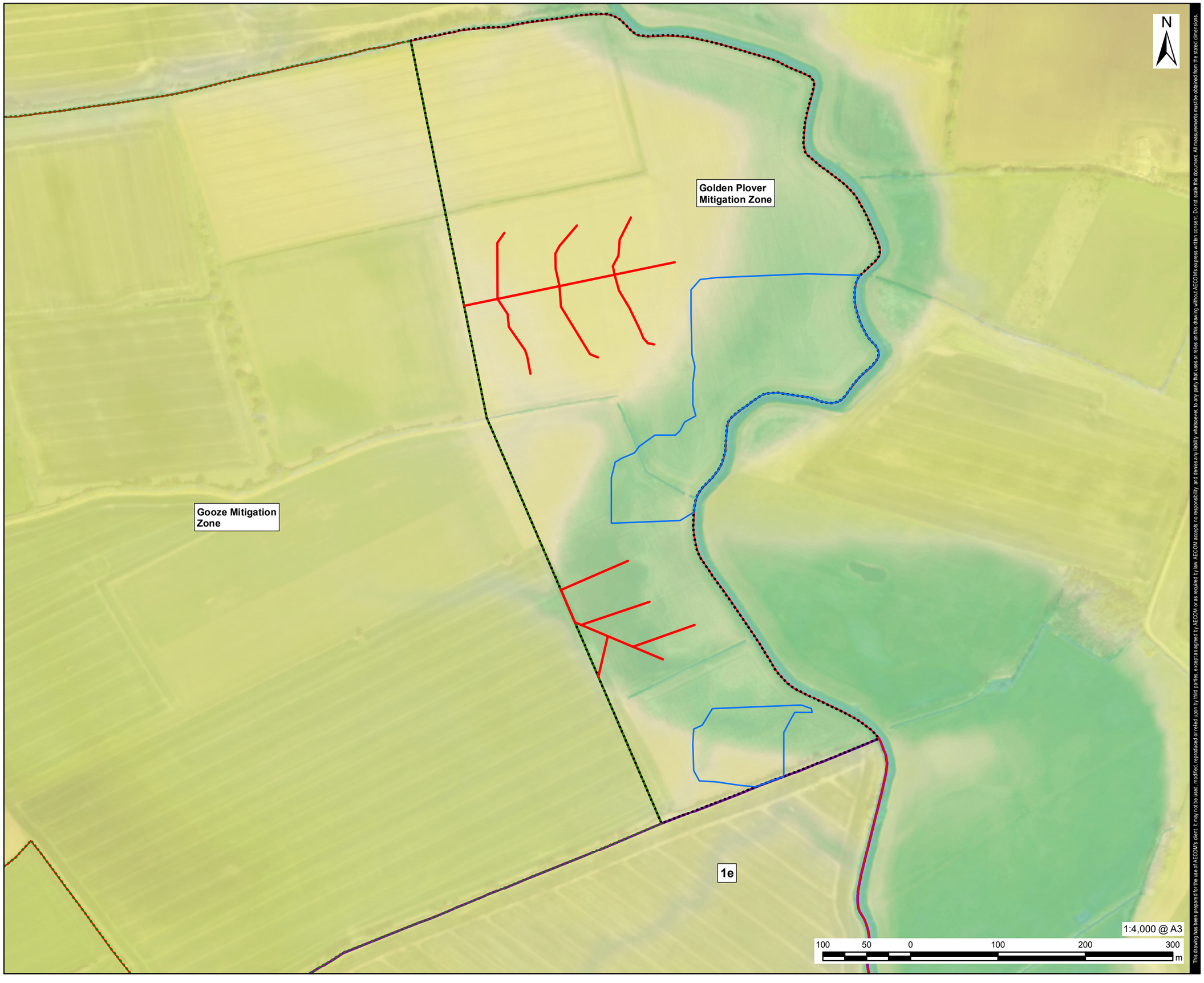
FIGURE NUMBER

Figure 12

Figure 13. Indicative location of linear foot drains in the Golden Plover Mitigation Zone

Revision: 0 Drawn: LP Checked: AK Approved: SE Date: 2023-11-08

Filename: I:\5004 - Information Systems\60683115_Boom Power\02_Maps\DCO\Doc_7-12_HRA_Report\HRA_ES_Fig7-12-13_Indicative_Location_Placing_Foot_Drains_A3_20231108_R0.mxd



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LEGEND

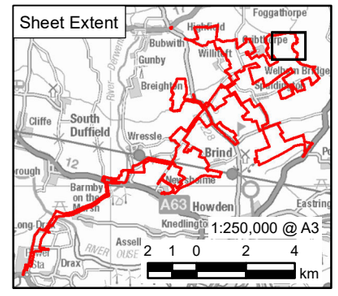
- Order limits
- Solar PV Site (xx = Solar PV Area)
- Foot Drains Indicative Location
- Goose Mitigation Zone
- Golden Plover Mitigation Zone
- Peat Area

Elevation (m)

High : 46.886

Low : -5.269

Sheet Extent



NOTES

ISSUE PURPOSE

Final HRA

PROJECT NUMBER

60683115

FIGURE TITLE

Indicative Location of Linear Foot Drains in the Golden Plover Mitigation Zone'

FIGURE NUMBER

Figure 13

Appendix B – Screening Matrices

Matrix Key

✓ = LSEs **cannot** be excluded

X = LSEs **can** be excluded

C = Construction phase

O = Operation phase

D = Decommission phase

Where effects are not relevant to a particular feature the matrix cell has been formatted as follows:

Table 14. Detailed screening matrix assessing the qualifying features of the River Derwent SAC against the identified impact pathways during construction (C columns), operation (O columns) and decommission (D columns)

Name of European site and Designation: River Derwent SAC

EU Code: UK0030253

Distance to Order limits: Grid Connection Corridor crosses this SAC

European site features	**LSEs Determination**																	
Effect	**Noise and Visual Disturbance**			**Water Quality**			**Water Quantity, Level and Flow**			**Temporary Loss of/Damage to Qualifying Habitat**			**Atmospheric Pollution (incl. Dust Deposition)**			**Introduction of INNS**		
Stage of Development	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**
3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation				✓~~c~~e	~~N/A~~✓e	✓~~c~~e	×~~e~~g	×~~e~~g	×~~e~~g	✓~~f~~h		✓~~f~~h	✓~~g~~i		✓~~g~~i	×~~h~~j		×~~h~~j
1099 River lamprey *Lampetra fluviatilis*	×a	×~~a~~b	×a	✓~~d~~f	~~×a~~✓f	✓~~d~~f	×~~e~~g	×~~e~~g	×~~e~~g				✓~~g~~i		✓~~g~~i	×~~h~~j		×~~h~~j
1095 Sea lamprey *Petromyzon marinus*	×a	×~~a~~b	×a	✓~~d~~f	~~×a~~✓f	✓~~d~~f	×~~e~~g	×~~e~~g	×~~e~~g				✓~~g~~i		✓~~g~~i	×~~h~~j		×~~h~~j
1163 Bullhead *Cottus gobio*	×a	×~~a~~b	×a	✓~~d~~f	~~×a~~✓f	✓~~d~~f	×~~e~~g	×~~e~~g	×~~e~~g				✓~~g~~i		✓~~g~~i	×~~h~~j		×~~h~~j
1355 Otter *Lutra lutra*	✓~~b~~c	~~✓b~~×d	✓~~b~~c	✓~~d~~f	~~×a~~✓f	✓~~d~~f	×~~e~~g	×~~e~~g	×~~e~~g	✓~~f~~h		✓~~f~~h	✓~~g~~i		✓~~g~~i	×~~h~~j		×~~h~~j

a. The potential for noise and vibration disturbance to qualifying fish is discussed in paragraphs 6.2.5 to ~~6.2.7.~~6.2.9. While all lamprey species and bullhead lack swim bladders (and are classed as low hearing sensitivity fish), potential impacts on their migratory routes were considered as a precautionary measure. It is noted that the Scheme will not involve in-river works, which are associated with the highest disturbance potential. Generally, vibration and any resulting particle motion from HDD is likely to be minimal with limited transmission to in-river sound waves, particularly compared to activities such as pile driving, dredging and seismic surveying (paragraph 6.2.6). The HDD crossings beneath the River Derwent and River Ouse would be a minimum depth of ~~5 m~~5m beneath the riverbeds, as set out in the **Framework CEMP [EN010143/APP/7.7]**.

b. In contrast to the construction and decommissioning phases (in which HDD operations may result in noise/vibration disturbance to qualifying fish), the operational phase of the Scheme involves no activities with the potential to alter the in-river noisescape.

~~b.~~c. Qualifying otter may be present within the designated site boundary, as well as along functionally linked sections of watercourses up to 80km from it. While this species is not considered to be particularly sensitive to visual and noise disturbance, particular regard must be given to habitat features required by otter, including couches, slides and holts. The potential for the Scheme to result in visual and noise disturbance to roaming otter in the construction and decommissioning phases is screened in for AA, specifically surrounding the HDD crossings of the River Derwent, the River Ouse and unnamed drain DE53 in the Grid Connection Corridor (see paragraph 6.2.4).

d. Sources of noise and visual disturbance to qualifying otter in functionally linked habitats in the operational phase encompass three permanent staff at Johnson's Farm, vegetation management and intermittent repair works. Therefore, as highlighted in paragraph 6.3.4, the potential for visual disturbance impacts will be minimal and at or below the levels of disturbance arising from existing farming practices.

~~c.~~e. All aquatic ecosystems are sensitive to water quality impacts potentially arising in the construction and decommissioning phases of developments (paragraph 6.2.11). Aquatic habitats and plants can be directly impacted from surface runoff containing toxic and non-toxic pollutants, as well as sediment. At its closest, the River Derwent SAC adjoins the Grid Connection Corridor of the Scheme and is traversed by HDD. Noting that the SIP for the River Derwent SAC specifies water pollution (particularly from sedimentation) as one of the main threats to site integrity, this impact pathway is screened in for AA.

~~d.~~f. All aquatic and semi-aquatic (otter) species in the River Derwent SAC are indirectly sensitive to water pollution, primarily due to negative impacts on their ability to forage adequately. For example, waterborne sediments from the adjoining Scheme have the potential to reduce visibility for visual hunters, as well as impacting sediment-dwelling invertebrates and reducing interstitial DO availability (paragraph 6.2.11).

~~e.~~g. All qualifying features of the River Derwent SAC are sensitive to changes in water quantity, level and flow. For example, *Ranunculion fluitantis*

vegetation requires hydrological flows within narrow limits for optimal growth. Furthermore, sea lamprey (an anadromous species) require sufficient flow regimes to reach their preferred spawning grounds in upstream river patches. However, LSEs screening shows that there is no potential for the Scheme to materially affect in-river water levels/flows. For example, paragraph 6.2.18 that the 35,000m^3 potable water demand in the construction period will be met through a private water supply borehole or from an existing licensed water abstraction source from Yorkshire Water. While HDD operations have the potential to affect local water levels, it was established that there are unlikely to be material interactions between the HDD pits and groundwater-bearing strata in the local geologies. Furthermore, aquifers are protected from abstractions in excess of 20m^3/d through Environment Agency licensing, such that no excessive draining of HDD pits is permissible (paragraph 6.2.21). Furthermore, paragraphs 6.2.23 and 6.2.24 specify that any increased water runoff from impermeable surfaces will be addressed through a temporary SuDS in line with the Environmental Damage (Prevention and Remediation) (England) Regulations 2015 and the Environmental Permitting (England and Wales) Regulations 2016, which make it illegal to pollute watercourses.

~~f.~~h. Several elements of the Scheme with the potential for damage to and temporary loss of qualifying habitat in the River Derwent SAC were considered, including the use of an existing track off the A63 for temporary access to a construction compound and the underground cable routing in the adjoining Grid Connection Corridor. It has been confirmed that the single-lane access track is of sufficient width to accommodate the anticipated vehicular usage. Furthermore, as identified in paragraph 6.2.27, a controlled access system will be utilised to managed traffic along the track, reducing the potential for any impacts to verge habitats. Notwithstanding this, as highlighted in paragraph 6.2.28, temporary access into the field to the north of the access track in the form of a bell mouth will require the temporary removal of a section of verge habitat within the designated site boundary. Since this would result in the temporary loss of habitat from within a European site, LSEs cannot be excluded and this impact is screened in for AA.

~~g.~~i. The qualifying features of the River Derwent SAC are directly or indirectly sensitive to dust deposition. Works required for the Grid Connection Corridor in the south-west part of the Scheme, including the HDD crossing of the River Derwent, will be carried out within 200m of the European site boundary, the screening threshold identified through consultation with Natural England (paragraph 6.2.35). Dust release from construction works may be associated with negative direct impacts on habitats/plants (i.e., through smothering and affecting gaseous exchange) and indirect effects on fauna (i.e., through changes in foraging behaviour).

~~h.~~j. The introduction of INNS is a realistic threat wherever construction and decommissioning works involving large numbers of vehicle and staff movements are carried out in close proximity (of up to 50m) to European sites. On this basis, vehicle movements in the south-west portion of the Grid Connection Corridor would pose the highest risk of inadvertently introducing INNS. However, legislative drivers prohibit the planting or inadvertent spreading of species listed in Schedule 9 of the Wildlife and Countryside Act 1981 (as amended) and Schedule 2 species identified in the Invasive Alien

Species (Enforcing and Permitting) Order 2019 (as amended). This means that adequate biosecurity measures will be deployed on-site irrespective of the River Derwent SAC (paragraph 6.2.40).

Table 15: Detailed screening matrix assessing the qualifying features of the Lower Derwent Valley SAC against the identified impact pathways during construction (C columns), operation (O columns) and decommission (D columns)

Name of European site and Designation: Lower Derwent Valley SAC

EU Code: UK0012844

Distance to Order limits: Approximately 1.3km at its closest

European site features	**LSEs Determination**											
Effect	**Water Quality**			**Water Quantity, Level and Flow**			**Atmospheric Pollution (incl. Dust Deposition)**			**Introduction of INNS**		
Stage of Development	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**
6510 Lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*)	✓a	✓b	✓a	×c	×d	×c	×e		×e	×f		×f
91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) * Priority feature	✓a	✓b	✓a	×c	×d	×c	×e		×e	×f		×f

a. Activities undertaken in the construction and decommissioning phases of the Scheme (and any resulting water pollution) have the potential to result in direct impacts on qualifying lowland hay meadows and alluvial forests. Several sections of the Scheme are hydrologically connected to the River Derwent and its floodplain (which encompasses the Lower Derwent Valley SAC), meaning that negative impacts of aquatic pollutants arising in the construction and decommissioning phases cannot be excluded (paragraph 6.2.13).

b. Solar farms do not generate process effluent and as such there is no major discharge associated with the Scheme. However, potential operational water quality impacts were considered in relation to surface runoff from hardstanding, routine operations to clean solar PV panels and sewage effluent generated by site staff. LSEs in relation to water quality impacts from sewage were screened out on the basis of the minimal sewage generation by the one to three operational site staff (paragraph 6.3.13). Sewage will be directed toward a septic tank or self-contained welfare units in more distant parts of the Site. LSEs in relation to the routine cleaning of solar PV panels were screened out because the sole cleaning agent will be water (paragraph 6.3.14). Due to proximity of the Scheme (particularly the Grid Connection Corridor) to the Lower Derwent Valley SAC, surface runoff from impermeable surfaces in the operational phase is screened in for AA (paragraph 6.3.12).

c. The Scheme comprises a range of elements with the potential to affect local hydrological conditions, including potable water requirements, HDD pits in relation to river crossings and an increase in impermeable surfaces. However, paragraph 6.2.18 indicates that LSEs will not arise from water requirements, given that potable water will be sourced either from a private supply borehole or a licensed abstraction source operated by Yorkshire Water. While HDD operations have the potential to affect local water levels, it was established that there are unlikely to be material interactions between the HDD pits and groundwater-bearing strata in the local geologies. Furthermore, aquifers are protected from abstractions in excess of 20m^3/d through Environment Agency licensing, such that no excessive draining of HDD pits is permissible (paragraph 6.2.21). The likely increase in the volume and/or rate of surface runoff will be minimised through the use of a temporary SuDS in compliance with the Environmental Damage (Prevention and Remediation) (England) Regulations 2015 and the Environmental Permitting (England and Wales) Regulations 2016.

d. Any potential water quantity, level and flow impacts in the operational period will be adequately addressed by the detailed **Framework Surface Water Drainage Strategy (Appendix 9-4, ES Volume 2 [EN010143/APP/6.2])** accompanying the DCO application, which includes measures such as boundary and routing swales to maintain runoff to greenfield rates (paragraph 6.3.16). Notably, SuDS are delivered to protect the wider integrity of the aquatic environment, rather than specifically protecting the hydrology in European sites.

e. Potential indirect impacts of traffic-related emissions and dust deposition on qualifying habitats in the Lower Derwent Valley SAC were considered. However, atmospheric pollution was screened out due to the low volume of

construction traffic (a maximum of 50 AADT) and the ARN lying beyond 200m from the designated site boundary (paragraph 6.2.33).

f. The introduction of INNS is a realistic threat wherever construction and decommissioning works involving large numbers of vehicle and staff movements are carried out in close proximity (of up to 50m) to European sites. Importantly, the Lower Derwent Valley SAC is situated upstream and it is, therefore, extremely unlikely that INNS would be introduced as a result of the Scheme. Furthermore, legislative drivers prohibit the planting or inadvertent spreading of species listed in Schedule 9 of the Wildlife and Countryside Act 1981 (as amended) and Schedule 2 species identified in the Invasive Alien Species (Enforcing and Permitting) Order 2019 (as amended). This means that adequate biosecurity measures will be deployed on-site irrespective of the Lower Derwent Valley SAC (paragraph 6.2.40).

Table 16. Detailed screening matrix assessing the qualifying features of the Lower Derwent Valley SPA against the identified impact pathways during construction (C columns), operation (O columns) and decommission (D columns)

Name of European site and Designation: Lower Derwent Valley SPA

EU Code: UK9006092

Distance to Order limits: Approximately 1.3km at its closest

European site features **LSEs Determination**

~~Table 15.~~

~~**Detailed screening matrix assessing the qualifying features of the Lower Derwent Valley SPA against the identified impact pathways during construction (C columns), operation (O columns) and decommission (D columns)**~~

~~**Name of European site and Designation: Lower Derwent Valley SPA**~~

~~**EU Code:** UK9006092~~

~~**Distance to Order limits:** Approximately 1.3km at its closest~~

~~**European site features** **LSEs Determination**~~

~~***Effect***~~	~~**Loss of Functionally Linked Habitat**~~			~~**Noise and Visual Disturbance**~~			~~**Water Quality**~~			~~**Water Quantity, Level and Flow**~~			~~**Atmospheric Pollution (incl. Dust Deposition)**~~		
~~***Stage of Development***~~	~~**C**~~	~~**O**~~	~~**D**~~	~~**C**~~	~~**O**~~	~~**D**~~	~~**C**~~	~~**O**~~	~~**D**~~	~~**C**~~	~~**O**~~	~~**D**~~	~~**C**~~	~~**O**~~	~~**D**~~
~~Bewick's swan *Cygnus columbianus bewickii*~~	~~✗a~~	~~✓b~~	~~✗a~~	~~✓c~~	~~✗d~~	~~✓c~~	~~✓e~~	~~✓f~~	~~✓e~~	~~✗g~~	~~✗h~~	~~✗g~~	~~✗i~~		~~✗i~~
~~Golden plover *Pluvialis apricaria* (over winter)~~	~~✗a~~	~~✓b~~	~~✗a~~	~~✓c~~	~~✗d~~	~~✓c~~	~~✓e~~	~~✓f~~	~~✓e~~	~~✗g~~	~~✗h~~	~~✗g~~	~~✗i~~		~~✗i~~
~~Ruff *Philomachus pugnax* (over winter)~~	~~✗a~~	~~✓b~~	~~✗a~~	~~✓c~~	~~✗d~~	~~✓c~~	~~✓e~~	~~✓f~~	~~✓e~~	~~✗g~~	~~✗h~~	~~✗g~~	~~✗i~~		~~✗i~~
~~Shoveler *Anas clypeata* (breeding)~~	~~✗a~~	~~✓b~~	~~✗a~~	~~✓c~~	~~✗d~~	~~✓c~~	~~✓e~~	~~✓f~~	~~✓e~~	~~✗g~~	~~✗h~~	~~✗g~~	~~✗i~~		~~✗i~~
~~Teal *Anas crecca* (Waterfowl assemblage)~~	~~✗a~~	~~✓b~~	~~✗a~~	~~✓c~~	~~✗d~~	~~✓c~~	~~✓e~~	~~✓f~~	~~✓e~~	~~✗g~~	~~✗h~~	~~✗g~~	~~✗i~~		~~✗i~~

~~**Name of European site and Designation: Lower Derwent Valley SPA**~~

~~Wigeon *Anas Penelope* (waterfowl assemblage)~~	~~×a~~	~~✓b~~	~~×a~~	~~✓c~~	~~×d~~	~~✓c~~	~~✓e~~	~~✓f~~	~~✓e~~	~~×g~~	~~×h~~	~~×g~~	~~×i~~		~~×i~~
~~Shoveler (on passage)~~	~~×a~~	~~✓b~~	~~×a~~	~~✓c~~	~~×d~~	~~✓c~~	~~✓e~~	~~✓f~~	~~✓e~~	~~×g~~	~~×h~~	~~×g~~	~~×i~~		~~×i~~
~~Pochard *Aythya farina* (on passage)~~	~~×a~~	~~✓b~~	~~×a~~	~~✓c~~	~~×d~~	~~✓c~~	~~✓e~~	~~✓f~~	~~✓e~~	~~×g~~	~~×h~~	~~×g~~	~~×i~~		~~×i~~
~~Whimbrel *Numenius phaeopus* (on passage)~~	~~×a~~	~~✓b~~	~~×a~~	~~✓c~~	~~×d~~	~~✓c~~	~~✓e~~	~~✓f~~	~~✓e~~	~~×g~~	~~×h~~	~~×g~~	~~×i~~		~~×i~~
~~Ruff (on passage)~~	~~×a~~	~~✓b~~	~~×a~~	~~✓c~~	~~×d~~	~~✓c~~	~~✓e~~	~~✓f~~	~~✓e~~	~~×g~~	~~×h~~	~~×g~~	~~×i~~		~~×i~~

Effect	**Loss of Functionally Linked Habitat**			**Noise and Visual Disturbance**			**Water Quality**			**Water Quantity, Level and Flow**			**Atmospheric Pollution (incl. Dust Deposition)**			**Introduction of INNS**		
Stage of Development	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**
Bewick's swan *Cygnus columbianus bewickii*	×a	✓b	×a	✓c	×d	✓c	✓e	✓f	✓e	×g	×h	×g	×i		×i	×j		×j
Golden plover *Pluvialis apricaria* (over winter)	×a	✓b	×a	✓c	×d	✓c	✓e	✓f	✓e	×g	×h	×g	×i		×i	×j		×j
Ruff *Philomachus pugnax* (over winter)	×a	✓b	×a	✓c	×d	✓c	✓e	✓f	✓e	×g	×h	×g	×i		×i	×j		×j
Shoveler *Anas clypeata* (breeding)	×a	✓b	×a	✓c	×d	✓c	✓e	✓f	✓e	×g	×h	×g	×i		×i	×j		×j
Teal *Anas crecca* (Waterfowl assemblage)	×a	✓b	×a	✓c	×d	✓c	✓e	✓f	✓e	×g	×h	×g	×i		×i	×j		×j
Wigeon *Anas Penelope* (waterfowl assemblage)	×a	✓b	×a	✓c	×d	✓c	✓e	✓f	✓e	×g	×h	×g	×i		×i	×j		×j
Shoveler (on passage)	×a	✓b	×a	✓c	×d	✓c	✓e	✓f	✓e	×g	×h	×g	×i		×i	×j		×j
Pochard *Aythya farina* (on passage)	×a	✓b	×a	✓c	×d	✓c	✓e	✓f	✓e	×g	×h	×g	×i		×i	×j		×j
Whimbrel *Numenius phaeopus* (on passage)	×a	✓b	×a	✓c	×d	✓c	✓e	✓f	✓e	×g	×h	×g	×i		×i	×j		×j
Ruff (on passage)	×a	✓b	×a	✓c	×d	✓c	✓e	✓f	✓e	×g	×h	×g	×i		×i	×j		×j

a. While activities in the construction and decommissioning phases are likely to lead to visual and noise disturbance to qualifying birds and a certain degree of functionally linked habitat loss, this impact will not take full effect until the operational phase when supporting habitat in the Solar PV Areas will be permanently lost. Therefore, the AA of functionally linked habitat loss is restricted to the operational phase.

b. The Lower Derwent Valley SPA is designated for a range of qualifying wader and waterfowl species (including an overarching waterbird assemblage), all of which are mobile and routinely forage beyond the designated site boundary. At a distance of approximately 1.3km from the SPA, the Site lies within the potential core foraging range for several component species. Given that it comprises suitable foraging habitats, the Scheme may regularly support significant proportions of relevant qualifying populations (paragraph 6.3.2). This impact pathway is screened in for more detailed AA.

c. The SACO for the Lower Derwent Valley SPA highlights the sensitivity of qualifying birds to visual and auditory cues, which applies both within the designated site boundary and in functionally linked habitats (paragraph 6.2.1). Given that the Site comprises extensive tracts of agricultural land within the core foraging ranges of SPA component species, activities in the construction and decommissioning phases have the potential for disturbance to important foraging/roosting habitats (paragraph 6.2.2).

d. Solar PV panels, the key elements of the Scheme, were assessed for their potential to result in visual disturbance to qualifying birds utilising or flying over habitats within the Order limits. Consideration was given to reflection of sunlight from PV surfaces ('glint and glare') as well as potential disturbance displacement resulting from solar infrastructure. Paragraphs 6.3.6 and 6.3.7 identify that glint and glare is unlikely to be an issue since (a) qualifying birds are likely to move through the flat landscape on a broad front, minimising any potential exposure time to glint and glare, and (b) the solar PV panels being mounted on a tiltable east-west single axis tracker designed to maximise light absorption. The potential for disturbance displacement was excluded on the basis of the low height of the solar PV panels, which will fall well within the range of heights of other landscape/habitat features, such as hedgerows, trees and wooded parcels (paragraph 6.3.3). Any material visual disturbance resulting from maintenance activities was excluded on the basis of the small number of permanent staff and the *ad hoc* nature of repair works (paragraph 6.3.4), particularly in comparison to the much greater levels of visual disturbance arising from ongoing farming operations.

e. Direct water quality impacts on qualifying waders and waterfowl in the Lower Derwent Valley SPA/Ramsar are unlikely and the primary water pollution impacts on birds will occur indirectly through negative effects on foraging resources. Several sections of the Scheme are hydrologically connected to the River Derwent and its floodplain (the Lower Derwent Valley SPA/Ramsar), meaning that water quality impacts in the construction and decommissioning phases cannot be excluded (paragraph 6.2.13).

f. Solar farms do not generate process effluent and as such there is no major discharge associated with the Scheme. However, potential operational water quality impacts were considered in relation to surface runoff from

hardstanding, routine operations to clean solar PV panels and sewage effluent generated by site staff. LSEs in relation to water quality impacts from sewage were screened out on the basis of the minimal sewage generation by the one to three operational site staff (paragraph 6.3.13). Sewage will be directed toward a septic tank or self-contained welfare units in more distant parts of the Site. LSEs in relation to the routine cleaning of solar PV panels were screened out because the sole cleaning agent will be water (paragraph 6.3.14). Due to proximity of the Scheme (particularly the Grid Connection Corridor) to the Lower Derwent Valley SPA, surface runoff from impermeable surfaces in the operational phase is screened in for AA (paragraph 6.3.12).

g. The Scheme comprises a range of elements with the potential to affect local hydrological conditions, including potable water requirements, HDD pits in relation to river crossings and an increase in impermeable surfaces. However, paragraph 6.2.18~~ indicates that LSEs will not arise from water requirements, given that potable water will be sourced either from a private supply borehole or a licensed abstraction source operated by Yorkshire Water. While HDD operations have the potential to affect local water levels, it was established that there are unlikely to be material interactions between the HDD pits and groundwater-bearing strata in the local geologies. Furthermore, aquifers are protected from abstractions in excess of 20m^3/d through Environment Agency licensing, such that no excessive draining of HDD pits is permissible (paragraph 6.2.19).~~ indicates that LSEs will not arise from water requirements, given that potable water will be sourced either from a private supply borehole or a licensed abstraction source operated by Yorkshire Water. While HDD operations have the potential to affect local water levels, it was established that there are unlikely to be material interactions between the HDD pits and groundwater-bearing strata in the local geologies. Furthermore, aquifers are protected from abstractions in excess of 20m^3/d through Environment Agency licensing, such that no excessive draining of HDD pits is permissible (paragraph 6.2.21). The likely increase in the volume and/or rate of surface runoff will be minimised through the use of a temporary SuDS in compliance with the Environmental Damage (Prevention and Remediation) (England) Regulations 2015 and the Environmental Permitting (England and Wales) Regulations 2016.

h. Any potential water quantity, level and flow impacts in the operational period will be adequately addressed by the detailed **Framework Surface Water Drainage Strategy** (**Appendix 9-4, ES Volume 2 [EN010143/APP/6.2]**) accompanying the DCO application, which includes measures such as boundary and routing swales to maintain runoff to greenfield rates (paragraph 6.3.16). Notably, SuDS are delivered to protect the wider integrity of the aquatic environment, rather than specifically protecting the hydrology in European sites.

i. Potential indirect impacts of traffic-related emissions and dust deposition on qualifying species in the Lower Derwent Valley SPA were considered. However, atmospheric pollution was screened out due to the low volume of construction traffic (a maximum of 50 AADT) and the ARN lying beyond 200m from the designated site boundary (paragraph 6.2.33). Furthermore, the designated site boundary and any functionally linked habitats used by birds lie

beyond 200m from any dust-generating activities required for the Scheme (paragraph 6.2.35).

j. The introduction of INNS is a realistic threat wherever construction and decommissioning works involving large numbers of vehicle and staff movements are carried out in close proximity (of up to 50m) to European sites. Importantly, the Lower Derwent Valley SPA is situated upstream and it is, therefore, extremely unlikely that INNS would be introduced as a result of the Scheme. Furthermore, legislative drivers prohibit the planting or inadvertent spreading of species listed in Schedule 9 of the Wildlife and Countryside Act 1981 (as amended) and Schedule 2 species identified in the Invasive Alien Species (Enforcing and Permitting) Order 2019 (as amended). This means that adequate biosecurity measures will be deployed on-site irrespective of the Lower Derwent Valley SPA (paragraph 6.2.40).

Table 17. Detailed screening matrix assessing the qualifying features of the Lower Derwent Valley Ramsar against the identified impact pathways during construction (C columns), operation (O columns) and decommission (D columns)

Name of European site and Designation: Lower Derwent Valley Ramsar

EU Code: N/A

Distance to Order limits: Approximately 1.3km at its closest

European site features	**LSEs Determination**																	
Effect	**Loss of Functionally Linked Habitat**			**Noise and Visual Disturbance**			**Water Quality**			**Water Quantity, Level and Flow**			**Atmospheric Pollution (incl. Dust Deposition)**			**Introduction of INNS**		
Stage of Development	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**
Ramsar Criterion 1: The site represents one of the most important examples of traditionally managed species-rich alluvial flood meadow habitat remaining in the UK.							✓e	✓f	✓e	×g	×h	×g	×i		×i	×j		×j
Ramsar Criterion 2: The site has a rich assemblage of wetland invertebrates including 16 species of dragonfly and damselfly, 15 British Red Data Book wetland invertebrates as well as a leafhopper, *Cicadula ornate* for which Lower Derwent Valley is the only known site in Great Britain.							✓e	✓f	✓e	×g	×h	×g	×i		×i	×j		×j
Ramsar Criterion 4: The site qualifies as a staging post for passage birds in spring. Of particular note are the nationally important				✓c	×d	✓c	✓e	✓f	✓e	×g	×h	×g	×i		×i	×j		×j

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Name of European site and Designation: Lower Derwent Valley Ramsar

numbers of ruff, *Philomachus pugnax* and whimbrel, *Numenius phaeopus*.																		
Ramsar Criterion 5: Assemblages of international importance – Species with peak counts in winter.	×a	✓b	×a	✓c	×d	✓c	✓e	✓f	✓e	×g	×h	×g	×i		×i	×j		×j
Ramsar Criterion 6 – species/populations occurring at levels of international importance. Species with peak counts in winter: Wigeon *Anas Penelope*	×a	✓b	×a	✓c	×d	✓c	✓e	✓f	✓e	×g	×h	×g	×i		×i	×j		×j
Teal *Anas crecca*	×a	✓b	×a	✓c	×d	✓c	✓e	✓f	✓e	×g	×h	×g	×i		×i	×j		×j

a. While activities in the construction and decommissioning are likely to lead to visual and noise disturbance to qualifying birds and a certain degree of functionally linked habitat loss, this impact will not take full effect until the operational phase when supporting habitat in the Solar PV Areas will be permanently lost. Therefore, the AA of functionally linked habitat loss is restricted to the operational phase.

b. The Lower Derwent Valley Ramsar is designated for wigeon and teal, as well as a waterbird assemblage of international importance. All qualifying overwintering bird species are mobile and routinely forage/roost beyond the designated site boundary. At a distance of approximately 1.3km from the Ramsar, the Site lies within the potential core foraging range for several component species. Given that it comprises suitable foraging habitats, the Site may regularly support significant proportions of relevant qualifying populations (paragraph 6.3.2). This impact pathway is screened in for more detailed AA.

c. All birds are sensitive to visual and auditory cues to varying degrees, both within the designated site boundary and in functionally linked habitats (paragraph 6.2.1). While direct noise and visual disturbance impacts to birds within the designated site boundary can be excluded due to distance, disturbance is an issue where birds are utilising functionally linked habitats in the vicinity of the Site (paragraph 6.2.2).

d. Visual disturbance impacts from the solar PV panels through glint and glare and disturbance displacement of qualifying birds utilising or flying over habitats within the Order limits were considered. Paragraphs 6.3.6 and 6.3.7 identify that glint and glare is unlikely to be an issue since (a) qualifying birds are likely to move through the flat landscape on a broad front, minimising any potential exposure time to glint and glare effects, and (b) the solar PV panels mounted on a tiltable east-west single axis tracker being designed for maximum light absorption. The potential for disturbance displacement was excluded on the basis of the low height of the solar PV panels, which will fall well within the range of heights of other landscape/habitat features, such as hedgerows, trees and wooded parcels (paragraph 6.3.3). Any material visual disturbance resulting from maintenance activities was excluded on the basis of the small number of permanent staff and the *ad hoc* nature of repair works (paragraph 6.3.4), particularly in comparison to the much greater levels of visual disturbance arising from ongoing farming operations.

e. There is the potential for direct water quality impacts to species-rich alluvial flood meadow (Ramsar criterion 1) and wetland invertebrates (Ramsar criterion 2), as well as indirect impacts on qualifying birds via the food chain. Several sections of the Site are hydrologically connected to the River Derwent and its floodplain (which encompasses the Lower Derwent Valley Ramsar), meaning that water quality impacts in the construction and decommissioning phases cannot be excluded (paragraph 6.2.13).

f. Solar farms do not generate process effluent and as such there is no major discharge associated with the Scheme. However, potential operational water quality impacts were considered in relation to surface runoff from hardstanding, routine operations to clean solar PV panels and sewage effluent generated by site staff. LSEs in relation to water quality impacts from

sewage were screened out on the basis of the minimal sewage generation by the one to three operational site staff (paragraph 6.3.13). Sewage will be directed toward a septic tank or self-contained welfare units in more distant parts of the Site. LSEs in relation to the routine cleaning of solar PV panels were screened out because the sole cleaning agent will be water (paragraph 6.3.14). Due to proximity of the Scheme (particularly the Grid Connection Corridor) to the Lower Derwent Valley Ramsar, surface runoff from impermeable surfaces in the operational phase is screened in for AA (paragraph 6.3.12).

g. The Scheme comprises a range of elements with the potential to affect local hydrological conditions, including potable water requirements, HDD pits in relation to river crossings and an increase in impermeable surfaces. However, paragraph 6.2.18 indicates that LSEs will not arise from water requirements, given that potable water will be sourced either from a private supply borehole or a licensed abstraction source operated by Yorkshire Water. While HDD operations have the potential to affect local water levels, it was established that there are unlikely to be material interactions between the HDD pits and groundwater-bearing strata in the local geologies. Furthermore, aquifers are protected from abstractions in excess of 20m^3/d through Environment Agency licensing, such that no excessive draining of HDD pits is permissible (paragraph 6.2.21). ~~indicates that LSEs will not arise from water requirements, given that potable water will be sourced either from a private supply borehole or a licensed abstraction source operated by Yorkshire Water. While HDD operations have the potential to affect local water levels, it was established that there are unlikely to be material interactions between the HDD pits and groundwater-bearing strata in the local geologies. Furthermore, aquifers are protected from abstractions in excess of 20m^3/d through Environment Agency licensing, such that no excessive draining of HDD pits is permissible (paragraph 6.2.19).~~ The likely increase in the volume and/or rate of surface runoff will be minimised through the use of a temporary SuDS in compliance with the Environmental Damage (Prevention and Remediation) (England) Regulations 2015 and the Environmental Permitting (England and Wales) Regulations 2016.

h. Any potential water quantity, level and flow impacts in the operational phase will be adequately addressed by the detailed **Framework Surface Water Drainage Strategy** (**Appendix 9-4, ES Volume 2 [EN010143/APP/6.2]**) accompanying the DCO application, which includes measures such as boundary and routing swales to maintain runoff to greenfield rates (paragraph 6.3.16). Notably, SuDS are delivered to protect the wider integrity of the aquatic environment, rather than specifically protecting the hydrology in European sites.

i. Potential indirect impacts of traffic-related emissions and dust deposition on qualifying habitats and species in the Lower Derwent Valley Ramsar were considered. However, atmospheric pollution was screened out due to the low volume of construction traffic (a maximum of 50 AADT) and the ARN lying beyond 200m from the designated site boundary (paragraph 6.2.33). Furthermore, the designated site boundary and any functionally linked habitats potentially used by mobile birds lie beyond 200m from any dust-generating activities required for the Scheme (paragraph 6.2.35).

j. The introduction of INNS is a realistic threat wherever construction and decommissioning works involving large numbers of vehicle and staff movements are carried out in close proximity (of up to 50m) to European sites. Importantly, the Lower Derwent Valley Ramsar is situated upstream and it is, therefore, extremely unlikely that INNS would be introduced as a result of the Scheme. Furthermore, legislative drivers prohibit the planting or inadvertent spreading of species listed in Schedule 9 of the Wildlife and Countryside Act 1981 (as amended) and Schedule 2 species identified in the Invasive Alien Species (Enforcing and Permitting) Order 2019 (as amended). This means that adequate biosecurity measures will be deployed on-site irrespective of the Lower Derwent Valley Ramsar (paragraph 6.2.40).

Table 18. Detailed screening matrix assessing the qualifying features of the Humber Estuary SPA against the identified impact pathways during construction (C columns), operation (O columns) and decommission (D columns)

Name of European site and Designation: Humber Estuary SPA

EU Code: UK9006111

Distance to Order limits: Approximately 3km at its closest

European site features	**LSEs Determination**																	
Effect	**Loss of Functionally Linked Habitat**			**Noise and Visual Disturbance**			**Water Quality**			**Water Quantity, Level and Flow**			**Atmospheric Pollution (incl. Dust Deposition)**			**Introduction of INNS**		
Stage of Development	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**
Avocet (wintering and breeding)	×a	✓b	×a	✓c	×d	✓c	✓e	✓f	✓e	×g	×h	×g	×i		×i	×j		×j
Bittern (wintering and breeding)	×a	✓b	×a	✓c	×d	✓c	✓e	✓f	✓e	×g	×h	×g	×i		×i	×j		×j
Hen harrier *Circus cyanea* (wintering)	×a	✓b	×a	✓c	×d	✓c	✓e	✓f	✓e	×g	×h	×g	×i		×i	×j		×j
Golden plover *Pluvialis apricaria* (wintering)	×a	✓b	×a	✓c	×d	✓c	✓e	✓f	✓e	×g	×h	×g	×i		×i	×j		×j
Bar-tailed godwit *Limosa lapponica* (wintering)	×a	✓b	×a	✓c	×d	✓c	✓e	✓f	✓e	×g	×h	×g	×i		×i	×j		×j
Ruff *Philomachus pugnax* (passage)	×a	✓b	×a	✓c	×d	✓c	✓e	✓f	✓e	×g	×h	×g	×i		×i	×j		×j
Marsh harrier (breeding)	×a	✓b	×a	✓c	×d	✓c	✓e	✓f	✓e	×g	×h	×g	×i		×i	×j		×j

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Name of European site and Designation: Humber Estuary SPA

Little tern (breeding) – Annex I stop	×a	✓b	×a	✓c	×d	✓c	✓e	✓f	✓e	×g	×h	×g	×i		×i	×j		×j
Shelduck *Tadorna tadorna* (wintering)	×a	✓b	×a	✓c	×d	✓c	✓e	✓f	✓e	×g	×h	×g	×i		×i	×j		×j
Knot *Calidris canutus* (wintering and passage)	×a	✓b	×a	✓c	×d	✓c	✓e	✓f	✓e	×g	×h	×g	×i		×i	×j		×j
Dunlin *Calidris alpina* (wintering and passage)	×a	✓b	×a	✓c	×d	✓c	✓e	✓f	✓e	×g	×h	×g	×i		×i	×j		×j
Black-tailed godwit *Limosa limosa* (wintering and passage)	×a	✓b	×a	✓c	×d	✓c	✓e	✓f	✓e	×g	×h	×g	×i		×i	×j		×j
Redshank *Tringa tetanus* (wintering and passage) – migratory species not Annex I	×a	✓b	×a	✓c	×d	✓c	✓e	✓f	✓e	×g	×h	×g	×i		×i	×j		×j
Assemblage Qualification: Dark-bellied brent goose *Branta bernicla bernicla,* shelduck, wigeon *Anas penelope*, teal *Anas crecca*, mallard *Anas platyrhynchos*, pochard *Aythya ferina,* scaup *Aythya marila,* goldeneye *Bucephala clangula*, bittern,	×a	✓b	×a	✓c	×d	✓c	✓e	✓f	✓e	×g	×h	×g	×i		×i	×j		×j

Name of European site and Designation: Humber Estuary SPA

oystercatcher *Haematopus ostralegus*, avocet, ringed plover *Charadrius hiaticula,* golden plover, grey plover *P. squatarola,* lapwing *Vanellus vanellus*, knot, sanderling *Calidris alba,* dunlin, ruff, black-tailed godwit, bar-tailed godwit, whimbrel *Numenius phaeopus*, curlew *N. arquata*, redshank, greenshank *Trimga nebularia* and turnstone *Arenaria interpres.*																		

a. The staggered works, whereby different elements of the Scheme will be progressed in various Solar PV Areas at the same time, will lead to some visual and noise disturbance in the construction and decommissioning phases of the Scheme. This is likely to gradually reduce the suitability of some functionally linked habitat parcels for qualifying birds from the Humber Estuary SPA. However, the loss of functionally linked habitat will be at its greatest extent and permanent in the operational phase of the Scheme. Therefore, the AA of functionally linked habitat loss is restricted to the operational phase.

b. The Humber Estuary SPA is designated for a range of qualifying wader and waterfowl species (including an overarching waterbird assemblage), all of which are mobile and routinely forage or roost beyond the designated site boundary. At a distance of approximately 3km from the SPA, the Site lies within the potential core foraging range for several qualifying species of the SPA. The Scheme comprises extensive tracts of agricultural land, a suitable foraging habitat for some qualifying species, and may regularly support significant proportions of relevant qualifying populations (paragraph 6.3.2). This impact pathway is screened in for more detailed AA.

c. As highlighted in the SIP and SACO for the Humber Estuary SPA, visual and noise disturbance represents a key threat to its qualifying bird populations. At a distance of approximately 3km from the Scheme, direct disturbance in the construction and decommissioning phases on the designated site can be excluded. However, due regard to potential disturbance must also be given in functionally linked habitats (paragraph 6.2.1). Given that the Site comprises extensive tracts of agricultural land within the core foraging ranges of some of the SPA component species, activities in the construction and decommissioning phases have the potential for disturbance to important off-site foraging/roosting habitats (paragraph 6.2.2).

d. Solar PV panels, the key elements of the Scheme, were assessed for their potential to result in visual disturbance to qualifying birds utilising or flying over habitats within the Order limits. Consideration was given to reflection of sunlight from PV surfaces (‘glint and glare’) as well as potential disturbance displacement resulting from solar infrastructure. Paragraphs 6.3.6 and 6.3.7 identify that glint and glare is unlikely to be an issue since (a) qualifying birds are likely to move through the flat landscape on a broad front (since there are no obvious landmarks concentrating bird movements in particular flight channels), minimising any potential exposure time to glint and glare, and (b) the solar PV panels being mounted on a tiltable east-west single axis tracker designed to maximise light absorption. The potential for disturbance displacement was excluded on the basis of the low height of the solar PV panels, which will fall well within the range of heights of other landscape/habitat features, such as hedgerows, trees and wooded parcels (paragraph 6.3.3). Any material visual disturbance resulting from maintenance activities was excluded on the basis of the small number of permanent staff and the *ad hoc* nature of repair works (paragraph 6.3.4), particularly in comparison to the much greater levels of visual disturbance arising from ongoing farming operations.

e. Direct water quality impacts on qualifying waders and waterfowl in the Humber Estuary SPA are unlikely and any negative effects on birds will primarily occur indirectly through trophic cascades. Several sections of the

Site are hydrologically connected to the River Derwent, River Ouse and, ultimately, the Humber Estuary SPA. While the flow path distance between the geographically closest elements of the Order limits and the estuary is approximately 7.2km, water quality impacts in the construction and decommissioning phases are taken forward to AA as a precautionary measure (paragraph 6.2.13).

f. Solar farms do not generate process effluent and as such there is no major discharge associated with the Scheme. However, potential operational water quality impacts were considered in relation to surface runoff from hardstanding, routine operations to clean solar PV panels and sewage effluent generated by site staff. LSEs in relation to water quality impacts from sewage were screened out on the basis of the minimal sewage generated by the one to three operational site staff (paragraph 6.3.13). Sewage will be directed toward a septic tank or self-contained welfare units in more distant parts of the Site. LSEs in relation to the routine cleaning of solar PV panels were screened out because the sole cleaning agent will be water (paragraph 6.3.14). Due to the hydrological connection between the Scheme (particularly the Grid Connection Corridor) to the Humber Estuary SPA (via the Rivers Derwent and Ouse), surface runoff from impermeable surfaces in the operational phase is screened in for AA as a precautionary measure in line with the 'Rochdale Envelope' (paragraph 6.3.12).

g. Hydrological effects on the Humber Estuary SPA, while unlikely due to distance, are considered here as a precautionary measure. The Scheme comprises a range of elements with the potential to affect local hydrological conditions, including potable water requirements, HDD crossings of the Rivers Derwent and Ouse, and an increase in impermeable surfaces. However, paragraph 6.2.18 indicates that LSEs from potable water demand will not arise, given that the water will be sourced either from a private supply borehole or a licensed abstraction source operated by Yorkshire Water. While HDD operations have the potential to affect local water levels, it was established that there are unlikely to be material interactions between the HDD pits and groundwater-bearing strata in the local geologies. Furthermore, aquifers are protected from abstractions in excess of $20m^3/d$ through Environment Agency licensing, such that no excessive draining of HDD pits is permissible (paragraph 6.2.21). The likely increase in the volume and/or rate of surface runoff will be minimised by deploying temporary SuDS in compliance with the Environmental Damage (Prevention and Remediation) (England) Regulations 2015 and the Environmental Permitting (England and Wales) Regulations 2016 (paragraph 6.2.24).

h. Any potential water quantity, level and flow impacts in the operational period will be adequately addressed by the detailed **Framework Surface Water Drainage Strategy** (**Appendix 9-4, ES Volume 2 [EN010143/APP/6.2]**) accompanying the DCO application, which includes measures such as boundary and routing swales to limit runoff to greenfield rates (paragraph 6.3.16). Notably, SuDS are delivered to protect the wider integrity of the aquatic environment, rather than specifically protecting the hydrology in European sites.

i. Potential indirect impacts of traffic-related emissions and dust deposition on supporting habitats and qualifying species in the Humber Estuary SPA were

considered. However, atmospheric pollution was screened out due to the low volume of construction traffic (a maximum of 50 AADT) and the ARN lying beyond 200m from the designated site boundary (paragraph 6.2.33). Furthermore, the designated site boundary and any functionally linked habitats potentially used by mobile birds lie beyond 200m from any dust-generating activities required for the Scheme (paragraph 6.2.35).

j. The introduction of INNS is a realistic threat wherever construction and decommissioning works involving large numbers of vehicle and staff movements are carried out in close proximity (of up to 50m) to European sites. Notably, the Humber Estuary SPA is situated downstream from the Scheme, far beyond the 50m impact distance for the introduction of INNS. Furthermore, legislative drivers prohibit the planting or inadvertent spreading of species listed in Schedule 9 of the Wildlife and Countryside Act 1981 (as amended) and Schedule 2 species identified in the Invasive Alien Species (Enforcing and Permitting) Order 2019 (as amended). This means that adequate biosecurity measures will be deployed on-site irrespective of the Humber Estuary SPA (paragraph 6.2.40).

Table 19. Detailed screening matrix assessing the qualifying features of the Humber Estuary Ramsar against the identified impact pathways during construction (C columns), operation (O columns) and decommission (D columns)

Name of European site and Designation: Humber Estuary Ramsar

EU Code: N/A

Distance to Order limits: Approximately 3km at its closest

European site features	**LSEs Determination**																	
Effect	**Loss of Functionally Linked Habitat**			**Noise and Visual Disturbance**			**Water Quality**			**Water Quantity, Level and Flow**			**Atmospheric Pollution (incl. Dust Deposition)**			**Introduction of INNS**		
Stage of Development	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**
Ramsar Criterion 1: The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons. It is a large macro-tidal coastal plain estuary with high suspended sediment loads, which feed a dynamic and rapidly changing system of accreting and eroding intertidal and subtidal mudflats, sandflats, saltmarsh and reedbeds. Examples of both strandline, foredune, mobile, semi-fixed dunes, fixed dunes and dune grassland occur on both banks of the estuary and along the coast. The estuary supports a full range of saline conditions from							✓i	✓j	✓i	✕k	✕l	✕k	✕m		✕m	✕n		✕n

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Name of European site and Designation: Humber Estuary Ramsar

the open coast to the limit of saline intrusion on the tidal rivers of the Ouse and Trent. Wave exposed sandy shores are found in the outer/open coast areas of the estuary. These change to the more moderately exposed sandy shores and then to sheltered muddy shores within the main body of the estuary and up into the tidal rivers. The lower saltmarsh of the Humber is dominated by common cordgrass *Spartina anglica* and annual glasswort *Salicornia* communities. Low to mid marsh communities are mostly represented by sea aster *Aster tripolium*, common saltmarsh grass *Puccinellia maritima* and sea purslane *Atriplex portulacoides* communities. The upper portion of the saltmarsh community is atypical, dominated by sea couch *Elytrigia atherica* (*Elymus pycnanthus*) saltmarsh community. In the upper reaches of the estuary, the tidal marsh community is dominated by the common reed *Phragmites australis* fen and sea club rush *Bolboschoenus maritimus* swamp with the couch grass *Elytrigia repens* (*Elymus repens*) saltmarsh community. Within the Humber Estuary Ramsar site there are good examples of four of the five physiographic types of saline lagoon.																			
Ramsar Criterion 3: The Humber Estuary Ramsar site supports a breeding colony of grey seals *Halichoerus grypus* at Donna Nook. It is the second largest	×a	×a	×a	×e	×e	×e	✓i	✓j	✓i	×k	×l	×k	×m		×m	×n		×n

Name of European site and Designation: Humber Estuary Ramsar

grey seal colony in England and the furthest south regular breeding site on the east coast. The dune slacks at Saltfleetby-Theddlethorpe on the southern extremity of the Ramsar site are the most north-easterly breeding site in Great Britain of the natterjack toad *Bufo calamita*.																		
Ramsar Criterion 5: Assemblages of international importance – Species with peak counts in the non-breeding season	×b	✓b	×b	✓f	×g	✓f	✓i	✓j	✓i	×k	×l	×k	×m		×m	×n		×n
Ramsar Criterion 6 – species/populations occurring at levels of international importance. Golden plover *Pluvialis apricaria* (spring/autumn)	×b	✓b	×b	✓f	×g	✓f	✓i	✓j	✓i	×k	×l	×k	×m		×m	×n		×n
Knot *Calidris canutus* (spring/autumn)	×b	✓c	×b	✓f	×g	✓f	✓i	✓j	✓i	×k	×l	×k	×m		×m	×n		×n
Dunlin *Calidris alpina alpina* (spring/autumn)	×b	✓c	×b	✓f	×g	✓f	✓i	✓j	✓i	×k	×l	×k	×m		×m	×n		×n
Black-tailed godwit *Limosa limosa islandica* (spring/autumn)	×b	✓c	×b	✓f	×g	✓f	✓i	✓j	✓i	×k	×l	×k	×m		×m	×n		×n
Redshank *Tringa tetanus* (spring/autumn)	×b	✓c	×b	✓f	×g	✓f	✓i	✓j	✓i	×k	×l	×k	×m		×m	×n		×n
Shelduck *Tadorna tadorna* (winter)	×b	✓c	×b	✓f	×g	✓f	✓i	✓j	✓i	×k	×l	×k	×m		×m	×n		×n
Golden plover *Pluvialis apricaria* (winter)	×b	✓c	×b	✓f	×g	✓f	✓i	✓j	✓i	×k	×l	×k	×m		×m	×n		×n
Knot *Calidris canutus* (winter)	×b	✓c	×b	✓f	×g	✓f	✓i	✓j	✓i	×k	×l	×k	×m		×m	×n		×n
Dunlin *Calidris alpina alpina* (winter)	×b	✓c	×b	✓f	×g	✓f	✓i	✓j	✓i	×k	×l	×k	×m		×m	×n		×n

Name of European site and Designation: Humber Estuary Ramsar

Black-tailed godwit *Limosa limosa islandica* (winter)	×b	✓c	×b	✓f	×g	✓f	✓i	✓j	✓i	×k	×l	×k	×m		×m	×n		×n
Bar-tailed godwit *Limosa lapponica* (winter)	×b	✓c	×b	✓f	×g	✓f	✓i	✓j	✓i	×k	×l	×k	×m		×m	×n		×n
Ramsar Criterion 8: The Humber Estuary acts as an important migration route for both river lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus* between coastal waters and their spawning areas.	×d	×d	×d	×h		×h	✓i	✓j	✓i	×k	×l	×k	×m		×m	×n		×n

a. Grey seal from the breeding colony at Donna Nook may travel vast distances from the designated site boundary. However, this species is primarily restricted to marine habitats and the Site is located approximately 3.4km inland from the estuary (and considerably further from 'truly' marine habitats). Grey seal are not expected to regularly occur in the Rivers Derwent and Ouse in proximity to the Site and potential functionally linked habitat loss in relation to this species is not assessed in this HRA.

b. While activities in the construction and decommissioning phases are likely to lead to visual and noise disturbance to qualifying birds and a limited degree of functionally linked habitat loss, this impact will not take full effect until the operational phase when supporting habitat under the footprint of the Solar PV Areas will be permanently lost. Therefore, the AA of functionally linked habitat loss is restricted to the operational phase.

c. The Humber Estuary Ramsar is designated for a range of overwintering and passage waders and waterfowl, as well as an overarching assemblage of international importance. All qualifying bird species are mobile and routinely forage/roost beyond the designated site boundary. At a distance of approximately 3km from the Ramsar, the Site lies within the potential core foraging range for several of the SPA's component species. Given that it comprises an extensive agricultural landscape, the Site may regularly support significant proportions of relevant qualifying populations (paragraph 6.3.2). This impact pathway is screened in for more detailed AA.

d. Anadromous species, such as river lamprey and sea lamprey, undertake annual migrations between coastal waters and upstream spawning areas. Due to the hydrological connectivity between the estuary and the Rivers Ouse and Derwent, it is likely that lamprey will be reliant on functionally linked habitats adjoining the Site. However, no in-river works with the potential for temporary/permanent aquatic habitat loss will be undertaken, such that impacts on lamprey regarding the loss of functionally linked habitats have been scoped out from the HRA (but see assessment of noise and visual effects).

e. As discussed under a., grey seal are unlikely to be regularly encountered in the Rivers Derwent and Ouse adjoining the Site. Furthermore, the grey seal colony at Donna Nook lies far beyond the distance at which direct visual and noise disturbance impacts would be considered. Visual and noise disturbance impacts to grey seal have been scoped out of this HRA.

f. All birds are sensitive to visual and auditory cues to varying degrees, both within the designated site boundary and in functionally linked habitats (paragraph 6.2.1). While direct noise and visual disturbance impacts to birds within the designated site boundary can be excluded due to distance, disturbance is an issue where birds from the Humber Estuary Ramsar are utilising functionally linked habitats in the vicinity of the Site (paragraph 6.2.2).

g. Operational visual disturbance impacts from the solar PV panels through glint and glare and disturbance displacement of qualifying birds utilising or flying over habitats within the Order limits were considered. Paragraphs 6.3.6 and 6.3.7 identify that glint and glare is unlikely to be an issue since (a) qualifying

birds are likely to move through the flat landscape on a broad front, minimising any potential exposure time to glint and glare effects, and (b) the solar PV panels mounted on a tiltable east-west single axis tracker being designed for maximum light absorption. The potential for disturbance displacement was excluded on the basis of the low height of the solar PV panels, which will fall well within the range of heights of other landscape/habitat features, such as hedgerows, trees and wooded parcels (paragraph 6.3.3). Any material visual disturbance resulting from maintenance activities was excluded on the basis of the small number of permanent staff and the *ad hoc* nature of repair works (paragraph 6.3.4), particularly in comparison to the much greater levels of visual disturbance arising from ongoing farming operations.

h. Fish are sensitive to noise and vibration disturbance that arises from construction and decommissioning phase activities. While all lamprey species lack swim bladders (and are classed as low hearing sensitivity fish), potential impacts on their migratory routes were considered as a precautionary measure. The Scheme will not involve in-river works, which are associated with the highest disturbance potential for aquatic species. Notwithstanding this, trenchless cable crossings (i.e., HDD) under the River Derwent and River Ouse will be undertaken. The distance of HDD launch pits from the watercourse edge will be a minimum of 30m. Furthermore, as set out in the **Framework CEMP [EN010143/APP/7.7],** the drill depths will be a minimum of 5m below bed. Given the above, it is considered that there will be no material disturbance impact on qualifying lamprey (paragraph 6.2.6).

i. There is the potential for direct water quality impacts to the near-natural estuarine system (Ramsar Criterion 1), as well as indirect impacts on qualifying grey seal (Ramsar Criterion 3), bird assemblage (Ramsar Criterion 5), individual component bird species (Ramsar Criterion 6) and anadromous lamprey (Ramsar Criterion 8). Several sections of the Site are hydrologically connected to the River Derwent, River Ouse and the estuary, meaning that water quality impacts in the construction and decommissioning phases cannot be excluded (paragraph 6.2.13).

j. Solar farms do not generate process effluent and as such there is no major discharge associated with the Scheme. However, potential operational water quality impacts were considered in relation to surface runoff from hardstanding, routine solar PV panel cleaning and sewage effluent generated by site staff. LSEs in relation to water quality impacts from sewage were screened out on the basis of the minimal sewage generation by the one to three operational site staff (paragraph 6.3.13). Sewage will be directed toward a septic tank or self-contained welfare units in more distant parts of the Site. LSEs in relation to the routine cleaning of solar PV panels were screened out because the sole cleaning agent will be water (paragraph 6.3.14). Due to hydrological connectivity of the Site (particularly the Grid Connection Corridor) to the Humber Estuary Ramsar, surface runoff from impermeable surfaces in the operational phase is screened in for AA (paragraph 6.3.12).

k. The Scheme comprises a range of elements with the potential to affect local hydrological conditions, including potable water requirements, HDD pits in relation to river crossings and an increase in impermeable surfaces. However,

paragraph 6.2.18 indicates that LSEs will not arise from water requirements, given that potable water will be sourced either from a private supply borehole or a licensed abstraction source operated by Yorkshire Water. While HDD operations have the potential to affect local water levels, it was established that there are unlikely to be material interactions between the HDD pits and groundwater-bearing strata in the local geologies. Furthermore, aquifers are protected from abstractions in excess of 20m^3/d through Environment Agency licensing, such that no excessive draining of HDD pits is permissible (paragraph 6.2.21). ~~indicates that LSEs will not arise from water requirements, given that potable water will be sourced either from a private supply borehole or a licensed abstraction source operated by Yorkshire Water. While HDD operations have the potential to affect local water levels, it was established that there are unlikely to be material interactions between the HDD pits and groundwater-bearing strata in the local geologies. Furthermore, aquifers are protected from abstractions in excess of 20m^3/d through Environment Agency licensing, such that no excessive draining of HDD pits is permissible (paragraph 6.2.19).~~ The likely increase in the volume and/or rate of surface runoff will be minimised through the use of a temporary SuDS in compliance with the Environmental Damage (Prevention and Remediation) (England) Regulations 2015 and the Environmental Permitting (England and Wales) Regulations 2016 (paragraph 6.2.24).

l. Any potential water quantity, level and flow impacts in the operational period will be adequately addressed by the detailed **Framework Surface Water Drainage Strategy** (**Appendix 9-4, ES Volume 2 [EN010143/APP/6.2]**) accompanying the DCO application, which includes measures such as boundary and routing swales to maintain runoff to greenfield rates (paragraph 6.3.16). Notably, SuDS are delivered to protect the wider integrity of the aquatic environment, rather than specifically protecting the hydrology in European sites.

m. Potential indirect impacts of traffic-related emissions and dust deposition on supporting habitats and qualifying species in the Humber Estuary Ramsar were considered. However, atmospheric pollution was screened out due to the low volume of construction traffic (a maximum of 50 AADT) and the ARN lying beyond 200m from the designated site boundary (paragraph 6.2.33). Furthermore, the designated site boundary and any functionally linked habitats potentially used by mobile birds lie beyond 200m from any dust-generating activities required for the Scheme (paragraph 6.2.35).

n. The introduction of INNS is a realistic threat wherever construction and decommissioning works involving large numbers of vehicle and staff movements are carried out in close proximity (of up to 50m) to European sites. Notably, the Humber Estuary Ramsar is situated downstream from the Scheme, far beyond the 50m impact distance for the introduction of INNS. Furthermore, legislative drivers prohibit the planting or inadvertent spreading of species listed in Schedule 9 of the Wildlife and Countryside Act 1981 (as amended) and Schedule 2 species identified in the Invasive Alien Species (Enforcing and Permitting) Order 2019 (as amended). This means that adequate biosecurity measures will be deployed on-site irrespective of the Humber Estuary Ramsar (paragraph 6.2.40).

Table 20. Detailed screening matrix assessing the qualifying features of the Humber Estuary SAC against the identified impact pathways during construction (C columns), operation (O columns) and decommission (D columns)

Name of European site and Designation: Humber Estuary SAC

EU Code: UK0030170

Distance to Order limits: Approximately 3km at its closest

European site features	**LSEs Determination**																	
Effect	**Loss of Functionally Linked Habitat**			**Noise and Visual Disturbance**			**Water Quality**			**Water Quantity, Level and Flow**			**Atmospheric Pollution (incl. Dust Deposition)**			**Introduction of INNS**		
Stage of Development	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**
1130 Estuaries							✓e	✓f	✓e	×g	×h	×g	×i		×i	×j		×j
1140 Mudflats and sandflats not covered by seawater at low tide							✓e	✓f	✓e	×g	×h	×g	×i		×i	×j		×j
1110 Sandbanks which are slightly covered by sea water all the time							✓e	✓f	✓e	×g	×h	×g	×i		×i	×j		×j
1150 Coastal lagoons							✓e	✓f	✓e	×g	×h	×g	×i		×i	×j		×j
1310 *Salicornia* and other annuals colonising mud and sand							✓e	✓f	✓e	×g	×h	×g	×i		×i	×j		×j

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Name of European site and Designation: Humber Estuary SAC

1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)							✓e	✓f	✓e	×g	×h	×g	×i		×i	×j		×j
2110 Embryonic shifting dunes							✓e	✓f	✓e	×g	×h	×g	×i		×i	×j		×j
2120 Shifting dunes along the shoreline with *Ammophila arenaria* ('white dunes')							✓e	✓f	✓e	×g	×h	×g	×i		×i	×j		×j
2130 Fixed coastal dunes with herbaceous vegetation ('grey dunes') * Priority feature							✓e	✓f	✓e	×g	×h	×g	×i		×i	×j		×j
2160 Dunes with *Hippopha rhamnoides*							✓e	✓f	✓e	×g	×h	×g	×i		×i	×j		×j
Sea lamprey *Petromyzon marinus*	×a		×a	×c		×c	✓e	✓f	✓e	×g	×h	×g	×i		×i	×j		×j
River lamprey *Lampetra fluviatilis*	×a		×a	×c		×c	✓e	✓f	✓e	×g	×h	×g	×i		×i	×j		×j
Grey seal *Halichoerus grypus*	×b		×b	×d		×d	✓e	✓f	✓e	×g	×h	×g	×i		×i	×j		×j

a. Anadromous species, such as river lamprey and sea lamprey, undertake annual migrations between coastal waters and upstream spawning areas. Due to the hydrological connectivity between the estuary and the Rivers Ouse and Derwent, it is likely that lamprey will be reliant on functionally linked habitats adjoining the Site. However, no in-river works with the potential for temporary/permanent aquatic habitat loss will be undertaken, such that impacts on lamprey regarding the loss of functionally linked habitat have been scoped out from the HRA (but see assessment of noise and visual disturbance impacts).

b. Grey seal from the breeding colony at Donna Nook may travel vast distances from the designated site boundary. However, this species is primarily restricted to marine habitats and the Scheme is located a relatively long distance inland from the estuary. Grey seal are not expected to regularly occur in the Rivers Derwent and Ouse in proximity to the Site and potential functionally linked habitat loss in relation to this species is not assessed in this HRA.

c. The potential for noise and vibration disturbance to qualifying fish is discussed in paragraphs 6.2.5 to ~~6.2.7.~~6.2.9. While all lamprey species lack swim bladders (and are classed as low hearing sensitivity fish), potential impacts on their migratory routes were considered as a precautionary measure. It is noted that the Scheme will not involve in-river works, which are associated with the highest disturbance potential. Generally, vibration and any resulting particle motion from HDD is likely to be minimal with limited transmission to in-river sound waves, particularly compared to activities such as pile driving, dredging and seismic surveying (paragraph 6.2.6). The HDD crossings beneath the River Derwent and River Ouse would be a minimum depth of 5 m beneath the riverbeds as set out in the **Framework CEMP [EN010143/APP/7.7].**

d. As discussed under b., grey seal are unlikely to be regularly encountered in the Rivers Derwent and Ouse adjoining the Site. Furthermore, the grey seal colony at Donna Nook lies far beyond the distance at which direct visual and noise disturbance impacts would be considered. Visual and noise disturbance impacts to grey seal have been scoped out of this HRA.

e. The Scheme may be associated with direct water quality impacts on aquatic and dune habitat, both as a result of sedimentation and toxic contamination. Furthermore, it is associated with potential indirect impacts on qualifying lamprey and grey seal through impacts on the food web and foraging behaviour. Several sections of the Scheme (i.e., the Grid Connection Corridor and Solar PV Areas) are hydrologically connected to the River Derwent, River Ouse and the estuary, meaning that water quality impacts in the construction and decommissioning phases cannot be excluded (paragraph 6.2.13).

f. Solar farms do not generate process effluent and as such there is no major discharge associated with the Scheme. However, potential operational water quality impacts were considered in relation to surface runoff from hardstanding, routine solar PV panel cleaning and sewage effluent generated by site staff. LSEs in relation to water quality impacts from sewage were screened out on the basis of the small volume of sewage that would be generated by the one to three operational site staff (paragraph 6.3.13).

Sewage will be directed toward a septic tank or self-contained welfare units in more distant parts of the Site. LSEs in relation to the routine cleaning of solar PV panels were screened out because the sole cleaning agent will be water (paragraph 6.3.14). Due to hydrological connectivity of the Site (particularly the Grid Connection Corridor) to the Humber Estuary SAC, surface runoff from impermeable surfaces in the operational phase is screened in for AA (paragraph 6.3.12).

g. The Scheme comprises a range of elements with the potential to affect local hydrological conditions, including potable water requirements, HDD pits in relation to river crossings and an increase in impermeable surfaces. However, paragraph 6.2.18 indicates that LSEs will not arise from water requirements, given that potable water will be sourced either from a private supply borehole or a licensed abstraction source operated by Yorkshire Water. While HDD operations have the potential to affect local water levels, it was established that there are unlikely to be material interactions between the HDD pits and groundwater-bearing strata in the local geologies. Furthermore, aquifers are protected from abstractions in excess of 20m^3/d through Environment Agency licensing, such that no excessive draining of HDD pits is permissible (paragraph 6.2.21). ~~indicates that LSEs will not arise from water requirements, given that potable water will be sourced either from a private supply borehole or a licensed abstraction source operated by Yorkshire Water. While HDD operations have the potential to affect local water levels, it was established that there are unlikely to be material interactions between the HDD pits and groundwater-bearing strata in the local geologies. Furthermore, aquifers are protected from abstractions in excess of 20m^3/d through Environment Agency licensing, such that no excessive draining of HDD pits is permissible (paragraph 6.2.19).~~ The likely increase in the volume and/or rate of surface runoff will be minimised through the use of a temporary SuDS in compliance with the Environmental Damage (Prevention and Remediation) (England) Regulations 2015 and the Environmental Permitting (England and Wales) Regulations 2016 (paragraph 6.2.24).

h. Any potential water quantity, level and flow impacts in the operational period will be adequately addressed by the detailed **Framework Surface Water Drainage Strategy** (**Appendix 9-4, ES Volume 2 [EN010143/APP/6.2]**) accompanying the DCO application, which includes measures such as boundary and routing swales to maintain runoff to greenfield rates (paragraph 6.3.16). Notably, SuDS are delivered to protect the wider integrity of the aquatic environment, rather than specifically protecting the hydrology in European sites.

i. Potential direct and indirect impacts of traffic-related emissions and dust deposition on qualifying habitats and species in the Humber Estuary SAC were considered. However, atmospheric pollution was screened out due to the low volume of construction traffic (a maximum of 50 AADT) and the ARN lying beyond 200m from the designated site boundary (paragraph 6.2.33).

j. The introduction of INNS to within the site boundary of the Humber Estuary SAC is excluded due to the long flowpath distance to the site, which is far beyond the 50m screening distance established for this impact pathway. However, given the presence of watercourses that are functionally linked to the SAC adjoining the south-west portion of the Grid Connection Corridor,

INNS introduction remains a feasible threat. Notwithstanding this, legislative drivers prohibit the planting or inadvertent spreading of species listed in Schedule 9 of the Wildlife and Countryside Act 1981 (as amended) and Schedule 2 species identified in the Invasive Alien Species (Enforcing and Permitting) Order 2019 (as amended). This means that adequate biosecurity measures will be deployed on-site irrespective of the Humber Estuary SAC (paragraph 6.2.40).

Appendix C – Appropriate Assessment Matrices

Matrix Key

✓ = Adverse effects on site integrity (after considering mitigation) **cannot** be excluded

X = Adverse effects on site integrity (after considering mitigation) **can** be excluded

C = Construction phase

O = Operation phase

D = Decommission phase

Where effects are not relevant to a particular feature or the screening assessment excluded a potential for LSEs, the matrix cell has been formatted as follows:

Table 21[7]: Detailed AA matrix assessing the qualifying features of the Lower Derwent Valley SAC against the identified impact pathways for which LSEs could not be excluded during construction (C columns), operation (O columns) and decommission (D columns)

EU Code: UK0012844

Distance to Order limits: Approximately 1.3km at its closest			
European site features	**AA Determination**		
Effect	**Water Quality**		
Stage of Development	**C**	**O**	**D**
6510 Lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*)	×a	×b	×a
91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) * Priority feature	×a	×b	×a

a. The construction, operational and decommissioning phases of the Scheme all have the potential to result in water quality impacts to aquatic ecosystems and dependent species, both within and surrounding the Scheme. A particular risk stems from construction/decommissioning activities that involve earthworks (sedimentation is one of the key pressures identified for the Derwent Lower Yorkshire Operational Catchment) or waterbody crossing methodologies (i.e., HDD). Fine sediment runoff will be minimised through several mitigation measures, including a temporary drainage system (using protective elements such as drain covers, sandbags, earth bunds and geotextile silt fences), storing excavated topsoil a minimum of 20m from water features and providing dedicated wash-down areas (paragraph 8.2.8). Additional mitigation measures are secured in the **Framework CEMP [EN010143/APP/7.7]**, such as the safe storage of chemicals in bunded containers, servicing of plant/equipment in dedicated areas, provision of spill kits and oil-absorbent materials, and routine collection of water quality data in the construction period (paragraph 8.2.9). To prevent negative water quality impacts from potential frac-out incidents at the proposed HDD crossings, the drilling depth beneath the Rivers Derwent and Ouse will be a minimum of 5 m; a thorough pre-drill geological assessment undertaken, and site-specific hydraulic fracture risk assessment conducted (paragraph 8.2.11). Taking these mitigation measures into account, adverse effects of the Scheme on the Lower Derwent Valley SAC regarding water quality in the construction and decommissioning phases can be excluded.

b. As identified in paragraph 8.2.13, surface run-off from impermeable surfaces in the two Grid Connection Substations has the potential to introduce toxic and non-toxic pollutants to the Lower Derwent Valley SAC. However, a Framework Surface Water Drainage Strategy has been developed for the Scheme, which proposes densely vegetated attenuation ponds at key locations. The water quality index of the on-site operational drainage strategy is associated with a higher quality treatment index than the pollution hazard index of the Scheme (paragraph 8.2.14).

Table 22. Detailed AA matrix assessing the qualifying features of the Lower Derwent Valley SPA against the identified impact pathways for which LSEs could not be excluded during construction (C columns), operation (O columns) and decommission (D columns)

EU Code: UK9006092

Distance to Order limits: Approximately 1.3km at its closest

European site features	**AA Determination**					
Effect	**Noise and Visual Disturbance**			**Water Quality**		**Loss of Functionally Linked Habitat**
Stage of Development	**C**	**D**	**O**	**O**	**D**	**O**
Bewick's swan *Cygnus columbianus bewickii*	×a	×a	×b	×b	×b	×c
Golden plover *Pluvialis apricaria* (over winter)	×a	×a	×b	×b	×b	×c
Ruff *Philomachus pugnax* (over winter)	×a	×a	×b	×b	×b	×c
Shoveler *Anas clypeata* (breeding)	×a	×a	×b	×b	×b	×c
Teal *Anas crecca* (Waterfowl assemblage)	×a	×a	×b	×b	×b	×c
Wigeon *Anas Penelope* (waterfowl assemblage)	×a	×a	×b	×b	×b	×c
Shoveler (on passage)	×a	×a	×b	×b	×b	×c
Pochard *Aythya farina* (on passage)	×a	×a	×b	×b	×b	×c
Whimbrel *Numenius phaeopus* (on passage)	×a	×a	×b	×b	×b	×c
Ruff (on passage)	×a	×a	×b	×b	×b	×c

~~a.~~c. Noise modelling undertaken for the Scheme indicates that works in the construction and decommissioning phases will temporarily expose functionally linked habitats adjoining the Order limits to noise levels above the 55dB disturbance threshold and visual stimuli from machinery/construction crews. This disturbance is generally predicted to occur up to 500m from source and within the first tier of arable fields adjoining the Order limits (paragraph 8.1.14). The AA sets the likely magnitude of disturbance into the context of the farming operations (with similar existing disturbance levels than those anticipated for the Scheme; paragraph 8.1.15) and available extent of suitable foraging habitat (only an exceedingly small proportion of which would be impacted when works are taking place close to the Order limits; paragraph 8.1.18) in the wider East Yorkshire landscape. ~~Furthermore, suitable habitat provided in the Golden Plover and Goose Mitigation Zones (see c. below) would offer refuges and foraging opportunities for birds that are temporarily displaced from around the Order limits (paragraph~~ Furthermore, suitable habitat provided in the Golden Plover and Goose Mitigation Zones (see c. below) would offer refuges and foraging opportunities for birds that are temporarily displaced from around the Order limits (paragraph 8.1.20). Overall, therefore, adverse effects of the Scheme on the Lower Derwent Valley SPA regarding noise and visual disturbance in the construction/decommissioning phases can be excluded.

~~b.~~d. The construction, operational and decommissioning phases of the Scheme all have the potential to result in water quality impacts to aquatic ecosystems and dependent species, both within and surrounding the Scheme. A particular risk stems from construction/decommissioning activities that involve earthworks (sedimentation is one of the key pressures identified for the Derwent Lower Yorkshire Operational Catchment) or waterbody crossing methodologies (i.e., HDD). Fine sediment runoff will be minimised through several mitigation measures, including a temporary drainage system (using protective elements such as drain covers, sandbags, earth bunds and geotextile silt fences), storing excavated topsoil a minimum of 20m from water features and providing dedicated wash-down areas (paragraph 8.2.8). Additional mitigation measures are secured in the **Framework CEMP [EN010143/APP/7.7]**, such as the safe storage of chemicals in bunded containers, servicing of plant/equipment in dedicated areas, provision of spill kits and oil-absorbent materials, and routine collection of water quality data in the construction period (paragraph 8.2.9). To prevent negative water quality impacts from potential frac-out incidents at the proposed HDD crossings, the drilling depth beneath the Rivers Derwent and Ouse will be a minimum of 5 m; a thorough pre-drill geological assessment undertaken, and site-specific hydraulic fracture risk assessment conducted (paragraph 8.2.11). Taking these mitigation measures into account, adverse effects of the Scheme on the Lower Derwent Valley SPA regarding water quality in the construction, operational and decommissioning phases can be excluded.

~~c.~~e. The Lower Derwent Valley SPA is designated for a range of wader and waterfowl species that routinely utilise functionally linked habitats beyond the designated site boundary, including arable fields that lie within the Scheme's Order limits. Non-breeding bird survey data presented in the AA, indicate that qualifying populations of golden plover and pink-footed goose associated with the SPA occur on arable fields within the Scheme at levels approaching (and

in certain years ~~potentially~~ exceeding) the commonly accepted 1% population threshold (paragraph 8.4.7). Therefore, based on the size of arable plots for which peak counts of these species were recorded, the AA set out that a minimum of ~~30ha~~43.75ha of mitigation land will need to be delivered to offset the loss of habitat with functional linkage to the Lower Derwent Valley SPA. Habitat mitigation will be delivered in the Golden Plover Mitigation Zone and Goose Mitigation Zone respectively, in the north-east section of the Order limits. In the Golden Plover Mitigation Zone, a minimum of ~~15ha~~28.75ha of wet grassland will be delivered through the provision of a series of foot drains (paragraph 8.4.28), designed to hold water throughout the overwintering season and maximise prey availability (e.g., earthworms, leatherjackets and beetles). In the Goose Mitigation Zone, a minimum of 15ha of suitable foraging habitat will be delivered under a suitable cropping regime (e.g., through planting spring-sown wheat and barley and longer retention of winter stubble; paragraph 8.4.25). The provision of mitigation habitat will be secured through the **Framework LEMP [EN010143/APP/7.14]** (paragraph 8.4.23 and following paragraphs), which will accompany the DCO submission. Overall, given that adequate mitigation will be provided, adverse effects of the Scheme on the Lower Derwent Valley SPA regarding loss of functionally linked habitat can be excluded.

Table 23. Detailed AA matrix assessing the qualifying features of the Lower Derwent Valley Ramsar against the identified impact pathways for which LSEs could not be excluded during construction (C columns), operation (O columns) and decommission (D columns)

EU Code: N/A

Distance to Order limits: Approximately 1.3km at its closest

European site features	**AA Determination**					
Effect	**Noise and Visual Disturbance**		**Water Quality**		**Loss of Functionally Linked Habitat**	
Stage of Development	**C**	**D**	**C**	**O**	**D**	**O**
Ramsar Criterion 1: The site represents one of the most important examples of traditionally managed species-rich alluvial flood meadow habitat remaining in the UK.			×b	×b	×b	
Ramsar Criterion 2: The site has a rich assemblage of wetland invertebrates including 16 species of dragonfly and damselfly, 15 British Red Data Book wetland invertebrates as well as a leafhopper, *Cicadula ornate* for which Lower Derwent Valley is the only known site in Great Britain.			×b	×b	×b	
Ramsar Criterion 4: The site qualifies as a staging post for passage birds in spring. Of particular note are the nationally important numbers of ruff, *Philomachus pugnax* and whimbrel, *Numenius phaeopus*.	×a	×a	×b	×b	×b	×c

Ramsar Criterion 5: Assemblages of international importance – Species with peak counts in winter.	×a	×a	×b	×b	×b	×c
Ramsar Criterion 6 – species/populations occurring at levels of international importance. Species with peak counts in winter: Wigeon *Anas Penelope*	×a	×a	×b	×b	×b	×c
Teal *Anas crecca*	×a	×a	×b	×b	×b	×c

a. Noise modelling undertaken for the Scheme indicates that works in the construction and decommissioning phases will temporarily expose functionally linked habitats adjoining the Order limits to noise levels above the 55dB disturbance threshold and visual stimuli from machinery/construction crews. This disturbance is generally predicted to occur up to 500m from source and within the first tier of arable fields adjoining the Order limits (paragraph 8.1.14). The AA sets the likely magnitude of disturbance into the context of the farming operations (with similar existing disturbance levels than those anticipated for the Scheme; paragraph 8.1.15) and available extent of suitable foraging habitat (only an exceedingly small proportion of which would be impacted when works are taking place close to the Order limits; paragraph 8.1.18) in the wider East Yorkshire landscape. Furthermore, suitable habitat provided in the Golden Plover and Goose Mitigation Zones (see c. below) would offer refuges and foraging opportunities for birds that are temporarily displaced from around the Order limits (paragraph ~~Furthermore, suitable habitat provided in the Golden Plover and Goose Mitigation Zones (see c. below) would offer refuges and foraging opportunities for birds that are temporarily displaced from around the Order limits (paragraph~~ 8.1.20). Overall, therefore, adverse effects of the Scheme on the Lower Derwent Valley Ramsar regarding noise and visual disturbance in the construction/decommissioning phases can be excluded.

b. The construction, operational and decommissioning phases of the Scheme all have the potential to result in water quality impacts to aquatic ecosystems and dependent species, both within and surrounding the Scheme. A particular risk stems from construction/decommissioning activities that involve earthworks (sedimentation is one of the key pressures identified for the Derwent Lower Yorkshire Operational Catchment) or waterbody crossing methodologies (i.e., HDD). Fine sediment runoff will be minimised through several mitigation measures, including a temporary drainage system (using protective elements such as drain covers, sandbags, earth bunds and geotextile silt fences), storing excavated topsoil a minimum of 20m from water features and providing dedicated wash-down areas (paragraph 8.2.8). Additional mitigation measures are secured in the **Framework CEMP [EN010143/APP/7.7]**, such as the safe storage of chemicals in bunded containers, servicing of plant/equipment in dedicated areas, provision of spill kits and oil-absorbent materials, and routine collection of water quality data in the construction period (paragraph 8.2.9). To prevent negative water quality impacts from potential frac-out incidents at the proposed HDD crossings, the drilling depth beneath the Rivers Derwent and Ouse will be a minimum of ~~5 m~~5m, a thorough pre-drill geological assessment undertaken, and site-specific hydraulic fracture risk assessment conducted (paragraph 8.2.11). Taking these mitigation measures into account, adverse effects of the Scheme on the Lower Derwent Valley Ramsar regarding water quality in the construction, operational and decommissioning phases can be excluded.

c. The Lower Derwent Valley Ramsar is designated for a range of wader and waterfowl species that routinely utilise functionally linked habitats beyond the designated site boundary, including arable fields that lie within the Scheme's Order limits. Non-breeding bird survey data presented in the AA, indicate that qualifying populations of golden plover and pink-footed goose associated with the SPA occur on arable fields within the Scheme at levels approaching (and

in certain years ~~potentially~~ exceeding) the commonly accepted 1% population threshold (paragraph 8.4.7). Therefore, based on the size of arable plots for which peak counts of these species were recorded, the AA set out that a minimum of ~~30ha~~43.75ha of mitigation land will need to be delivered to offset the loss of habitat with functional linkage to the Lower Derwent Valley SPA. Habitat mitigation will be delivered in the Golden Plover Mitigation Zone and Goose Mitigation Zone respectively, in the north-east section of the Order limits. In the Golden Plover Mitigation Zone, a minimum of ~~15ha~~28.75ha of wet grassland will be delivered through the provision of a series of foot drains (paragraph 8.4.28), designed to hold water throughout the overwintering season and maximise prey availability (e.g., earthworms, leatherjackets and beetles). In the Goose Mitigation Zone, a minimum of 15ha of suitable foraging habitat will be delivered under a suitable cropping regime (e.g., through planting spring-sown wheat and barley and longer retention of winter stubble; paragraph 8.4.25). The provision of mitigation habitat will be secured through the **Framework LEMP [EN010143/APP/7.14]** (paragraph 8.4.23 and following paragraphs), which will accompany the DCO submission. Overall, given that adequate mitigation will be provided, adverse effects of the Scheme on the Lower Derwent Valley Ramsar regarding loss of functionally linked habitat can be excluded.

Table 24. Detailed AA matrix assessing the qualifying features of the Humber Estuary SPA against the identified impact pathways for which LSEs could not be excluded during construction (C columns), operation (O columns) and decommission (D columns)

Name of European site and Designation: Humber Estuary SPA

EU Code: UK9006111

Distance to Order limits: Approximately 3km at its closest

European site features	**AA Determination**					
Effect	**Noise and Visual Disturbance**		**Water Quality**			**Loss of Functionally Linked Habitat**
Stage of Development	**C**	**D**	**C**	**O**	**D**	**O**
Avocet (wintering and breeding)	×a	×a	×b	×b	×b	×c
Bittern (wintering and breeding)	×a	×a	×b	×b	×b	×c
Hen harrier *Circus cyanea* (wintering)	×a	×a	×b	×b	×b	×c
Golden plover *Pluvialis apricaria* (wintering)	×a	×a	×b	×b	×b	×c
Bar-tailed godwit *Limosa lapponica* (wintering)	×a	×a	×b	×b	×b	×c
Ruff *Philomachus pugnax* (passage)	×a	×a	×b	×b	×b	×c
Marsh harrier (breeding)	×a	×a	×b	×b	×b	×c
Little tern (breeding) – Annex I stop	×a	×a	×b	×b	×b	×c
Shelduck *Tadorna tadorna* (wintering)	×a	×a	×b	×b	×b	×c
Knot *Calidris canutus* (wintering and passage)	×a	×a	×b	×b	×b	×c
Dunlin *Calidris alpina* (wintering and passage)	×a	×a	×b	×b	×b	×c
Black-tailed godwit *Limosa limosa* (wintering and passage)	×a	×a	×b	×b	×b	×c

Name of European site and Designation: Humber Estuary SPA

Redshank *Tringa tetanus* (wintering and passage) – migratory species not Annex I	✕a	✕a	✕b	✕b	✕b	✕c
Assemblage Qualification: Dark-bellied brent goose *Branta bernicla bernicla,* shelduck, wigeon *Anas penelope*, teal *Anas crecca*, mallard *Anas platyrhynchos*, pochard *Aythya ferina,* scaup *Aythya marila,* goldeneye *Bucephala clangula*, bittern, oystercatcher *Haematopus ostralegus*, avocet, ringed plover *Charadrius hiaticula,* golden plover, grey plover *P. squatarola,* lapwing *Vanellus vanellus*, knot, sanderling *Calidris alba,* dunlin, ruff, black-tailed godwit, bar-tailed godwit, whimbrel *Numenius phaeopus*, curlew *N. arquata*, redshank, greenshank *Trimga nebularia* and turnstone *Arenaria interpres.*	✕a	✕a	✕b	✕b	✕b	✕c

a. Noise modelling undertaken for the Scheme indicates that works in the construction and decommissioning phases will temporarily expose functionally linked habitats adjoining the Order limits to noise levels above the 55dB disturbance threshold and visual stimuli from machinery/construction crews. This disturbance is generally predicted to occur up to 500m from source and within the first tier of arable fields adjoining the Order limits (paragraph 8.1.14). The AA sets the likely magnitude of disturbance into the context of the farming operations (with similar existing disturbance levels than those anticipated for the Scheme; paragraph 8.1.15) and available extent of suitable foraging habitat (only an exceedingly small proportion of which would be impacted when works are taking place close to the Order limits; paragraph 8.1.18) in the wider East Yorkshire landscape. Furthermore, suitable habitat provided in the Golden Plover and Goose Mitigation Zones (see c. below) would offer refuges and foraging opportunities for birds that are temporarily displaced from around the Order limits (paragraph 8.1.20). Overall, therefore, adverse effects of the Scheme on the Humber Estuary SPA regarding noise and visual disturbance in the construction/decommissioning phases can be excluded.

b. The construction, operational and decommissioning phases of the Scheme all have the potential to result in water quality impacts to aquatic ecosystems and dependent species, both within and surrounding the Scheme. A particular risk stems from construction/decommissioning activities that involve earthworks (sedimentation is one of the key pressures identified for the Derwent Lower Yorkshire Operational Catchment) or waterbody crossing methodologies (i.e., HDD). Fine sediment runoff will be minimised through several mitigation measures, including a temporary drainage system (using protective elements such as drain covers, sandbags, earth bunds and geotextile silt fences), storing excavated topsoil a minimum of 20m from water features and providing dedicated wash-down areas (paragraph 8.2.8). Additional mitigation measures are secured in the **Framework CEMP [EN010143/APP/7.7]**, such as the safe storage of chemicals in bunded containers, servicing of plant/equipment in dedicated areas, provision of spill kits and oil-absorbent materials, and routine collection of water quality data in the construction period (paragraph 8.2.9). To prevent negative water quality impacts from potential frac-out incidents at the proposed HDD crossings, the drilling depth beneath the Rivers Derwent and Ouse will be a minimum of ~~5 m~~5m, a thorough pre-drill geological assessment undertaken, and site-specific hydraulic fracture risk assessment conducted (paragraph 8.2.11). Taking these mitigation measures into account, adverse effects of the Scheme on the Humber Estuary SPA regarding water quality in the construction, operational and decommissioning phases can be excluded.

c. The Humber Estuary SPA is designated for a range of wader and waterfowl species that routinely utilise functionally linked habitats beyond the designated site boundary, including arable fields that lie within the Scheme's Order limits. Non-breeding bird survey data presented in the AA, indicate that qualifying populations of golden plover and pink-footed goose associated with the SPA occur on arable fields within the Scheme at levels approaching (and in certain years ~~potentially~~ exceeding) the commonly accepted 1% population threshold (paragraph 8.4.7). Therefore, based on the size of arable plots for which peak counts of these species were recorded, the AA set out that a minimum of

~~30ha~~43.75ha of mitigation land will need to be delivered to offset the loss of habitat with functional linkage to the Lower Derwent Valley SPA. Habitat mitigation will be delivered in the Golden Plover Mitigation Zone and Goose Mitigation Zone respectively, in the north-east section of the Order limits. In the Golden Plover Mitigation Zone, a minimum of ~~15ha~~28.75ha of wet grassland will be delivered through the provision of a series of foot drains (paragraph 8.4.28), designed to hold water throughout the overwintering season and maximise prey availability (e.g., earthworms, leatherjackets and beetles). In the Goose Mitigation Zone, a minimum of 15ha of suitable foraging habitat will be delivered under a suitable cropping regime (e.g., through planting spring-sown wheat and barley and longer retention of winter stubble; paragraph 8.4.25). The provision of mitigation habitat will be secured through the **Framework LEMP [EN010143/APP/7.14]** (paragraph 8.4.23 and following paragraphs), which will accompany the DCO submission. Overall, given that adequate mitigation will be provided, adverse effects of the Scheme on the Humber Estuary SPA regarding loss of functionally linked habitat can be excluded.

Table 25. Detailed AA matrix assessing the qualifying features of the Humber Estuary Ramsar against the identified impact pathways for which LSEs could not be excluded during construction (C columns), operation (O columns) and decommission (D columns)

Name of European site and Designation: Humber Estuary Ramsar

EU Code: N/A

Distance to Order limits: Approximately 3km at its closest

European site features	**AA Determination**					
Effect	**Noise and Visual Disturbance**		**Water Quality**			**Loss of Functionally Linked Habitat**
Stage of Development	**C**	**D**	**C**	**O**	**D**	**O**
Ramsar Criterion 1: The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons. It is a large macro-tidal coastal plain estuary with high suspended sediment loads, which feed a dynamic and rapidly changing system of accreting and eroding intertidal and subtidal mudflats, sandflats, saltmarsh and reedbeds. Examples of both strandline, foredune, mobile, semi-fixed dunes, fixed dunes and dune grassland occur on both banks of the estuary and along the coast. The estuary supports a full range of saline conditions from the open coast to the limit of saline intrusion on the tidal rivers of the Ouse and Trent. Wave exposed sandy shores are found in the outer/open coast areas of the estuary. These change to the more moderately exposed sandy shores and then to sheltered muddy shores within the main body of the estuary and up into the tidal rivers. The lower saltmarsh of the Humber is dominated by common cordgrass *Spartina anglica* and annual glasswort *Salicornia* communities. Low to mid marsh communities are mostly represented by sea aster *Aster tripolium*, common saltmarsh grass			×b	×b	×b	

Name of European site and Designation: Humber Estuary Ramsar

Puccinellia maritima and sea purslane *Atriplex portulacoides* communities. The upper portion of the saltmarsh community is atypical, dominated by sea couch *Elytrigia atherica* (*Elymus pycnanthus*) saltmarsh community. In the upper reaches of the estuary, the tidal marsh community is dominated by the common reed *Phragmites australis* fen and sea club rush *Bolboschoenus maritimus* swamp with the couch grass *Elytrigia repens* (*Elymus repens*) saltmarsh community. Within the Humber Estuary Ramsar site there are good examples of four of the five physiographic types of saline lagoon.						
Ramsar Criterion 3: The Humber Estuary Ramsar site supports a breeding colony of grey seals *Halichoerus grypus* at Donna Nook. It is the second largest grey seal colony in England and the furthest south regular breeding site on the east coast. The dune slacks at Saltfleetby-Theddlethorpe on the southern extremity of the Ramsar site are the most north-easterly breeding site in Great Britain of the natterjack toad *Bufo calamita*.			×b	×b	×b	
Ramsar Criterion 5: Assemblages of international importance – Species with peak counts in the non-breeding season	×a	×a	×b	×b	×b	×c
Ramsar Criterion 6 – species/populations occurring at levels of international importance. Golden plover *Pluvialis apricaria* (spring/autumn)	×a	×a	×b	×b	×b	×c
Knot *Calidris canutus* (spring/autumn)	×a	×a	×b	×b	×b	×c
Dunlin *Calidris alpina alpina* (spring/autumn)	×a	×a	×b	×b	×b	×c
Black-tailed godwit *Limosa limosa islandica* (spring/autumn)	×a	×a	×b	×b	×b	×c
Redshank *Tringa tetanus* (spring/autumn)	×a	×a	×b	×b	×b	×c
Shelduck *Tadorna tadorna* (winter)	×a	×a	×b	×b	×b	×c

Name of European site and Designation: Humber Estuary Ramsar

Golden plover *Pluvialis apricaria* (winter)	×a	×a	×b	×b	×b	×c
Knot *Calidris canutus* (winter)	×a	×a	×b	×b	×b	×c
Dunlin *Calidris alpina alpina* (winter)	×a	×a	×b	×b	×b	×c
Black-tailed godwit *Limosa limosa islandica* (winter)	×a	×a	×b	×b	×b	×c
Bar-tailed godwit *Limosa lapponica* (winter)	×a	×a	×b	×b	×b	×c
Ramsar Criterion 8: The Humber Estuary acts as an important migration route for both river lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus* between coastal waters and their spawning areas.			×b	×b	×b	

a. Noise modelling undertaken for the Scheme indicates that works in the construction and decommissioning phases will temporarily expose functionally linked habitats adjoining the Order limits to noise levels above the 55dB disturbance threshold and visual stimuli from machinery/construction crews. This disturbance is generally predicted to occur up to 500m from source and within the first tier of arable fields adjoining the Order limits (paragraph 8.1.14). The AA sets the likely magnitude of disturbance into the context of the farming operations (with similar existing disturbance levels than those anticipated for the Scheme; paragraph 8.1.15) and available extent of suitable foraging habitat (only an exceedingly small proportion of which would be impacted when works are taking place close to the Order limits; paragraph 8.1.18) in the wider East Yorkshire landscape. Furthermore, suitable habitat provided in the Golden Plover and Goose Mitigation Zones (see c. below) would offer refuges and foraging opportunities for birds that are temporarily displaced from around the Order limits (paragraph 8.1.20). Overall, therefore, adverse effects of the Scheme on the Humber Estuary Ramsar regarding noise and visual disturbance in the construction/decommissioning phases can be excluded.

b. The construction, operational and decommissioning phases of the Scheme all have the potential to result in water quality impacts to aquatic ecosystems and dependent species, both within and surrounding the Scheme. A particular risk stems from construction/decommissioning activities that involve earthworks (sedimentation is one of the key pressures identified for the Derwent Lower Yorkshire Operational Catchment) or waterbody crossing methodologies (i.e., HDD). Fine sediment runoff will be minimised through several mitigation measures, including a temporary drainage system (using protective elements such as drain covers, sandbags, earth bunds and geotextile silt fences), storing excavated topsoil a minimum of 20m from water features and providing dedicated wash-down areas (paragraph 8.2.8). Additional mitigation measures are secured in the **Framework CEMP [EN010143/APP/7.7]**, such as the safe storage of chemicals in bunded containers, servicing of plant/equipment in dedicated areas, provision of spill kits and oil-absorbent materials, and routine collection of water quality data in the construction period (paragraph 8.2.9). To prevent negative water quality impacts from potential frac-out incidents at the proposed HDD crossings, the drilling depth beneath the Rivers Derwent and Ouse will be a minimum of ~~5 m~~5m, a thorough pre-drill geological assessment undertaken, and site-specific hydraulic fracture risk assessment conducted (paragraph 8.2.11). Taking these mitigation measures into account, adverse effects of the Scheme on the Humber Estuary Ramsar regarding water quality in the construction, operational and decommissioning phases can be excluded.

c. The Humber Estuary Ramsar is designated for a range of wader and waterfowl species that routinely utilise functionally linked habitats beyond the designated site boundary, including arable fields that lie within the Scheme's Order limits. Non-breeding bird survey data presented in the AA, indicate that qualifying populations of golden plover and pink-footed goose associated with the SPA occur on arable fields within the Scheme at levels approaching (and in certain years ~~potentially~~ exceeding) the commonly accepted 1% population threshold (paragraph 8.4.7). Therefore, based on the size of arable plots for which peak counts of these species were recorded, the AA set out that a

minimum of ~~30ha~~43.75ha of mitigation land will need to be delivered to offset the loss of habitat with functional linkage to the Lower Derwent Valley SPA. Habitat mitigation will be delivered in the Golden Plover Mitigation Zone and Goose Mitigation Zone respectively, in the north-east section of the Order limits. In the Golden Plover Mitigation Zone, a minimum of ~~15ha~~28.75ha of wet grassland will be delivered through the provision of a series of foot drains (paragraph 8.4.28), designed to hold water throughout the overwintering season and maximise prey availability (e.g., earthworms, leatherjackets and beetles). In the Goose Mitigation Zone, a minimum of 15ha of suitable foraging habitat will be delivered under a suitable cropping regime (e.g., through planting spring-sown wheat and barley and longer retention of winter stubble; paragraph 8.4.25). The provision of mitigation habitat will be secured through the **Framework LEMP [EN010143/APP/7.14]** (paragraph 8.4.23 and following paragraphs), which will accompany the DCO submission. Overall, given that adequate mitigation will be provided, adverse effects of the Scheme on the Humber Estuary Ramsar regarding loss of functionally linked habitat can be excluded.

Table 26. Detailed AA matrix assessing the qualifying features of the River Derwent SAC against the identified impact pathways for which LSEs could not be excluded during construction (C columns), operation (O columns) and decommission (D columns)

Name of European site and Designation: River Derwent SAC

EU Code: UK0030253

Distance to Order limits: Grid Connection Corridor crosses this SAC

European site features	**AA Determination**								
Effect	**Noise and Visual Disturbance**		**Water Quality**			**Atmospheric Pollution (incl. Dust Deposition)**		**Temporary Loss of/Damage to Qualifying Habitat**	
Stage of Development	**C**	**D**	**C**	**O**	**D**	**C**	**D**	**C**	**D**
3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation			×b	×b	×b	×c	×c	×d	×d
1099 River lamprey *Lampetra fluviatilis*			×b	×b	×b	×c	×c		
1095 Sea lamprey *Petromyzon marinus*			×b	×b	×b	×c	×c		
1163 Bullhead *Cottus gobio*			×b	×b	×b	×c	×c		
1355 Otter *Lutra lutra*	×a	×a	×b	×b	×b	×c	×c	×d	×d

a. The AA established that the major waterbodies within and adjoining the Scheme are frequented by otter (e.g., lay-up resting place along drain DE53 to the north of the Grid Connection Corridor), potentially including designated individuals from the River Derwent SAC. Two HDD locations traversing watercourses within the Grid Connection Corridor were considered to have the greatest disturbance potential to foraging/commuting/resting otter and identified for noise modelling. Noise modelling data indicate that approx. 450m (HDD Location 1) and 150m (HDD Location 2) of bankside habitat would be subject to temporary noise levels from the HDD operations of roughly 60-70dB, considerably higher than the pre-construction noise baseline (paragraph 8.1.34). However, the AA also identified that there is limited information on the hearing threshold of the European otter, this species is tolerant of anthropogenic disturbance (8.1.29) and no holts or natal dens were recorded within or adjoining the Site. To minimise any potential for noise disturbance, noise fencing will be erected around the HDD entry points to reduce noise levels by 10dB. Mitigation measures will also be deployed in relation to any lighting required in the construction/decommissioning phases, such as using lighting equipment with minimum brightness/power rating, reduced light spillage and PIR technology (paragraph 8.1.37). Overall, adverse effects of the Scheme on the River Derwent SAC regarding construction/decommissioning noise and visual disturbance to otter were excluded.

b. The construction, operational and decommissioning phases of the Scheme all have the potential to result in water quality impacts to aquatic ecosystems and dependent species, both within and surrounding the Scheme. A particular risk stems from construction/decommissioning activities that involve earthworks (sedimentation is one of the key pressures identified for the Derwent Lower Yorkshire Operational Catchment) or waterbody crossing methodologies (i.e., HDD). Fine sediment runoff will be minimised through several mitigation measures, including a temporary drainage system (using protective elements such as drain covers, sandbags, earth bunds and geotextile silt fences), storing excavated topsoil a minimum of ~~20 m~~20m from water features and providing dedicated wash-down areas (paragraph 8.2.8). Additional mitigation measures are secured in the **Framework CEMP [EN010143/APP/7.7]**, such as the safe storage of chemicals in bunded containers, servicing of plant/equipment in dedicated areas, provision of spill kits and oil-absorbent materials, and routine collection of water quality data in the construction period (paragraph 8.2.9). To prevent negative water quality impacts from potential frac-out incidents at the proposed HDD crossings, the drilling depth beneath the Rivers Derwent and Ouse will be a minimum of ~~5 m~~5m, a thorough pre-drill geological assessment undertaken, and site-specific hydraulic fracture risk assessment conducted (paragraph 8.2.11). Taking these mitigation measures into account, adverse effects of the Scheme on the River Derwent SAC regarding water quality in the construction, operational and decommissioning phases can be excluded.

c. Potential release of dust in the construction and decommissioning phases of the Scheme (specifically in the Grid Connection Corridor) has the potential to result in direct or indirect impacts on the qualifying habitat and species in the River Derwent SAC. However, a range of mitigation measures will minimise any dust release from construction/decommissioning activities. For example, relevant GPP, CIRIA and BSI documents will be adhered to (paragraph 8.3.2).

Furthermore, the CEMP secures further measures that will minimise dust release, including the dampening of excavated materials, a minimum storage distance of 20m from any water features, covering of earth stockpiles and ensuring that excavated soils remain bound in root systems of vegetation where possible (paragraph 8.3.3). Overall, it is concluded that the Scheme will not result in adverse effects on the integrity of the River Derwent SAC regarding dust release in the construction and decommissioning phases.

d. The AA assessed potential impacts on the River Derwent SAC regarding damage to and temporary loss of qualifying habitat. Temporary removal of vegetation will be required to accommodate a bell mouth to enable access to the construction compound to the north of the SAC. However, any vegetation to be temporarily cut back is (a) not a qualifying feature of and (b) considered not to be functionally linked to the SAC (i.e., no wet woodland or fen is located in this part of the site; paragraph 8.5.2). Furthermore, temporary impacts on roaming otter were excluded because no evidence of otter presence was recorded along the ditch, the access track being under existing heavy recreational use and the temporary nature of the vegetation removal (paragraph 8.5.3). Overall, based on the available evidence, it is concluded that the use of this access route will not result in adverse effects on the River Derwent SAC regarding temporary loss of qualifying habitat itself and its suitability for roaming otter.

Table 27. Detailed AA matrix assessing the qualifying features of the Humber Estuary SAC against the identified impact pathways for which LSEs could not be excluded during construction (C columns), operation (O columns) and decommission (D columns)

Name of European site and Designation: Humber Estuary SAC			
EU Code: UK0030170			
Distance to Order limits: Approximately 3km at its closest			
European site features	**AA Determination**		
Effect	**Water Quality**		
Stage of Development	**C**	**O**	**D**
1130 Estuaries	×a	×a	×a
1140 Mudflats and sandflats not covered by seawater at low tide	×a	×a	×a
1110 Sandbanks which are slightly covered by sea water all the time	×a	×a	×a
1150 Coastal lagoons	×a	×a	×a
1310 *Salicornia* and other annuals colonising mud and sand	×a	×a	×a
1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	×a	×a	×a
2110 Embryonic shifting dunes	×a	×a	×a
2120 Shifting dunes along the shoreline with *Ammophila arenaria* (‘white dunes’)	×a	×a	×a
2130 Fixed coastal dunes with herbaceous vegetation (‘grey dunes’) * Priority feature	×a	×a	×a
2160 Dunes with *Hippopha rhamnoides*	×a	×a	×a
Sea lamprey *Petromyzon marinus*	×a	×a	×a
River lamprey *Lampetra fluviatilis*	×a	×a	×a
Grey seal *Halichoerus grypus*	×a	×a	×a

a. The construction, operational and decommissioning phases of the Scheme all have the potential to result in water quality impacts to aquatic ecosystems and dependent species, both within and surrounding the Scheme. A particular risk stems from construction/decommissioning activities that involve earthworks (sedimentation is one of the key pressures identified for the Derwent Lower Yorkshire Operational Catchment) or waterbody crossing methodologies (i.e., HDD). Fine sediment runoff will be minimised through several mitigation measures, including a temporary drainage system (using protective elements such as drain covers, sandbags, earth bunds and geotextile silt fences), storing excavated topsoil a minimum of 20m from water features and providing dedicated wash-down areas (paragraph 8.2.8). Additional mitigation measures are secured in the **Framework CEMP [EN010143/APP/7.7]**, such as the safe storage of chemicals in bunded containers, servicing of plant/equipment in dedicated areas, provision of spill kits and oil-absorbent materials, and routine collection of water quality data in the construction period (paragraph 8.2.9). To prevent negative water quality impacts from potential frac-out incidents at the proposed HDD crossings, the drilling depth beneath the Rivers Derwent and Ouse will be a minimum of ~~5 m~~5m, a thorough pre-drill geological assessment undertaken, and site-specific hydraulic fracture risk assessment conducted (paragraph 8.2.11). Taking these mitigation measures into account, adverse effects of the Scheme on the Humber Estuary SAC regarding water quality in the construction, operational and decommissioning phases can be excluded.

Appendix D – Non-breeding Bird Surveys 2023–2024

D.1 Introduction

D.1.1 This appendix sets out details of non-breeding bird surveys undertaken in relation to the Scheme in 2023–2024. Non-breeding bird surveys were undertaken during the winter period in 2022–2023 (**Appendix 8-6: Survey Report for Non-Breeding Birds, ES Volume 2 [EN010143/APP/6.2]**) and provided a suitable baseline against which to undertake the assessment presented in the ES accompanying the DCO Application made on 21 November 2023 and accepted by PINS for Examination on 19 December 2023. In response to comments received from Natural England during statutory consultation, the Applicant repeated the non-breeding bird surveys between September/early October 2023[26] and March/early April 2024[27] in order to validate the findings of the aforementioned non-breeding bird surveys submitted with the DCO Application.

D.1.2 The scope of non-breeding bird surveys undertaken in 2023–2024 is set out below, which along with amendments to the survey methods employed, address Natural England's previous comments in relation to the collection of ornithological baseline data.

D.2 Methods

D.2.1 The focus of non-breeding bird surveys undertaken in 2023–2024 was to record any species listed as qualifying features for the Humber Estuary SPA/Ramsar and Lower Derwent Valley SPA/Ramsar, including the additional species previously identified by Natural England as occurring at levels that would now qualify for inclusion on the designations (see attached appendices).

D.2.2 Surveys for non-breeding birds were based on an adapted transect (walkover) methodology as detailed in Bibby, *et al.* (2000)[28] and Gilbert, *et al.* (1998)[29]. Survey routes followed hedgerows, fence lines and field margins (including paths, tracks and roads) and avoided walking through ploughed or cultivated fields. To minimise on site disturbance and reduce the need to walk all boundary features, regular stopping points at pre-determined strategic locations providing good visibility of open fields were incorporated into the methodology to allow surveyors to locate and observe target bird species, whilst minimising disturbance. This

[26] Note, late September surveys were actually undertaken in the first week of October; however, from a biological perspective there is little difference between the end of September and beginning of October, i.e., it is within the arrival periods for target bird species. There is therefore considered to be no limitation or lack of comparability with the previous year's data in not having a survey on an actual September calendar date. The surveys undertaken at the beginning of October are referred to as 'September' visits throughout this note to distinguish them from surveys undertaken later in October.

[27] As above, the last visit in March was undertaken in early April. The early April visit is referred to as a 'March' visit throughout this note. As with late September/early October, there is therefore considered to be no limitation or lack of comparability with the previous year's data in not having a survey on an actual March calendar date.

[28] Bibby, C.J., Burgess, N.D., Hill, D.A. & Mustoe, S.H. (2000). Bird Census Techniques: 2nd edition. Academic Press, London.

[29] Gilbert G., Gibbons D.W., and Evans J. (1998) Bird Monitoring Methods: A manual of techniques for key UK species. RSPB, Bedfordshire.

adapted methodology allows surveyors to record bird presence and behaviour in a manner similar to Vantage Point surveys, but reflects the practicalities of surveying a large site, spread across a flat agricultural landscape with widespread existing features which limit views from a static position, e.g., hedgerows, woodlands, agricultural buildings, residential properties, etc. Whilst this is a deviation from the standard SNH VP guidance[30], as the Applicant has set out in previous correspondence with Natural England, this hybrid approach allows efficient coverage of the entirety of the survey area (Order limits and 300m buffer), minimising disturbance whilst allowing observation of target bird species presence, abundance, and behaviour.

D.2.3 On each survey visit, the route was walked at a slow pace and at least 15 minutes of scanning was undertaken from each stopping point location (longer if target bird species were present to establish numbers and observe behaviour). Prior to approaching a field, the observer undertook an initial scan to determine the presence of any target species already present, before entering and continuing along the route. Where target species were encountered, e.g., a flock of geese, then observations were made of the species, number and behaviour and the birds then left undisturbed, with where practicable, the surveyor retracing their route and moving on to the next survey area. All target bird species seen and heard were recorded directly onto paper maps or an ArcGIS base map using 'Field Maps' software on hand-held Samsung Tablet devices, with a 1:10,000 scale Ordnance Survey base map of the survey area. Registrations of birds were recorded using standard British Trust for Ornithology (BTO) two letter species codes.

D.2.4 The survey area included all land within the Order limits and a 300m buffer around the Order limits.

D.2.5 Surveys were undertaken on the following dates[31]:

a. 2, 3, 4, 6 October 2023;
b. 10, 11 12, 16 October 2023;
c. 24–25 October 2023;
d. 14–16 November 2023;
e. 28 November 2023;
f. 5–7 December 2023;
g. 18–19 December 2023;
h. 8–10 January 2024;
i. 29–30 January 2024;
j. 5–6 February 2024;
k. 19–20 February 2024;

[30] Scottish Natural Heritage: Recommended bird survey methods to inform impact assessment of onshore wind farms (March 2017. Version 2).
[31] Note, the number of days required to complete a survey visit reflects the number of surveyors undertaking the survey visit. The entirety of the Survey Area was surveyed on each visit and the survey effort remained constant.

l. 6–8 March 2024; and

m. 17–18 April 2024.

D.3 Results

D.3.1 A total of ten target species (see Annex A) were recorded during surveys between September 2023 and March 2024. Peak monthly counts of all target species recorded within the Survey Area, irrespective of behaviour and site usage, such as those in flight over the Survey Area, are presented in Table 28.

D.3.2 Table 29 provides a more detailed narrative of observations for pink-footed goose (*Anser brachyrhynchus)*, lapwing (*Vanellus vanellus*) and golden plover (*Pluvialis apricaria*).

D.3.3 The final survey undertaken in April 2024 was also used to determine whether the survey area is likely to support habitat that may attract passage waterbirds into May. A combination of crop types and heights and absence of areas of substantial standing water indicate that the survey area is not suitable for aggregations of passage waterbirds, potentially stopping off on their northbound migration. As such, further surveys into May are not required.

Table 28. Peak monthly counts of target species recorded in the survey area during the Non-breeding Bird Survey 2023–2024

Species	Qualifying Feature	Peak Count (Survey Area)							
		September 2023	October 2023	November 2023	December 2023	January 2024	February 2024	March 2024	Notes on distribution and occurrence
Greylag Goose (*Anser anser*)		232	500	0	24	7	30	0	Larger flocks recorded flying over high north (500 individuals) on 10 October 2023 and feeding in stubble in south-eastern corner of Solar PV Area 1e (232 individuals) on 2 October 2023. Smaller groups widely scattered across the survey area throughout the survey period.
Pink-footed Goose		58	932	150	800	54	2	Heard but not seen (Unknown number flying over)	See Table 29 for detailed observations.
Whooper Swan (*Cygnus cygnus*)		0	0	6	0	0	0	0	Small herd present briefly in the north of Ecology Mitigation Area 1h near the River Foulness on 14 November 2023, only.

Species	Qualifying Feature	Peak Count (Survey Area)							
		September 2023	October 2023	November 2023	December 2023	January 2024	February 2024	March 2024	Notes on distribution and occurrence
Shoveler (*Spatula clypeata)*		0	1	8	1	3	4	0	Recorded only from the lake at Drax Abbey Farm outside the Grid Connection Corridor and north of the Power Station.
Gadwall (*Mareca strepera)*		0	9	2	4	3	1	0	Recorded only from the lake at Drax Abbey Farm outside the Grid Connection Corridor and north of the Power Station and the area of the River Derwent and River Ouse confluence.
Mallard (*Anas platyrhynchos)*		0	11	14	17	24	29	0	Predominantly recorded from the lake at Drax Abbey Farm outside the Grid Connection Corridor and north of the Power Station, the area of the River Derwent and River Ouse confluence and various points along the River Derwent.
Teal (*Anas crecca)*		0	6	42	41	3	11	0	Recorded only from the lake at Drax Abbey Farm outside the Grid

Species	Qualifying Feature	Peak Count (Survey Area)							
		September 2023	October 2023	November 2023	December 2023	January 2024	February 2024	March 2024	Notes on distribution and occurrence
									Connection Corridor and north of the Power Station and the area of the River Derwent and River Ouse confluence.
Lapwing		51	128	288	600	250	2	8	See Table 2 for detailed observations.
Golden Plover		48	475	179	209	4	0	72	See Table 2 for detailed observations.
Redshank (*Tringa totanus)*			0	7	1	0	0	0	On flooded fields east of the River Foulness on 14 November 2023 and 15 December 2023, only.

Table 29. Summary of observations of selected target species recorded during the Non-breeding Bird Survey 2023–2024[32]

Species	October 2023	November 2023	December 2023	January 2024	February 2024	March 2024
Pink-footed Goose	3 October – **58 foraging in stubble in south-east corner of 1e (am only in rain, gone pm and not there following day).** 4 October – Flocks of 162, 220 and 150 1–1.5 miles south of 1e (outside survey area) 10 October – 87 flying over high south-east over 3b. 11 October – 240 flying high over south-east over 2e. 16 October – Flocks of 93, 63, 80 and 90, 1–1.5 miles south of 1e	16 November – 150 flying high north-west over 3c and 3b. 28 November – 119 flying over south, 520 feeding off site (outside survey area).	7 December – **260 feeding in 1h.** 18/ 19 December – **800 feeding in stubble in 1h on 18, with c.600 still present on 19**	9 January – 54 flying north over 2e.	5 February – 2 flying south over 1h. 19 February – 114 feeding off site west of 1e (outside survey area).	7 March – flock heard, but not seen flying over 1b.

[32] Observations of birds utilising the Order limits, i.e., not observations of birds flying over or occurring outside the Order limits, are shown in **bold**.

Species	October 2023	November 2023	December 2023	January 2024	February 2024	March 2024
	(outside survey area). 16 October – 90 Pink-footed goose flying north-west over 1g. **515 feeding in field in north end of 2a (not subsequently recorded again).** 23 October – 50 flying north-east over River Derwent north of Barmby on the Marsh, approx. 20 heard but not seen flying over north-west of Derwent. 39 flying north-west over River Derwent west of business park. 24 October – **706 spread out, feeding in stubble in 1h.** 25 October – 16 flying over high over 2e.					

Species	October 2023	November 2023	December 2023	January 2024	February 2024	March 2024
Lapwing	3 October – **51 roosting in deep plough in 1e, west of Johnsons Farm (JF).** 16 October – **125 roosting in deep plough just north of JF (1e).** 24 October – 3 flew north over JF, **then two flocks (62 and 63) came in at dusk to roost in deep plough north of JF (1e).**	15 November – **14 feeding in 2e.** 16 November – **274 in deep plough, roosting just north of JF (1e).** 28 November – 18 flew north-west over 2e.	5 December – **60 feeding in 1e.** 18 December – 600 in flooded fields, east of River Foulness.	9 January – 50 outside of survey area in area with extensive flooding east of R. Foulness. Also 200 flying south over this area.	19 February – **2 in 3c**.	6 March – **8 in 3c.**
Golden Plover	3 October – **47 birds roosting in deep plough in 1e, north of JF, with 47 birds (presumably the same) in light plough field (1e), east of JF on 4 October.** 4 October – Single bird flew over 1a.	16 November – **179 in till/crop north of JF, roosting and feeding (1e).** 28 November – **48 feeding in 1e joined by 20 more.** In addition, 800 distantly in flight to the east (outside survey area).	5 December – **52 feeding in 1e.** 18 December – **9 in till/crop in 1e.** 18 December – 200 in flooded fields, to the east of River Foulness.	30 January – **4 in 2e.**	No observations.	7 March – 72 in flight high over 1e at dusk but didn't land.

Species	October 2023	November 2023	December 2023	January 2024	February 2024	March 2024
	16 October – **460 birds in field north of JF (ploughed/ tilled land) (1e).** 16 October – **15 in 3c**. 24 October – **230 feeding in plough/till in 1e (north of JF).**					

D.4 Evaluation

D.4.1 Of the ten target species recorded, four (shoveler, gadwall, mallard and teal) were recorded in small numbers at wetland areas adjacent the Grid Connection Corridor. Redshank were only recorded in flooded fields to the east of the River Foulness and not within the Order limits. A herd of six whooper swan were recorded in the north of the Ecology Mitigation Area 1h briefly on a single date in November 2023.

D.4.2 The remaining four species (greylag goose, pink-footed goose, lapwing and golden plover) were recorded within the PV and mitigation areas on more than a single occasion (see Table 28 and Table 29). As set out in the HRA and agreed with Natural England, greylag goose populations occurring within the Order limits are not considered as part of the designated sites populations, so are not considered further in this note.

D.4.3 The distribution of pink-footed goose and golden plover within the survey area are presented in **Figure D-1** and **Figure D-2**.

D.4.4 Table 30 provides the peak monthly counts for observations from areas proposed as Solar PV Areas, i.e., those which will become unavailable to pink-footed goose, lapwing and golden pPlover, in relation to the populations cited for the Humber Estuary SPA/Ramsar and Lower Derwent Valley SPA/Ramsar.

Figure D-1: Distribution of pink-footed goose within the Order limits and a 300m buffer recorded during the Non-breeding Bird Survey 2023–2024

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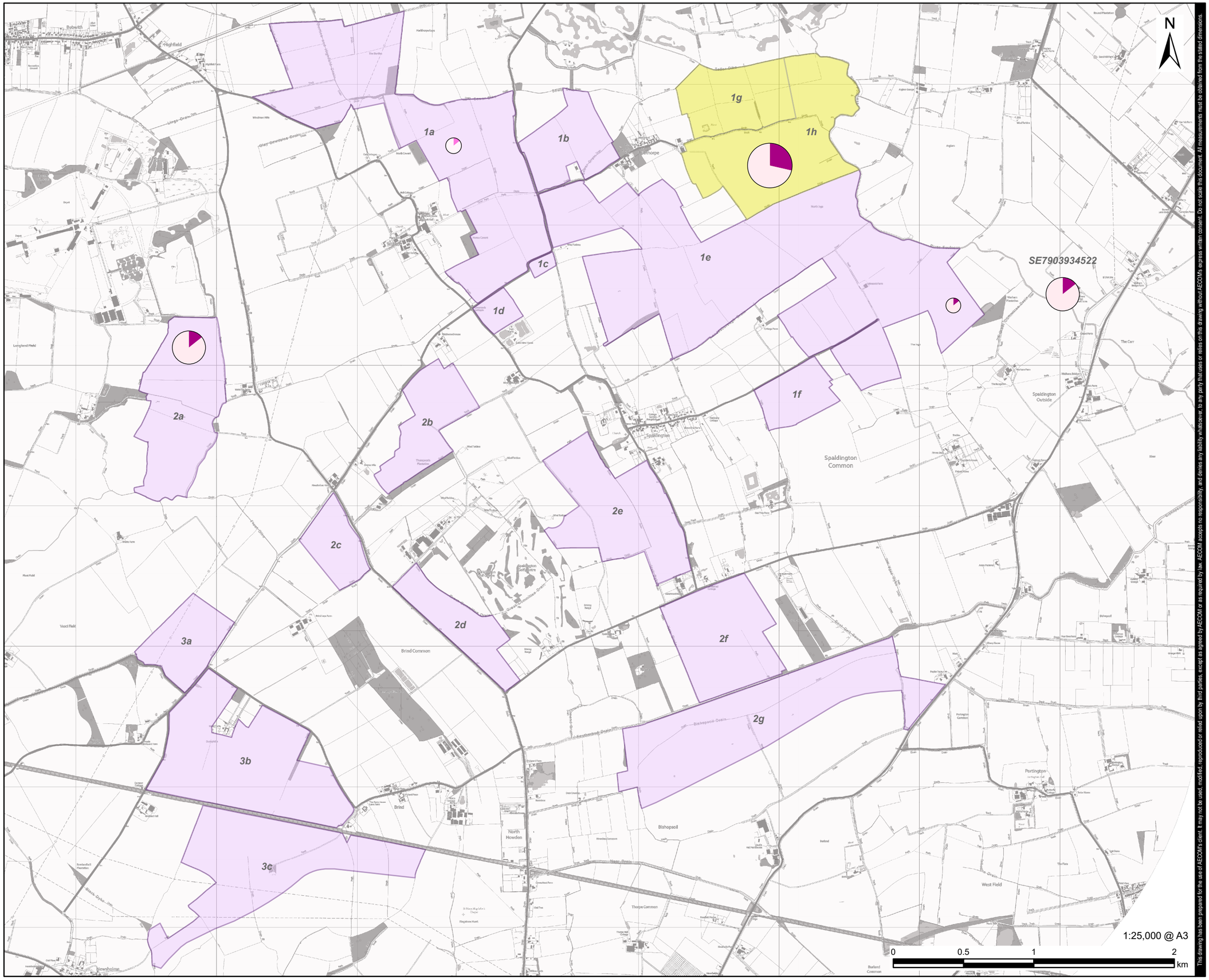

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LEGEND

- Solar PV Site (xx = Solar PV Area)
- Ecology Mitigation Area (xx = Ecology Mitigation Area)

Pink-footed Goose Presence (September 2022 - March 2023)

- Birds Present (total months)
- Birds Absent (total months)

Pink-footed Goose Presence (September 2023 - March 2024)

- Birds Present (total months)
- Birds Absent (total months)

Peak_Count

- 800
- 430
- 58

NOTES

ISSUE PURPOSE

HRA

PROJECT NUMBER

60683115

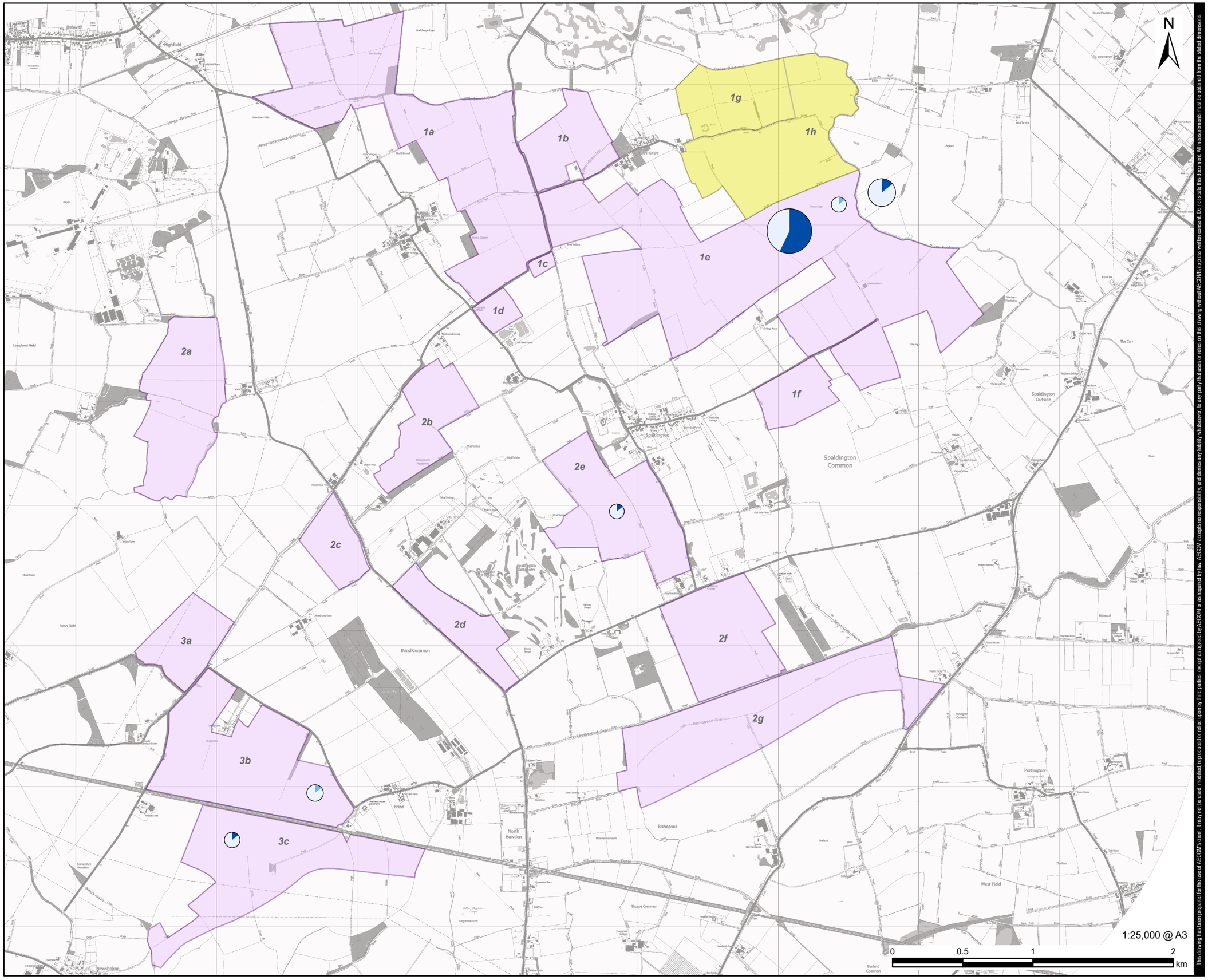
FIGURE TITLE

Distribution of Non Breeding Bird Species: Pink-footed Goose

FIGURE NUMBER

Figure D-1

Figure D-2: Distribution of golden plover within the Order limits and a 300m buffer recorded during the Non-breeding Bird Survey 2023–2024



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LEGEND

▨ Solar PV Site (xx = Solar PV Area)

▨ Ecology Mitigation Area (xx = Ecology Mitigation Area)

Golden Plover Presence (September 2022 - March 2023)

■ Birds Present (total months)

□ Birds Absent (total months)

Golden Plover Presence (September 2023 - March 2024)

■ Birds Present (total months)

□ Birds Absent (total months)

Peak_Count

○ 460
○ 230
○ 4

NOTES

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ISSUE PURPOSE

HRA

PROJECT NUMBER

60683115

FIGURE TITLE

Distribution of Non Breeding Bird Species: Golden Plover

FIGURE NUMBER

Figure D-2

Table 30. Peak monthly counts of relevant target species and relative importance (Solar PV Areas only).

	Peak Monthly Counts							Seasonal Mean		
Species	September 2023	October 2023	November 2023	December 2023	January 2024	February 2024	March 2024	September 2023–March 2024	SPA Population (based on most recent yr peak mean)	% of SPA population
Pink-footed Goose	58	515	0	0	0	0	0	81.86	Humber Estuary – 25,332	2.03% (peak count) 0.32% (mean count)
Lapwing	51	125	274	60	0	2	8	74.29	Humber Estuary – 15,247	1.8% (peak count) 0.49% (mean count)
									Lower Derwent Valley – 5,487	4.99% (peak count) 1.35% (mean count)

Species	Peak Monthly Counts							Seasonal Mean		
	September 2023	October 2023	November 2023	December 2023	January 2024	February 2024	March 2024	September 2023–March 2024	SPA Population (based on most recent yr peak mean)	% of SPA population
Golden Plover	47	460	179	52	4	0	0	106.00	Humber Estuary – 20,812	2.21% (peak count) 0.51% (mean count)
									Lower Derwent Valley – 3,131	14.69% (peak count) 3.39% (mean count)

Annex A

Humber Estuary Special Protection Area: non-breeding waterbird assemblage (as provided by NE)

The Humber Estuary Special Protection Area (SPA) qualifies under article 4.2 of the European Commission Bird Directive (79/409/EEC) in that it supports an internationally important assemblage of waterbirds. Confusion can arise concerning which species to consider when assessing the Humber Estuary SPA non-breeding, waterbird assemblage feature.

Natural England recommends focusing on what are referred to as the 'main component species' of the assemblage. Main component species are defined as:

a) All species listed individually under the assemblage feature on the SPA citation (i.e. the species that qualified in 2007 when the site was designated).

b) Species which might not be listed on the SPA citation but occur at site levels of more than 1% of the national population according to the most recent Humber Estuary Wetland Bird Survey (WeBS) 5-year average count (currently 2017/18 – 2021/22).

c) Species where more than 2000 individuals are present according to the most recent Humber Estuary WeBS count.

The assemblage qualification is therefore subject to change as species' populations change. It should be noted that species listed on the citation under the assemblage features, whose populations have fallen to less than 1% of the national population, retain their status as a main component species and should be considered when assessing the impacts of a project or plan on the Humber Estuary SPA.

Natural England advises that the main component species of the Humber Estuary SPA non-breeding waterbird assemblage include (June 2023):

a) Species listed individually under the assemblage feature on the SPA citation:

- Avocet, *Recurvirostra avosetta* (non-breeding)
- Bar-tailed godwit, *Limosa lapponica* (non-breeding)
- Bittern, *Botaurus stellaris* (non-breeding)
- **Black-tailed godwit, *Limosa limosa islandica* (non-breeding)**[33]
- **Brent goose, *Branta bernicla* (non-breeding)**
- **Curlew, *N. arquata* (non-breeding)**
- **Dunlin, *Calidris alpina alpina* (non-breeding)**
- **Golden plover, *Pluvialis apricaria* (non-breeding)**
- Goldeneye, *Bucephala clangula* (non-breeding)
- Greenshank, *T. nebularia* (non-breeding)

[33] Species known to use off-site supporting habitat / functionally linked land (FLL) in the non-breeding season are shown in **bold**.

- Grey plover, *P. squatarola* (non-breeding)
- Knot, *Calidris canutus* (non-breeding)
- **Lapwing, *Vanellus vanellus* (non-breeding)**
- **Mallard, *Anas platyrhynchos* (non-breeding)**
- Oystercatcher, *Haematopus ostralegus* (non-breeding)
- Pochard, *Aythya ferina* (non-breeding)
- **Redshank, *Tringa totanus* (non-breeding)**
- Ringed plover, *Charadrius hiaticula* (non-breeding)
- **Ruff, *Philomachus pugnax* (non-breeding)**
- Sanderling, *Calidris alba* (non-breeding)
- Scaup, *Aythya marila* (non-breeding)
- **Shelduck, *Tadorna tadorna* (non-breeding)**
- **Teal, *Anas crecca* (non-breeding)**
- Turnstone, *Arenaria interpres* (non-breeding)
- **Whimbrel, *Numenius phaeopus* (non-breeding)**
- **Wigeon, *Anas Penelope* (non-breeding)**

And

b) Species which are not listed on the SPA citation but occur at site levels of more than 1% of the national population according to the most recent Humber Estuary Wetland Bird Survey (WeBS) 5-year average count:

- Green sandpiper, *Tringa ochropus* (non-breeding)
- **Greylag goose, *Anser anser* (non-breeding)**
- **Little egret, *Egretta garzetta* (non-breeding)**
- **Pink-footed goose, *Anser brachyrhynchus* (non-breeding)**
- Shoveler, *Anas clypeata* (non-breeding)
- **Crane, *Grus grus* (non-breeding)**

As stated above, the assemblage qualification is subject to change as species' populations change; therefore, the appropriate WeBS data should be considered in any assessment and the above list should be used as a guide only.

Please note, the advice set out above should be considered when assessing potential impacts on the waterbird assemblage feature. You will also need to consider potential impacts on species which are not considered to be non-breeding waterbirds but are listed on the citation qualifying under article 4.1 and 4.2 of the Directive. These include:

- **Hen harrier, *Circus cyaneus* (non-breeding)**
- **Marsh Harrier, *Circus aeruginosus* (breeding)**
- Little tern, *Sterna albifrons* (breeding)

- Avocet, *Recurvirostra avosetta* (breeding)
- Bittern, *Botaurus stellaris* (breeding)

The species marked **in bold text** are known to use off-site supporting habitat / functionally linked land (FLL) (e.g. arable farmland, grassland/pasture, and/or non-estuarine waterbodies) in the non-breeding season and may therefore be the most relevant for assessing potential impacts of a proposed plan/project on birds using FLL associated with the Humber Estuary SPA. However, please note that this list should be used as a guide only; usage may depend on factors such as the habitats available on the site and distance to the Humber Estuary etc. Therefore, assessments of potential impacts on birds using functionally linked land should consider all relevant species and clear justification should be provided if any species are excluded from the assessment.

Lower Derwent Valley Special Protection Area: non-breeding waterbird assemblage (as provided by NE)

The Lower Derwent Valley Special Protection Area (SPA) qualifies under article 4.2 of the European Commission Bird Directive (79/409/EEC) because it supports an internationally important assemblage of waterbirds. Confusion can arise concerning which species to consider when assessing the Lower Derwent Valley SPA non-breeding, waterbird assemblage feature.

Natural England recommends focusing on what are referred to as the 'main component species' of the assemblage. Main component species are defined as:

a) All species listed individually under the assemblage feature on the SPA citation (i.e. the species that qualified when the site was designated).

b) Species which might not be listed on the SPA citation but occur at site levels of more than 1% of the national population according to the most recent Lower Derwent Ings Wetland Bird Survey (WeBS) count.

c) Species where more than 2000 individuals are present according to the most recent Lower Derwent Ings WeBS count.

The assemblage qualification is therefore subject to change as species' populations change. It should be noted that species listed on the citation under the assemblage feature, whose populations have fallen to less than 1% of the national population, retain their status as a main component species and should be considered when assessing the impacts of a project or plan on the Lower Derwent Valley SPA.

Natural England advises that the main component species of the Lower Derwent Valley SPA include (June 2023):

a) Species listed individually under the assemblage feature on the SPA citation:

- Pochard, *Aythya ferina* (non-breeding)
- **Ruff, *Philomachus pugnax* (non-breeding)**
- Shoveler, *Anas clypeata* (non-breeding)
- **Teal, *Anas crecca* (non-breeding)**
- **Whimbrel, *Numenius phaeopus* (non-breeding)**
- **Wigeon, *Anas penelope* (non-breeding)**

And

b) Species which are not listed on the SPA citation but occur at site levels of more than 1% of the national population according to the most recent Lower Derwent Ings Wetland Bird Survey (WeBS) 5-year average count:

- Gadwall, *Anas strepera* (non-breeding)
- **Greylag goose, *Anser anser* (non-breeding)**
- Pintail, *Anas acuta* (non-breeding)
- **Whooper swan, *Cygnus cygnus* (non-breeding)**

And

c) Species where more than 2000 individuals are present according to the most recent Lower Derwent Ings WeBS 5-year average count:

- **Golden plover, *Pluvialis apricaria* (non-breeding)**
- **Lapwing, *Vanellus vanellus* (non-breeding)**

As stated above, the assemblage qualification is subject to change as species' populations change; therefore, the appropriate WeBS data should be considered in any assessment and the above list should be used as a guide only.

Please note, the advice set out above should be considered when assessing potential impacts on the waterbird assemblage feature. You will also need to consider potential impacts on other individual species listed on the citation qualifying under article 4.1 and 4.2 of the Directive. These include:

- **Bewick's swan, *Cygnus columbianus bewickii* (non-breeding)**
- Shoveler, *Anas clypeata* (breeding)

Further detailed guidance on assessing potential impacts on the Lower Derwent Valley SPA can be found in the Supplementary advice on conserving and restoring site features.

Individual species listed on the citations for the relevant underpinning Sites of Special Scientific Interest (SSSIs) should also be considered in assessments of potential SSSI impacts, where appropriate.

The species marked **in bold text** are known to use off-site supporting habitat / functionally linked land (FLL) (e.g. arable farmland, grassland/pasture, and/or wetlands/waterbodies outside the designated site) and may therefore be the most relevant for assessing potential impacts of a proposed plan/project on birds using FLL associated with the Lower Derwent Valley SPA. However, please note that this list should be used as a guide only; usage may depend on factors such as the habitats available on the site and distance to the Lower Derwent Valley SPA etc. Therefore, assessments of potential impacts on birds using functionally linked land should consider all relevant species and clear justification should be provided if any species are excluded from the assessment.