NORTH FALLS

Offshore Wind Farm

Report to Inform Appropriate Assessment

Part 5 Onshore European and Ramsar Sites

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Glossary of Acronyms

BCT	Bat Conservation Trust
BPM	Best Practical Means
BTO	British Trust for Ornithology
DCO	Development Consent Order
Defra	Department for Environment, Food and Rural Affairs
EACN	East Anglia Connection Node
ECoW	Ecological Clerk of Works
EIA	Environmental Impact Assessment
EMP	Ecological Management Plan
EPP	Evidence Plan Process
EPS	European Protected Species
ES	Environmental Statement
ETG	Expert Topic Group
FCS	Favourable Conservation Status
FLL	Functionally Linked Land
GGOW	Greater Gabbard Offshore Wind Farm
ha	Hectare
HDD	Horizontal Directional Drilling
HRA	Habitats Regulations Assessment
HVAC	High Voltage Alternating Current
IAQM	The Institute of Air Quality Management
ILP	Institute of Lighting Professionals
IRZ	Impact Risk Zone
JNCC	Joint Nature Conservation Committee
km	Kilometre
LNR	Local Nature Reserve
LSE	Likely Significant Effect
m	Metre
NBN	National Biodiversity Network
NCA	National Character Area
NFOW	North Falls Offshore Wind Farm Limited
NS	North Sea
NSIP	Nationally Significant Infrastructure Project
NVC	National Vegetation Classification
O&M	Operation and Maintenance
OLEMS	Outline Landscape and Ecological Management Strategy
OWF	Offshore Wind Farm
PEIR	Preliminary Environmental Information Report
PRoWs	Public Right of Ways

RIAA	Report to Inform Appropriate Assessment
RSPB	Royal Society for the Protection of Birds
RWE	RWE Renewables UK Swindon Limited
SAC	Special Area of Conservation
SNS	Southern North Sea
SPA	Special Protection Area
SSER	SSE Renewables Offshore Windfarm Holdings Limited
SSSI	Site of Special Scientific Interest
UK	United Kingdom
UKHPI	UK Habitat of Principal Importance
WeBS	Wetland Bird Survey
ZoI	Zone of Influence

Glossary of Terminology

Cable circuit (onshore)	The onshore export cables are comprised of cable 'circuits'. Each cable circuit is typically comprised of three power cables, as well as fibre cables and earth cables. It is expected that each circuit would compromise up to seven cables in total.
Cable construction compound	Area set aside to facilitate construction of the onshore cable route. Will be located adjacent to the onshore cable route, with access to the highway.
Haul road	The track along the onshore cable route used by construction traffic to access different sections of the onshore cable route.
Horizontal directional drill (HDD)	Trenchless technique to bring the offshore export cables ashore at landfall. The technique will also be the primary trenchless technique used for installation of the onshore export cables at sensitive areas of the onshore cable route.
Jointing bay	Underground structures, constructed at regular intervals along the onshore cable route to connect the sections of cable together so that each cable is a continuous length, as well as facilitating the installation of the cables into the buried cable ducts.
Landfall	The location where the offshore export cables come ashore at Kirby Brook.
Landfall construction compound	Compound at landfall within which HDD or other trenchless technique would take place.
Landfall search area	The area considered at PEIR, comprising the Essex coast between Clacton-on-Sea and Frinton-on-Sea within which the landfall is located.
Link boxes	Underground chambers or above ground cabinets next to the onshore export cables housing low voltage electrical earthing links.
National Grid connection point	The grid connection location for the Project. National Grid are proposing to construct new electrical infrastructure (a new substation) to allow the Project to connect to the grid, and this new infrastructure will be located at the National Grid connection point.
National Grid substation connection works	Infrastructure required to connect the Project to the National Grid connection point.
Onshore cable corridor(s)	Onshore corridor(s) considered at PEIR within which the onshore cable route, as assessed at ES, is located.
Onshore cable route	Onshore route within which the onshore export cables and associated infrastructure would be located.
Onshore export cables	The cables which take the electricity from landfall to the onshore substation. These comprise High Voltage Alternative Current (HVAC) cables, buried underground.
Onshore project area	The boundary in which all onshore infrastructure required for the project will be located (i.e. landfall; onshore cable route, accesses, construction compounds; onshore substation and National Grid substation extension), as considered within the PEIR.
Onshore scoping area	The boundary in which all onshore infrastructure required for the Project will be located, as considered within the North Falls EIA Scoping Report.
Onshore substation	A compound containing electrical equipment required to transform and stabilise electricity generated by the Project so that it can be connected to the National Grid.
Onshore substation construction compound	Area set aside to facilitate construction of the onshore substation. Will be located adjacent to the onshore substation.
Onshore substation zone	The area considered at PEIR, within which the onshore substation will be located.
Scour protection	Protective materials to avoid sediment being eroded away from the base of the wind turbine generator foundations and offshore substation platform (OSP) or /

	and offshore converter platform (OCP) foundations as a result of the flow of water.
The Applicant	North Falls Offshore Wind Farm Limited (NFOW).
The project Or 'North Falls'	North Falls Offshore Wind Farm, including all onshore and offshore infrastructure.
Transition joint bay	Underground structures that house the joints between the offshore export cables and the onshore export cables
Trenchless crossing compound	Areas within the cable corridor(s) which will house trenchless crossing (e.g. HDD) entry or exit points.

5 Onshore European and Ramsar Sites

5.1 Introduction

5.1.1 Background

1. North Falls Offshore Wind Farm (hereafter 'North Falls' or 'the Project') is an extension to the existing Greater Gabbard Offshore Wind Farm (GGOW), in the southern North Sea (SNS). When operational, North Falls would have the potential to generate renewable power for approximately 400,000 United Kingdom (UK) homes from up to 57 wind turbines.
2. The offshore project area lies in the region of the Outer Thames Estuary, in the southern NS and the onshore project area is located in the Tendring Peninsula of Essex and includes:
   - Landfall at Kirby Brook, where the offshore export cables are brought ashore;
   - Onshore cable route, which includes space for temporary works for the installation of cable ducts and buried onshore export cables, including areas for temporary construction compounds (TCCs), construction and operation and maintenance (O&M) accesses (including Bentley Road improvement works);
   - Onshore substation, proposed to be located west of Little Bromley;
   - Onshore substation works area, which includes land required for temporary construction, export cables, means of access, drainage, landscaping and environmental mitigation for the onshore substation; and
   - The search area for the East Anglia Connection Node (EACN) (the Project's National Grid connection point), within which will be located the Project's National Grid substation connection works.
3. The Applicant, North Falls Offshore Wind Farm Limited (NFOW), is a joint venture between SSE Renewables Offshore Windfarm Holdings Limited (SSER) and RWE Renewables UK Swindon Limited (RWE), both of which are highly experienced developers.

5.1.2 Purpose of this document

4. The purpose of the Report to Inform Appropriate Assessment (RIAA) is to provide the information necessary for the competent authority to carry out the Appropriate Assessment (AA) of the North Falls Offshore Wind Farm (OWF) (hereafter 'North Falls' or 'the Project').
5. This Part of the RIAA provides the shadow AA for onshore European sites screened in based on the Habitats Regulations Assessment (HRA) Screening Report (RIAA Appendix 1.1 (Document Reference: 7.1.1.1)) and summarised in Section 5.3. This Part of the RIAA also considers onshore Ramsar sites, as described in Part 1 of the RIAA (Document Reference: 7.1.1).

5.2 Approach to assessment

6. The assessment follows the HRA process outlined in Section 1.1.4 in Part 1 of the RIAA (Document Reference: 7.1.1). The assessment is based on the onshore project description described in Section 1.2 in Part 1 of the RIAA (Document Reference: 7.1.1). It should be read in conjunction with:

- RIAA Appendix 1.1 Habitats Regulations Assessment Screening (Document Reference: 7.1.1.1));
- Environmental Statement (ES) Chapter 23 Onshore Ecology (Document Reference: 3.1.25);
- ES Chapter 24 Onshore Ornithology (Document Reference: 3.1.26);
- ES Onshore Ecology Appendices 23.1 to 23.10 (Document Reference: 3.3.30 to 3.3.39).
- ES Figures 24.1 to 24.16 (Document Reference: 3.2.20); and
- ES Onshore Ornithology Appendices 24.1 to 24.8 (Document Reference: 3.3.40 to 3.3.47).

5.2.1 Consultation

7. The onshore HRA Screening Report was submitted to the relevant ETGs on 2 November 2022 and discussed in an ETG meeting on 15 November 2022.

8. The following stakeholders were consulted as part of the ETG:

- Natural England;
- Royal Society for the Protection of Birds (RSPB);
- Essex Wildlife Trust;
- Essex County Council;
- Tendring District Council; and
- Environment Agency.

9. Relevant comments regarding onshore SPAs and Ramsar sites are provided in Table 5.1 and comments regarding onshore SACs are provided in Table 5.2. Subsequent to the publication of the Preliminary Environmental Information Report (PEIR), comments relating to onshore ornithology and onshore ecology were received from stakeholders. These are summarised and addressed in detail in Table 23.1 of ES Chapter 23: Onshore Ecology (Document Reference: 3.1.25) and Table 24.1 of ES Chapter 24 Onshore Ornithology (Document Reference: 3.1.26) respectively, but where comments were specifically relevant to the HRA process, these have been summarised here in Table 5.1.

Table 5.1 Consultation responses in relation to onshore SPAs and Ramsar sites

Consultee	Date / Document	Comment	Response / where addressed in the RIAA
Tendring District Council (Places Services)	15/11/2023 Onshore Ecology and Ornithology Expert Topic Group (ETG) Meeting 2	If any of the Site of Special Scientific Interest (SSSI) features which underpin the qualifying features of European sites were identified as potentially subject to effects during construction or operation of the project, and therefore potentially giving rise to LSE upon the qualifying features, this will need to be taken into account during the HRA screening.	Features which support European and Ramsar sites have been considered in the screening (RIAA Appendix 1.1 (Document Reference: 7.1.1.1)), and where a likely significant effect (LSE) is identified, in this RIAA.
Natural England	02/12/2022 Comments on HRA Screening Report	We note that North Falls has chosen an area of 10km for the desk-based study area for designated sites, and the rationale for this buffer should be provided. However, we advise that the scoping area should be based on the potential for species to be present within the area, the Impact Risk Zone (IRZ) for designated sites as available on Magic, the ecology, i.e. foraging areas of designated species of sites in proximity to the proposed development area, and consideration given to Functionally Linked Land. We repeat our earlier advice, that the onus is on the Applicant to determine whether there is sufficient information/evidence to exclude areas from the desk-based study and for surveys.	NFOW are comfortable that the 10 kilometres (km) buffer used for the initial filter of sites for consideration within the HRA screening is the appropriate buffer to use. For onshore ornithology the 10km buffer has been used based on existing literature which identifies that potential foraging ranges of up to 10km for geese and wader species of the south-east of England can commonly occur from core feeding grounds (Hearn, 2004; Gillings and Fuller, 1999). Based on the qualifying features of SPAs in the south-east of England this buffer is considered appropriate to cover all usage of functionally linked land (FLL) by Special Protection Area (SPA) individuals. Please note a further, more detailed sift of potential LSEs requiring further consideration in the AA is set out in Table 9.4 of the HRA Screening Report (RIAA Appendix 1.1 (Document Reference: 7.1.1.1).
Natural England	02/12/2022 Comments on HRA Screening Report	Potential Effects Considered in Screening: Section 9.3, Table 9-3 - Direct temporary damage / disruption of habitats within site boundaries which support qualifying features. This has not been included for the Construction, Operation or Decommissioning stages. Whilst impacts to ex-situ habitats have been considered, suitable habitats at the site that may support the qualifying features of the SPA have not been considered. Habitats within the project area could potentially support qualifying features of the protected sites, e.g. dark-bellied brent geese (Hamford Water SPA 0.3km and Stour and Orwell Estuaries SPA 3.3km).	Direct impacts in this assessment refer to those impacts which occur within the European / Ramsar site boundary. As the Project's onshore project area has been routed to avoided European designations / Ramsar sites, then no direct impacts under this definition can occur. Potential impacts upon FLL (ex-situ habitats) located outside the European / Ramsar site boundary but within the onshore project area up to 10km from the European / Ramsar site have still been screened in for further assessment within the AA – see HRA Screening Report (RIAA Appendix 1.1 (Document Reference: 7.1.1.1)) Table 9.3.
Natural England	10/02/2023 Further comments on HRA Screening Report	*[Response to NFOW comments]* We are content with the sites that have been scoped into the assessment, however, we advise that the Project should be mindful of the IRZs, foraging areas of designated species, and functionally linked land (FLL) on a site-by-site basis.	Sites screened in have been detailed in the HRA Screening Report (RIAA Appendix 1.1 (Document Reference: 7.1.1.1)) and summarised in Section 5.3.1. The screening process has taken into account usage of foraging areas / FLL by SPA qualifying features within the onshore ornithology study area.

Consultee	Date / Document	Comment	Response / where addressed in the RIAA
Natural England	10/02/2023 Further comments on HRA Screening Report	*[Response to NFOW comments]* We are content with the information and explanation provided. We are, therefore, content with the proposed screening for direct temporary damage/disruption of habitats within site boundaries which support qualifying features.	Noted.
Natural England	02/12/2022 Comments on HRA Screening Report	Section 9.4 Screening: Pages 172-177, Table 9-4 Onshore Ornithology - Screening Summary Potential for a Direct temporary effect to habitats within the project area that support the qualifying features of the sites listed in the table (Hamford Water SPA and Ramsar, Stour and Orwell Estuaries SPA and Ramsar, Colne Estuary (Mid-Essex Coast Phase 2) SPA and Ramsar) need to be included as per the above comment.	See above comment. No direct impacts on habitats within SPAs are predicted, and direct impacts on FLL within the onshore project area which support the designated sites screened in are assessed.
Natural England	10/02/2023 Further comments on HRA Screening Report	*[Response to NFOW comments]* We are also content with this screening.	Noted.
Natural England	02/12/2022 Comments on HRA Screening Report	We also advise that the project should fully consider cumulative impacts for the different construction scenarios with Five Estuaries e.g. concurrently, sequentially etc., as was discussed in the ETG.	NFOW agrees and has considered the worst-case scenario (in respect of onshore ornithology) of the Five Estuaries Offshore Wind Farm project ('Five Estuaries') construction within the in-combination assessment, using the most up-to-date information shared with NFOW by the project at the time of writing.
Natural England	02/12/2022 Comments on HRA Screening Report	Water Quality and Quantity - Depending on the final red line boundary and infrastructure area it may be necessary to consider potential impacts to water tables and water quality and quantity in relation to designated sites and features within the water catchments.	NFOW agrees, and indirect impacts on within-SPA habitats and FLL supporting SPA qualifying features have been considered within the screening and within this RIAA.
Natural England	14/07/2023 PEIR Response	We are…concerned about potential in-combination impacts (with other projects such as Five Estuaries) to SPA birds.	In-combination effects have been assessed in Section 5.4.7.
Natural England	14/07/2023 PEIR Response	We note the avoidance of land within designated site boundaries, although we note that the onshore project area is in close proximity to Hamford Water SAC, SPA/Ramsar site (300m at closest point). Consideration will therefore be required of impacts on Annex I birds that are utilising functionally linked land surrounding the SPA.	Since the PEIR, the proposed onshore project area has been refined, based on a number of factors, including potential impacts on the Hamford Water SPA / Ramsar site bird assemblage. As such, the route would now be a minimum of approximately 0.8km from the SPA at its closest point. At this distance, the potential for disturbance to birds utilising habitats within the designation boundary is highly unlikely. Consideration has however been given to the potential impacts on SPA bird populations utilising functionally-linked land outside

Consultee	Date / Document	Comment	Response / where addressed in the RIAA
			of the SPA, and what measures can be undertaken to minimise the risk of an adverse effect on the SPA.
Natural England	14/07/2023 PEIR Response	Reference is included to PEIR Chapter 24 Onshore Ornithology and that embedded mitigation for onshore ornithology includes that monitoring will be carried out to 'ensure' no significant disturbance to overwintering birds. We note that no reference is included to avoiding (where possible) work in land identified as potentially important to Hamford Water SPA features during key periods of the non-breeding season or keeping hedgerows etc. for visual screening (PEIR Chapter 24, para 249-251). We note that this mitigation could conflict with embedded mitigation around not removing vegetation, which relates to ground nesting birds, in the nesting season. We advise that any mitigation included in the chapters, should be included in the HRA where it relates to impacts on designated sites.	The refinement of the onshore project area since PEIR stage has reduced the likelihood of non-breeding SPA qualifying features being impacted by disturbance. The embedded mitigation (see Table 5.3) does include the ability for the Ecological Clerk of Works (ECoW) to determine the requirements for additional mitigation such as temporary screening to avoid disturbance impacts on SPA species on FLL, including during the non-breeding season. In addition, it would be ensured that mitigation measures required for ecological or ornithological features would be complimentary with each other, and reference is made in this assessment of proposed ecological mitigation and enhancement measures.
Natural England	14/07/2023 PEIR Response	We agree with the plans and projects which have been identified for potential in-combination effects, namely Five Estuaries and Norwich to Tilbury. These are both subject to separate Development Consent Order (DCO) permissions which may or may not be granted to allow construction within the same timeframe and/or consecutive timeframes. There would be less disturbance if Five Estuaries OWF and North Falls OWF construction activities took place simultaneously along the same construction route. If they were to pursue individual connections, particularly in the same area, for example consecutively, this could lead to continual impacts over an elongated period. We note that the grid connection is dependent on Norwich to Tilbury substation being constructed.	In-combination effects are considered in Section 5.4.7. Whilst provision has been made within the project design envelope to facilitate coordinated construction, the worst-case in-combination scenario for the construction of the Project and Five Estuaries has been assessed, which for onshore ornithology, is considered to be the sequential construction of the two projects, with a gap of at least three years between construction phases. See Part 1 of the RIAA (Document Reference: 7.1.1) for further information.
Natural England	08/12/2023 Discretionary Advice	We welcome the Onshore Cable Route Non-Breeding Bird Surveys Report (2022-23). We are content with the survey report in general. However, the survey results will need to be considered in terms of disturbance/displacement impacts from all parts of the project (and other relevant projects) on SPA birds.	Noted. These results form part of the baseline dataset used to describe the existing environment and have been used to assess disturbance and displacement impacts on SPA qualifying features and determine mitigation measures as appropriate.

Table 5.2 Consultation responses in relation to onshore SACs

Consultee	Date / Document	Comment	Response / where addressed in the RIAA
Tendring District Council (Places Services)	15/11/2023 Onshore Ecology and Ornithology ETG Meeting 2	If any of the SSSI features which underpin the qualifying features of European sites were identified as potentially subject to effects during construction or operation of the project, and therefore potentially giving rise to LSE upon the qualifying features, this will need to be taken into account during the HRA screening.	Features which support European and Ramsar sites have been considered in both the screening and in this draft RIAA.
Natural England	02/12/2022 Comments on HRA Screening Report	We note that North Falls has chosen an area of 10km for the desk-based study area for designated sites, and the rationale for this buffer should be provided. However, we advise that the scoping area should be based on the potential for species to be present within the area, the IRZ for designated sites as available on Magic, the ecology, i.e. foraging areas of designated species of sites in proximity to the proposed development area, and consideration given to Functionally Linked Land. We repeat our earlier advice, that the onus is on the Applicant to determine whether there is sufficient information/evidence to exclude areas from the desk-based study and for surveys.	NFOW are comfortable that the 10km buffer used for the initial 'sift' of sites for consideration within the HRA screening is the right buffer to use – this has been selected as the largest buffer from the various buffers used when considering different potential indirect effects. The largest buffer relates to effects upon functionally-linked land (ex-situ habitats), and here the 10km buffer has been used based on existing literature which identifies that potential foraging ranges of up to 10km for typical geese and wader species of the east of England can commonly occur from core feeding grounds (Hearn, 2004; Gillings and Fuller, 1999). NFOW notes that SSSI Impact Risk Zones for the SSSI which underpin the European and Ramsar sites considered in the HRA Screening extend at most to 5km, so all are covered by using this 10km buffer for the initial sift. Please note a further, more detailed sift of potential LSEs requiring further consideration in the AA which considers different buffers for different indirect effects described in Section 5.3, is set out in Table 9.4 of the HRA Screening Report (RIAA Appendix 1.1 (Document Reference: 7.1.1.1)).
Natural England	10/02/2023 Further comments on HRA Screening Report	*[Response to NFOW comments]* We are content with the sites that have been scoped into the assessment, however, we advise that the Project should be mindful of the IRZs, foraging areas of designated species, and FLL on a site-by-site basis.	Sites screened in have been detailed in the HRA Screening Report (RIAA Appendix 1.1 (Document Reference: 7.1.1.1)) and summarised in Section 5.3.1. The screening process has taken into account usage of FLL by SPA qualifying features within the onshore ornithology study area.

Consultee	Date / Document	Comment	Response / where addressed in the RIAA
Natural England	02/12/2022 Comments on HRA Screening Report	We also advise that the project should fully consider cumulative impacts for the different construction scenarios with Five Estuaries e.g. concurrently, sequentially etc., as was discussed in the ETG.	NFOW agree and have considered the Five Estuaries project within the in-combination assessment, using the most up-to-date information shared with NFOW by the project at the time of writing.
Natural England	02/12/2022 Comments on HRA Screening Report	Water Quality and Quantity - Depending on the final red line boundary and infrastructure area it may be necessary to consider potential impacts to water tables and water quality and quantity in relation to designated sites and features within the water catchments.	NFOW agree, and this has been considered within the screening and within this RIAA, with such potential effects upon Hamford Water screened in for further assessment.
Natural England	14/07/2023 PEIR Statutory Consultation	We note the avoidance of land within designated site boundaries, although we note that the onshore project area is in close proximity to Hamford Water SAC, SPA/Ramsar site (300m at closest point). Consideration will therefore be required of impacts on Annex I birds that are utilising functionally linked land surrounding the SPA. As advised for all OWF Nationally Significant Infrastructure Projects (NSIPs) two years of data is required to support Applications to take account of interannual variation.	Impacts on SPAs, SACs and Ramsar sites are fully considered as part of the HRA screening and within this RIAA, with such potential effects upon Hamford Water screened in for further assessment. Impact on Annex I birds are considered in Section 5.4.
Natural England	14/07/2023 PEIR Statutory Consultation	We agree with the methodology that has been used to assess potential impact pathways to international notified features e.g. wintering and breeding birds, and Fishers Estuarine Moth as a feature of Hamford Water SAC.	Noted.

5.2.2 Worst case scenario

10. The worst-case scenarios for construction, operation and decommissioning related to the onshore project area are presented in Section 1.2.1.2 and Section 1.2.7 – 1.2.12 of RIAA Part 1 Introduction (Document reference: 7.1.1). The shadow AAs for each designated site screened in have been based on these worst-case scenarios.

5.2.3 Embedded mitigation

11. Table 5.3 outlines the embedded mitigation relevant to the onshore ornithology assessment, which has been incorporated into the design of North Falls.

Table 5.3 Embedded mitigation measures

Parameter	Mitigation measures embedded into the project design
Ecological Management Plan	Prior to works commencing, NFOW will prepare a final Ecological Management Plan (EMP) setting out full details of the ecological mitigation measures which will be adhered to during the Project's construction. This will include: • A programme of works; • A list of roles and responsibilities for ecological mitigation, including the role of an ECoW, and any suitably qualified ornithologist; • A plan showing ecological and ornithological constraints; • Full details of good industry practice mitigation in relation to all species and habitats affected by the Project; • Full details of any project-specific mitigation identified within this chapter, including habitat creation or species-specific mitigation programmes. Any such programmes will be accompanied by mitigation layout plans as applicable; • If considered necessary, a list of Schedule 1 bird species' licences and site consents required to facilitate construction; • Habitat reinstatement method statements for all habitats proposed to be reinstated following the completion of construction (including grassland, hedgerows, watercourses, arable crops and arable field margins – see below). • Any associated standalone mitigation plans, e.g. Bird Disturbance Management Plan (or similar). As part of the Project's DCO application, the Outline Landscape and Ecological Management Strategy (OLEMS) (Document Reference: 7.14) sets out the ecological and ornithological mitigation requirements identified within the ES that must be incorporated into the EMP for delivery during the Project's construction phase. The OLEMS acts as the single source for all ecological and ornithological mitigation measures proposed within the ES.
Good practice Measures	The EMP will include details of good practice for minimising impact to notable habitats and legally protected and notable species, including (but not limited to) the following: • Avoid sensitive times of the year for construction activities, including:

Parameter	Mitigation measures embedded into the project design
	○ Avoid undertaking vegetation removal during the bird nesting season (March – August inclusive, although weather dependent) where practicable. Where this cannot be achieved, a pre-construction check of all nesting habitat is required no more than 48 hours prior to removal. Should a nest be found, a buffer zone (minimum 5m, species-dependent) around the nest must be created, and no works must be undertaken within the buffer zone until the young have fledged and / or nest is no longer active. For Schedule 1 listed bird species, further mitigation measures may be required to avoid disturbance to breeding adults, as advised by the ECoW or ornithological expert. • Undertaking pre-construction checks of all habitats identified of being of conservation importance prior to works, to ensure that the ecological / ornithological constraints identified prior to consent have not changed. • Ensuring security lighting used during construction adheres as far as practicable to accepted lighting guidance: ○ Ensure lighting is cowled and angled downwards and does not shine directly on sensitive habitats; ○ Ensure lighting is motion activated to minimise unnecessary lighting; • Ensuring good practice pollution prevention measures are adhered to at all times to minimise the risk of pollutant release to sensitive habitats (see also ES Chapter 21 Water Resources and Flood Risk (Document Reference: 3.1.23)). • Best Practicable Means (BPM) to be employed during construction to limit dust, odour, and exhaust emissions during construction works, to reduce LSEs upon air quality-sensitive habitat (see ES Chapter 20 Onshore Air Quality (Document Reference: 3.1.22)). • All habitats temporarily disturbed during construction are reinstated in full where practicable upon completion of construction. • A 20m standoff will be in place where works are located on the north side of the Holland Haven Marshes SSSI / Local Nature Reserve (LNR), to avoid direct impacts on the designated site during construction. • Protective fencing will be installed around retained UK Habitat of Principal Importance (UKHPIs).
Mitigation by site selection	The onshore project area and onshore substation location have been defined following an extensive site selection process, which has sought to take account of environmental, engineering, planning and land requirements to seek to identify and avoid where practicable sensitive environmental features. The site selection process is described in detail in ES Chapter 4 Site Selection and Assessment of Alternatives (Document Reference: 3.1.6). The site selection process has included consideration of the following ecological and ornithological criteria as part of the process: • Avoidance of statutory and non-statutory designated sites for conservation and associated buffer zones for indirect effects, as far as practicable; • Where practicable, avoidance of FLL which has been identified as being of relatively higher importance for SPA qualifying features;

Parameter	Mitigation measures embedded into the project design
	• Avoidance of ancient woodland and associated buffer zones for indirect effects, as far as practicable; • Avoidance of UKHPI as far as practicable; • Avoidance of habitat potentially suitable for supporting legally protected and notable species as far as practicable. As part of this process, the onshore project area presented in ES Chapter 5 Project Description (Document Reference: 3.1.7) does not overlap with any European / Ramsar sites nor ancient woodlands. The onshore project area does cross Holland Haven Marshes SSSI. However, the SSSI will be crossed using Horizontal Directional Drilling (HDD) techniques thereby avoiding any direct impacts on habitats (see below). During route refinements, the location of the crossing was carefully selected to avoid sensitive parts of Holland Haven Marshes SSSI for the breeding and non-breeding bird assemblages, e.g. the lagoon and adjacent wetland areas.
Mitigation by construction method selection	North Falls has committed to seeking to use trenchless techniques (e.g. HDD) where practicable at all key sensitive linear features, including the following relevant to this assessment: • Land within Holland Haven Marshes SSSI; • Holland Brook and associated watercourses at landfall; • Watercourses upstream of Hamford Water SAC; • Veteran trees; • Woodland UKHPI; • Ponds UKHPI. At this stage in the Project's design trenchless techniques cannot be committed to at all locations, where the engineering feasibility of using such techniques needs further assessment before it can be confirmed. The list of techniques being considered at each crossing is described in ES Chapter 5 Project Description (Document Reference: 3.1.7), ES Appendix 5.1 Crossing Schedule (Document Reference: 3.3.2).
	At all trenched watercourse crossings, good industry practice measures will be in place to minimise disturbance of the beds, banks and downstream habitats (see ES Chapter 21 Water Resources and Flood Risk (Document Reference: 3.1.23)). Where temporary dams are used: • The onshore export cables would typically be a minimum of 3 metres (m) below the channel bed (dependent on local geology and geomorphological risks). This would avoid exposure during periods of higher energy flow when the bed could be mobilised. This depth takes into consideration anticipated climate-change related changes in fluvial flows and erosion that will occur over time; • The amount of time that temporary dams or flumes are in place will be kept to a reasonably practicable minimum; • Flumes or pumps would be adequately sized to ensure that flows downstream are maintained whilst minimising upstream impoundment; • Scour protection would also be used to protect the river bed downstream of the dam from high energy flow at the outlets of flumes and pumps;

Parameter	Mitigation measures embedded into the project design
	• If a diversion channel is required, geotextiles or similar techniques will be used to line the channel and prevent sediment entering the watercourse; • Vegetation would not be removed from the banks unless necessary to undertake the works, in which case removal would be restricted to the smallest practicable footprint; • Channel bed and banks would be sympathetically reinstated (e.g. by replacing re-sectioned banks with more natural profiles that are typical of the natural geomorphology of the watercourse); and • Prior to dewatering the area between the temporary dams, a fish rescue would be undertaken.
Draft 'Break-out' Contingency Plan	As advised by Natural England during the Evidence Plan Process (EPP), an Outline Horizontal Directional Drill Method Statement and Contingency Plan (Document Reference: 7.15) has been submitted with the Project's DCO application. This outline plan sets out the steps will be taken to minimise the risk of effects upon interest features of the Holland Haven Marshes SSSI as a result of a bentonite, an inert clay, 'breakout' during the landfall HDD beneath the SSSI, including the provision of an ECoW during landfall HDD. It details both the measures proposed to reduce the risk of a breakout occurring, and the contingency plans steps to reduce the extent of the breakout and to clean up the spill should it occur. In summary, these steps include: • Pre-drilling ground conditions assessment and hydrofracture modelling to target formations with lower risk of breakout; • Use of drill casing in softer, surface deposits; • Constant fluid monitoring during drilling, so that a breakout can be identified as soon as it occurs; • Provision of appropriate spill management supplies and staff training on breakout management on site; • Process of containment and spill removal once a spill has been identified. Please refer to the Outline Horizontal Directional Drill Method Statement and Contingency Plan (Document Reference: 7.15) for full details of the measures proposed.
Mitigation by design	NFOW has committed to reduce the onshore cable route working width to 30m at hedgerow crossings where open cut trenching is proposed, to minimise the amount of hedgerow removal required. This will be achieved by not including the topsoil / subsoil storage bunds in the onshore cable route working width at hedgerow crossings. Hedgerows will be replanted in situ following construction but note that canopy tree species cannot be replanted within 6m of the buried cables, which will restrict tree planting for a 37m swathe during hedgerow reinstatement (as the maximum width of hedgerow removal is 30m, in practice this restriction will only apply for a maximum 30m swathe). Hedgerow planting would be undertaken in the first winter season following construction. Suitable screening would be erected for the duration of HDD work at landfall, around the landfall compound, in order to reduce the likelihood of visual or noise disturbance to birds utilising Holland Haven Marshes SSSI and adjoining land. Further information will be included within

Parameter	Mitigation measures embedded into the project design
	the EMP developed post-consent, secured by DCO Requirement. To avoid potentially significant disturbance effects to SSSI / SPA qualifying features using functionally-linked land within the onshore project area, suitable temporary screening may be erected around any other discrete locations of importance for birds (for example a particular agricultural reservoir used by green sandpipers), for the duration of onshore works within a specified area of possible disturbance, as determined by an ECoW or suitably qualified ornithologist (where required). The requirements for restrictions would be informed by pre-construction surveys and may be seasonal, and therefore screening would only be erected should nearby works overlap with key periods for birds recorded utilising such locations.
Habitat reinstatement	As noted above, where practicable all habitats subject to temporary disturbance during construction, will be reinstated in full following the completion of construction. The specific details of the reinstatement will be set out within the EMP for each habitat. The following core principles for habitat reinstatement would be included within the EMP: **Grassland habitats** All topsoil stripped in grassland areas would be stored separately and reinstated following the completion of construction. Topsoil storage would be subject to a Soil Management Plan (secured by DCO Requirement), which would also detail measures for soil storage and handling. Grassland reseeding would be undertaken using a local seed mix, to be agreed in advance with Natural England and Essex Wildlife Trust. Where practicable, harvesting a green hay crop from the grassland areas being lost will be carried out, for use as seed on the reinstatement and compensation areas. Where practicable the salvage of turves from grasslands areas being lost will be carried out for re-use on the reinstatement and compensation areas. **Trees and hedgerows** As advised by Essex County Council during the EPP, all tree and shrub planting undertaken by NFOW will be subject to an up to 10-year after care period. As advised by Natural England during the EPP, all hedgerows within the onshore project area not removed for construction to be allowed, where practicable, to thicken up during construction and operation to facilitate use as feeding and commuting corridors for wildlife. All reinstated hedgerows will be replanted using locally important and native species, as advised by Essex Wildlife Trust. Pre-planting will be carried out where practicable within the onshore substation works area so hedgerows and trees can establish as close as possible to the time of initial habitat loss. **Arable field margins** If landowner permission can be reached, this habitat will be reinstated in consultation with Essex Wildlife Trust and the local landowner to ensure the optimum benefits can be gained from each margin affected. Prior to construction, the arable field margins will be re-surveyed to assess their conservation value. Attempts will then be made to ensure

Parameter	Mitigation measures embedded into the project design
	habitat reinstatement takes the form of one of the following (Joint Nature Conservation Committee (JNCC), 2008): • Cultivated, low-input margins (land managed specifically to create habitat for rare annual arable plants); • Margins sown to provide seed for wild birds (margins or blocks sown with plants that are allowed to set seed and which remain in place over the winter); • Margins sown with wildflowers or agricultural legumes and managed to allow flowering to provide pollen and nectar resources for invertebrates; • Margins providing permanent, grass strips with mixtures of tussocky and fine-leaved grasses. Effort would also be made to determine whether it is possible to create suitable habitat for turtle doves, e.g. tall scrub and dense hedgerow, taking into consideration current good practice advice from sources such as Operation Turtle Dove. All planned mitigation will be site-specific and seek to provide maximum benefit for the local environment. Following decommissioning of the onshore substation, it is expected the footprint and platform areas would be reinstated to agricultural land use with hedgerows reinstated.
Best practice dust management mitigation measures	The Project will commit to the implementation of best practice dust mitigation measures associated with a 'high risk' site, as described by the Institute of Air Quality Management (IAQM) guidance (2014). These measures will be outlined within the Project's Outline Code of Construction Practice (CoCP) (Document Reference: 7.13) submitted as part of the Project's DCO application and will be secured within the final CoCP submitted post-consent.
Biodiversity Net Gain (BNG)	NFOW is exploring opportunities to deliver biodiversity net gain for the onshore elements of the Project. The biodiversity net gain delivered would be determined following completion of the latest version of the Department for Environment, Food and Rural Affairs (Defra) Biodiversity Metric (currently version 4.0), an indicative version of which has been provided as part of the DCO application. As part of this, environmental enhancement is proposed to be included within the onshore substation landscaping design, an outline version of which is provided in Figure 30.1.6 (Document Reference: 3.2.26).
Habitat creation	As part of the landscaping, EMP and Biodiversity Net Gain (BNG) commitments, habitat creation will be carried out as compensation. Habitat creation will be detailed in the EMP, and will include measures relevant to this RIAA such as: • Increase habitat connectivity, with a specific focus on providing habitat for notable species which may be present in the relevant areas; • Wildflower meadow creation and maintenance; and • Ecological improvements to watercourses.

5.3 Screening conclusions

5.3.1 Onshore ornithology (SPAs and Ramsar sites)

12. Effects on qualifying features were identified, which could result in LSE on the SPA and Ramsar sites shown in Table 5.4. All other SPA and Ramsar sites are screened out on the basis of no potential for LSE. For further information on the rationale for this screening out, see RIAA Appendix 1.1 (Document Reference: 7.1.1.1).

13. The shadow AA considers the following effects, based on those identified in the HRA Screening Report (RIAA Appendix 1.1) (Document Reference: 7.1.1.1):

- All screened in sites:
  - Direct effects on FLL (outside of the SPA) which support qualifying features of the sites due to habitat loss;
  - Direct effects on qualifying features from noise and visual disturbance in FLL during construction; and
  - Indirect effects on FLL during construction which support qualifying features of the sites due to air quality emissions or changes in supporting surface or groundwater resources (including bentonite breakout events).
- Additionally, for Hamford Water SPA and Ramsar only:
  - Direct effects on qualifying features within the SPA from noise and visual disturbance.

14. All other construction effects, and all operational effects were screened out due to a lack of LSE.

15. The European and Ramsar sites screened in are shown in Figure 1.2, Part 1 of the RIAA (Document Reference: 7.1.1).

Table 5.4 Summary of onshore SPAs and Ramsar sites and features screened in

Site	Qualifying feature screened in
Hamford Water SPA	The site qualifies under Article 4.1 and 4.2 of the Birds Directive (2009/147/EC) for supporting the following species: • Little tern *Sternula albifrons* 39 pairs – breeding (78 breeding adults) 2010 – 2014, 2.1% of GB population • Avocet *Recurvirostra avosetta* 99 individuals – wintering 1986/87 – 1990/91, 7% of GB population • Dark bellied brent goose *Branta bernicla bernicla*, 5,650 individuals – wintering, 1986/87 – 1990/91, 2% of biogeographic population • Shelduck *Tadorna tadorna* 840 individuals – wintering 1986/87 – 1990/91 1% of GB population • Teal *Anas crecca* 3,630 individuals – wintering 1986/87 – 1990/91 2% of GB population • Ringed plover *Charadrius hiaticula* 620 individuals – wintering 1986/87 – 1990/91 1% of biogeographic population • Grey plover *Pluvialis squatarola* 1,080 individuals – wintering 1986/87 – 1990/91 2% of GB population • Black-tailed godwit *Limosa limosa* 1,580 individuals – wintering 1986/87 – 1990/91 2% of biogeographic population • Redshank *Tringa tetanus* 1,240 individuals – wintering 1986/87 – 1990/91 1% of biogeographic population

Site	Qualifying feature screened in

Hamford Water Ramsar	Ramsar criterion 6 – species / population occurring at levels of international importance.
	Qualifying species / populations (as identified at designation):
	• Species with peak counts in spring / autumn:
	  ○ Ringed plover, *Charadrius hiaticula*, Europe / north-west Africa. 1,169 individuals, representing an average of 1.6% of the population (five year peak mean 1998/9-2002/3)
	  ○ Common redshank , *Tringa totanus totanus*, 2.099 individuals, representing an average of 1.8% of the GB population (five year peak mean 1998/9-2002/3)
	• Species with peak counts in winter:
	  ○ Dark-bellied brent goose, *Branta bernicla bernicla*, 3,629 individuals, representing an average of 1.6% of the population (five year peak mean 1998/9-2002/3)
	  ○ Black-tailed godwit , *Limosa limosa islandica*, Iceland/W Europe 377 individuals, representing an average of 1% of the population (five year peak mean 1998/9- 2002/3)
	Species / populations identified subsequent to designation for possible future consideration under criterion 6.
	• Species with peak counts in winter:
	  ○ Grey plover, *Pluvialis squatarola*, E Atlantic / W Africa -wintering 2,749 individuals, representing an average of 1.1% of the population (five year peak mean 1998/9-2002/3)

Stour and Orwell Estuaries SPA	The site qualifies under Article 4.1 of the Birds Directive (2009/147/EC) for supporting the following species: • Avocet *Recurvirostra avosetta*, 21 pairs – breeding, five year peak mean 1996 – 2000 3.6% of GB population The site qualifies under Article 4.2 of the Birds Directive (2009/147/EC) for supporting the following species: • Redshank *Tringa tetanus* 2,588 individuals – autumn passage five year peak mean 1995/96 – 1999/2000 2.0% brittanica • Dark-bellied brent goose *Branta bernicla bernicla* 2,627 individuals – wintering five year peak mean 1995/96 – 1999/2000 1.2% bernicla, western Siberia (breeding) • Pintail Anas acuta 741 individuals – wintering five year peak mean 1995/96 – 1999/2000 1.2% north-western Europe (non-breeding) • Grey plover *Pluvialis squatarola* 3,261 individuals - Wintering five year peak mean 1995/96 – 1999/2000 1.3% eastern Atlantic (nonbreeding) • Knot *Calidris canutus Islandica* 5,970 individuals – wintering five year peak mean 1995/96 – 1999/2000 1.3% islandica • Dunlin *Calidris alpina alpina* 19,114 individuals – wintering five year peak mean 1995/96 – 1999/2000 1.4% alpina, western Europe (non-breeding) • Black-tailed godwit *Limosa limosa islandica* 2,559 individuals - Wintering five year peak mean 1995/96 – 1999/2000 7.3% islandica • Redshank *Tringa tetanus* 3,687 individuals - Wintering five year peak mean 1995/96 – 1999/2000 2.8% brittanica The site qualifies under article 4.2 of the Directive (79/409/EEC) as it is used regularly by over 20,000 waterbirds, including: • great crested grebe *Podiceps cristatus*, • cormorant *Phalacrocorax carbo*, • dark-bellied brent goose *Branta bernicla bernicla*, • shelduck *Tadorna tadorna*, • wigeon *Anas penelope*, • gadwall *Anas strepera*, • pintail *Anas acuta*, • goldeneye *Bucephala clangula*, • ringed plover *Charadrius hiaticula*, • grey plover *Pluvialis squatarola*, • lapwing *Vanellus vanellus*, • knot *Calidris canutus islandica*,

Site	Qualifying feature screened in
	• dunlin *Calidris alpina alpina*, • black-tailed godwit *Limosa limosa islandica*, • curlew *Numenius arquata*, • redshank *Tringa totanus* and • turnstone *Arenaria interpres*

Stour and Orwell Estuaries Ramsar	Ramsar criterion 5: Assemblages of international importance:
	• Species with peak counts in winter:
	  ○ 63,017 waterfowl (five year peak mean 1998/99-2002/2003)
	Ramsar criterion 6: species / populations occurring at levels of international importance.
	Qualifying species / populations (as identified at designation):
	• Species with peak counts in spring / autumn:
	  ○ Common redshank , *Tringa totanus totanus*, 2,588 individuals, representing an average of 2% of the population (five year peak mean 1995/96- 1999/2000)
	• Species with peak counts in winter:
	  ○ Dark-bellied brent goose, *Branta bernicla bernicla*, 2,627 individuals, representing an average of 1.2% of the population (five year peak mean 1995/96-1999/2000)
	  ○ Northern pintail , *Anas acuta*, NW Europe 741 individuals, representing an average of 1.2% of the population (five year peak mean 1995/96- 1999/2000)
	  ○ Grey plover , *Pluvialis squatarola*, E Atlantic / W Africa -wintering 3261 individuals, representing an average of 1.3% of the population (five year peak mean 1995/96-1999/2000)
	  ○ Red knot , *Calidris canutus islandica*, W & southern Africa (wintering) 5,970 individuals, representing an average of 1.3% of the population (five year peak mean 1995/96-1999/2000)
	  ○ Dunlin , *Calidris alpina alpina*, W Siberia/W Europe 19,114 individuals, representing an average of 1.4% of the population (five year peak mean 1995/96-1999/2000)
	  ○ Black-tailed godwit, *Limosa limosa islandica*, Iceland/W Europe 2,559 individuals, representing an average of 7.3% of the population (five year peak mean 1995/96-1999/2000)
	  ○ Common redshank, *Tringa totanus totanus*, 3,687 individuals, representing an average of 2.8% of the population (five year peak mean 1995/96-1999/2000)

Colne Estuary (Mid-Essex Coast Phase 2) SPA	The site qualifies under Article 4.1 of the Birds Directive (2009/147/EC) for supporting the following species: • Little tern *Sterna albifrons*, breeding - 73 pairs 1987-1991 (3% of British breeding population). • Hen harrier *Circus cyaneus*, wintering - 19 birds 1987/88 to 1991/92 (2% of the British total). The site qualifies under Article 4.2 of the Birds Directive (2009/147/EC) for supporting as a wetland of international importance by regularly supporting, in winter, over 20,000 waterfowl, including internationally important numbers of: • 5,315 dark-bellied brent geese *Branta bernicla bernicla* (3.1 % of the total world population, 5.9% of the British wintering population) • 1,252 redshank *Tringa totanus* (1.1% of the East Atlantic Flyway (EAF) population, 1.6% of British). and nationally important numbers of: • 243 cormorant *Phalacrocorax carbo* (1.2% of British), • 354 mute swan *Cygnus olor* (1.9% of British), • 1,237 shelduck *Tadorna tadorna* 1.6% of British), • 262 Goldeneye *Bucephala clangula* (1.7% of British), • 355 ringed plover *Charadrius hiaticula* (1.5% of British), • 1,168 grey plover *Pluvialis squatarola* (5.5% of British), • 219 sanderling *Calidris alba* (1.5% of British), • 11,272 dunlin *Calidris alpina* (2.6% of British), • 606 black-tailed godwit *Limosa limosa* (12.7% of British)

Site	Qualifying feature screened in
	• 938 curlew *Numenius arquata* (1% of British). Breeding: • 15 pairs (7% of British breeding population) of pochard *Aythya farina* • 135 pairs (1% of British) of ringed plover *Chararius hiaticula*

Colne Estuary (Mid-Essex Coast Phase 2) Ramsar	Ramsar criterion 5: Assemblages of international importance:
	• Species with peak counts in winter:
	  ○ 32,041 waterfowl (five year peak mean 1998/99-2002/2003)
	
	Ramsar criterion 6: species / populations occurring at levels of international importance.
	Qualifying Species / populations (as identified at designation):
	• Species with peak counts in winter:
	  ○ Dark-bellied brent goose, *Branta bernicla bernicla*, 3,165 individuals, representing an average of 1.4% of the population (five year peak mean 1998/9-2002/3)
	  ○ Common redshank, *Tringa totanus totanus*, 1,624 individuals, representing an average of 1.3% of the GB population (five year peak mean 1998/9-2002/3)

5.3.2 Onshore ecology (Annex I habitats or Annex II species in SACs)

16. There is potential for indirect effects which could result in LSE on the designated Annex II species feature Fisher's estuarine moth *Gortyna borelii lunata* of Hamford Water Special Area of Conservation (SAC) for the Project alone or in-combination, this site has been screened in to the shadow AA.

17. All other European sites designated for onshore Annex I habitats or Annex II species or Ramsar sites are screened out on the basis of no potential for LSE. For further information on the rationale, see RIAA Appendix 1.1 (Document Reference: 7.1.1.1).

18. The shadow AA considers the following impacts, based on those identified in the HRA Screening Report (RIAA Appendix 1.1 (Document reference 7.1.1.1)):

- Impact 1: Indirect disturbance of Annex II species from noise;
- Impact 2: Indirect disturbance of Annex II species from visual / lighting;
- Impact 3: Indirect effects on Annex I habitats and Annex II species arising from changes in supporting surface or groundwater resources; and
- Impact 4: Direct and indirect effects on ex-situ habitats which support Annex II species of European sites.

19. With respect to each of these identified impacts, an assessment is carried out for the SAC's qualifying features, within the context of the site's conservation objectives. The assessment should be read in conjunction with ES Chapter 23 Onshore Ecology (Document Reference: 3.1.25) and ES Onshore Ecology Appendices 23.1 to 23.10 (Document Reference: 3.3.30 to 3.3.39) which present detailed information on baseline conditions within the onshore project area, and an assessment on impacts to ecological features, including species which are also qualifying features of Hamford Water SAC.

20. The European sites screened in are shown in Figure 1.2, Part 1 of the RIAA (Document Reference: 7.1.1).

5.4 Onshore ornithology (SPAs and Ramsar sites)

5.4.1 Conservation objectives

21. The conservation objectives for all assessed SPAs have been determined by Natural England (2019a; 2019b; 2019c) as follows:

22. 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;

    1. The extent and distribution of the habitats of the qualifying features;
    2. The structure and function of the habitats of the qualifying features;
    3. The supporting processes on which the habitats of the qualifying features rely;
    4. The population of each of the qualifying features, and,
    5. The distribution of the qualifying features within the site.

23. These conservation objectives are considered in the process of determining AEoI of SPAs (and by extension, Ramsar sites), whereupon evidence is provided to ascertain which, and whether any of the SPA's conservation objectives may be compromised due to a predicted impact.

5.4.2 Hamford Water SPA and Ramsar site

5.4.2.1 Site overview

24. A list of qualifying features for the Hamford Water SPA and Ramsar site are presented in Table 5.4, and cited and current SPA populations are given in Table 5.5. Most species are qualifying features of both designated sites, although the Ramsar site citation does not include breeding little tern and non-breeding avocet and shelduck. The SPA and Ramsar site are similar in extent (excluding the marine component of the SPA) and because impacts are likely to be similar, the conclusions of the assessment of effects on the integrity of the SPA are also applicable to the Ramsar site, unless specifically noted.

25. Hamford Water SPA is approximately 800m from the onshore project area at its closest point (see Figure 1.2, Part 1 of the RIAA (Document Reference: 7.1.1)).

26. It is a large tidal embayment between Walton-on-the-Naze and Dovercourt on the north Essex coastline in eastern England. The site is a large, shallow basin, protected by The Naze headland, which supports a wide range of habitats, including tidal creeks, mud and sand flats, grasslands, beaches, a large extent of saltmarsh and multiple islands (Natural England, 2017). Whilst the site appears to be estuarine, there is no significant freshwater input (Thomson et al., 2011). The SPA includes a marine area in Pennyhole Bay beyond the mouth of Hamford Water, consisting of subtidal habitats and Pye Sands, an intertidal sandbank. An area of intertidal beach below the cliffs of The Naze is also included within the SPA (Natural England, 2017).

27. The complexity of habitats within the site, its mild climate and abundant invertebrate communities attracts a diverse and abundant community of

waterbirds and wildfowl. It is an important refuge for waterbirds, especially during periods of severe winter weather on the continent (Natural England 2017). Non-breeding protected species include dark-bellied brent geese and shelduck. Overwintering waders, such as avocet, black-tailed godwit, ringed plover, grey plover, and redshank, are also designated species. There is an important little tern breeding colony within the SPA, however nesting is now restricted to the north-eastern side of Horsey Island.

28. The main vulnerability of the SPA identified in the Natura 2000 citation is natural changes in sea level, leading to accelerated erosion of saltmarshes. This has been addressed in two ways; using of sand and gravels from dredging in Harwich harbour to reinforce existing beaches and protecting grazing marsh areas by to reinforce the seawall toe with these materials in the most aggressive areas.

29. Also identified as vulnerabilities are discharges from boats, local sewage works, small industrial discharges, and disturbance due to yachts and accompanying water sports.

Table 5.5 Cited and current populations of qualifying features of Hamford Water SPA

Species	Cited SPA population (Individuals)	Current SPA population (Individuals)*
Little tern	39 pairs	2
Avocet	99	728
Dark-bellied brent goose	5,650	4,367
Shelduck	840	1,007
Teal	3,630	3,836
Ringed plover	620	174
Grey plover	1,080	1,689
Black-tailed godwit	1,580	838
Redshank	1,240	1,995

* British Trust for Ornithology (BTO) Wetland Bird Survey (WeBS) core count data - five-year average from 2018-19 to 2022-23 (Woodward *et al*, 2024).

30. Usage of the onshore project area by qualifying features is species-specific and based on habitat preferences and ecology. Of the SPA qualifying features, most show strong preferences for the type of habitats found within the SPA such as intertidal mudflats and saltmarsh. This is reflected in the results of baseline surveys carried out within the onshore project area in the 2021-22 and 2022-23 non-breeding seasons - see ES Figures 24.9 to 24.16 (Document Reference: 3.2.20), where highest aggregations were recorded within the western edge of the SPA which overlapped with the onshore ornithology survey area.

5.4.2.2 Shadow Appropriate Assessment

31. The HRA Screening Report identified that the following impacts on Hamford Water SPA qualifying features may occur during the construction (and decommissioning) period only:

32. Effects on qualifying features occurring within the SPA:

- Direct effects on qualifying features from noise and visual disturbance.

33. Effects on qualifying features in FLL (i.e. occurring outside of the SPA):

- Direct effects on habitats which support qualifying features of the sites due to habitat loss;
- Direct effects on qualifying features from noise and visual disturbance; and
- Indirect effects on habitats which support qualifying features of the sites due to air quality emissions or changes in supporting surface or groundwater resources (including bentonite breakout events).

34. All other construction effects, and all operational effects were screened out due to a lack of LSE.

35. The screened-in direct and indirect construction effects are addressed for each SPA qualifying feature in turn below.

5.4.2.2.1 Little tern

Disturbance within SPA

36. Little tern has been scoped into this assessment because the onshore project area is within theoretical foraging range of Hamford Water SPA for this species (foraging range recommended as 5km by Woodward *et al.* 2019).

37. In the Natural England (2015) review of the proposed extension to the Hamford Water SPA for little tern, it is noted that the only remaining colony is on Horsey Island which is over 3.5km from the onshore project area, meaning no nesting birds would be disturbed by construction activities (only two individuals were recorded in most recent WeBS counts, see Table 5.5). The feeding grounds of the little terns that nest at Horsey Island lie predominantly in marine areas in the shallower water along the edges and mouths of creeks and channels and the shallower waters around Pennyhole Bay and along the coastline, which again means no disturbance would occur. No AEoI is therefore predicted.

Effects on functionally linked land: habitat loss and disturbance

38. The HRA Screening Report identified that direct habitat loss impacts on FLL for qualifying features, outside of Hamford Water SPA, may occur.

39. However, there were no records of little terns within the onshore project area during breeding season surveys, and it is considered very unlikely that little terns would utilise any inland habitat, with species' preferences for coastal and marine SPA habitats described in Natural England (2015). No impacts on habitats, or disturbance on FLL would therefore occur due to the Project. No AEoI is therefore predicted.

5.4.2.2.2 Wader and duck qualifying features

Disturbance within SPA

40. ES Figures 24.11 to 24.16 show that, outside of the landfall survey area, wader and duck activity recorded within the onshore project area during the 2021-22 and 2022-23 non-breeding season surveys was largely confined to the western part of the Hamford Water SPA at Beaumont Creek, approximately 800m from

the onshore project area at its closest point, where there is suitable mudflat and saltmarsh habitat.

41. The main exceptions to this were lapwing, curlew and golden plover which typically travel further inland during winter than other wader species (see ES Figures 24.11 and 24.12 for distribution), however these are not Hamford Water SPA qualifying features.

42. At Beaumont Creek, redshank was the SPA qualifying wader feature most commonly recorded, with birds feeding on saltmarsh and within small creeks in the SPA. Flock sizes were generally small, with a peak count of 45 individuals. Pairs of birds were recorded closer to the onshore project area on two occasions.

43. Teals were present in flocks of up to 76 individuals in Beaumont Creek. Inland from the SPA, birds were strongly associated with standing waterbodies, with flocks of up to 80 birds recorded. Elsewhere teal were only sporadically present in low numbers.

44. Shelduck were found in flocks of up to 27 individuals within the SPA and occasionally inland in smaller numbers (up to nine individuals).

45. Avocets were recorded on three occasions within the SPA (peak flock size of five individuals) and black-tailed godwit and grey plover were recorded more frequently with a peak flock count of 195 and 32 individuals respectively. Two ringed plovers were recorded adjacent to the SPA on a single occasion.

46. Within the SPA, Beaumont Creek therefore evidently provides suitable feeding and roosting habitats for some SPA qualifying features. At 800m distant from the onshore project area there would however be no direct SPA habitat loss.

47. Goodship and Furness (2022) in their review of disturbance ranges for various species, generally advise distances of up to 600m to avoid disturbance to waders or ducks (e.g. up to 400m for shelduck, up to 500m for golden plover) with a maximum of up to 650m for curlew. The closest part of the SPA to the onshore project area is located beside an active farm (Quay Farm) and a Public Rights of Way (PRoW), and within 300m of a minor road, and therefore birds there are likely to be accustomed to some degree of human activity.

48. As outlined in Table 5.3, embedded mitigation includes ECoW provision and good practice measures for avoiding potentially significant disturbance effects to SPA qualifying features using FLL within the onshore project area. Therefore, given that this would include the part of the onshore project area closest to Hamford Water SPA, and the fact that the SPA is at least 800m from the onshore project area and in an area of existing human activities, there would be no disturbance to birds within the SPA. No AEoI is therefore predicted.

Effects on functionally linked land: habitat loss

49. With most species having strong preferences for wetland habitats, the only Hamford Water SPA qualifying features regularly recorded inland within or adjacent to the onshore project area during the 2021-22 and 2022-23 non-breeding season surveys were shelduck and teal (noting that these are not Ramsar site qualifying features). Additionally, single black-tailed godwits were also recorded on an agricultural reservoir adjacent to the onshore project area, and near to the SPA, on two occasions.

50. Therefore, in most cases the SPA qualifying features observed within the onshore project area were recorded on or adjacent to waterbodies which would not be directly affected by habitat loss.

51. Whilst flocks of up to 12 teal and five shelduck were occasionally recorded away from waterbodies within the onshore project area, these were generally in ephemeral puddles and flooded areas of farmland which are unlikely to be a reliable food or roost resource, and therefore any short-term habitat losses would be unimportant to non-breeding shelduck and teal SPA populations. No AEoI is therefore predicted.

Effects on functionally linked land: disturbance

52. As noted above, most of the observations of wader and duck qualifying features were within or directly adjacent to the preferred habitats within the SPA, and being at least 800m distant, disturbance to these birds is unlikely.

53. Only teal and shelduck were more widespread in their distribution, although mainly confined to permanent and ephemeral waterbodies within the onshore project area. Although some temporary disturbance may occur to these birds, it should also be noted that even if these birds were to be affected, the peak flock sizes recorded close to Hamford Water SPA were usually well below 1% of the current SPA populations. The cited SPA populations for teal and shelduck are 3,630 and 840 individuals respectively, and according to the latest WeBS core counts carried out for the BTO within the Hamford Water count sector (which approximates the SPA extent) the five-year average counts (2018-18 to 2022-23) were 3,836 teal and 1,007 shelduck (Woodward et al. 2024).

54. Small numbers of other SPA qualifying features such as black-tailed godwit may occasionally be recorded using suitable habitats such as agriculture reservoirs within or adjacent to the onshore project area (also used by teal and shelduck), but any short-term disturbance event would not affect the survival rate of the SPA population.

55. The embedded mitigation outlined in Table 5.3 includes pre-construction checks during the non-breeding season to identify any particular areas of importance to wintering birds, including SPA qualifying features. Should any areas be identified (e.g. inland waterbodies) then the ECoW would have the ability to enforce restrictions to construction works, either by measures such as temporary screening of the water body, or avoiding construction within an area during sensitive times, e.g. around high tide or during particularly cold periods. This would mean that any disturbance which could affect the survival rate of an SPA qualifying feature's population would be avoided, and no AEoI is predicted.

Indirect effects on functionally linked land

56. Although not directly affected by habitat loss, it is possible that within the onshore project area, watercourses, waterbodies and wetlands used by teal and shelduck, and occasionally by other SPA qualifying features, could be affected by any unmitigated pollution incidents.

57. As outlined in Table 5.3, embedded mitigation includes a commitment of using trenchless techniques (e.g. HDD) where practicable at all main rivers and watercourses, as well as adopting good practices to avoid any pollution incidents and bentonite breakouts, as detailed in the Outline Horizontal

Directional Drill Method Statement and Contingency Plan (Document Reference: 7.15).

58. When accounting for these measures, the risks to SPA qualifying features are considered to be sufficiently small, and would not compromise any of the conservation objectives. No AEoI is predicted.

5.4.2.2.3 Dark-bellied brent goose

Disturbance within SPA

59. No dark-bellied brent geese were recorded within or near the SPA during the 2021-22 non-breeding season surveys (see ES Figure 24.9 (Document Reference: 3.2.20)) but were found within the landfall survey area (ES Figure 24.5 (Document Reference: 3.2.20)), located at least 4km from Hamford Water SPA. In the following 2022-23 winter period, brent goose observations were made within Hamford Water SPA (see ES Figure 24.10 (Document Reference: 3.2.20)), with a peak flock of 350 individuals flushed from fields adjacent to the SPA in February 2023. It should be noted that on Figure 24.10, records of brent geese made within the onshore ornithology study area refer to birds flying over only.

60. Goodship and Furness (2022) did not include brent goose in their literature review of disturbance ranges of bird species, but similar species such as barnacle goose and white-fronted goose were evaluated. For all goose species, the maximum recommended disturbance buffer was 600m, and therefore it is considered reasonable that this would also apply to brent goose. With the SPA being at least 800m from the onshore project area, there would be no disturbance impacts on birds within the SPA and no AEoI is predicted.

Effects on functionally linked land: Disturbance

61. Rowell and Robinson (2004) undertook a thorough review of dark-bellied brent goose feeding ecology in the UK and note that historically, dark-bellied brent geese had fed exclusively on intertidal habitats, predominantly on mudflats, and also saltmarshes. However, since the 1970s, inland feeding by large numbers of birds has also become a regular occurrence at almost all the key sites in the south-east of England.

62. Inland habitats used include grasslands (particularly fertilised grassland), winter cereals, oilseed rape, and occasionally recreation and sports grounds. Most sites used by the birds are within 5km from the coast, and they prefer large, open sites where they have clear sight lines.

63. There is evidence that suggests the first habitats used when the birds arrive in autumn are intertidal, and that inland feeding only occurs once the intertidal resources have been depleted. By late winter / early spring, inland pasture has been shown to have a higher nutrient quality than saltmarsh resources, but this situation reverses as the spring progresses, which helps explain the general shift back to saltmarsh feeding in spring. The use of inland feeding sites is greatest at high tide, when the availability of intertidal food resources is limited.

64. If it is assumed that based on the Rowell and Robinson (2004) review, dark-bellied brent geese may travel up to 5km to feed, then it is possible that the birds recorded within the landfall area (ES Figure 24.5) may comprise part of

the Hamford Water SPA population, particularly during the late winter / early spring period.

65. The landfall non-breeding bird surveys (ES Appendices 24.1 (Document Reference: 3.3.40) and 24.3 (Document Reference: 3.3.42)) recorded widespread and frequent human activity across large parts of the landfall search area during the non-breeding season, including dog walkers, wildfowling, golfing, angling (at rocky jetties) and metal detecting.

66. The majority of the coastal strip (seawall to Kirby Brook) from Holland Haven to Frinton is used for recreational pursuits, so there is frequent potential disturbance to birds. During one of the non-breeding bird survey visits in late December 2020, for example, a total of 23 dog-walkers with 30 dogs (some off leash), 28 joggers, 21 golfers and 50-100 non-dog walkers were noted. Some PRoWs in other parts of the landfall survey area were also in heavy use by walkers.

67. Gas gun scarers were stationed in fields in and around the landfall survey area during winter months. These are likely to affect the current distribution and site usage of geese, with birds likely to move frequently between locations in response to disturbance sources.

68. At the landfall, recorded dark-bellied brent goose usage within the vicinity of the Temporary Construction Compound (TCC) for HDD works was relatively low and infrequent compared to other parts of the landfall survey area, which may at least in part be due to current levels of disturbance, although may also be due to other factors such as suitability of habitat or field size. Any disturbance associated with landfall HDD works is not predicted to affect the ability of geese to forage or roost successfully outside of Hamford Water SPA, as these birds already tolerate and cope with disturbance in the wider area, and range widely. No AEoI is predicted.

Effects on functionally linked land: Habitat loss

69. ES Figures 24.5, 24.9 and 24.10 (Document Reference: 3.2.20) show that across the two winters surveyed, there was only a single brent goose record (a flock of 1,000 birds north of the landfall, see ES Figure 24.5) within the onshore project area (note all other records within the onshore ornithology study area buffer shown on Figure 24.10 refer to birds in flight). Whilst some arable land within the onshore project area may be suitable for geese, at least for part of the winter, any usage is likely to be low and infrequent compared to that within the Hamford Water SPA and Holland Haven Marshes SSSI. Direct habitat loss associated construction may therefore reduce the amount of habitat potentially available to geese, possibly over two winters, but with the species commuting relatively widely, and generally utilising wetland areas outside of the onshore project area, habitat loss would not affect the ability of geese to forage or roost successfully through the winter. No AEoI is predicted.

Indirect effects on functionally linked land

70. Dark-bellied brent goose records within the onshore project area were largely confined to the landfall area, where HDD works would take place. During the drilling process there is the potential for the release / breakout of inert drilling fluids (bentonite breakout) which may impact the watercourses and waterbodies

within and around Holland Haven Marshes and in turn result in indirect impacts upon geese due to contamination of aquatic and wetland habitats.

71. As outlined in Table 5.3, as part of the project's embedded mitigation, the HDD will be designed considering the ground conditions to minimise the risk of a breakout where possible. A Horizontal Directional Drill Method Statement and Contingency Plan will be prepared in advance of construction which will detail the measures to be taken in the event of a drilling fluid breakout in order to minimise effects upon watercourses. An outline version of this document is provided with the DCO application (Document Reference: 7.15) to provide assurance that reasonable steps will be taken to minimise the risk of effects arising as a result of 'break-out' during HDD beneath Holland Haven Marshes SSSI.

72. It therefore follows that there would be no indirect effects on dark-bellied brent geese. No AEoI is therefore predicted.

5.4.2.2.4 Conclusions

Disturbance within and outside of SPA

73. The closest part of the SPA at Beaumont Creek hosts relatively small populations of most of the SPA qualifying features, but due to the distance from the onshore project area, no disturbance within the SPA would occur. Mitigation in the form of screening or temporal restrictions would be employed, as required, to avoid disturbance to important non-breeding bird aggregations in the part of the onshore project area closest to the SPA.

74. Any disturbance events within functionally linked land would be temporary, and limited in spatial extent. The onshore project area is of limited importance for SPA qualifying features (particularly away from waterbodies), and even in the case of brent goose where peak numbers within the onshore ornithology study area have represented a notable part of the SPA population, frequency of occurrence is low, which may be due to existing disturbance sources.

75. Disturbance events would therefore have no effect on survival, productivity or distribution at a population level for any qualifying feature and as such, no AEoI of the Hamford Water SPA are predicted. It can also be reasonably concluded that no AEoI of the Hamford Water Ramsar site will occur.

Habitat loss within and outside of SPA

76. There would be no direct habitat loss within the SPA, and when embedded mitigation is considered (mitigation by construction method selection, breakout contingency plan, EMP, ECoW provision – see Table 5.3), the small chance of indirect impacts on SPA habitats due to hydrological connectivity would be removed.

77. Temporary or permanent loss, or indirect impacts on functionally linked land would be very small compared with overall habitat available to these wide-ranging species, unimportant compared to the wetland habitats within the SPA.

78. Any habitat loss or change would not therefore have an effect on survival or productivity at a population level for any qualifying feature and as such, no AEoI of the Hamford Water SPA are predicted. It can also be reasonably concluded that no AEoI of the Hamford Water Ramsar site will occur.

5.4.3 Stour and Orwell Estuaries SPA and Ramsar site

5.4.3.1 Site overview

79. A list of qualifying features for the Stour and Orwell Estuaries SPA and Ramsar site are presented in Table 5.4, and cited and current populations are given in Table 5.6. The SPA and Ramsar site are similar in extent and because impacts are likely to be similar, the assessment of effects on the integrity of the SPA is also applicable to the Ramsar site, unless specifically noted.

80. Stour and Orwell Estuaries SPA is approximately 3.3km to the north of the onshore project area at its closest point (see Figure 1.2, Part 1 of the RIAA (Document Reference: 7.1.1)).

81. The Estuaries are adjacent but combine near the mouth as they join the NS. Both are tidal, shallow and relatively sheltered, although the Orwell Estuary is narrower and more linear compared to the wider Stour Estuary.

82. Invertebrate-rich mudflats flank the edges of both estuaries, regularly being covered and uncovered by the tide. The Stour Estuary in particular has extensive mudflats due to the wider and more intertidal channel, with large areas found within the main bays. Several small areas of seagrass (*Zostera* spp.) are found across the mudflats and diverse communities of saltmarsh fringe the edges of both estuaries. Several freshwater pools and grazing marshes fall within the SPA boundary, such as Trimley and Shotley Marshes.

83. The SPA hinterlands include large areas of arable agricultural land, as well as several major urban areas, including Ipswich at the head of the Orwell Estuary, and the towns of Harwich and Felixstowe at the mouth of the estuaries.

84. Breeding avocet feed upon the intertidal mudflats and use the grazing marshes to nest during the summer. The SPA also supports important numbers of overwintering waterbirds, which also use the mudflats extensively for feeding. The saltmarsh and grazing marsh provide important roosting sites, whilst some birds feed and roost on the surrounding arable land.

Table 5.6 Cited and current populations of qualifying features of Stour and Orwell Estuaries SPA

Species	Cited SPA Population (Individuals)	Current SPA Population (Individuals)*
Avocet (breeding, SPA only)	21 pairs	447 + 230 (individuals)
Dark-bellied brent goose	2,627	2,337 + 1,432
Redshank (overwinter)	2,588	1,221 + 1,393
Pintail	741	273 + 142
Grey plover	3,261	1,651 + 291
Knot	5,970	11,336 + 895
Dunlin	19,114	9,838 + 4,514
Black-tailed godwit	2,559	1,956 + 969
Redshank (on passage)	3,687	1,221 + 1,393
Non-breeding waterbird assemblage including:		

Species	Cited SPA Population (Individuals)	Current SPA Population (Individuals)*
Lapwing	5,537 + 2,579**	1,554 + 1,234
Curlew	1,283 + 796**	1,144 + 533
Cormorant	139 + 131**	121 + 846

* BTO WeBS core count data - five-year average from 2015-16 to 2019-20 for Stour Estuary + Orwell Estuary sectors combined (Woodward et al, 2024).

** BTO WeBS core count data - five-year average from 1995-96 to 1999-2000 for Stour Estuary and Orwell Estuary sectors combined (Woodward et al, 2024). This year range is consistent with the data used to determine the cited SPA populations.

5.4.3.2 Shadow Appropriate Assessment

85. The HRA Screening Report identified that the following impacts on the Stour and Orwell Estuaries SPA qualifying features may occur during the construction (and decommissioning) period only:

- Direct impacts on FLL which supports qualifying features of the sites due to habitat loss;
- Direct impacts on qualifying features from noise and visual disturbance in FLL; and
- Indirect impacts on FLL which support qualifying features of the sites due to air quality emissions or changes in supporting surface or groundwater resources (including bentonite breakout events).

86. All other construction impacts and all operational impacts were screened out due to a lack of LSE.

87. Most of the SPA qualifying features show preferences for the type of habitats that are found within the SPA but not in the onshore project area, such as intertidal mudflats and saltmarsh. This is reflected in the results of baseline surveys carried out in the 2021-22 and 2022-23 non-breeding seasons where most qualifying features were absent from the onshore project area.

88. For the purposes of the assessment, it is assumed that any qualifying species found in proximity to the Hamford Water SPA (e.g. teal, black-tailed godwit) belong to that SPA, and for most species, material connectivity with the Stour and Orwell Estuaries SPA is only considered possible if individuals were recorded in the northern half of the onshore project area (within up to 5km of the Stour and Orwell Estuaries SPA). It is therefore assumed that the landfall area falls outside the range of connectivity with the Stour and Orwell Estuaries SPA.

89. Based on the results of the 2021-22 and 2022-23 non-breeding season surveys, occurrences of most qualifying features within the onshore project area and within 5km of the SPA were rare. Concentrations of waterbirds were recorded by waterbodies at Stacie's Farm, over 2km north of the onshore project area, but the only species regularly recorded within or adjacent to the northern part of the onshore project area were SPA assemblage species, lapwing and curlew (ES Figures 24.11 and 24.12 (Document Reference: 3.2.20)). Cormorant, another assemblage species, was also regularly recorded across the onshore project area.

90. For curlew, the closest aggregation of records in 2021-22 was around 5.5km to the south of the Stour and Orwell Estuaries SPA, and around 3.5km to the north-

west of the Hamford Water SPA (ES Figure 24.11 (Document Reference: 3.2.20)). Recorded distribution in 2022-23 was more concentrated within Hamford Water SPA and north of the landfall, with no records in closer proximity to the Stour and Orwell Estuaries SPA.

91. Curlews are known to utilise inland areas near coasts during winter months, but according to Musgrove et al. (2011) these are thought likely to form only a small proportion of the total national wintering population. In a study of waders on the Ribble Estuary, Greenhalgh (1975) found that curlew was an inland-feeder as well as shore-feeder, particularly at high tides.

92. In a study of wintering movements of three tagged curlews in the Cefni Valley, birds flew up to 4.5km inland from the Newborough Warren estuary to grassland / pasture fields (BTO, 2021). Based on this maximum distance, then birds present in the central part of the onshore project area in 2021-22 were most likely to belong to the closer Hamford Water, where the species is not a qualifying feature. As such, no AEoI on the Stour and Orwell SPA curlew population is predicted.

93. Cormorants were regularly recorded during surveys, but most observations were made either of birds in flight, or outside of the onshore project area on waterbodies or watercourses. Terrestrial habitats within the onshore project area are generally unsuitable for the species, and thus the onshore project area is of low importance for the species. With embedded mitigation around waterbodies (i.e. mitigation by construction method selection, breakout contingency plan, EMP, ECoW provision – see Table 5.3), no direct or indirect habitat impacts are predicted.

94. Additionally, cormorants are considered to be of low sensitivity to disturbance, with birds commonly being found in close proximity to humans, e.g. along urban rivers or in coastal ports. As such, no AEoI on the Stour and Orwell SPA cormorant population is predicted.

95. The focus of the assessment is therefore on lapwing, with no AEoI predicted for all other qualifying features.

5.4.3.2.1 Lapwing

Effects on functionally linked land: Habitat loss

96. Gillings and Fuller (1999) provided a review of studies on wintering lapwing. They found that the species can be observed on winter cereals, bare till and on a variety of grassland types, including pastures and airfields. Most studies of habitat use that the authors reviewed reported a strong preference for feeding on grassland, particularly permanent pastures and this apparent preference for grassland could explain the rather low lapwing densities which have been recorded in the largely arable landscape of East Anglia in mid-winter.

97. Gilling and Fuller's study reported that during surveys, lapwings made movements of up to 6km from daytime roosts. More local movements appear to be common, and flocks can be extremely mobile within winters. A typical pattern observed was that birds may use one or two particular areas of farmland for several weeks and then move to another area, which may be several kilometres away. The authors concluded that the notion of 'traditional sites' needs to be treated with caution and found that on much farmland the birds are

extremely localised and large areas of apparently suitable habitat are typically unused within any winter.

98. ES Figure 24.11 (Document Reference: 3.2.20) shows that in the northern half of the onshore project area, most lapwing records during winter 2021-22 were in arable fields more than 400m from the onshore project area. There was, however, a concentration of usage in closer proximity to the onshore substation compound where counts of up to 125 individuals were made.

99. In 2022-23, lapwing observations in the northern half of the onshore ornithology study area were less frequent, but there was a concentration of up to 153 individuals at Horsley Cross (where a TCC is proposed), and 56 individuals at the onshore substation compound area.

100. Notwithstanding this, the evidence does show that based on the records from 2021-22 and 2022-23, usage within the northern half of the onshore project area itself is generally low, and infrequent.

101. Birds present around the onshore substation compound and Horsley Cross may be from the Stour and Orwell Estuaries SPA and they may on occasion use fields within the onshore project area for feeding or roosting.

102. Any arable habitat loss associated with cable construction would however be short-term, localised and reversible, and not significantly different to annual changes in the agricultural landscape of the area. This is unlikely to affect the ability of lapwings to forage or roost successfully.

103. Overall impacts of permanent direct habitat loss associated with the onshore substation would also be relatively small scale in extent, and it is evident from survey results that alternative habitat nearby would be available. Therefore over the course of a winter, direct temporary or permanent habitat loss would not affect the survival rates within the lapwing SPA population. No AEoI is predicted.

Effects on functionally linked land: Disturbance

104. From studies carried out in West Sussex (Shrubb, 1988) and Hampshire (Milson et al. 1985) feeding and roosting lapwings demonstrated a preference for the most open habitats or for large fields, potentially to minimise predation and human disturbance risks. Cutts et al. (2013) considered lapwing to be of moderate sensitivity to disturbance and recommended a disturbance distance of around 300-400m for lapwing when planning operations at estuarine sites, but a smaller distance when inland.

105. Evidence therefore suggests that the main areas of lapwing activity recorded between the Stour and Orwell Estuaries SPA and the northern onshore project area are beyond potential disturbance range. Within the 400m onshore ornithology study area, most recorded activity was near the onshore substation compound and at Horsley Cross where a TCC is planned, and it is therefore possible that birds may be displaced from fields within and surrounding these areas, depending on agricultural practices at the time of construction.

106. Overall, disturbance due to construction activity would not however be at a level that would be significant for the Stour and Orwell Estuaries SPA lapwing population, based on the recorded distribution and frequency, and therefore

relatively low importance of the northern onshore project area. No effects on survival rates would occur over a winter, and no AEoI is predicted.

Indirect habitat effects on functionally linked land

107. Shrubb (1988) found that the main driver for lapwing feeding sites appeared to be the organic matter content of the soil, which significantly affects the population levels of soil and surface-dwelling invertebrates present. Disruption to the regular agricultural crop rotation due to trenching and cable installation may therefore temporarily reduce food concentrations in the soil, although this is likely to be limited to within the onshore project area footprint and reversible over the short- or medium-term. Pollution incidents within large arable fields preferred by lapwings would unlikely be diffuse, based on ground conditions, unless close to a watercourse. This is however unlikely to affect feeding birds (due to a reduction in prey density or contamination of prey), assuming that they would already be displaced from the area directly around ongoing construction works.

108. Overall the risk of indirect impacts on supporting habitats is low (not at least due to embedded mitigation based on good practice as outlined in Table 5.3) and, if it did occur, would be small-scale and reversible. No AEoI is therefore predicted.

Conclusions

109. Based on the above information, lapwing is the only Stour and Orwell Estuary SPA and Ramsar site species (as part of the non-breeding assemblage) that was found regularly within terrestrial habitats and in sufficient numbers within the northern part of the onshore ornithology study area to be considered for detailed assessment.

110. Occurrence of lapwings within the onshore project area was still however relatively low and the limited extent of direct or indirect habitat loss and disturbance on FLL, mainly associated with the onshore substation compound and Horsley Cross TCC, is not considered important to the SPA population. As impacts would be relatively limited in spatial extent, particularly with embedded mitigation, no impacts on lapwing survival rates over a winter are predicted.

111. It is therefore unlikely that any impacts would result in material effects on survival, productivity or distribution at a population level for any qualifying feature (or assemblage species). As a result, no AEoI of the Stour and Orwell Estuaries SPA are predicted. It can also be reasonably concluded that no AEoI of the Stour and Orwell Estuaries Ramsar site will occur.

5.4.4 Colne Estuary (Mid-Essex Coast Phase 2) SPA and Ramsar site

5.4.4.1 Site overview

112. A list of qualifying features for the Colne Estuary SPA and Ramsar site are presented in Table 5.4, and Table 5.7 provides information on cited and current populations. The SPA and Ramsar site are similar in extent and because impacts are likely to be similar, the assessment of effects on the integrity of the SPA is also applicable to the Ramsar site, unless specifically noted.

113. Colne Estuary SPA is 7.7km west of the onshore project area at its closest point (see Figure 1.2, Part 1 of the RIAA (Document Reference: 7.1.1)). It is an

integral component of the five phased Mid-Essex Coast SPAs, and supports internationally important populations of breeding birds, as well as internationally important assemblages of wintering waterfowl, present in both nationally and internationally important numbers. The Mid-Essex Coast comprises an extensive complex of estuaries and intertidal sand and silt flats, including several islands, shingle and shell beaches and extensive areas of saltmarsh (English Nature, 1993).

114. The diversity of estuarine habitats provides good quality feeding areas for a diversity of waterbird species. At high tide, the birds roost along the shoreline and salt marsh fringe.

Table 5.7 Cited and current populations of non-breeding qualifying features of Colne Estuary SPA

Species	Cited SPA Population (Individuals)	Current SPA Population (Individuals)*
Hen harrier	19	Unknown
Dark-bellied brent goose	5,315	3,649
Redshank	1,252	1,427
Cormorant	243	214
Mute swan	354	19
Shelduck	1,237	871
Goldeneye	262	1
Ringed plover	355	134
Grey plover	1,168	612
Sanderling	219	83
Dunlin	11,272	6,494
Black-tailed godwit	606	927
Curlew	938	399

* BTO WeBS core count data - five-year average from 2018-19 to 2022-23 for Colne Estuary sector (Woodward et al, 2024).

5.4.4.2 Shadow Appropriate Assessment

115. The Colne Estuary SPA lies further (7.7km) from the onshore project area than the other two SPAs considered above (800m for Hamford Water SPA and 3.3km for Stour and Orwell Estuaries SPA), as well as the Holland Haven Marshes SSSI (overlaps with landfall). The sections above have attributed the presence of some qualifying features occurring within the onshore project area as being part of the Hamford Water SPA and Stour and Orwell Estuaries SPA assemblages, and it therefore follows that individuals of these qualifying features recorded within the onshore project area are less likely to be from the Colne Estuary SPA. As the HRA Screening Report screened in the SPA due to theoretical connectivity within a 10km study area, a further screening of likely connectivity for qualifying features is however still required.

116. For qualifying features that are breeding species (little tern, pochard and ringed plover), based on the distance of the SPA to the onshore project area being

beyond foraging ranges, the low suitability of habitat, and the absence of records of these species within the onshore project area, it is considered that there is no connectivity, and no effects would occur.

117. As with Hamford Water SPA and Stour and Orwell Estuaries SPA, most of the SPA non-breeding season qualifying features and assemblage species show preferences for the type of wetland habitats that are found within the Colne Estuary SPA but not in most of the onshore project area, and were therefore absent from baseline surveys. The possible exceptions to this are the landfall area within Holland Haven Marshes SSSI (see Section 5.4.5) and the inland feeding areas that may be used by the wider-ranging dark-bellied brent geese (qualifying feature) and curlew (assemblage species) from the Colne Estuary SPA, both of which are considered below.

5.4.4.2.1 Curlew

118. As noted in Section 5.4.3.2, curlews can travel to feed up to around 5km inland from estuarine sites. Most inland concentrations of curlews within the onshore project area were found within 4-5km of Holland Haven Marshes SSSI and Hamford Water SPA (ES Figures 24.11 and 24.12 (Document Reference: 3.2.20)), suggesting those birds present within the onshore project area are likely to have roosted and spent most of their time within these closer designated sites, rather than Colne Estuary SPA. Therefore, although it cannot be completely discounted that curlews from the Colne Estuary SPA would travel to feed or roost within the onshore project area (see Section 5.4.5 below), the frequency of occurrence, and importance of the area for Colne Estuary SPA birds is likely to be low. Any habitat loss or disturbance would not affect the population and no AEoI is therefore predicted.

5.4.4.2.2 Dark-bellied brent goose

119. Wood (2007) stated that at least at the time of writing, there are nine separate large wintering flocks of dark-bellied brent geese in Essex with little interchange between them, with the Colne Estuary hosting two flocks, and single flocks at Hamford Water and on the Stour Estuary. It is also stated that in years of high numbers, brent geese may move up to 4km inland to feed. Rowell and Robinson (2004) also identified two dark-bellied brent goose flocks that winter on the Colne Estuary. The larger flock's main feeding area was at a reserve at East Mersea and the smaller flock was found around Colne Point.

120. Rowell and Robinson (2004) also note that in years when there have been high numbers (up to 1,000) birds from Hamford Water have moved south to Holland Haven.

121. The closest aggregations of dark-bellied brent geese to Colne Estuary SPA were recorded within the landfall survey area over 8km away. Based on the historic evidence provided and relative distances of SPAs from Holland Haven, geese present occasionally within and around the landfall area are much more likely to be from the closer Hamford Water SPA population than Colne Estuary SPA. Although it cannot be completely discounted that Colne Estuary birds would occasionally make wider movements towards the onshore project area, any habitat loss or disturbance associated with the Project is unlikely to impact on the survival of feeding or roosting birds through the winter, for the same reasons described above in the assessments of dark-bellied brent goose from other SPAs.

122. No AEoI on the Colne Estuary SPA dark-bellied brent goose population is therefore predicted.

5.4.5 Holland Haven Marshes: Potential usage as a refuge

123. During most of the winter, the Holland Haven Marshes SSSI non-breeding bird assemblage is likely to be sedentary and separate from the three SPA assemblages. It is, however, possible that, for example during periods of extreme cold weather and / or disturbance events such as wildfowling, coastal birds may undertake larger movements between estuaries. Holland Haven Marshes SSSI could therefore also be an occasional refuge at sensitive times for SPA qualifying features. In order of likelihood of origin, based on distances to Holland Haven Marshes SSSI, this may include birds from Hamford Water SPA, Colne Estuary SPA, then Stour and Orwell Estuaries SPA.

124. Table 5.8 provides an indication of peak flock sizes of species that are qualifying features at nearby SPAs which have been recorded at Holland Marshes, during monthly WeBS counts and non-breeding season surveys undertaken for the project (ES Appendices 24.1 (Document Reference: 3.3.40) and 24.3 (Document Reference: 3.3.42)). Although large-scale movements may be brief and occur during darkness (therefore may be easily missed) the results of both studies provide an indication of peak usage at Holland Marshes, placed within the context of the nearest SPA populations.

Table 5.8 Current populations of non-breeding qualifying features of SPAs and of Holland Haven Marshes (shaded = SPA qualifying feature)

Species	Holland Marshes – Webs Five Year Mean Count	Holland Marshes – Peak Survey Count	Hamford Water	Colne Estuary	Stour And Orwell Estuaries
Dark-bellied brent goose	641	110	5,657	2,847	3,349
Redshank	5	5	1,844	1,201	2,453
Cormorant	53	232**	562	227	3,254*
Mute swan	4	7	49	24	426
Shelduck	22	19	1,089	646	2,393
Goldeneye	0	0	2	2	150
Ringed plover	0	0	336	179	443
Grey plover	0	3	1,813	599	1,906
Sanderling	0	1	79	192	122
Dunlin	3	6	5,203	3,483	14,603
Black-tailed godwit	22	21	888	1,121	3,213
Curlew	25	54	863	351	1,651
Teal	280	324**	4,041	789	2,548
Pintail	2	16**	83	13	476

Species	Holland Marshes – Webs Five Year Mean Count	Holland Marshes – Peak Survey Count	Hamford Water	Colne Estuary	Stour And Orwell Estuaries
Knot	0	1	5,191	1,278	13,485
Lapwing	382	137	2,716	1,344	1,651*
Avocet	38	42	813	532	185

* Considered within context of non-breeding assemblage only. ** includes counts of birds on sea

125. For most species, including those such as dunlin, knot, grey plover and redshank that are numerous elsewhere, Holland Marshes appears to be unimportant, with low peak counts. For some, such as dark-bellied brent goose, cormorant, curlew, lapwing and teal, peak numbers can be higher, although still proportionately quite small compared to the nearest estuary SPA populations.

126. The HDD temporary construction compound would be located outside of the Holland Haven Marshes SSSI, approximately 600m from the Holland Marshes lagoon, which hosts the highest numbers of birds during the non-breeding season.

127. At this distance, it is unlikely that noise and visual disturbance or indirect impacts on habitats such as HDD 'break-outs' during construction would prevent SPA birds from using the lagoon as a refuge during winter. Embedded mitigation measures would however be adopted to minimise impacts on key aggregations of non-breeding birds, such as good construction practice, breakout contingency plan, ECoW presence, keeping existing hedgerows and vegetation for visual screening, or the installation of additional solid or acoustic fencing around compounds or noisy plant, where considered necessary. This is of particular relevance to the landfall HDD works near the Holland Haven Marshes SSSI.

128. It can therefore be reasonably be concluded that SPA birds would still be able to use Holland Marshes as an occasional refuge, and no AEoI of any SPAs would result.

5.4.6 Conclusions on AEoI to SPAs and Ramsar Sites

129. The above sections have provided an assessment of potential direct and indirect impacts that may result from the Project's construction (and decommissioning), on qualifying features of nearby Hamford Water SPA, Stour and Orwell Estuaries SPA and Colne Estuary SPA, and their associated Ramsar sites.

130. In general, usage of the onshore project area by qualifying features was sufficiently low and infrequent to be able to confidently conclude that the distribution, survival or productivity of populations would be unaffected, and consequently no AEoI of any SPA or Ramsar site would occur, particularly when embedded and additional mitigation measures are considered which would reduce disturbance and habitat loss / change on FLL.

5.4.7 In-combination effects

131. The in-combination assessment requires the identification of the other plans, projects and activities that may result in in-combination effects on onshore ornithological features (described as 'project screening').

132. The screening was informed by the development of a project list which forms an exhaustive list of plans, projects and activities within an appropriate onshore ornithology in-combination study area. This includes all projects across the whole of Essex where the Hamford Estuary SPA, Stour and Orwell Estuaries SPA and Colne Estuary SPA are located, but also includes projects within the part of Suffolk which is located within 10km of the Stour and Orwell Estuaries SPA (based on the consistent assumption that qualifying features, in this case, geese, may forage at most 10km from the three SPAs – see Table 5.1 for justification). The list was appraised, based on the confidence in being able to undertake an assessment from the information and data available, enabling individual plans, projects and activities to be screened in or out.

133. This project information is set out in Table 5.9, together with a consideration of the relevant details of each, including current status (e.g. under construction), planned construction period, closest distance to the North Falls project, status of available data and rationale for including or excluding from the assessment.

134. Following this screening process, three of the listed projects were included in the in-combination assessment: Five Estuaries, National Grid Energy Transmission's Norwich to Tilbury project, and Bradwell B New Nuclear Power Station. There were no projects within the Suffolk search area which were determined to be of a location, scale or nature that would impact upon SPA qualifying features.

135. The following sections evaluate the potential for in-combination effects with North Falls, firstly due to Five Estuaries; and then due to Five Estuaries, Norwich to Tilbury, and Bradwell B New Nuclear Power Station together.

Table 5.9 Summary of projects considered for the in-combination assessment in relation to SPAs and Ramsar sites (project screening)

Project	Status	Construction period	Closest distance from the onshore project area (km)	Confidence in data	Included in the in-combination assessment (Y/N)	Rationale
National Infrastructure Planning						
Five Estuaries Offshore Wind Farm EN010115	Pre-application	2028 – 2030	Five Estuaries onshore project area directly overlaps with North Falls onshore project area.	High	Yes	The onshore project area for Five Estuaries covers largely the same area as North Falls. There is also a possibility that both projects could be constructed at around the same time, therefore, in-combination effects may occur.
Norwich to Tilbury EN020027	Pre-application (PEIR submitted April 2024)	2027 – 2031	Proposed EACN Substation scoping area directly overlaps with North Falls onshore project area.	Low	Yes	The proposed substation area for Norwich to Tilbury is in close proximity to North Falls proposed onshore substation works area; and the proposed new substation operational access road overlaps with the Bentley Road improvement works. Therefore, in-combination impacts could occur.
East Anglia TWO Offshore Wind Farm EN010078	Approved (DCO Issued 2022)	Mid 2020s	47	High	No	The project's HRA did not screen in any onshore SPA apart from the Sandlings SPA, which comprises an area of heath with nightjar and woodlark as qualifying features. Due to the different habitats, no qualifying features from the Hamford Water SPA, Stour and Orwell Estuaries SPA or Colne Estuary SPA are likely to be affected. No in-combination impacts could occur.
Bradwell B new nuclear power station EN010111	Pre-application	Predicted 9 – 12 years	21	Low	Yes	The Stage One consultation document notes that the project would be in the vicinity of the Colne Estuary, and that arable fields within the site provide foraging habitat for wintering dark-bellied brent geese. As such in-combination effects may occur.
Ipswich Rail Chord TR040002	Approved (DCO issued 2012)	Built	17	High	No	Ipswich Rail Chord has already concluded construction and will therefore not contribute to in-combination effects during North Falls construction or

Project	Status	Construction period	Closest distance from the onshore project area (km)	Confidence in data	Included in the in-combination assessment (Y/N)	Rationale
						decommissioning periods. This project is unlikely to impact on SPA qualifying features so will not likely have an in-combination effect during operation.
Sizewell C Project EN010012	Approved (DCO issued 2022)	2022 – 2034	49	High	No	Sizewell C Project is located in Suffolk over 10km from the nearest screened in SPA (Stour and Orwell Estuaries SPA) and so no in-combination effects will occur.
Nautilus Interconnector EN020023	Pre-application	Information unavailable	44	Medium	No	The extent of onshore infrastructure associated with this project is not known, however, the proposed grid connection sites are located in Suffolk over 10km from the nearest screened in SPA (Stour and Orwell Estuaries SPA) and so no in-combination effects will occur.
Lake Lothing Third Crossing TR010023	Approved (DCO issued 2020)	Over two years	76	High	No	This is unlikely to impact on SPA qualifying features so will not have an in-combination effect on onshore ornithology.
Richborough Connection Project EN020017	Approved (DCO issued 2017)	Built	55	High	No	This project has already been built and is located outside of Essex and so no in-combination construction effects will occur.
Manston Airport TR02002	Information unavailable	Information unavailable	53	N/A	No	This project is located outside of Essex and so no in-combination effects will occur on the regional reference populations of North Falls IOFs.
Kentish Flats Extension EN010036	Approved (DCO issued 2013)	Built	46	High	No	This project is located outside of Essex and so no in-combination effects will occur on the regional reference populations of North Falls IOFs.
Sea Link EN020026	Pre-application	Information unavailable	20	N/A	No	The location of any onshore infrastructure associated with this project is not known, however, it is located outside of Essex and so no in-combination effects will occur on the regional reference populations of North Falls IOFs.
Galloper Offshore Wind Farm EN010003	Approved	Built	15	High	No	This project has already been built and so no in-combination construction effects will occur.
A12 Chelmsford to A120 widening scheme	Pre-examination	Information unavailable	27	Medium	No	This is unlikely to impact on SPA qualifying features so will not have any in-combination effects.

Project	Status	Construction period	Closest distance from the onshore project area (km)	Confidence in data	Included in the in-combination assessment (Y/N)	Rationale
TR010060						
Rivenhall IWMF and Energy Centre EN010138	Pre-application	Information unavailable	27	Medium	No	The project is located within a quarried area and is unlikely to impact on SPA qualifying species so will not have an in-combination effect.
Essex County Council						
Elmstead Hall, Elmstead, Colchester, Essex ESS/24/15/TEN	Approved	Information unavailable.	5	N/A	No	Small-scale project. No in-combination effects are predicted.
Land at: Elmstead Hall, Elmstead, Colchester, Essex ESS/105/21/TEN	Approved	Information unavailable.	5	N/A	No	Small-scale project. No in-combination effects are predicted.
St. George's Infant School and Nursery, Barrington Road, Colchester, Essex, CO2 7RW CC/COL/71/22	Approved	Information unavailable	9	N/A	No	Small-scale project and habitats are different to the North Falls onshore project area and so this is unlikely to impact on any SPA qualifying features. No in-combination effects are predicted.
Wilson Marriage Centre, Barrack Street, Colchester, Essex, CO1 2LR CC/COL/85/22	Approved	Information unavailable	9	N/A	No	Small-scale project and habitats are different to the North Falls onshore project area and so this is unlikely to impact on any SPA qualifying features. No in-combination effects are predicted.
Wivenhoe Quarry Alresford Road, Wivenhoe, Essex, CO7 9JU ESS/80/20/TEN/42/2	Approved	Information unavailable	7	N/A	No	Small-scale project and habitats are different to the North Falls onshore project area and so this is unlikely to impact on any SPA qualifying features. No in-combination effects are predicted.
Old Heath County Primary School, Old Heath Road, Colchester, Essex, CO2 8DD CC/COL/50/22	Approved	Information unavailable.	8	N/A	No	Small-scale project and habitats are different to the North Falls onshore project area and so this is unlikely to impact on any SPA qualifying features. No in-combination effects are predicted.
Crown Quarry (Wick Farm), Old Ipswich Road, Ardleigh, CO7 7QR ESS/57/04/TENLA4	Approved	Information unavailable.	6	N/A	No	Existing quarry. Habitats are different to the North Falls onshore project area and so this is unlikely to impact on any SPA qualifying features. No in-combination effects are predicted.
Crown Quarry (Ardleigh Reservoir Extension), Wick Farm, Old Ipswich	Approved	Information unavailable.	3	N/A	No	Existing quarry. Habitats are different to the North Falls onshore project area and so this is unlikely to

Project	Status	Construction period	Closest distance from the onshore project area (km)	Confidence in data	Included in the in-combination assessment (Y/N)	Rationale
Road, Tendring, Colchester, CO7 7QR ESS/57/04/TENLA4						impact on any SPA qualifying features. No in-combination effects are predicted.
Martell's Quarry, Slough Lane, Ardleigh, Essex, CO7 7RU ESS/42/22/TEN	Out for consultation	Information unavailable	3	N/A	No	Habitats are different to the North Falls onshore project area and so this is unlikely to impact on any SPA qualifying features. No in-combination effects are predicted.
Land at: Martells Quarry, Slough Lane, Ardleigh, Essex, CO7 7RU ESS/39/22/TEN/NMA/1	Approved	Information unavailable	3	N/A	No	Habitats are different to the North Falls onshore project area and so this is unlikely to impact on any SPA qualifying features. No in-combination effects are predicted.
Land to the south of Colchester Main Road, Alresford, Colchester, CO7 8DB ESS/17/18/TEN?NMA2	Report being prepared	Information unavailable	6	N/A	No	Small-scale project and habitats are different to the North Falls onshore project area and so this is unlikely to impact on any SPA qualifying features. No in-combination effects are predicted.
Tendring Education Centre, Jaywick Lane, Clacton on Sea, Essex, CO16 8BE CC/TEN/40/21/3/1	Approved	Information unavailable.	6	N/A	No	Small-scale project and habitats are different to the North Falls onshore project area and so this is unlikely to impact on any SPA qualifying features. No in-combination effects are predicted.
Tendring Education Centre, Jaywick Lane, Clacton on Sea, Essex, CO16 8BE CC/TEN/40/21/4/1	Approved	Information unavailable.	6	N/A	No	Small-scale project and habitats are different to the North Falls onshore project area and so this is unlikely to impact on any SPA qualifying features. No in-combination effects are predicted.
Ardleigh Waste Transfer Station, A120, Ardleigh, Colchester, CO7 7SL ESS/04/17/TEN	Approved	Information unavailable.	5	N/A	No	Habitats are different to the North Falls onshore project area and so this is unlikely to impact on any SPA qualifying features. No in-combination effects are predicted.
35 Roach Vale, Colchester, CO4 3YN CC/COL/07/22	Approved	Information unavailable.	4	N/A	No	Small-scale project and habitats are different to the North Falls onshore project area and so this is unlikely to impact on any SPA qualifying features. No in-combination effects are predicted.
Boxted Bridge, Boxted, Essex, CO4 5TB CC/COL/106/21	Report being prepared	Information unavailable	9	N/A	No	Small-scale project and habitats are different to the North Falls onshore project area and so this is unlikely to impact on any SPA qualifying features. No in-combination effects are predicted.

Project	Status	Construction period	Closest distance from the onshore project area (km)	Confidence in data	Included in the in-combination assessment (Y/N)	Rationale
Lufkins Farm, Great Bentley Road, Frating CO7 7HN ESS/99/21/TEN/SO	Environmental Impact Assessment (EIA) not required	Information unavailable.	6	N/A	No	Small-scale project. No in-combination effects on SPA qualifying features are predicted.
Lufkins Farm, Great Bentley Road, Frating CO7 7HN ESS/99/21/TEN	Resolution made/ awaiting legal agreement	Information unavailable.	6	N/A	No	Small-scale project. No in-combination effects are predicted.
Tendring District Council						
Land Between the A120 and A133, To The East of Colchester and of Elmstead Market 21/01502/CMTR	Awaiting decision	Information unavailable.	3	N/A	No	Small-scale project and habitats are different to the North Falls onshore project area and so this is unlikely to impact on any SPA qualifying features. No in-combination effects are predicted.
Hamilton Lodge Parsons Hill Great Bromley Colchester Essex CO7 7JB 20/00547/OUT	Approval-outline	Information unavailable.	2	N/A	No	Small-scale project and habitats are different to the North Falls onshore project area and so this is unlikely to impact on any SPA qualifying features. No in-combination effects are predicted.
Land adjacent to Lawford Grid Substation Ardleigh Road Little Bromley Essex CO11 2QB. 21/02070/FUL	Approved	Information unavailable.	0.3	N/A	No	Small-scale project. No in-combination effects are predicted.

5.4.7.1 Five Estuaries

5.4.7.1.1 Habitat loss and indirect impacts on functionally linked land

136. The Five Estuaries onshore project area largely overlaps with the North Falls onshore project area, albeit with a separate onshore substation compound. The overlapping nature of both project areas means that the Five Estuaries construction would affect the same SPA qualifying features (and potentially the same individuals in some cases) as those for the North Falls project.

137. The worst-case construction scenario for onshore ornithology assumes that North Falls 'Option 1' build out is progressed (see RIAA Part 1, Section 2 (Document Reference: 7.1.1)) and Five Estuaries undertakes a separate landfall, onshore substation and onshore cable route construction and cable pull with a multi-year (i.e. > three year) gap between the two construction activities.

138. This scenario would increase the duration of possible habitat loss or indirect habitat impacts on FLL for SPA qualifying features, in some cases becoming a long-term impact (over a number of breeding or non-breeding seasons).

139. The only location where there is some potential for additional in-combination habitat loss impacts is where the Five Estuaries project would have a separate onshore substation compound, and temporary and permanent attenuation ponds. It should be noted however that the worst-case assessment of construction for North Falls alone assumed full site clearance of the onshore substation compound, which includes the Five Estuaries onshore substation infrastructure, and so the only additional spatial habitat loss impacts would relate to permanent Five Estuaries onshore substation infrastructure.

140. Based on the assessment in Sections 5.4.2 – 5.4.4 above for North Falls only, the SPA qualifying features that have the potential to be impacted by additional habitat loss or alteration within the onshore project area are shelduck, teal and dark-bellied brent goose from Hamford Water SPA, and lapwing from Stour and Orwell Estuaries SPA. There would be no AEoI for any other qualifying feature.

141. For the screened-in qualifying features, although the duration of habitat loss would be increased by both projects occurring simultaneously, this extent of habitat loss or alteration in mainly suboptimal habitats for these species is still very small and therefore unlikely to affect the survival of any individuals. For lapwing, which was recorded in proximity to the onshore substation works area, there would be some permanent in-combination habitat loss due to the two projects, but because of the mobility of the species and relative infrequence of occurrence in this area, no additional impacts are predicted on the Stour and Orwell Estuaries SPA lapwing population. As such, no AEoI can be concluded.

5.4.7.1.2 Effects on functionally linked land: Disturbance

142. As with habitat loss and indirect impacts on FLL, it is likely that the same species / individuals could be affected by the increased duration of disturbance (it is assumed that with sequential construction there would be no difference in the spatial extent of disturbance between the two projects, albeit exact locations of construction may slightly differ, particularly in the onshore substation compound area, where separate infrastructure is required).

143. Whilst the increased duration of construction activities may mean that disturbance impacts are more likely to occur on particular birds than if only one project was constructed (or both projects were constructed simultaneously), it is assumed that both projects would have similar embedded and additional mitigation measures to avoid significant disturbance effects on all species.

144. As outlined in Sections 5.4.2 – 5.4.4 above, the only SPA qualifying species that may be found within the onshore project area are teal, shelduck and dark-bellied brent goose from Hamford Water SPA, and lapwing from the Stour and Orwell Estuaries SPA. In all cases, the recorded distribution and frequency of presence of these species within the onshore ornithology study area indicates that no significant disturbance impacts would occur to any SPA population, with all parts being of low importance at best compared to more suitable permanent wetland habitats within and beside the SPAs and SSSIs in the local area. As such, no AEoI can be concluded.

5.4.7.2 Five Estuaries, Norwich to Tilbury and Bradwell B New Nuclear Power Station

5.4.7.2.1 Norwich to Tilbury

145. Norwich to Tilbury is a project to reinforce the high-voltage power network in East Anglia. It would comprise approximately 184km of new electricity infrastructure, comprising new overhead lines and a new 400kV substation.

146. The new substation is proposed to be built by National Grid, close to the preferred location for the North Falls onshore substation (and Five Estuaries onshore substation). North Falls is planned for construction from 2027 at the earliest, compared to 2027 to 2031 for Norwich to Tilbury.

147. It is likely that similar qualifying features will be affected by the construction of the Norwich to Tilbury onshore substation, with lapwing from the Stour and Orwell Estuaries SPA the qualifying feature most likely to be affected (see Section 5.4.3.2). Assuming a similar location and size of substation as that planned for North Falls and Five Estuaries, an increased area of habitat for feeding may be affected due to habitat loss and / or construction disturbance. It is however considered that due to the distribution and low frequency of lapwing records in this area it is unlikely that the scale of loss would make a material difference to the survival rates within the SPA population and therefore no adverse in-combination effects are predicted for all projects. As such, no AEoI can be concluded.

5.4.7.2.2 Bradwell B New Nuclear Power Station

148. Bradwell B is a proposed new nuclear power station at Bradwell-on-Sea in Essex. It would be located approximately 3.2km south-west of the Colne Estuary SPA, but beyond the maximum 10km search area for Hamford Water SPA or Stour and Orwell Estuaries SPA. As noted above in Section 5.4.4.2 the only Colne Estuary SPA qualifying feature that may be found within the onshore project area is dark-bellied brent goose.

149. In addition to the power station site itself (covering approximately 230 hectare (ha)), the project will also require some associated developments in the area to support construction, such as park and ride sites, temporary accommodation, marine transport facilities and road improvements. Construction would take 9-12 years. Stage One consultation took place in 2020 and the associated report summarised likely ornithological interest. It was noted that the arable fields

within the site provide foraging habitat for wintering dark-bellied brent geese, which have historically been recorded there in large numbers.

150. The total footprint would be greater for Bradwell B than for North Falls, Five Estuaries or Norwich to Tilbury, and some habitat used by geese associated with the Colne Estuary SPA, but more likely the closer Blackwater (Mid-Essex Coast Phase 4) SPA or Dengie (Mid-Essex Coast Phase 1) SPA (both of which have dark-bellied brent goose as a qualifying feature) may be lost either temporarily or permanently.

151. A proposed ecological mitigation strategy for the Bradwell B site includes habitat creation / enhancement which may benefit geese, and so overall the in-combination significance of habitat loss for dark-bellied brent goose from the Colne Estuary SPA is not predicted to increase above that predicted for North Falls alone, or combined with Five Estuaries and Norwich to Tilbury projects.

152. The decision to locate the power station on the higher ground to the south and west of the existing Bradwell power station was influenced by reducing potential disturbance of wintering birds using the coastal mudflats which are centred on Dengie Flats to the east of the site. It is however possible that some dark-bellied brent geese may forage further inland and so during the construction period, birds may be disturbed from adjacent land. As noted above, birds present are most likely to be from the nearer Blackwater SPA or Dengie SPA than Colne Estuary SPA, and overall, it is considered unlikely that in-combination disturbance with all projects would result in an AEoI to the Colne Estuary SPA.

5.4.8 Overall conclusion

153. The evidence presented above indicates that, when taking into consideration mitigation, it is concluded that no AEoI of the Hamford Water SPA and Ramsar site, Stour and Orwell Estuaries SPA and Ramsar site, or Colne Estuary SPA or Ramsar site, will occur due to the project, either alone or in-combination with other projects.

5.5 Onshore ecology (onshore SACs)

5.5.1 Hamford Water SAC

5.5.1.1 SAC overview

154. Hamford Water SAC is a large, shallow estuarine basin within the Greater Thames Estuary National Character Area (NCA) that covers an area of 50.34ha, comprising tidal creeks, islands, intertidal mud, sand flats and saltmarshes. Above the saltmarsh there is unimproved and improved grassland (including grazing marsh), scrub, woodland, hedges, ditches, ponds and reedbeds. The underlying geology consists of Tertiary, Palaeogene clays overlain by Neogene and early Pleistocene crag deposits and fluvial deposits of mud, sand and shingle.

155. The SAC is designated primarily for the presence of the Annex II species Fisher's estuarine moth *Gortyna borelli lunata* which is only found in two UK locations, the north Essex coast and the north Kent coast.

156. No other species or habitats are listed as primary reasons or qualifying features of the SAC's designation.

157. The location of Hamford Water SAC is shown on Figure 1.2, Part 1 of the RIAA (Document Reference: 7.1.1).

5.5.1.1.1 Fisher's estuarine moth

Details of the qualifying feature

158. The Fisher's estuarine moth is a European Protected Species (EPS) listed on Annex II of the Habitats Directive (92/43/EEC) and implemented in the UK by the Conservation of Habitats and Species Regulations 2017 (as amended). Additionally, the Fisher's estuarine moth is also a Red Data Book listed species. The species is also listed in Schedule 5 of the Wildlife and Countryside Act 1981 (as amended), which under Section 9 of the Act makes it an offence to intentionally kill, injure or take wild Fisher's estuarine moth.

159. The total UK population has been previously estimated to be 1,000 – 5,000 adult moths (Gibson, 2000). Of the 12 UK occurrence records for the moth species available on the National Biodiversity Network (NBN) Atlas[1], six are situated within Hamford Water SAC (NBN Atlas Partnership, 2021a). Whilst these records date from 1973 –1989 and so are unlikely to accurately represent the current population in the SAC, it is nevertheless indicative that Hamford Water SAC supports a substantial component of the UK's Fisher's estuarine moth population, and (as noted below) is the key UK site for this species.

160. The site is described in the SAC citation as follows:

"*Hamford Water supports the majority of the Essex population and is the most important UK site for this species, supporting approximately 70% of the population. Hamford Water is a large, shallow estuarine basin comprising tidal creeks, islands, intertidal mud, sand flats and saltmarshes. Above the saltmarsh there is unimproved and improved grassland (including grazing marsh), scrub, woodland, hedges, ditches, ponds and reedbeds. The site encompasses those areas where the moth's food plant hog's fennel Peucedanum officinale grows and where there is an abundance of the grasses required by the species for egg laying*." (JNCC, 2016).

161. The moth's eggs hatch in late spring, where larvae then feed on hog's fennel stems and roots before pupating, with adults finally emerging in autumn (Butterfly Conservation, 2023). Larvae of Fisher's estuarine moth are therefore dependent on their sole food plant, hog's fennel *(Peucedanum officinale)*, which also has a very limited distribution and is at risk from sea-level rise as well as historic poor habitat management (Ringwood, Hill and Gibson, 2004). Hog's fennel, even though it is a coastal species, cannot tolerate saltwater so is more closely associated with sea walls and coastal grasslands (Butterfly Conservation, 2023). Coastal grasses such as sea couch *Elymus pungens* and false oat-grass *Arrhenatherum elatius* that often surround hog's fennel are utilised by Fisher's estuarine moth for oviposition and are also essential for their

[1] The records obtained from NBN Atlas excluded those held under a Creative Commons with attribution non-commercial (CC-BY-NC) data licence, as such records cannot be used for commercial purposes. The NBN Atlas records used were held under either an Open Government Licence (OGL) or Creative Commons No right reserved licence (CC0).

breeding success. Without such coarse grass species, oviposition is not possible (Ringwood, Hill and Gibson, 2002). JNCC (2024) state the main threats to Fisher's estuarine moth in the UK are sea level rise and inappropriate habitat management of hog's fennel.

162. Of the 27 occurrence records for hog's fennel in the UK available on the NBN Atlas, two are situated within Hamford Water SAC dated from 2017 and 2018 (NBN Atlas Partnership, 2021b).

163. In 2006, a project was set up to plant a sustainable landscape-scale network of Hog's fennel sites and habitat suitable for Fisher's estuarine moth on the Essex coast (Action for the Wild, 2022). The creation of habitat has, to date, involved planting 32 sites along the Essex coastline. Habitat creation has been combined with captive breeding of Fisher's estuarine moth at Colchester Zoo since 2008, establishing new wild populations of the species with positive records of larval feeding in 20 out of the 27 areas studied (Action for the Wild, 2022; Gardiner *et al.*, 2016). The success of reintroducing this moth species is underpinned by connectivity, quality and density of wild hog's fennel, therefore any works which adversely impact hogs' fennel will in turn indirectly impact Fisher's estuarine moth. Coarse grasses for moth oviposition have not required habitat management intervention due to being relatively common species.

164. Actions and targets set out in the Butterfly Conservation Regional Action Plan for Anglia (Joy and Bourn, 2000) relating to the conservation of the Fisher's estuarine moth include:

- Continuing the monitoring of the moth over parts of its range;
- Supporting ecological research so that it can more easily be conserved, particularly concerning the larval habitats occupied by the species; and
- Continuing to liaise with land managers to ensure they are aware of the importance of this moth and appropriate management for this species.

Status of the qualifying feature within the onshore project area and adjacent habitats

165. Hamford Water SAC is situated 0.8km north of the onshore project area at its closest point, near Landermere.

166. Records of hog's fennel within Hamford Water SAC are associated with coastal grassland habitats, typically being found adjacent to areas of sea wall, or on the landward side of the coastal zone adjacent to upper saltmarsh (NBN Atlas 2021b; Natural England, 2019a; 2019b; 2019c). These coastal grassland habitats are not found within the onshore project area. Similarly, Fisher's estuarine moth records are located entirely within the footprints of the SAC (NBN Atlas, 2021a).

167. Hog's fennel was recorded within the bounds of Holland Haven Marshes SSSI in *Lolium perenne – Alopecurus pratensis – Festuca pratensis* grassland (National Vegetation Code (NVC) code MG7c) in the National Vegetation Classification (NVC) survey undertaken 2021. In this grassland type, coarse grasses required by the species for egg laying would be fairly common. Holland Haven Marshes SSSI is within the onshore project area and all land within the SSSI boundary is being avoided through the use of HDD techniques to install

cable ducts in this area. Full details of the NVC survey are outlined in ES Appendix 23.7 (Document Reference: 3.3.36).

168. Due to the strong association between Fisher's estuarine moth and its host plant, it was assumed that moth populations could be utilising the hog's fennel found within the Holland Haven Marshes SSSI. This has since been confirmed by a terrestrial and aquatic invertebrate survey undertaken in 2021, which reports known records (obtained from a data search from Essex Field Club) of the moth species within Holland Haven Marshes SSSI, although the onshore project area. This population is potentially isolated from the Hamford Water SAC moth population, however, is still of national notable importance. Full details of the invertebrate survey are outlined in ES Appendix 23.6 (Document Reference: 3.3.35).

169. Generally, moth home ranges and dispersal rates vary between species and are highly dependent on wind speed and species-specific habitat resource availability (Alerstam *et al*., 2011). Due to the coastal location increasing exposure and the specificity of larval feeding behaviour, it is likely Holland Haven Marshes SSSI and Hamford Water SAC populations of Fisher's estuarine moth are isolated and do not mix while breeding or feeding. Distinctly separate populations of Fisher's estuarine moth have been recorded between the mainland and Skippers Island within Hamford Water SAC, which are approximately 1.7km apart (Gardiner and Ringwood, 2010). Hamford Water SAC is approximately 5.7km north of Holland Haven Marshes SSSI, therefore moth population mixing is unlikely due to the geographical distance of these two sites.

5.5.1.2 Conservation objectives

170. The conservation objectives identified for Hamford Water SAC, as detailed by Natural England (2019b), include maintaining or restoring:

- The extent and distribution of the habitats of qualifying species;
- The structure and function of the habitats of qualifying species;
- The supporting processes on which the habitats of qualifying species rely;
- The populations of qualifying species; and
- The distribution of qualifying species within the site.

171. The implementation of these conservation objectives will 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 (FCS) of its Qualifying Features (i.e. Fisher's estuarine moth).

5.5.1.3 Shadow Appropriate Assessment

172. The only qualifying feature of Hamford Water SAC and therefore the only feature to be considered in this assessment is the Fisher's estuarine moth.

173. The Fisher's estuarine moth's dispersal is dependent on the presence of its larval food plant, hog's fennel, as well as coarse grass species required for oviposition. Hog's fennel is present within certain areas of Holland Haven Marshes SSSI, but not within the onshore project area.

174. It is unlikely that the population of Fisher's estuarine moth present within the Holland Haven Marshes SSSI is linked to or a component of the moth population at Hamford Water SAC, mainly due to geographical isolation. The Holland Haven Marshes SSSI population of Fisher's estuarine moth is nevertheless included in this assessment as it forms part of the local habitat network which provides some resilience to the population found within the Hamford Water SAC.

5.5.1.3.1 Impact 1: Indirect disturbance of Annex II species from noise.

175. As noted above, there is limited evidence as to the effects of noise pollution on moths, other than a limited potential for noise and dust to affect moth physiology, behaviour, and reproduction (Newport, Shorthouse and Manning, 2014; Van Dongen, Lens and Matthysen, 2001).

176. Hamford Water SAC is located within the precautionary Zone of Influence (ZoI) of 1km for noise disturbance identified in the HRA Screening Report (RIAA Appendix 1.1 (Document Reference: 7.1.1.1)), however it is outside the specific 500m ZoI buffer for invertebrates and there is no clear link indicating that either Fisher's estuarine moth nor the habitat which supports it will be at risk from disturbance from noise generating activities, including the HDD works at the landfall within Holland Haven Marshes SSSI. Therefore, will be no effects on Fisher's estuarine moth or their habitat within Hamford Water SAC due to noise.

177. It should be also noted that, any excess noise produced by the Project during construction will be localised and temporary in nature. Measures to minimise the emissions during the Project's construction are set out in the Outline Code of Construction Practice (Document Reference: 7.13).

178. As a result of impacts being localised and temporary, no indirect effects arising from noise disturbance will impact Annex II species such as the Fisher's estuarine moth, and no AEoI is therefore predicted.

5.5.1.3.2 Impact 2: Indirect disturbance of Annex II species from visual / lighting

179. As the Annex II Fisher's estuarine moth is a nocturnal species, artificial light at night has the potential to impact moths during construction.

180. Excessive exposure to artificial light can cause life cycle changes in moths, specifically larvae entering pupation too early, and larvae emerging from pupation much earlier than larvae which were not exposed to artificial light (Van Geffen *et al.,* 2014). Artificial light reducing the overall larval pupation period may result in reduced fitness and increased mortality.

181. Artificial light at night has also been found to inhibit breeding behaviour in moth species. Female moths found in areas with artificial light at night have been found to have reduced breeding rates than those in non-illuminated areas (Van Geffen et al., 2015). Furthermore, male moths in areas with artificial light have shown reduced attraction to female moth pheromone traps, which can in turn show reduced attraction to female moths when exposed to artificial light at night (Van Geffen *et al.,* 2015).

182. Outside of breeding, artificial light at night also impacts moth species interactions, including intra-specific communication, trophic interactions and plant–pollinator interactions, with cascading effects in the ecosystem and impacts on ecosystem functioning (Grubisic and Van Grunsven, 2021). Reduced population sizes and changes in invertebrate community composition

because of exposure to artificial light at night have been reported, but the understanding of the impacts is still very limited in scientific literature.

183. As part of the embedded mitigation set out in ES Chapter 23 Onshore Ecology (Document Reference: 3.1.25), security lighting used during construction adheres as far as possible to accepted lighting guidance (Bat Conservation Trust (BCT) and Institute of Lighting Professionals (ILP), 2023). This includes the following measures:

- Ensure security lighting is cowled and angled downwards and does not shine directly on sensitive habitats; and
- Ensure security lighting is motion activated to minimise unnecessary lighting.

184. By employing sensitive lighting measures within the onshore project area during construction, artificial light at night will be localised to zones and habitats which are not of value to the Annex II Fisher's estuarine moth i.e. those located at approximately 800m from the boundary of the SAC, and at least from 300m from any of the records reported during the 2021 Invertebrate Survey at Holland Haven Marshes SSSI (ES Appendix 23.6 (Document Reference: 3.3.35)). Therefore, it is unlikely that the above adverse effects artificial lighting can have on moths will occur. If light spill does occur into valuable areas for the moth species, this disturbance will be temporary and will not have a long-term adverse effect on local populations and their dynamics.

185. In respect of the operational period after construction, operational lighting will be localised to the area surrounding the onshore substation, which does not contain suitable habitat for Fisher's estuarine moth and is 12km from Hamford Water SAC, and 14km from Holland Haven Marshes SSSI.

186. As a result of impacts being localised and temporary and the mitigation proposed, no indirect effects arising from light and visual disturbance will impact Annex II species such as the Fisher's estuarine moth, and no AEoI is therefore predicted.

5.5.1.3.3 Impact 3: Indirect effects on Annex I habitats and Annex II species arising from changes in supporting surface or groundwater resources

187. There is theoretically a pathway for effects upon Hog's fennel within the SAC boundary arising from increases in sediment / potential pollutant release during installation of cable ducts across watercourses located approximately 1.3km upstream of the Hamford Water SAC. In addition, changes in groundwater resources have the theoretical potential to affect the areas with Hamford Water SAC suitable for hog's fennel growth, therefore limiting habitat resources for the Fisher's estuarine moth. As part of the Project's embedded mitigation, the watercourses which feed Hamford Water are proposed to be crossed using trenchless techniques (HDD) to minimise the risks of any downstream effects. As such the only effects which may arise will be in the event of 'break-out' i.e. when drilling fluid (an inert clay) is accidentally released into the watercourse. The development and implementation of a breakout management plan, and outline version of which is provided with the DCO application (Document Reference: 7.15) as outlined in Section 5.2.3, will reduce the risk of break-out, and mitigate the effects should they occur. The plan will include measures to trap and remove the clay before it is released downstream.

188. The trenching works and trenchless works located within the catchment will not extend greater than 2m below ground level for trenching works or 10m below ground level for trenchless duct installation. As such the interaction with ground water resources are minimal, and connectivity with the ground water resources which support Hamford Water and hog's fennel within the SAC are not anticipated.

189. As a result of embedded mitigation, no indirect effects arising from changes in supporting surface or groundwater resources will impact Annex II species such as the Fisher's estuarine moth, and no AEoI is therefore predicted.

5.5.1.3.4 Impact 4: Direct and indirect effects on ex-situ habitats which support Annex II species of European sites.

190. As established in the terrestrial and aquatic invertebrate survey undertaken in 2021 (ES Appendix 23.6 (Document Reference: 3.3.35)), it is highly likely that Fisher's estuarine moth are present within the Holland Haven Marshes SSSI. Holland Haven Marshes SSSI has habitat suitable for both larval feeding and oviposition by the Fisher's estuarine moth, specifically with the presence of hog's fennel and coarse grass species. Neither hog's fennel nor the Fisher's Estuarine moth been recorded within the sections of Holland Haven Marshes SSSI within the onshore project area, with the nearest location being approximately 100m to the west.

191. North Falls has committed to using HDD techniques to avoid direct impacts on land within the SSSI. Using HDD would therefore avoid destruction of the moth's habitat, larvae, eggs, and adult populations within the onshore project area at Holland Haven Marshes SSSI, were they to be present within the onshore project area. Furthermore, the onshore project area refinement has moved the onshore project area outside the areas of Fisher's estuarine moth and hog's fennel records within the SSSI to further minimise the risk. Hog's fennel and the coarse grass species which support the moth are terrestrial species and are at a low at risk in the unlikely event of a breakout during the HDD process, as any effects within terrestrial habitats will be extremely localised.

192. By refining the onshore project area at landfall and committing to HDD at this section of the onshore project area, no indirect effects on ex-situ habitats which support Annex II Fisher's estuarine moth will occur, and no AEoI is therefore predicted.

5.5.2 In-combination effects

5.5.2.1 In-combination construction effects

5.5.2.1.1 Five Estuaries

193. The overlapping nature of both North Falls and Five Estuaries onshore project areas means that the Five Estuaries construction activities will very likely also affect Holland Haven Marshes SSSI, which (as outlined above) has resident Fisher's estuarine moth.

194. In the Five Estuaries DCO application, there is a commitment to using trenchless techniques at landfall, crossing Holland Haven Marshes SSSI. The potential for in-combination effects on Fisher's estuarine moth within the onshore project area are therefore considered to be limited if there is also temporal overlap in construction activities. North Falls is planned for

construction from 2027 at the earliest, compared to 2028 to 2030 for Five Estuaries and so parallel and sequential construction may occur. However, given the avoidance of Fisher's estuarine moth habitat by virtue of the embedded mitigation and HDD techniques outlined above, this is unlikely to change the overall likelihood of adverse effects on Fisher's estuarine moth.

195. As noted above, in-combination effects during the Projects' operation have not been screened in for further assessment.

196. No other projects have been identified that potentially impact the habitat of Fisher's estuarine moth.

5.5.3 Overall conclusion

197. The evidence presented above indicates that, when taking into consideration mitigation, no adverse effect on the integrity of the Hamford Water SAC will occur due to the Project either alone or in-combination with other projects.

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