



The Sizewell C Project

5.10 Shadow Habitats Regulations Assessment Addendum

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EXECUTIVE SUMMARY

Introduction

This Shadow Habitats Regulations Assessment Addendum ('Addendum') assesses the implications of a number of proposed changes to the Development Consent Order (DCO) application for the Sizewell C Project ('the Application'), the additional baseline surveys and other information ('Additional Information') on the findings of the **Shadow HRA Report** (Doc Ref. 5.10).

The proposed changes considered relevant to the scope of this Addendum (because they have the potential to affect the conclusions of the **Shadow HRA Report** (Doc Ref. 5.10)) are as follows:

- Change 1: Potential to increase in the frequency of freight train movements to facilitate bulk material imports by rail.
- Change 2: An enhancement of the permanent beach landing facility and construction of a new, temporary beach landing facility.
- Change 5: Change to the location of the water resource storage area and the addition of flood mitigation measures to lower flood risk.

The Additional Information relevant to this Addendum is as follows:

- updated baseline surveys undertaken in late 2019-2020 for wintering waterbirds, breeding waterbirds, nightjar, marsh harrier and terns.
- additional fish assessments, comprising revised predictions of fish entrapment, further assessment of potential effects on certain fish stocks and European populations estimates of twaite shad.
- additional noise modelling outputs.
- further analysis of inter-pathway effects.

In addition to the above, while not being the primary objective of this Addendum, some points received in Relevant Representations have been addressed where they have a bearing on the scope of the Shadow HRA.

Scoping of European sites

The Additional Information and the proposed changes do not alter the outcome of the scoping exercise as reported in the **Shadow HRA Report** (Doc Ref. 5.10).

In its Relevant Representation, the Environment Agency made reference to potential effects of the Sizewell C Project (due to entrapment) on additional European sites

(i.e. beyond those assessed in the Shadow HRA Report) with allis shad *Alosa alosa*, twaite shad *Alosa fallax* and river lamprey *Lampetra fluviatilis* as qualifying interest features.

In light of the Environment Agency's Relevant Representation, further analysis of potentially relevant European sites has been undertaken. This results in additional European sites being scoped into the assessment, as summarised below:

- Allis shad: Plymouth Sound and Estuaries Special Area of Conservation (SAC) and seven SACs in northern France are scoped into the likely significant effect (LSE) screening assessment.
- Twaite shad: two additional SACs, both located in northern France, are scoped into the LSE screening assessment.
- River lamprey: seventeen additional European sites, located in the Scheldt, Ems, Weser, Elbe, Eider river systems and along the northern French coast, are scoped into the LSE screening assessment.

Screening of potential effects

The Additional Information and the proposed changes do not alter the outcome of the LSE screening as reported in the **Shadow HRA Report** (Doc Ref. 5.10).

The LSE screening exercise has been supplemented to include the additional European sites with migratory fish qualifying interest features that have been scoped into the assessment. The relevant screening category is '*physical interaction between species and infrastructure*' (i.e. impingement and entrainment of fish in the cooling water system).

For European sites with allis shad as a qualifying interest feature, LSE can be excluded because of the very low predicted impingement at Sizewell C. the scale of predicted effect would not affect any European site, regardless of location.

LSE cannot be excluded for all additional European sites scoped into the assessment for twaite shad and river lamprey. Without mitigation, it is predicted that 2,989 twaite shad and 2,929 river lamprey would be impinged at Sizewell C. These European sites are, therefore, carried through to the next stage of the HRA (appropriate assessment).

Updates to baseline conditions

a) Coastal, freshwater and terrestrial habitats

There is no Additional Information relevant to the assessment on European sites with coastal, freshwater and terrestrial habitat qualifying interest features.

b) Birds

A number of additional bird baseline surveys have been undertaken to augment those reported in the **Shadow HRA Report** (Doc Ref. 5.10).

i. Alde-Ore Estuary SPA and Ramsar site

Data from further surveys of tern foraging activity undertaken from May to August 2020 are relevant to the breeding little tern and breeding Sandwich tern qualifying features and of the Alde-Ore Estuary Special Protection Area (SPA) and Ramsar site.

The surveys recorded low levels of occurrence of both of these species in near-shore areas in the vicinity of the Alde-Ore Estuary SPA and Ramsar site. This is associated with the fact that neither species has bred at the SPA and Ramsar site for several years. The data does not, therefore, alter the conclusions drawn in the **Shadow HRA Report** (Doc Ref. 5.10).

ii. Minsmere to Walberswick SPA and Ramsar site

Further survey work has been undertaken to augment the existing baseline data for some of the key qualifying features of the Minsmere-Walberswick SPA and Ramsar site, namely:

- Wintering waterbirds (gadwall and shoveler): surveys were undertaken of the Sizewell Marshes and Minsmere South Levels over the winter of 2019/20. Nocturnal surveys for white-fronted goose are being undertaken over the winter of 2020/21.

The number of gadwall recorded in the Sizewell Marshes in 2019/20 was substantially lower than in either the 2014/15 or 2018/19 winters. In contrast, numbers were substantially higher in the Minsmere South Levels.

There were no records of shoveler in the Sizewell Marshes during the 2019/20 surveys. Substantially higher numbers of shoveler were recorded in the Minsmere South Levels during 2019/20 than in either of the previous winter surveys

- Breeding waterbirds (avocet, bittern, gadwall, shoveler and teal): these surveys covered the same areas as the wintering waterbird survey.

The abundance estimates from the 2020 surveys suggested relatively low breeding numbers of avocet, gadwall, shoveler and teal in the Minsmere South Levels and, particularly, the Sizewell Marshes. For the Sizewell Marshes the findings from 2020 are largely consistent with those from earlier years.

A single bittern record was obtained during the dedicated breeding waterbird surveys. This finding is consistent with earlier surveys reported in the **Shadow HRA Report** (Doc Ref. 5.10), which indicated limited usage of the Minsmere South Levels and Sizewell Marshes by bittern during the breeding season.

- Marsh harrier: surveys of marsh harrier flight activity were undertaken in 2020 across 11 areas, aligned closely with the areas surveyed and reported in the **Shadow HRA Report** (Doc Ref. 5.10). The data from the 2020 surveys closely corresponds with that presented in the Shadow HRA Report (Doc Ref. 5.10) based on previous surveys.
- Nightjar: surveys of nightjar were undertaken in May and June 2020 to determine the presence of birds within potentially suitable habitat within and adjacent to the main development site.

There were no records of nightjar during either the May or June surveys; this is consistent with the findings of earlier surveys reported in the **Shadow HRA Report** (Doc Ref. 5.10).

- Little tern: the approach for the surveys of little tern foraging activity were as detailed for the Alde-Ore Estuary SPA and Ramsar site described above.

Records of foraging little terns were concentrated in the near-shore areas around the more northerly Vantage Points (VPs). There were relatively few records of foraging little terns overall, with almost all of these occurring during the first survey in May. These results are associated with the occurrence of little terns at the Minsmere colony but their subsequent failure to breed at the colony and, therefore, provide limited further information on the foraging distribution of the Minsmere-Walberswick SPA and Ramsar site breeding little tern population.

iii. Outer Thames Estuary SPA

The further surveys of tern foraging activity described above for the Alde-Ore Estuary SPA and Ramsar site are relevant to the breeding little tern and breeding common tern qualifying features for which the Outer Thames Estuary SPA provides supporting foraging habitats.

For common terns, the distribution of foraging birds in relation to the different VP locations was broadly similar to that for little terns but with common terns being more abundant and present over the full survey period. A higher proportion of the common tern records were further offshore than for little terns.

Because common terns may forage considerable distances offshore (and well beyond the distances at which birds can be recorded during shore-based surveys), these surveys have limited value in determining the full extent of the important marine foraging areas of this species.

c) Marine mammals

There is no further baseline data relevant to the assessment for marine mammals.

The Additional Information on fish impingement predictions is relevant to the assessment of potential effects on marine mammals.

d) Migratory fish

Further work to identify the possible spawning population of twaite shad and to estimate its size based concluded that the most likely origin of the twaite shad caught at Sizewell is fish originating from the Elbe and to a lesser extent the Scheldt. An estimated annual average of 5.2 million adult twaite shad passed through these two river systems, with the majority being in the Elbe.

No further baseline information is available for allis shad or river lamprey.

Information for appropriate assessment

e) Coastal, freshwater and terrestrial habitats

There is no relevant Additional Information to the assessment of potential effects on coastal, freshwater and terrestrial habitats.

The enhanced permanent Beach Landing Facility (BLF) and a new, temporary facility have the potential to cause different effects on coastal processes to that described in the **Shadow HRA Report** (Doc Ref. 5.10) (the effect pathway is referred to as '*alteration of coastal processes / sediment transport*'). This pathway is relevant to the following European sites:

- Alde, Ore and Butley Estuaries SAC.
- Alde-Ore Estuary Ramsar site.
- Benacre to Easton Bavents Lagoons SAC.
- Minsmere to Walberswick Heaths and Marshes SAC.
- Minsmere-Walberswick Ramsar site.
- Orfordness to Shingle Street SAC.

During construction, the coastal processes assessment concludes the BLFs would not have an effect on the screened in European sites and qualifying features from a coastal process perspective.

During operation, the low density spacing of the piles means that both the BLFs would allow passage of water and sediment through the structures, and the effect on currents and waves would be minimal. It is concluded that there would be no effect

on the screened in European sites and qualifying features from a coastal process perspective.

The above conclusions align with those drawn in the **Shadow HRA Report** (Doc Ref. 5.10). Consequently, the proposed change does not alter the findings of the **Shadow HRA Report** (Doc Ref. 5.10) for the listed European sites and there would not be an adverse effect on the integrity of these European sites.

f) **Birds**

i. **Alde-Ore Estuary SPA and Ramsar site**

Implications of Additional Information

Sandwich terns continue to be absent from this European site as a breeding species and the 2020 surveys provided little information on foraging areas in the vicinity of the SPA (and Ramsar site). The additional survey data do not, therefore, add in any substantive way to the existing baseline data for this SPA population and do not change the conclusion of no adverse effect on integrity.

A similar position exists for little tern, with the 2020 surveys providing very few records of foraging birds within the vicinity of the European site. However, there was no apparent avoidance of areas predicted to be encompassed by the thermal and chemical plumes associated with discharges from SZB. Therefore, the additional survey data from 2020 do not change the conclusion of no adverse effect on integrity.

Assessment of proposed changes

Change 2 - Enhanced permanent BLF and new, temporary BLF

Given the minimal effects on coastal processes predicted to arise as a result of the construction of the BLFs, no adverse effects are predicted on the qualifying features of the Alde-Ore Estuary SPA (and Ramsar site) as a result of the alteration of coastal processes / sediment transport.

ii. **Minsmere to Walberswick SPA and Ramsar site**

Implications of Additional Information

In addition to the further survey data, the Additional Information relevant to the assessment of the Minsmere-Walberswick SPA and Ramsar site includes further noise modelling for the construction works associated with the main development site. Specifically, this further noise modelling provides information on chronic noise levels and night-time noise levels during the construction period, together with updates to formally incorporate the construction of the water resource storage area located in the northeast of the main development site into the modelling and to

further refine the existing modelling presented in the **Shadow HRA Report** (Doc Ref. 5.10).

Breeding birds

With respect to breeding avocet, bittern, marsh harrier, little tern, gadwall, shoveler, teal, nightjar and non-breeding gadwall and shoveler, the data derived from the additional surveys undertaken in 2020 do not alter the conclusions drawn in the **Shadow HRA Report** (Doc Ref. 5.10).

The implications of the additional noise modelling on breeding and non-breeding bird populations has been assessed.

The areas encompassed by the 65dB L_{Amax} contour and 70dB L_{Amax} contour (the thresholds below which there are unlikely to be effects of construction noise on breeding waterbirds and foraging marsh harrier respectively) in the updated daytime noise modelling for Phases 1 to 4 are essentially unchanged compared to the modelling outputs used in Shadow HRA, except for Phase 1 in the vicinity of the flood compensation area and wetland (formerly a proposed water storage area) in the northeast of the main development site. However, because the construction of this feature would occur during winter, this would not coincide with the seasonal period relevant to the SPA breeding bird population.

Predicted chronic noise levels are lower than for impulsive noise during the same construction phase. For Phases 3 and 4, predicted noise levels are relatively low (at 40 - 50dB L_{Aeq}) across much of the Minsmere South Levels but higher across the Sizewell Marshes. However, the assessment undertaken in the Shadow HRA Report assumed that potential effects of noise disturbance on breeding waterbirds could occur across much of the Sizewell Marshes because most of the area is encompassed by the 65dB L_{Amax} contour during Phases 1 and 2.

Night-time construction noise would occur at low levels across the Sizewell Marshes and, particularly, Minsmere South Levels.

Neither chronic noise levels nor night-time noise are considered to be relevant to the assessment of potential disturbance effects on foraging marsh harrier.

In summary, consideration of the additional noise modelling in relation to breeding birds (avocet, bittern, marsh harrier, gadwall, shoveler, teal and nightjar) does not change the conclusion of the **Shadow HRA Report** (Doc Ref. 5.10).

Because the breeding little tern colony is beyond the distance at which construction noise from the main development site is predicted to have potential effects, the additional noise modelling has no implications for the SPA (and Ramsar site) breeding little tern population.

Non-breeding birds

Consideration of the additional noise modelling in relation to non-breeding hen harrier does not change the conclusion of no adverse effect on integrity, for the same reasons as outlined above for foraging breeding marsh harrier.

The Shadow HRA concluded that the 70dB L_{Amax} represented a suitable threshold below which there are unlikely to be effects of construction noise on non-breeding waterbirds. The areas encompassed by this contour are essentially unchanged from the outputs used in **Shadow HRA Report** (Doc. Ref. 5.10).

The differences in the Phase 1 modelling associated with the flood compensation area and wetland (formerly a proposed water storage area) are consistent with the findings of the initial modelling of the construction of the water storage area in isolation, as reported in the Shadow HRA. Furthermore, the 70dB L_{Amax} contour does not extend into the areas of the Minsmere South Levels which are of most importance to wintering waterbirds.

In summary, consideration of the additional noise modelling in relation to non-breeding gadwall and non-breeding shoveler does not change the conclusion of no adverse effect on integrity.

Assessment of proposed changes

Change 1 - Potential to increase in the frequency of freight train movements to facilitate bulk material imports by rail

The updated noise modelling demonstrates that the areas of land encompassed by the 65dB and 70dB L_{Amax} contours are essentially unchanged compared to the modelling outputs used in Shadow HRA. Consequently, it can be concluded that the increased frequency of freight train movements will not affect the conclusions of the **Shadow HRA Report** (Doc Ref. 5.10) in relation to potential effects of noise disturbance on the SPA (and Ramsar site) qualifying features.

Change 2 - An enhancement of the permanent beach landing facility and construction of a new, temporary beach landing facility

This proposed change has the potential to affect the qualifying features of the Minsmere-Walberswick SPA (and Ramsar site) via:

- Alteration of coastal processes / sediment transport during construction and (potentially) decommissioning
- Water quality effects – marine environment, during construction and (potentially) decommissioning
- Disturbance effects on species populations, during construction and (potentially) decommissioning.

For all of the SPA qualifying features except little tern, disturbance effects on species populations is the only relevant pathway (due to airborne noise generated by piling and potential for visual disturbance due to the artificial lighting associated with the new temporary BLF).

The updated noise modelling predicts less encroachment of the 65dB and 70dB L_{Amax} contours onto the SPA and, particularly, areas of functionally linked habitat in the Minsmere South Levels and Sizewell Marshes compared with the modelling for the main development site without the proposed change. This is due to refinements to the ground absorption areas within the model and updated assumptions on a small number of the construction activities.

For breeding little tern, the following effect pathways are relevant:

- alteration of coastal processes / sediment transport: no more than minimal effects on coastal process are predicted to arise as a result of the proposed change.
- water quality effects – marine environment: the assessment concludes that the proposed change would not result in greater effects than those assessed in the **Shadow HRA Report** (Doc Ref. 5.10).
- disturbance effects on species populations: there would be an increase in the number of vessel movements compared to that assessed in the Shadow HRA. However, the existing usage of the area by vessels, together with the fact that little terns foraging offshore are considered to be relatively insensitive to sources of anthropogenic disturbance, means that the increase in the expected levels of vessel traffic associated with the proposed change would not change the conclusion of the **Shadow HRA Report** (Doc Ref. 5.10). Furthermore, construction of the BLFs would occur outside the little tern breeding season.

In conclusion, the proposed change does not affect the conclusions of the **Shadow HRA Report** (Doc Ref. 5.10) for all qualifying interest features of the Minsmere-Walberswick SPA (and Ramsar site).

Change 3 - Change to the location of the water resource storage area and the addition of flood mitigation measures to lower flood risk

This change does not affect the conclusions drawn in the **Shadow HRA Report** (Doc Ref. 5.10) because the proposed construction of the flood mitigation area and wetland would have similar impacts to those assessed for the proposed water storage area in the same location in the Shadow HRA Report.

iii. Outer Thames Estuary SPA

Implications of Additional Information

For little tern and common tern, consideration of the 2020 survey data does not change the conclusion of no adverse effect on integrity as a result of potential effects on marine water quality during construction, operation and decommissioning or as a result of potential disturbance effects on species populations.

Assessment of proposed changes

Change 2 - An enhancement of the permanent beach landing facility and construction of a new, temporary beach landing facility

This proposed change has the potential to result in increased disturbance effects on breeding little tern and breeding common tern. For little tern, potential effects are limited to those colony populations from within (or close to) the Minsmere-Walberswick SPA (which currently comprise a small proportion of the overall little tern population for which the Outer Thames Estuary SPA provides supporting habitat).

With regard to common tern, several colonies contribute to the Outer Thames Estuary SPA common tern population, with birds from the Orfordness and Minsmere breeding colonies (within the Alde-Ore Estuary SPA and Ramsar site and Minsmere-Walberswick SPA and Ramsar site, respectively) potentially susceptible to noise and visual disturbance effects.

Indirect effects due to the effects of underwater noise on the fish prey species of common tern would not result from the construction of the BLFs because these works would occur outside the common tern breeding season. With respect to disturbance from vessel traffic, much of the foraging by common terns from the Minsmere and Orfordness colonies occurs in waters which experience high levels of vessel movements and common terns foraging offshore are considered to be relatively insensitive to sources of anthropogenic disturbance, such as vessel traffic.

Consequently, the proposed change would not alter the conclusion of the Shadow HRA Report that no adverse effects on the Outer Thames Estuary SPA little tern and common tern populations are predicted as a consequence of noise and visual disturbance.

Red-throated divers are highly sensitive to noise and visual disturbance in their wintering areas. An assessment of the predicted increase in vessel deliveries to the BLFs would result in a small increase in the existing levels of vessel traffic within the SPA, whilst birds which are displaced would be subjected to a brief period of effect only. Consequently, it is considered that the proposed change would not alter the conclusion of the **Shadow HRA Report** (Doc Ref. 5.10) of no adverse effects on the SPA non-breeding red-throated population.

g) Marine mammals

i. Implications of Additional Information

The revised predictions of fish impingement do not alter the conclusions of the Shadow HRA Report (Doc Ref. 5.10) with respect to European sites with grey seal, harbour porpoise or harbour seal qualifying interest features.

ii. Assessment of proposed changes

Change 2 - An enhancement of the permanent beach landing facility and construction of a new, temporary beach landing facility

The most relevant potential effect associated with this change is underwater noise generated by piling. The assessment has been updated to reflect the proposed piling required for the construction of the BLFs.

In addition, finalised JNCC guidance for assessing the significance of noise disturbance against conservation objectives of harbour porpoise SACs has been taken into account. The effect of this guidance is that the assessments for the Southern North Sea SAC are based on a worst-case.

The assessment concludes that the findings of the Shadow HRA Report (Doc Ref. 5.10) are unchanged with respect to grey seal (Humber Estuary SAC), harbour porpoise (Southern North Sea SAC) and harbour seal (The Wash and North Norfolk Coast SAC).

h) Migratory fish

i. Implications of Additional Information

The revised predicted annual impingement predictions do not alter the conclusions of the **Shadow HRA Report** (Doc Ref. 5.10) for the Humber Estuary SAC. The prediction for river lamprey is lower than that used as the basis for assessment in the Shadow HRA Report. For sea lamprey, the mitigated annual impingement losses are estimated to be less than one fish.

For the additional mainland European sites screened into the assessment for river lamprey, a weaker pathway for effect compared with that assessed for the Humber Estuary SAC, and an adverse effect on integrity can be excluded.

For European sites with twaite shad as a qualifying interest feature, the calculation of an estimated population size for this species does not alter the outcome of the assessment because the predicted impingement is the same as reported in the **Shadow HRA Report** (Doc Ref. 5.10). This conclusion also applies to the additional European sites screened into the assessment, given there is a weaker pathway for effect due to their greater distance from the Sizewell C site.

ii. Assessment of proposed changes

There are no proposed design changes that are relevant to the assessment of potential effects on migratory fish relevant to European sites.

1 INTRODUCTION

1.1 Background

1.1.1 NNB Generation Company (SZC) Limited (SZC Co.) submitted an application for a Development Consent Order (DCO) to the Planning Inspectorate under the Planning Act 2008 for the Sizewell C Project (referred to as the 'Application') in May 2020. The Application was accepted for examination in June 2020.

1.1.2 Since the submission of the Application, SZC Co. has continued to engage with the local authorities, environmental organisations, local stakeholder groups and the public to gather their responses to the Application. This process has identified potential opportunities for changing the Application to further minimise impacts on the local area and environment in many cases, whilst reflecting the further design detail that has come forward in preparation for implementation of the Sizewell C Project.

1.1.3 In addition to the proposed changes, SZC Co. has continued to develop the detail of its proposals and of the implementation of the Sizewell C Project (the 'Project'), and has undertaken some additional environmental assessment work in response to continuing engagement with stakeholders. This 'Additional Information' adds to the information supporting the Application and should assist interested parties in their understanding of matters.

1.1.4 The proposed changes and the Additional Information are described and assessed in a number of updates and addenda to the originally submitted Application documents.

1.2 Purpose of the Shadow HRA Addendum

1.2.1 A **Shadow Habitats Regulations Assessment (HRA) Report** (Doc Ref. 5.10) [APP-145 to APP-152] was submitted as part of the Application. It comprised four volumes, as follows:

- **Shadow HRA Report, Volume 1: Stages 1 and 2 - Screening and Appropriate Assessment** (Doc Ref. 5.10) [APP-145 to APP-149].
- **Shadow HRA Report, Volume 2: Stage 3 – Assessment of Alternative Solutions** (Doc Ref. 5.10) [\[APP-150\]](#).
- **Shadow HRA Report, Volume 3: Stage 4 - Imperative Reasons of Overriding Public Interest (IROPI)** (Doc Ref. 5.10) [\[APP-151\]](#).

- **Shadow HRA Report, Volume 4: Compensatory Measures** (Doc Ref. 5.10) [\[APP-152\]](#).

1.2.2 This report is an Addendum to the Shadow HRA Report. The purpose of this Shadow HRA Addendum is to present an assessment of any new or different effects that are likely to result from: (i) updated baseline surveys undertaken in late 2019-2020 for wintering waterbirds, breeding waterbirds, nightjar, marsh harrier and terns, (ii) Additional Information on fish assessments, comprising revised predictions of fish entrapment, further assessment of potential effects on certain fish stocks and European populations estimates of twaite shad, (iii) additional noise modelling outputs, (iv) assessment of effects of proposed changes to the Application and (v) further analysis of inter-pathway effects. The opportunity is also taken to provide a Site Integrity Plan for the Southern North Sea (SNS) Special Area of Conservation (SAC).

1.2.3 This Addendum includes details of the information described below, along with an assessment of the implications of the information on the original Shadow HRA Report.

a) **Baseline bird surveys**

1.2.4 Additional Information that is relevant to the Shadow HRA Report includes a number of further bird baseline survey reports as follows:

- Wintering waterbirds (**Chapter 2, Appendix 2.9.A** of the **ES Addendum** (Doc Ref. 6.14)).
- Breeding waterbirds (Found in both (Doc Ref. 6.13) [\[AS-021\]](#) and **Chapter 2, Appendix 2.9.A4** of the **ES Addendum**).
- Nightjar (Doc Ref. 6.13(A)) [\[AS-036\]](#).
- Marsh harrier (Doc Ref. 6.13(A)) [\[AS-036\]](#).
- Terns (Doc Ref. 6.13) [\[AS-022\]](#).

1.2.5 For wintering waterbirds, the Additional Information that is relevant to the Shadow HRA relates to the wintering gadwall and shoveler populations, for which an additional, complete, winter season of Project-specific survey data are available.

1.2.6 Project-specific surveys of breeding waterbirds and breeding nightjar were undertaken during the 2020 breeding season. These data are valuable in augmenting the information presented in the **Shadow HRA Report** (Doc Ref. 5.10) to further determine the usage of the relevant areas by these

qualifying features within the Shadow HRA Report (Doc Ref. 5.10). Furthermore, for the waterbirds, these recent survey data provide distributional information within the Minsmere South Levels and Sizewell Marshes.

- 1.2.7 In addition to the above, further Project-specific surveys were undertaken on foraging terns and marsh harriers during the 2020 breeding season. For terns, these surveys augment existing shore-based surveys from 2011 and 2013 (providing data on usage of near-shore habitats), whilst for marsh harrier they augment the data collected from 2014 to 2016 on foraging activity across a series of sample plots on wetland and agricultural habitats within relatively close proximity to the main development site. These latter data provide the basis for predicting the extent of the potential loss of marsh harrier foraging resource due to noise and visual disturbance during construction.

b) [Additional Information on fish assessments](#)

- 1.2.8 Since the submission of the Application, Additional Information on fish populations has become available, some of which is relevant to the Shadow HRA Report. This Additional Information is summarised as follows:

- Prediction of fish entrapment (Ref. 1.1). This document represents a further revision of a document included in the Application to reflect further stakeholder consultation, an updated low velocity side entry (LVSE) factor, updated impingement predictions for Sizewell B and the findings of a number of additional studies.
- Consideration of potential effects on selected fish stocks at Sizewell (Ref. 1.2). This document provides the results of the assessment of fish entrapment at a more localised scale than the relevant spawning stock biomass estimates produced by the International Council for the Exploration of the Sea (ICES) for the appropriate internationally agreed stock areas (which is the assessment methodology applied in Ref. 1.1).
- Estimates of European populations of twaite shad and cucumber smelt (Ref. 1.3). This document identifies the possible spawning population of twaite shad (*Alosa fallax*) for which there is no known spawning stock biomass estimate and estimate its population size.

c) [Additional noise modelling outputs](#)

- 1.2.9 Additional noise modelling was undertaken to supplement the modelling presented and used within the **Shadow HRA Report** (Doc Ref. 5.10).

Noise modelling for the Shadow HRA focussed on consideration of the daytime impulsive noise levels (i.e. as measured by L_{Amax}) for the different phases of the construction period. The further noise modelling presented in this Addendum considers:

- Updated modelling of L_{Amax} for daytime during Phases 1, 2 and 3 and 4 of the construction period, including formal incorporation of the construction works associated with the water resource area in the north-east of the main development site within the modelling for Phase 1 (noting that this is relevant only to the first winter of the construction period, as opposed to the entirety of Phase 1).
- Modelling of daytime chronic noise (i.e. as measured by L_{Aeq}) for Phases 3 and 4 of the construction period (on the basis that these phases will extend over the longest period of time, meaning that the chronic noise effects during this period are most relevant in considering the potential for effects on bird populations).
- Modelling of both L_{Amax} and L_{Aeq} noise during night-time for Phases 3 and 4, when night-time construction activities are planned to occur.

d) Proposed changes

1.2.10 This Addendum also considers the effects that may arise in respect of the proposed changes. Each of the proposed changes is reviewed in **Chapter 2 (Table 2.1)**, and those changes which are then considered in greater detail in that chapter and which are potentially relevant to the HRA are:

- Potential to increase in the frequency of freight train movements to facilitate bulk material imports by rail (Change 1).
- An enhancement of the permanent beach landing facility and construction of a new, temporary beach landing facility (Change 2).
- Change to the location of the water resource storage area and the addition of flood mitigation measures to lower flood risk (Change 5).

e) Inter-pathway effects

1.2.11 The Planning Inspectorate's Advice note 10 (Ref. 1.4) and its associated Appendix 1 (HRA Screening Matrices) requires that likely significant effect (LSE) on each qualifying feature is identified for each potential effect (screening pathway), on a pathway-by-pathway basis, and also in-combination effects (defined by Advice note 10 as '*an appraisal of the effects of any other plans or projects which, in combination with the*

Proposed Development, might be likely to have a significant effect on the European site(s)'. SZC Co. has followed this approach and guidance in the Shadow HRA.

1.2.12 The **Shadow HRA Report** (Doc Ref. 5.10) draws an overall conclusion regarding the effect on European site integrity when all pathways for effect are considered collectively (for habitats, marine mammals, birds and migratory fish). SZC Co. took a highly precautionary approach to the LSE screening stage. Therefore, all relevant pathways that could have any influence on the qualifying features of European sites were included in the appropriate assessment stage.

1.2.13 Further analysis of the pathways for effect on all European sites that were screened into the Shadow HRA has been undertaken to analyse the potential for inter-pathway effects for each European site (**Appendix 1A**). The supplementary analysis supports the conclusions of the within-Project (i.e. SZC Project 'alone') assessment.

f) **Southern North Sea Special Area of Conservation Site Integrity Plan**

1.2.14 Natural England, in its response to a review of an interim draft (November 2019) of the **Shadow HRA Report** (Doc Ref. 5.10), recommended that a Site Integrity Plan (SIP) be prepared for the SNS SAC. In response, a SIP has been prepared (**Appendix 9A**). Its overall objective is to reduce the risk of any significant disturbance to harbour porpoise in the SNS SAC winter area as a result of underwater noise, in-combination with other plans and projects.

1.2.15 Since completion of the **Shadow HRA Report** (Doc Ref. 5.10) JNCC (Ref. 9.1) has finalised guidance for assessing the significance of noise disturbance against conservation objectives of harbour porpoise SACs. The guidance identifies noise generating activities that can potentially result in disturbance to harbour porpoise and provides recommended Effective Deterrence Ranges (EDR) for these activities; this guidance has been taken into account in **Section 9** of this Addendum).

2 SUMMARY OF THE PROJECT

2.1 Relevant changes

2.1.1 A full description of the Project is provided in the Application. As a result of ongoing discussions with stakeholders and project contractors, SZC Co. have identified a number of design changes to further reduce impacts on the local area and maximise project construction efficiency.

2.1.2 The proposed changes are described in **Chapter 2** of the **ES Addendum** (Doc Ref. 6.14). **Table 2.1** in this section includes an initial assessment to determine whether each of the proposed changes would alter the conclusions of **Shadow HRA Report** (Doc Ref. 5.10). Where a proposed change could alter the conclusions that have previously been drawn, further assessments have been undertaken as presented in **Sections 7 to 9**.

2.1.3 In summary, the implications of the following proposed changes on the conclusions of the **Shadow HRA Report** (Doc Ref. 5.10) have been assessed:

- Change 1: Potential to increase in the frequency of freight train movements to facilitate bulk material imports by rail.
- Change 2: An enhancement of the permanent beach landing facility and construction of a new, temporary beach landing facility.
- Change 5: Change to the location of the water resource storage area and the addition of flood mitigation measures to lower flood risk.

Table 2.1: Initial assessment of HRA implications of proposed design changes

Design change	Outline description	HRA implications
Change 1: Potential to increase the frequency of freight train movements to facilitate bulk material imports by rail	Changes to the frequency of freight train movements using the rail infrastructure.	The increase in the frequency of freight train movements could result in greater noise levels during the construction and (potentially) decommissioning periods, with implications for the assessment of disturbance effects on species populations in relation to the Minsmere-Walberswick SPA (and Ramsar site). This proposed change is, therefore, considered further in Section 8 .
Change 2: An enhancement of the permanent beach landing facility and construction of a new, temporary beach landing facility	<p>To increase the amount of Abnormal Indivisible Loads that could be delivered by sea during construction, it is necessary to make the seabed in front of the permanent BLF better able to receive more regular deliveries by barge without requiring additional maintenance works. The current design limits the permanent BLF's capacity to receive more regular deliveries. The proposed change would add a grounding platform (also known as grillage), which is assumed to be made of a combination of concrete, timber and steel, or similar. It would protrude above bed level by less than a metre and shallow foundations are assumed to be embedded into the sea bed. The seabed would be graded to a roughly level surface before laying the platform. Excavated material would not be removed from the sea and would be placed in close proximity to the BLF.</p> <p>To reduce the amount of construction material that would otherwise need to be delivered by land, a temporary BLF is proposed predominantly for the delivery of bulk construction materials, such as aggregate. Other types of material may also</p>	This proposed change could affect habitats due to changes to coastal processes and birds and marine mammals, primarily due to potential effects on marine water quality and disturbance. This proposed change is, therefore, considered further in Sections 7, 8 and 9 .

Design change	Outline description	HRA implications
	be imported through the temporary BLF, such as marine tunnel segments for marine works.	
Change 3: Greater flexibility as to where certain Sizewell B facilities are relocated to potentially avoid the need for car parking on Pillbox Field	As part of SZC Co.'s commitment to continue to engage with stakeholders and explore the possibility for re-using previously developed land within the existing Sizewell power station complex, an area of land within the Sizewell A complex has become potentially available for use by the Sizewell B relocated facilities project, subject to the completion of a land agreement. In addition, following further design development, the layout of the relocated facilities has been revised to facilitate easier and more efficient construction.	Due to the location, nature and scale of this proposed change, it is concluded there is no potential to alter the findings of the Shadow HRA Report (Doc Ref. 5.10) because the change would not introduce a new effect pathway to a European site or result in a different effect on qualifying interest features of a European site. This change is, therefore, considered to be outside the scope of this Addendum.
Change 4: Change to certain parameter heights and activities on the main development site	<p>The quantity of materials that need to be managed on-site has increased by approximately two million tonnes. To accommodate this additional material an additional stockpile area would be required up to approximately 15m above ground level (35mAOD). The Application already applies for construction activities up to this height in the location and this change therefore relates to an additional activity, to also allow for stockpiling.</p> <p>The proposed design of the temporary HCDF has changed and released approximately 50m of additional usable space that allows marine tunnelling works to take place outside of the cut off wall. Relocation of the marine tunnelling works means that other construction works within the cut off wall can commence before the marine tunnelling work is complete, thereby making construction more efficient and potentially faster.</p> <p>Since the submission of the Application, there has been further contractor involvement which has identified further detail on the approximate routes of access and haul roads.</p>	Due to the location, nature and scale of this proposed change, it is concluded there is no potential to alter the findings of the Shadow HRA Report (Doc Ref. 5.10) because the change would not introduce a new effect pathway to a European site or result in a different effect on qualifying interest features of a European site. This change is, therefore, considered to be outside the scope of this Addendum.

Design change	Outline description	HRA implications
	<p>SZC Co. intends to construct a bat barn to compensate for potential disturbance for bats. The new structure would be approximately 6m above ground level (8m AOD).</p> <p>SZC Co. intend to improve connectivity between the two sites by providing a new mammal culvert located in close proximity to the existing culvert at Lover's Lane north of Leiston Recycling Centre. It would be designed with features to encourage use by mammals including otters and water voles. Otter fencing would also be installed to guide animals to the culvert.</p> <p>SZC Co. intend to reduce the height of the southernmost pylon from 79m AOD to 59m AOD ..</p>	
<p>Change 5: Change to the location of the water resource storage area and the addition of flood mitigation measures to lower flood risk</p>	<p>Further design work has identified that the water storage area can now be temporarily located elsewhere on the construction site, adjacent to a proposed attenuation pond, also known as water management zone 5, and adjacent to the proposed borrow pits and stockpiles.</p> <p>The storage area's original proposed location would instead provide additional, permanent, fluvial flood mitigation. Wetland habitat would also be created in this area, comprising open water channels and wet reedbeds to provide high quality foraging habitats for marsh harriers and other species during the construction of Sizewell C.</p> <p>Once the construction of Sizewell C is complete and compensatory marsh harrier foraging habitats are no longer required, the open water and wet reedbed habitats could be transitioned to wet woodland habitats, either through natural successional processes or through planting. In the long term, if progressed, this would compensate for the loss of wet woodland</p>	<p>This proposed change has potential implications for the assessment of disturbance effects on species populations in relation to the Minsmere-Walberswick SPA (and Ramsar site). This proposed change is, therefore, considered further in Section 8.</p>

Design change	Outline description	HRA implications
	from the Sizewell Marshes SSSI. The flood mitigation area would also be linked to the proposed permanent wetland habitat corridor immediately to the south to create a single integrated wetland feature.	
Change 6: Change to the Site of Special Scientific Interest (SSSI) crossing design to a single span bridge with embankments	<p>The design of the SSSI crossing is proposed to be changed, to comprise separate embankments at either end with an approximately 30m long single-span bridge connecting them. A sheet pile barrier wall would be driven into the ground either side of the Leiston Drain, with the total distance between the walls being approximately 24m. The bank and channel of Leiston Drain would be unaffected.</p> <p>This new bridge design would retain substantially more space around the Leiston Drain. The revised design retains an approximate crest width of 40m at road level and an overall width of up to approximately 70m at its base. Splayed wing walls over the Leiston Drain would maximise daylight and reduce the amount of permanent SSSI land take of wet woodland habitat stated in the Application by approximately 0.02ha.</p> <p>During construction, the SSSI crossing would continue to include segregated lanes for pedestrians, two-way light goods vehicles and two-way working for off-highway dump trucks.</p> <p>Two "Bailey" style temporary crossings would be installed in advance of the main culvert crossing and within the SSSI crossing working area to provide an early route between the temporary construction area and the main construction area and to facilitate construction of the permanent bridge.</p>	Due to the location, nature and scale of this proposed change, it is concluded there is no potential to alter the findings of the Shadow HRA Report (Doc Ref. 5.10) because the change would not introduce a new effect pathway to a European site or result in a different effect on qualifying interest features of a European site. This change is, therefore, considered to be outside the scope of this Addendum.

Design change	Outline description	HRA implications
Change 7: Revisions to tree retention on the main development site	Three locations where changes are proposed to the DCO Landscape Retention and Site Clearance Plans have been identified. These changes have arisen from the conflicts between retained landscape and access required into various parts of the site as detailed design has progressed in preparation for implementation.	Due to the location, nature and scale of this proposed change, it is concluded there is no potential to alter the findings of the Shadow HRA Report (Doc Ref. 5.10) because the change would not introduce a new effect pathway to a European site or result in a different effect on qualifying interest features of a European site. This change is, therefore, considered to be outside the scope of this Addendum.
Change 8: Surface water removed early in the construction process to be discharged to the foreshore via a temporary outfall	<p>In the period before the CDO is constructed, surface water would be temporarily pumped from the construction site, over the temporary sea defences and into a chamber before discharging water through a gravity pipe towards the shoreline. The pipe size is assumed to be less than 50cm in diameter. A maximum total suspended solids content of 250mg/l is assumed.</p> <p>The outfall would be designed to be pumped at a maximum permitted rate of 200 litres per second. It is assumed that the outfall would provide flexibility and would typically only be used when surface water is captured in the construction site which cannot be discharged through infiltration or to the surrounding watercourses (e.g. due to flooding). Surface water under normal conditions would be collected in balancing ponds, treated via water treatment systems and then either infiltrated to ground or discharged to the surrounding watercourses at greenfield rates.</p> <p>The temporary outfall would be laid under the Suffolk Coast Path to ensure no obstruction and would then terminate above the Mean High Water Spring tide level. The temporary outfall is assumed to be located south of both the permanent and temporary beach landing facilities.</p>	Due to the location, nature and scale of this proposed change, it is concluded there is no potential to alter the findings of the Shadow HRA Report (Doc Ref. 5.10) because the change would not introduce a new effect pathway to a European site or result in a different effect on qualifying interest features of a European site. This change is, therefore, considered to be outside the scope of this Addendum.

Design change	Outline description	HRA implications
Change 9: Change to the sea defence to make the scheme more efficient and resilient to climate change	<p>The temporary HCDF during the construction phase would comprise a sheet pile wall with a crest height of +7.3m AOD around the eastern perimeter of the main construction area.</p> <p>Under the proposed design, the crest height of the permanent sea defence (including the Northern Mound) would increase to +12.6m AOD plus up to two metres of landscaping. The seaward toe of the sea defence would be buried to a depth of approximately +0mOD. A temporary cofferdam would be created to facilitate construction underwater.</p> <p>The maximum crest height of the adaptive sea defence would be +16.4m AOD and landscaping would increase this to up to +18m AOD.</p>	Due to the location, nature and scale of this proposed change, it is concluded there is no potential to alter the findings of the Shadow HRA Report (Doc Ref. 5.10) because the change would not introduce a new effect pathway to a European site or result in a different effect on qualifying interest features of a European site. This change is, therefore, considered to be outside the scope of this Addendum.
Change 10: Extension of landscaped bund, other minor changes at the southern park and ride, including a minor reduction of the Order Limits	The landscape bund along the north-west boundary of the site could be extended to further aid visual and acoustic screening from the adjacent landscape and habitat. Additionally, minor design changes are proposed to reduce the Order Limits to the south of the A12, and to retain an existing private access along the eastern boundaries of the site.	Due to the location, nature and scale of this proposed change, it is concluded there is no potential to alter the findings of the Shadow HRA Report (Doc Ref. 5.10) because the change would not introduce a new effect pathway to a European site or result in a different effect on qualifying interest features of a European site. This change is, therefore, considered to be outside the scope of this Addendum.
Change 11: Extension of the Order Limits to provide for additional fen meadow habitat at Pakenham	The Application identifies two sites for fen meadow mitigation habitat at Benhall and Halesworth. Further advice from Natural England recommends that a larger extent of land is required in order to ensure sufficient mitigation habitat. A third site at Pakenham as therefore been identified to further increase the	Due to the location, nature and scale of this proposed change, it is concluded there is no potential to alter the findings of the Shadow HRA Report (Doc Ref. 5.10) because the change would not introduce a new effect pathway to a European site or result in a different effect on qualifying interest features of a European

Design change	Outline description	HRA implications
as mitigation for fen meadow loss	<p>probability of creating sufficient fen meadow habitat to mitigate for the loss of fen meadow from the Sizewell Marshes SSSI.</p> <p>SZC Co. has identified an additional site at Pakenham in West Suffolk, which has the potential for creating fen meadow. The site proposed comprises approximately 32ha of land located to the west of Fen Road, south of Thieves Lane / Broadway, east of Thurston Road and to the north of the Street. The site currently comprises a mix of grassland, fen meadow, rush pasture and drier grassland and is adjacent to the designated Pakenham Meadows SSSI for which lowland wet grassland and fen meadow are the primary interest features.</p> <p>The site has been identified as being potentially suitable for the creation of fen meadow as it lies in a shallow basin bisected by the Pakenham Stream, and is in close proximity to other areas of fen meadow habitat. Within the site identified, a total of 4.9ha is considered the primary locus for the creation of new fen meadow habitat, and some of the wider areas on the site may also have the potential for the creation of new fen meadow habitat.</p>	site. This change is, therefore, considered to be outside the scope of this Addendum.
Change 12: Extensions and reductions of the Order Limits for works on the two village bypass, Sizewell link road and Yoxford roundabout as well as minor changes to the public right of way proposals at these sites	<p>A minor change to the Order Limits is proposed to maximise visibility of the existing access road which will join the two village bypass at the north-west staggered junction, east of the River Alde bridge crossing. In addition, there is also a change to the formal alignment of PRoW E-243/011/0 at Walk Barn Farm. There is also an opportunity to use land within the Order Limits provide an enhancement of floodplain grazing marsh and the provision of additional floodplain habitat mitigation.</p> <p>Additional land may be necessary along the Sizewell link road to accommodate highway design development. This may</p>	Due to the location, nature and scale of this proposed change, it is concluded there is no potential to alter the findings of the Shadow HRA Report (Doc Ref. 5.10) because the change would not introduce a new effect pathway to a European site or result in a different effect on qualifying interest features of a European site. This change is, therefore, considered to be outside the scope of this Addendum.

Design change	Outline description	HRA implications
	<p>involve further works and vegetation removal to improve highway safety and refinements to the junction of Hawthorn Road and PRow alignments. The approach to drainage has also changed, and it is now proposed to hold water in attenuation basins and manage the release of the water to local watercourses, in accordance with the hierarchy within the Outline Drainage Strategy located in Volume 2, Chapter 2, Appendix 2A of the Environmental Statement (Doc Ref. 6.3) [APP-181]. This has resulted in the need for additional areas of land within the Order Limits to accommodate additional basins and potential routes to discharge surface water flows to local watercourses. Other minor design changes are proposed which would extend or reduce the Order Limits in response to topographic survey information or where land is no longer required, or the length of time the land is needed for.</p> <p>There are a number of minor reductions proposed to the Order Limits for the Yoxford roundabout to account for mapping or boundary discrepancies.</p>	
<p>Change 13: Minor extensions and reductions of the Order Limits for works on the main development site and related sites (fen meadow mitigation and marsh harrier improvement sites)</p>	<p>There are a number of minor reductions and additions proposed to the Order Limits for the main development site and the off-site habitat creation sites. These relate to the fen meadow compensation sites to the south of Benhall and to the east of Halesworth, the marsh harrier habitat improvement area to the west of Westleton, the temporary construction area, and Sizewell B relocated facilities and National Grid land.</p>	<p>Due to the location, nature and scale of this proposed change, it is concluded there is no potential to alter the findings of the Shadow HRA Report (Doc Ref. 5.10) because the change would not introduce a new effect pathway to a European site or result in a different effect on qualifying interest features of a European site. This change is, therefore, considered to be outside the scope of this Addendum.</p>
<p>Change 14: Minor reductions to the Order Limits of the northern park and</p>	<p>There are two minor reductions proposed to the Order Limit boundary of the northern park and ride to account for mapping or boundary discrepancies.</p>	<p>Due to the location, nature and scale of this proposed change, it is concluded there is no potential to alter the findings of the Shadow HRA Report (Doc Ref. 5.10)</p>

Design change	Outline description	HRA implications
ride, the A12/B1119 junction at Saxmundham and the A1094/B1069 south of Knodishall	There are a number of minor reductions proposed to the Order Limits for the A12/B1119 junction at Saxmundham and the A1094/B1069 south of Knodishall to account for mapping or boundary discrepancies.	because the change would not introduce a new effect pathway to a European site or result in a different effect on qualifying interest features of a European site. This change is, therefore, considered to be outside the scope of this Addendum.
Change 15: A new bridleway link between Aldhurst Farm and Kenton Hills	<p>A crossing point would be provided over Lover's Lane from the northern field of Aldhurst Farm into the arable field to the north. A new route would then pass through an existing field, parallel to the field boundary, towards Kenton Hills. It would then join the existing Bridleway 19 route.</p> <p>The new permanent route and crossing point would be made available for pedestrians in the construction phase once the entrance to the main development site from the B1122 is in place and the number of HGVs using the early years access is reduced. The link would be designated as a bridleway once construction is complete.</p>	Due to the location, nature and scale of this proposed change, it is concluded there is no potential to alter the findings of the Shadow HRA Report (Doc Ref. 5.10) because the change would not introduce a new effect pathway to a European site or result in a different effect on qualifying interest features of a European site. This change is, therefore, considered to be outside the scope of this Addendum.

3 THE HABITATS REGULATIONS ASSESSMENT PROCESS

- 3.1.1 Since the submission of the Application there have been no procedural changes to the HRA process (i.e. the staged approach to LSE screening, appropriate assessment, etc.) reported in the **Shadow HRA Report** (Doc Ref. 5.10).
- 3.1.2 Since the submission of the Application, stakeholder engagement has been ongoing, some of which is relevant to the HRA process. With respect to consultation on the Shadow HRA, a stakeholder workshop (attended by Natural England, East Suffolk Council, RSPB, Marine Management Organisation, and the Environment Agency) was held on 24 November 2020. The Suffolk Wildlife Trust and Suffolk County Council were invited, but unable to attend. The objective of the meeting was to provide an update on further work undertaken on within-Project effects and to discuss comments provided in the Relevant Representations made by the stakeholders.
- 3.1.3 While it is not the intention of this Addendum to take into account all relevant comments received in Relevant Representations, some points have been addressed where they have a bearing on the scope of the Shadow HRA (e.g. European sites scoped in).

4 SCOPING OF EUROPEAN SITES

4.1 Introduction

- 4.1.1 The scoping exercise, which identifies the European sites and the qualifying interest features to be taken forward into the likely significant effect (LSE) screening stage, is reported in **Section 4** of the **Shadow HRA Report** (Doc Ref. 5.10).
- 4.1.2 The Additional Information and the relevant proposed changes do not create any pathways to additional European sites with migratory fish qualifying interest features and, therefore, do not alter the outcome of the scoping exercise as report in the **Shadow HRA Report** (Doc Ref. 5.10).
- 4.1.3 In its Relevant Representation (paragraphs 9.2 to 9.4), the Environment Agency made reference to potential effects of the Sizewell C Project (due to entrapment) on additional European sites (i.e. beyond those assessed in the Shadow HRA Report) with allis shad *Alosa*, twaite shad *Alosa fallax* and river lamprey *Lampetra fluviatilis* as qualifying interest features. The scope of the Shadow HRA with respect to these species is further considered in this section.

4.2 Allis shad

- 4.2.1 Allis shad was not assessed in the Shadow HRA Report given that only a single individual of allis shad was recorded (in 2009) in the impingement data from Sizewell B (between 2009 and 2017, a total of 205 impingement monitoring visits were completed at Sizewell B) (Ref. 1.1).
- 4.2.2 The recorded individual is considered to be a straggler from the Gironde-Garonne-Dordogne population on the basis that this is by far the largest population in Europe and likely to provide the source for the occasional fish that are caught in the summer feeding grounds in the Celtic Sea, the English Channel and southern North Sea. (Ref. 1.1). However, the Environment Agency has noted that the Plymouth Sound and Estuaries SAC is closer to the location of the Sizewell C site and has a spawning population of allis shad. This species is also known to be present in northern France; Cefas notes that there are self-sustaining allis shad populations in Brittany and Normandy. The Scheldt and the Rhine are the nearest European rivers to Sizewell (approximately 150km to the east) with records of allis shad, but there is no convincing evidence of self-sustaining populations (Ref. 1.2).

- 4.2.3 JNCC¹ records that there are six SACs with allis shad as a qualifying interest feature in the UK (but not a primary reason for site selection), as follows:
- Plymouth Sound and Estuaries SAC.
 - Afon Tywi/River Tywi SAC.
 - Carmarthen Bay and Estuaries/Bae Caerfyrddin ac Aberoedd SAC.
 - Pembrokeshire Marine/Sir Benfro Forol SAC.
 - River Usk/Afon Wysg SAC.
 - River Wye/Afon Gwy SAC.
- 4.2.4 Cefas (Ref. 1.2) reports that individuals in breeding condition have been recorded from the river Tamar, which forms part of the Plymouth Sound and Estuaries SAC. Although considered unlikely, Cefas notes that it is feasible that the allis shad impinged at Sizewell B was from the Tamar population. On this basis, the Plymouth Sound and Estuaries SAC (which is approximately 615km distant) is included in the LSE screening assessment (**Section 5**).
- 4.2.5 The Welsh SACs are scoped out of further assessment because there is no confirmed breeding population within these SACs and, therefore, no realistic potential for an effect pathway. These SACs are also in excess of 1,000km by sea from the location of the Sizewell C site.
- 4.2.6 An analysis of the European sites along the northern French coast (Normandy to the west of Brittany, ranging between approximately 400km and 865km from the location of the Sizewell C site) has been undertaken. According to the Natura 2000 Standard Data Forms for these sites, the following SACs have recorded breeding populations of allis shad:
- Rivière Laïta, Pointe du Talud, étangs du Loc'h et de Lannec SAC.
 - Estuaire de la Rance SAC.
 - Rivière Elle SAC.
 - Rivière Elorn SAC.
 - Marais du Cotentin et du Bessin - Baie des Veys SAC.

¹ <https://sac.jncc.gov.uk/species/S1102/>

- Rivière Leguer, forêts de Beffou, Coat an Noz et Coat an Hay SAC.
- Tregor Goëlo SAC.

4.2.7 These SACs located in France are included in the LSE screening assessment (**Section 5** of this Addendum).

4.3 Twaite shad

4.3.1 Twelve non-UK European sites were scoped into the LSE screening assessment in the **Shadow HRA Report** (Doc Ref. 5.10) for twaite shad. The scoped in European sites were identified on the basis of genetic analysis indicating that the North Sea twaite shad population most likely originates from the German rivers of the Elbe/Weser and the Belgian river Scheldt.

4.3.2 In its Relevant Representation [\[RR-0373\]](#), the Environment Agency refers to the potential for other European sites not assessed in the Shadow HRA Report which may be functionally linked to Greater Sizewell Bay, referring to the Seine Estuary as an example. In response to this comment, further consideration of the potential for additional European sites with twaite shad as a qualifying interest features has been undertaken.

4.3.3 There are no known UK east coast spawning sites for twaite shad. Genetic analyses of twaite shad from Sizewell demonstrate that they do not originate from the Severn catchment (Ref. 1.3). It is concluded, therefore, that there are no UK SACs relevant to the scope of the assessment.

4.3.4 Further consideration has been given to European sites with twaite shad as a qualifying feature along the coastline from the mouth of the Schelde westwards along the northern French coastline to the west coast of Brittany. The following potentially relevant European sites were identified:

- Estuaire de la Seine SAC.
- Marais Vernier, Risle Maritime SAC.
- Baie de Seine occidentale SAC.
- Baie de Seine orientale SAC.
- Littoral Cauchois SAC.
- Baie du Mont Saint-Michel SAC.

- Chausey SAC.
- Marais du Cotentin et du Bessin - Baie des Veys SAC.
- Rivière Leguer, forêts de Beffou, Coat an Noz et Coat an Hay SAC.
- Tregor Goëlo SAC.
- Baie de Lancieux, Baie de l'Arguenon, Archipel de Saint Malo et Dinard SAC.
- Baie de Morlaix SAC.
- Baie de Saint-Brieuc – Est SAC.

4.3.5 Only two of the above SACs (Marais du Cotentin et du Bessin - Baie des Veys SAC and Tregor Goëlo SAC) are recorded as having a breeding population of twaite shad. On this basis, these two SACs are included in the LSE screening assessment (**Section 5**).

4.4 River lamprey

4.4.1 The Humber Estuary SAC was scoped into the LSE screening assessment in the **Shadow HRA Report** (Doc Ref. 5.10) for river lamprey due to the Humber catchment population likely to be the most significant contribution to the southern North Sea population.

4.4.2 In its Relevant Representation, the Environment Agency stated that there also appear to be mainland European sites for which river lamprey is a qualifying interest feature, such as the Scheldt estuary. The **Shadow HRA Report** (Doc Ref. 5.10) recognised that the Scheldt, Eider, Elbe, Weser and Ems also have spawning populations. In light of the Environment Agency's comment, further consideration has been given to the river lamprey populations in these rivers. In addition, other European sites along the northern French coast with river lamprey as a qualifying interest feature and which host a breeding population (based on information reported in the Natura 2000 Standard Data Form) were identified.

4.4.3 This additional consideration results in the following European sites being scoped into the LSE screening assessment (**Section 5**):

- Scheldt:
 - Schelde- en Durmeëstuarium van de Nederlandse grens tot Gent SAC.

- Ems:
 - Unterems und Außenems SCI.
 - Ems SCI.
- Weser:
 - Weser bei Bremerhaven SAC.
 - Weser zwischen Ochtummündung und Rekum SAC.
 - Unterweser SCI.
 - Nebenarme der Weser mit Strohauser Plate und Juliusplate SCI.
- Elbe:
 - Lesum SAC.
 - Bremische Ochtum SAC.
 - Mühlenberger Loch/Neßsand SAC.
 - Rapfenschutzgebiet Hamburger Stromelbe SCI.
 - Schleswig-Holsteinisches Elbästuar und angrenzende Flächen SAC.
 - Unterelbe SCI.
- Eider:
 - Treene Winderatter See bis Friedrichstadt und Bollingstedter Au SAC.
 - Untereider SAC.
- Northern France:
 - Havre de Saint-Germain-sur-Ay et Landes de Lessay SAC.
 - Marais Vernier, Risle Maritime SAC.

4.5 Summary

- 4.5.1 In summary, the following European sites are scoped into the LSE screening assessment, in addition to those already assessed in the **Shadow HRA Report** (Doc Ref. 5.10):

b) Allis shad

- Plymouth Sound and Estuaries SAC.
- Rivière Laïta, Pointe du Talud, étangs du Loc'h et de Lannec SAC.
- Estuaire de la Rance SAC.
- Rivière Elle SAC.
- Rivière Elorn SAC.
- Marais du Cotentin et du Bessin - Baie des Veys SAC.
- Rivière Leguer, forêts de Beffou, Coat an Noz et Coat an Hay SAC.
- Tregor Goëlo SAC.

c) Twaite shad

- Marais du Cotentin et du Bessin - Baie des Veys SAC.
- Tregor Goëlo SAC.

d) River lamprey

- Schelde- en Durmeëstuarium van de Nederlandse grens tot Gent SAC.
- Unterems und Außenems SCI.
- Ems SCI.
- Weser bei Bremerhaven SAC.
- Weser zwischen Ochtummündung und Rekum SAC.
- Unterweser SCI.
- Nebenarme der Weser mit Strohauser Plate und Juliusplate SCI.
- Lesum SAC.
- Bremische Ochtum SAC.
- Mühlenberger Loch/Neßsand SAC.

-
- Rapfenschutzgebiet Hamburger Stromelbe SCI.
 - Schleswig-Holsteinisches Elbästuar und angrenzende Flächen SAC.
 - Unterelbe SCI.
 - Treene Winderatter See bis Friedrichstadt und Bollingstedter Au SAC.
 - Untereider SAC.
 - Havre de Saint-Germain-sur-Ay et Landes de Lessay SAC.
 - Marais Vernier, Risle Maritime SAC.

5 SCREENING OF POTENTIAL EFFECTS

5.1 Introduction

5.1.1 The LSE screening exercise is reported in **Section 5** of the **Shadow HRA Report** (Doc Ref. 5.10).

5.1.2 The Additional Information or the relevant proposed changes do not alter the outcome of the LSE screening exercise as reported in the Shadow HRA Report. This section reports the LSE screening exercise for the additional European sites scoped into the assessment on the basis of migratory fish populations in light of the further consideration of European sites with migratory fish qualifying interest features undertaken in response to the Environment Agency's Relevant Representation.

5.2 Relevant screening category

5.2.1 The only relevant screening category for migratory fish is '*physical interaction between species and infrastructure*'. The operation of the cooling water system could lead, via impingement and entrainment, to a localised loss in migratory fish species that are a qualifying interest feature of European sites.

5.3 Screening for likely significant effect

5.3.1 The outcome of the LSE screening exercise is reported in **Appendix 5A**, which reproduces the screening matrices for SACs from **Appendix B1** of the **Shadow HRA Report** (Doc Ref. 5.10) and supplements them with additional screening matrices for those European sites scoped into the LSE screening assessment (based on the analysis reported in **Section 4**). The additional screening matrices are presented as HRA Screening Matrix B1.20 to B1.36, with the outcomes summarised in this section.

a) Allis shad

5.3.2 The operation of the cooling water system has the potential to impinge migratory fish species that are qualifying features of the European site. However, on the basis of the very low predicted impingement at Sizewell C (three individuals, based on a single individual being recorded in the monitoring data from Sizewell B in 2009), LSE can be excluded because this scale of effect would not make any material difference to the population of any European site, regardless of location.

b) Twaite shad and river lamprey

5.3.3 Operation of the cooling water system could lead, via impingement and entrainment, to a localised loss in migratory fish species that are a qualifying interest feature of a European site. Without mitigation, it is predicted that 2,989 twaite shad and 2,929 river lamprey would be impinged at Sizewell C (Ref. 1.1).

5.3.4 LSE cannot be excluded for the following additional European sites scoped into the assessment for twaite shad:

- Marais du Cotentin et du Bessin - Baie des Veys SAC.
- Tregor Goëlo SAC.

5.3.5 LSE cannot be excluded for the following additional European sites scoped into the assessment for river lamprey:

- Schelde- en Durmeëstuarium van de Nederlandse grens tot Gent SAC.
- Unterems und Außenems SCI.
- Ems SCI.
- Weser bei Bremerhaven SAC.
- Weser zwischen Ochtummündung und Rekum SAC.
- Unterweser SCI.
- Nebenarme der Weser mit Strohauser Plate und Juliusplate SCI.
- Lesum SAC.
- Bremische Ochtum SAC.
- Mühlenberger Loch/Neßsand SAC.
- Rapfenschutzgebiet Hamburger Stromelbe SCI.
- Schleswig-Holsteinisches Elbästuar und angrenzende Flächen SAC.
- Unterelbe SCI.
- Treene Winderatter See bis Friedrichstadt und Bollingstedter Au SAC.

-
- Untereider SAC.
 - Havre de Saint-Germain-sur-Ay et Landes de Lessay SAC.
 - Marais Vernier, Risle Maritime SAC.

6 ADDITIONAL INFORMATION: UPDATE TO BASELINE CONDITIONS

6.1 Introduction

- 6.1.1 This section presents additional baseline information of relevance to the HRA process and updates/supplements that presented in the **Shadow HRA Report** (Doc Ref. 5.10).

6.2 Coastal, freshwater and terrestrial habitats

- 6.2.1 There is no Additional Information relevant to the assessment for coastal, freshwater and terrestrial habitats. An updated extended Phase 1 habitat survey and National Vegetation Classification (NVC) survey (Doc Ref. 6.13) [\[AS-021\]](#) of the main development site has been undertaken, but these surveys are not relevant to the assessment of effects on qualifying interest features of European sites.

6.3 Birds

a) Alde-Ore Estuary SPA and Ramsar site

i. Introduction

- 6.3.1 Following the submission of the **Shadow HRA Report** (Doc Ref. 5.10), further survey work was undertaken to augment the existing baseline data for some of the key bird populations and species. This includes further project-specific surveys of tern foraging activity for which the resulting data are relevant to the breeding little tern and breeding Sandwich tern qualifying features and of the Alde-Ore Estuary SPA and Ramsar site.
- 6.3.2 The baseline data used in the **Shadow HRA Report** (Doc Ref. 5.10) for these two qualifying features include data from marine bird Vantage Point (VP) surveys which recorded foraging and flight activity of different tern species at a series of coastal VPs (Ref. 6.1, Ref. 6.2). These surveys were undertaken initially during the 2011 breeding season (commencing in April), with further bimonthly surveys undertaken from May to late August in 2013 (**Section 6.3** of the **Shadow HRA Report** (Doc Ref. 5.10)). The 2011 surveys used 12 VP locations, of which the most northerly (VP1) is c. 0.5 km north of the main development site and c. 9.5 km north of Alde-Ore Estuary SPA and the most southerly (VP12) is located at Orford Ness, within the SPA, approximately 6km south of Slaughden (see **Figure 6.1** of the **Shadow HRA Report** (Doc Ref. 5.10)). The 2013 surveys used the same VP locations plus a further three,

located north of VP1 (VPs 13, 14 and 15 – **Figure 6.1** of the **Shadow HRA Report** (Doc Ref. 5.10)).

- 6.3.3 Further VP surveys to record tern foraging and flight activity were undertaken in 2020 to augment the data from these earlier surveys reported in the **Shadow HRA Report** (Doc Ref. 5.10).

ii. Survey areas and methods

- 6.3.4 Surveys of tern foraging and flight activity were undertaken from May to August 2020, using 11 of the 13 VP locations from the 2013 surveys plus a further VP (13a) to give greater coverage of the areas close to the Minsmere tern colonies (**Appendix 6A, Figure 1**). The two most southerly VP locations (i.e. VPs 11 and 12) were omitted because access permission was withheld due to COVID-19 related restrictions. Survey visits to each VP location were made at two-week intervals, giving two survey visits in each month except for July when three survey visits were made. Survey timings and order of visits to VPs were varied throughout the survey period to ensure that a range of tidal states and times of day were covered.

- 6.3.5 Survey visits at each VP extended over a 45 minute period and during this time all terns observed were identified, with group size and behaviour recorded and locations mapped digitally on iPads. Full details of the survey methods and timings are provided in the **Tern Survey Report 2020** (Doc Ref. 6.13) [\[AS-022\]](#). For the purposes of the current reporting, only those records of birds assigned as ‘foraging’ were considered, as the main aim of this data is to identify areas of importance to foraging birds. All tern records are presented in the **Tern Survey Report 2020** (Doc Ref. 6.13) [\[AS-022\]](#).

iii. Findings from the 2020 surveys

- 6.3.6 Overall, few records of foraging terns were obtained from near-shore areas in the vicinity of the Alde-Ore Estuary SPA and Ramsar site (**Appendix 6A, Figure 2 to Figure 10**), with the areas of most concentrated activity being further north (i.e. from VP1 to VP14). Although the absence of surveys at VPs 11 and 12 will have contributed to this distributional pattern, a scarcity of records from VPs 8 to 10 is apparent.
- 6.3.7 Records of little tern foraging in near-shore areas close to the Alde-Ore Estuary SPA and Ramsar site were limited to two registrations from VP9 during the first May survey (**Appendix 6A, Figure 2**). There were also few records of foraging Sandwich terns in close proximity of the Alde-Ore Estuary SPA and Ramsar site, with higher levels of activity recorded in

near-shore areas further north, particularly during the earlier parts of the season (and likely associated with birds from the Minsmere colony – e.g. **Appendix 6A, Figure 2 to Figure 5**). However, for Sandwich tern, these surveys have limited value, given that (in contrast to little tern) they often forage considerable distances offshore and well beyond the distances at which birds can be recorded during shore-based surveys.

- 6.3.8 The low levels of occurrence of both of these qualifying features in near-shore areas in the vicinity of the Alde-Ore Estuary SPA and Ramsar site is associated with the fact that neither species has bred at the SPA and Ramsar site for several years, with the site no longer recognised as a “regularly occupied” breeding colony for little tern and there having been no breeding Sandwich terns recorded since 2009 (see **Section 6.3** of the **Shadow HRA Report** (Doc Ref. 5.10). As such, the more recent survey data are not considered to add in any meaningful way to the baseline data presented, or conclusions drawn in the **Shadow HRA Report** (Doc Ref. 5.10) in relation to the Alde-Ore Estuary SPA and Ramsar site.

b) Minsmere to Walberswick SPA and Ramsar site

i. Introduction

- 6.3.9 Following the submission of the **Shadow HRA Report** (Doc Ref. 5.10), further survey work has been undertaken to augment the existing baseline data for some of the key qualifying features of the Minsmere-Walberswick SPA and Ramsar site. These are as described below.

ii. Existing HRA baseline

Wintering waterbird populations

- 6.3.10 Populations of wintering waterbirds which are qualifying features of the Minsmere-Walberswick Special Protection Area (SPA) are given detailed consideration in the **Shadow HRA Report** (Doc Ref. 5.10). This is largely on the basis that these populations make use of the Sizewell Marshes and Minsmere South Levels (e.g. for foraging and roosting), with both of these areas being outside the SPA and closer to the main development site than much of the SPA itself. As such, these areas are potentially subject to greater levels of impact, particularly in relation to noise and visual disturbance associated with the construction (and potentially decommissioning) of the main development site. Thus, much of the concern over potential effects on SPA wintering waterbirds is focussed on their use of the functionally linked habitats in the Sizewell Marshes and Minsmere South Levels.

- 6.3.11 The relevant qualifying features of the Minsmere-Walberswick SPA are the non-breeding populations of gadwall, shoveler and white-fronted goose.
- 6.3.12 The baseline data used in the Shadow HRA for these qualifying features comprise project-specific surveys of the Sizewell Marshes and Minsmere South Levels combined with British Trust for Ornithology (BTO) Wetland Bird Survey (WeBS) data for count sectors within and close to the main development site and Minsmere-Walberswick SPA. The project-specific data provide finer resolution information than WeBS and, importantly, provide information on the distribution of the species within the Sizewell Marshes and Minsmere South Levels.
- 6.3.13 However, project-specific data were only available from a single complete winter season only (2014/15), plus partial coverage of the 2018/19 winter (with monthly surveys in 2018/19 from December to February as opposed to November to March).
- 6.3.14 In addition, the project-specific surveys do not provide data on white-fronted goose because this species uses the SPA and / or the Minsmere South Levels largely as a nocturnal roosting area and none of the SPA wintering waterbird baseline survey data used in the Shadow HRA were undertaken during hours of darkness.

Breeding waterbirds

- 6.3.15 Whilst the breeding populations of several waterbird species are qualifying features of the SPA (and Ramsar site), the focus of this update is on those breeding waterbird features for which the Sizewell Marshes and Minsmere South Levels may provide functionally linked habitats. These qualifying features are the breeding populations of avocet, bittern, gadwall, shoveler and teal (see the **Shadow HRA Report** (Doc Ref. 5.10)).
- 6.3.16 The areas identified above as having potential functional linkage for the SPA and Ramsar site breeding waterbird populations are closer to the main development site than much of the SPA itself. As such, these areas are potentially subject to greater levels of impact, particularly in relation to noise and visual disturbance, associated with the construction (and potentially decommissioning) of the main development site. Thus, much of the concern over potential effects on these SPA (and Ramsar site) qualifying features is concerned with their use of the functionally linked habitats (i.e. at the Sizewell Marshes and Minsmere South Levels).
- 6.3.17 The main sources of baseline data used in the **Shadow HRA Report** (Doc Ref. 5.10) to determine the extent to which the relevant qualifying

features use and depend upon habitats within the areas identified above are as follows:

- Bittern: Project-specific VP surveys to determine the extent to which birds breeding within the SPA / Ramsar site use the Minsmere South Levels and Sizewell Marshes, undertaken during the 2008 and 2011 breeding seasons. Additionally, Common Bird Census (CBC) data were available for the Sizewell Marshes for 2011 to 2017 (Ref. 6.3), together with data from an extensive programme of project-specific walkover surveys of this area during the 2011 breeding season (Ref. 6.4). Most of the Minsmere South Levels occur within the RSPB Minsmere Nature Reserve and, as such, any nesting by bitterns within this area is likely to be detected through the RSPB reserve monitoring programme for which data were accessed for the period 2003 to 2016.
- Avocet, gadwall, shoveler and teal: Estimates of the breeding numbers of these species on the part of the Minsmere South Levels within the RSPB reserve were obtained from the RSPB annual reserve monitoring data for the period 2009 to 2018, and for the Sizewell Marshes from CBC data reported for the period 2011 to 2017 (Ref. 6.3). Distributional information was not available for these species in those areas, except in the case of avocet for which broad-level information was available on the main areas used for nesting.

Marsh harrier

- 6.3.18 Breeding marsh harrier is a qualifying feature of the Minsmere-Walberswick SPA and Ramsar site. The main nesting area is within the SPA and beyond the distance at which effects of noise and visual disturbance are predicted to occur (**Shadow HRA Report** (Doc Ref. 5.10)). However, wetland habitats (i.e. coastal grazing marsh and reedbed or fen habitats) and, to a lesser extent, agricultural habitats outside the SPA provide foraging habitats for this SPA population.
- 6.3.19 Where it is closer to the main development site, such foraging habitat outside the SPA is potentially subject to greater levels of impact, particularly in relation to noise and visual disturbance associated with the construction (and potentially decommissioning) of the main development site. Thus, concern over potential effects on SPA breeding marsh harrier is focussed on their use of the functionally linked habitats and the possible displacement of foraging birds from habitats as a result of noise and visual disturbance (**Shadow HRA Report** (Doc Ref. 5.10)).
- 6.3.20 The baseline data used in the Shadow HRA to estimate the usage of wetland and agricultural habitats within the vicinity of the main development site by foraging marsh harrier comprise VP surveys

undertaken across a series of “high visibility areas” (HVAs), which encompass areas of unrestricted visibility from ground level upwards. These VP surveys were undertaken from April to September in 2014, 2015 and 2016.

Nightjar

- 6.3.21 In relation to nightjar, there is potential for woodland habitat at Kenton Hills and Goose Hill, which is within and adjacent to the main development site, to be functionally linked to the SPA. These areas are closer to the main development site than much of the SPA itself. As such, these areas are potentially subject to greater levels of impact, particularly in relation to noise and visual disturbance, associated with the construction (and potentially decommissioning) of the main development site. Thus, much of the concern over potential effects on the breeding nightjar qualifying feature of the SPA is concerned with its use of the functionally linked habitats (i.e. Kenton Hills and Goose Hill).
- 6.3.22 The main source of baseline data used in the **Shadow HRA Report** (Doc Ref. 5.10) are project-specific surveys of areas of potentially suitable habitat outwith the SPA but in closer proximity of the main development site (primarily Kenton Hills and Goose Hill), undertaken in 2014 and 2015.

Breeding little tern

- 6.3.23 As detailed above for the Alde-Ore Estuary SPA and Ramsar site, further project-specific surveys of tern foraging activity were undertaken during May to August 2020. These are relevant to the breeding little tern qualifying feature of the Minsmere-Walberswick SPA and Ramsar site. The existing project-specific baseline data used in the Shadow HRA for this qualifying feature are as described above for the Alde-Ore Estuary SPA and Ramsar site.

iii. Survey areas and methods in 2019-2020

Wintering waterbird populations

- 6.3.24 The wintering waterbird surveys of the Sizewell Marshes and Minsmere South Levels in 2019/20 were undertaken using the same methods as for the previous project-specific winter waterbird surveys for which the findings are detailed in the Shadow HRA Report (see **Section 6.3** of the Shadow HRA Report). The survey areas were as shown in **Appendix 6A, Figure 11**. Thus, surveys in the Sizewell Marshes were undertaken in three discrete sub-areas – i.e. Sizewell Belts, Rookyard Woods and Goodrum’s Fen and SSSI Reedbed.

6.3.25 As for the previous surveys, the 2019/20 wintering waterbird surveys do not address the particular issues relating to the SPA white-fronted goose population, given that this species uses the SPA (and associated functionally linked land) during the night-time period. Thus, nocturnally based surveys are currently being progressed over the winter of 2020/21 to assess white-fronted goose usage and activity within the key areas.

6.3.26 The dates of all visits for the project-specific surveys in each of the three winter survey seasons (i.e. including the surveys for which data are presented in the Shadow HRA) are shown in **Table 6.1**.

Breeding waterbirds

6.3.27 The breeding waterbird surveys encompassed the same areas as covered by the project-specific wintering waterbird surveys (see **Appendix 6A, Figure 11**). Thus, surveys in the Sizewell Marshes were undertaken in three discrete sub-areas – i.e. Sizewell Belts, Rookyard Woods and Goodrum's Fen and SSSI Reedbed.

6.3.28 Surveys were undertaken using a combination of transect and VP methods, with the method used dependent on the site conditions. Thus, VPs were used on the Minsmere South Levels where there are extensive areas of standing water and marsh habitats, limiting the practicality of transect surveys. The six VPs from which these surveys (**Appendix 6A, Figure 11**) were undertaken were located on elevated ground (e.g. the seawall bunds) enabling good visibility over the survey area, with 1 to 2 hours observation time at each VP. By contrast, transects were used on the Sizewell Marshes where there are few suitable locations from which VP surveys can be undertaken, in part due to the extent of tree and scrub cover. These transects were located along the sides of the ditches within the Sizewell Marshes.

6.3.29 Three surveys were undertaken in each of the Minsmere South Levels and Sizewell Marshes, with these being in April, May and June. It was not possible to access VP2 on the Minsmere South Levels during the April survey, although attempts were made to cover the same area using observations from a combination of VP1 and VP3 (**Appendix 6A, Figure 11**). All surveys were undertaken in the morning and virtually all were completed before 10:00 hours and in conditions of good visibility with no, or little, rain. Full details of the timings and weather conditions on each survey are provided in the **Breeding Bird and Waterfowl Survey Report 2020** (Doc Ref. 6.13) [\[AS-021\]](#).

Table 6.1: Details of the location and timing of the project-specific surveys for wintering waterbirds, including details for each of the three winter survey seasons¹

Survey Area	Location Relative To The Main Development Site	Survey Dates And Times 2014-2015	Survey Dates And Times 2018-2019	Survey Dates And Times 2019-2020	Overlap With SSSIs	Overlap With SPA/Ramsar Sites
Sizewell Belts. ²	Within 250m largely surrounded by main development site.	11/11 13:10-14:15 04/12 10:00-11:10 08/01 12:00-13:30 05/02 12:00-14:15 05/03 10:15-11:45	11/12 10:35-11:35 10/01 11:15-12:30 07/02 11:05-12:05	13/11 07:45 – 08:30 11/12 08:00 – 10:00 15/01 09:20 – 11:00 19/02 07:35 – 10:00 11/03 08:00 – 10:45	Sizewell Marshes.	None
Rookyard Woods. ³	Overlaps and largely surrounded by main	27/11 12:30-13:45 18/12 07:50-09:10	11/12 12:45-14:40 10/01 09:20-11:00	13/11 08:00 – 09:45 10/12 11:25 – 11:50	Sizewell Marshes.	None

Survey Area	Location Relative To The Main Development Site	Survey Dates And Times 2014-2015	Survey Dates And Times 2018-2019	Survey Dates And Times 2019-2020	Overlap With SSSIs	Overlap With SPA/Ramsar Sites
	development site.	08/01 12:00-14:00 19/02 10:00-11:20 03/03 08:45-10:15	07/02 13:15-14:25	14/01 09:20 – 09:35 18/02 11:00 – 11:30 10/03 10:15 – 10:45		
Goodrum's Fen and SSSI Reedbed. ⁴	Overlaps and largely surrounded by main development site.	11/11 11:30-12:40 04/12 08:10-09:30 08/01 10:15-11:40 05/02 09:30-11:45 05/03 09:00-09:50	11/12 09:50-10:30 10/01 13:30-14:45 07/02 09:40-10:40	Sizewell Marshes SSSI Reedbed 12/11 09:45 – 10:30 10/12 08:00 – 08:45 15/01 11:00 – 14:00 18/02 10:15 – 10:45 10/03	Sizewell Marshes.	None

NOT PROTECTIVELY MARKED

Survey Area	Location Relative To The Main Development Site	Survey Dates And Times 2014-2015	Survey Dates And Times 2018-2019	Survey Dates And Times 2019-2020	Overlap With SSSIs	Overlap With SPA/Ramsar Sites
				13:30 – 13:45 Goose Hill Marshes 13/11 08:45 – 10:30 11/12 10:00 – 10:30 15/01 11:00 – 11:30 19/02 10:15 – 11:00 11/03 11:15 – 12:15		
Minsmere South Levels.	Adjacent to northern boundary of main	11/11 12:00-14:10 04/12 08:00-12:00	11/12 10:30-14:30 10/01 09:30-13:30	VPs 1, 2, 3 13/11 10:40 – 13:30 11/12	Minsmere-Walberswick Heaths and Marshes.	None

NOT PROTECTIVELY MARKED

NOT PROTECTIVELY MARKED

Survey Area	Location Relative To The Main Development Site	Survey Dates And Times 2014-2015	Survey Dates And Times 2018-2019	Survey Dates And Times 2019-2020	Overlap With SSSIs	Overlap With SPA/Ramsar Sites
	development site.	08/01 11:00-13:40 05/02 10:00-12:40 05/03 08:30-11:00	07/02 09:30-12:50	09:00 – 11:15 15/01 08:45 – 11:30 19/02 08:50 – 11:15 11/03 09:20 – 12:00 VPs 4, 5, 6 13/11 11:00 – 13:10 11/12 10:30 – 12:45 15/01 11:30 – 13:50 19/02 11:15 – 13:05 11/03		

NOT PROTECTIVELY MARKED

Survey Area	Location Relative To The Main Development Site	Survey Dates And Times 2014-2015	Survey Dates And Times 2018-2019	Survey Dates And Times 2019-2020	Overlap With SSSIs	Overlap With SPA/Ramsar Sites
				12:30 – 15:15		
<p>1. Update of Table 6.10 in the Shadow HRA Report (Doc Ref. 5.10).</p> <p>2. Flooding of some parts of the survey area prevented access to the whole survey area during the November survey.</p> <p>3. Flooding of this area in December limited access so that from the December onwards surveys had to be undertaken from the perimeter of the area and from the edges of the flood waters.</p> <p>4. From the January survey onwards, flooding meant that planned transect routes in part of this area could not be followed and surveys were conducted from the edges of this part of the survey area (but because the affected area is relatively open this was considered unlikely to have affected the counts greatly).</p>						

- 6.3.30 The breeding status of birds recorded during these surveys and estimates of the numbers of breeding pairs of each species were determined according to standard definitions² and recommended guidance (Ref. 6.5). Further details are provided in the **Breeding Bird and Waterfowl Survey Report 2020** (Doc Ref. 6.13) [\[AS-021\]](#). For bittern, these surveys do not provide comprehensive coverage and were not aimed at estimating the numbers of breeding birds (as nesting is likely to be limited to habitats within the SPA). Rather, in the case of this species, the surveys are aimed at providing an indication of the level of usage of the Minsmere South Levels and Sizewell Marshes by the breeding birds from the SPA / Ramsar site. Given this, data were also extracted for incidental records of bittern (recorded during the course of other survey work) and are presented here alongside those from the dedicated waterbird surveys.

Marsh harrier

- 6.3.31 Surveys of marsh harrier flight activity were undertaken across 11 areas, which coincided closely with the HVAs used for the surveys reported in the **Shadow HRA Report** (Doc Ref. 5.10). The VP locations used at each of these HVAs were as in the previous surveys except in the cases of HVA 3 and HVA F.
- 6.3.32 At HVA 3 a second VP (VP7) (providing increased coverage of the southern parts of the HVA) was used in addition to the original VP (VP3) to provide simultaneous coverage of this HVA. Also, at HVA 3 access restrictions (related to COVID-19) meant that VP3 and VP7 could not be used during the April surveys, with alternative VPs used to the west and to the south of HVA 3. At HVA F the original VP (VP F) was not used and this HVA was covered from VP5, along with HVA 5. The areas defined for each of the HVAs in 2020 were as in the earlier surveys, except for slight differences in the boundaries of HVAs 2, 3, 4, 5, 8 and D and a more substantive increase in the area of HVA 1 (and **Figures 6.5** and **6.6** in the **Shadow HRA Report** (Doc Ref. 5.10)).
- 6.3.33 VP surveys of each HVA were conducted once per month between April and September, except in the case of HVA 3, for which two surveys were undertaken in each of these months (as during the 2014 and 2015 survey programmes). Each survey extended over a six hour period. Surveyors plotted the flight paths (digitally onto iPads) of any marsh harriers observed over the HVAs (see **Appendix 6A, Figure 12**), recording flight height (as estimated by eye), duration of the flight, sex of the bird where possible, whether or not prey was being carried, direction of travel and any behaviour indicative of nesting. Full details of the survey methods

² <https://www.bto.org/our-science/projects/birdatlas/methods/breeding-evidence>

and timings are provided in the **Marsh Harrier Survey Report 2020** (Doc Ref. 6.13(A)) [\[AS-036\]](#).

Nightjar

6.3.34 Transect surveys of nightjar were undertaken to determine the presence of birds within potentially suitable habitat within and adjacent to the main development site. Although identified as being potentially suitable, these areas of woodland habitat in proximity of the main development site are regarded as being sub-optimal for the species. This is due to the small areas of potentially suitable habitat that are present in these areas and the fact that woodland cover is often overgrown relative to the habitat preferences of breeding nightjar (**Breeding Bird and Waterfowl Survey Report 2020** (Doc Ref. 6.13) [\[AS-021\]](#)). Areas of more suitable habitat occur within the SPA at greater distance from the main development site.

6.3.35 The full transect route (**Appendix 6A, Figure 13**) was walked once in May and once in June, commencing at dusk on each occasion and with two surveyors for each survey. This method was also trialled at Dunwich Heath within the SPA, where nightjars are known to breed (with this trial undertaken in the period between the May and June surveys of habitat within and adjacent to the main development site).

Little tern

6.3.36 The methods for the surveys of little tern foraging activity were as detailed above for the Alde-Ore Estuary SPA and Ramsar site.

iv. Findings from the 2019/20 surveys in relation to those presented in the Shadow HRA Report

Gadwall – non-breeding

6.3.37 The results from all three years of the project-specific surveys are shown in **Table 6.2**.

6.3.38 The numbers recorded in the Sizewell Marshes in 2019/20 were lower than in either the 2014/15 or 2018/19 winters, with the 2019/20 total peak count of 21 being substantially lower than the previously recorded total peak counts of 31 (in 2014/15) and 80 (in 2018/19). As in previous winters, numbers were highest in the Goodrum's Fen and SSSI Reedbed section in the north of the Sizewell Marshes, with the distribution of records largely restricted to a relatively small part of the Sizewell Marshes (**Appendix 6A, Figure 14**).

Table 6.2: Number of gadwall recorded during project-specific winter waterbird surveys in the Sizewell Marshes and Minsmere South Levels for each of the three winters of survey¹

Winter Season	Date	Sizewell Marshes				Minsmere South Levels
		Sizewell Belts	Rookyard Woods	Goodrum's Fen and SSSI Reedbed	Total	
2014/15	11/11	0	-	0	0	0
	27/11	-	0	-		-
	04/12	0	-	0	2	50
	18/12	-	2	-		-
	08/01	0	0	3	3	110
	05/02	2	-	29	31	55
	19/02	-	0	-		-
	03/03	-	0	-	4	-
	05/03	4	-	0		126
	Peak	4	2	29	31	126
2018/19	11/12	4	2	0	6	2
	10/01	8	31	41	80	3
	07/02	0	23	24	47	28
	Peak	8	31	41	80	28
2019/20	12/11	-	-	0	0	-
	13/11	0	0	0		0
	10/12	-	0	-	2	-
	11/12	0	-	2		0
	14/01	-	0	-	6	-
	15/01	4	-	2		238
	18/02	-	0	-	17	-
	19/02	0	-	17		154
	10/03	-	0	-	0	
	11/03	0	-	0		201
	Peak	4	0	17	21	238

1. Update of **Table 6.12** in the **Shadow HRA Report** (Doc Ref. 5.10)

6.3.39 By contrast, the numbers recorded in the Minsmere South Levels in 2019/20 were higher than in any of the two previous survey winters, with

the 2019/20 peak count of 238 being substantially higher than the previously recorded peak counts of 28 (in 2018/19) and 126 (in 2014/15). As in the previous surveys, records in the Minsmere South Levels were concentrated around the largest pool system in the survey area, which lies to the east of the centre of the survey area. This is apparent by comparing **Figure 14 (Appendix 6A)** with **Figures 6.10 and 6.11** from the **Shadow HRA Report** (Doc Ref. 5.10).

Shoveler – non-breeding

6.3.40 The results from all three years of the project-specific surveys are shown in **Table 6.3**.

Table 6.3: Number of shoveler recorded during project-specific winter waterbird surveys in the Sizewell Marshes and Minsmere South Levels for each of the three winters of survey¹

Winter Season	Date	Sizewell Marshes				Minsmere South Levels
		Sizewell Belts	Rookyard Woods	Goodrum's Fen and SSSI Reedbed	Total	
2014/15	11/11	0	-	0	0	10
	27/11	-	0	-		-
	04/12	0	-	0	0	45
	18/12	-	0	-		-
	08/01	0	0	0	0	79
	05/02	0	-	2	2	85
	19/02	-	0	-		-
	03/03	-	0	-	0	-
	05/03	0	-	0		61
	Peak	0	0	2	2	85
2018/19	11/12	0	0	0	0	0
	10/01	0	0	0	0	1
	07/02	0	0	0	0	18
	Peak	0	0	0	0	18
2019/20	12/11	-	-	0	0	-
	13/11	0	0	0		0
	10/12	-	0	-	0	-
	11/12	0	-	0		14
	14/01	-	0	-	0	-

Winter Season	Date	Sizewell Marshes				Minsmere South Levels
		Sizewell Belts	Rookyard Woods	Goodrum's Fen and SSSI Reedbed	Total	
	15/01	0	-	0		334
	18/02	-	0	-	0	-
	19/02	0	-	0		2
	10/03	-	0	-	0	
	11/03	0	-	0		57
	Peak	0	0	0	0	334
1. Update of Table 6.14 in the Shadow HRA Report (Doc Ref. 5.10)						

6.3.41 Very few shoveler have been recorded in the Sizewell Marshes during the previous project-specific winter waterbird surveys, and during the 2019/20 surveys there were no records of this species (as for 2018/19).

6.3.42 Substantially higher numbers of shoveler were recorded in the Minsmere South Levels during 2019/20 than in either of the previous winter surveys. The 2019/20 peak count of 334 compares with peak counts of 18 (in 2018/19) and 85 (in 2014/15). Records of shoveler in the Minsmere South Levels were also concentrated around the largest pool system in the survey area. This is apparent by comparing **Figure 15 (Appendix 6A)** with **Figures 6.12** and **6.13** from the **Shadow HRA Report** (Doc Ref. 5.10).

Avocet, gadwall, shoveler and teal - breeding

6.3.43 Estimates of the number of breeding pairs of avocet, gadwall, shoveler and teal were available for the period 2010 to 2017 (but excluding 2015) for the Minsmere South Levels and 2011 to 2017 for the Sizewell Marshes in the **Shadow HRA Report** (Doc Ref. 5.10). These estimates are presented in **Table 6.4**, along with estimates of the number of breeding pairs of each of these species recorded in the Minsmere South Levels and Sizewell Marshes during the project-specific surveys in 2020.

Table 6.4: Annual numbers of breeding pairs of avocet, gadwall, shoveler and teal recorded on the Minsmere South Levels (MSL) and Sizewell Marshes (SM)

Year	Avocet		Gadwall		Shoveler		Teal	
	MSL	SM	MSL	SM	MSL	SM	MSL	SM
2010	13	-	14	-	17	-	0	-
2011	0	0	14	4	2	0	0	0

2012	0	0	12	4	7	0	0	0
2013	0	0	40	7	35	0	0	1
2014	0	0	16	6	4	1	0	0
2015	-	0	-	4	-	1	-	0
2016	0	0	1	3	2	0	0	0
2017	0	0	5	4	9	0	0	0
2020	0 - 1	0	3 - 4	1	1 - 2	0	1	0

¹ Data for 2020 are from the project-specific surveys detailed in this report whilst those for MSL for 2010-17 are derived from RSPB monitoring data and those for SM for 2011-17 are from Ref. 6.3

6.3.44 The abundance estimates from the 2020 surveys suggested relatively low breeding numbers of all four of these species in the Minsmere South Levels and, particularly, the Sizewell Marshes. For the Sizewell Marshes the findings from 2020 are largely consistent with those from earlier years (and as presented in the **Shadow HRA Report** (Doc Ref. 5.10)), although the estimate of a single pair of breeding gadwall is lower than any of the previous estimates for this species.

6.3.45 For the Minsmere South Levels, the occurrence of a probable breeding pair of teal was notable, with no records of breeding teal in any of the previous years of survey (**Table 6.4**). The survey estimates suggest that numbers of breeding gadwall and shoveler were low, relative to most previous years for which counts are available. For the duck species, several of the records were of likely non-breeders, based upon the size and composition (in terms of sex) of the observed groups (**Appendix 6A, Figure 16 to Figure 18**).

6.3.46 There was also a possible first record since 2010 of avocet breeding on the Minsmere South Levels, although this comprised a pair with a brood (on the June survey) and it is possible that they had nested elsewhere and led their chicks into the Minsmere South Levels. The avocet recorded on the Minsmere South Levels during the May survey showed no signs of breeding behaviour and appeared to be feeding or roosting on the site (**Appendix 6A, Figure 16**). Incidental records of all four species were obtained during the course of other survey work, including a single record of an avocet heard within the Sizewell Marshes (**Breeding Bird and Waterfowl Survey Report 2020** (Doc Ref. 6.13) [\[AS-021\]](#)).

6.3.47 Within the Minsmere South Levels, almost all of the records of these four species during the 2020 surveys were within or adjacent to the large pool system in the northeast of the area, with most of the exceptions involving

birds that were commuting over the area and, therefore, not classed as breeding in the Minsmere South Levels (**Appendix 6A, Figure 16 to Figure 19**).

Bittern - breeding

- 6.3.48 During the 2020 surveys, only a single bittern record was obtained during the dedicated breeding waterbird surveys. However, there were incidental records (obtained during the course of other survey work) of bittern flying from or over) the Minsmere South Levels in all three months of survey. Of the seven records associated with the Minsmere South Levels, one was of a feeding bird (recorded during the dedicated waterbird surveys), two were of birds taking off and the remainder were of birds in flight commuting over the area (**Appendix 6A, Figure 20**). There were no records of this species from the 2020 surveys of the Sizewell Marshes.
- 6.3.49 These findings are consistent with those from earlier surveys reported in **Section 6.3 f** of the **Shadow HRA Report** (Doc Ref. 5.10), which indicated limited usage of the Minsmere South Levels and Sizewell Marshes by bittern during the breeding season.

Marsh harrier

- 6.3.50 The marsh harrier flight activity data from the 2020 surveys were analysed and, following the same approach undertaken for the data presented in the **Shadow HRA Report** (Doc Ref. 5.10), a metric was developed that provides a measure of flight path (metre length) per hectare per hour (i.e. a measure of flight intensity). The metric of flight intensity was calculated for the HVAs on the Sizewell Marshes and Minsmere South Levels and, separately, for those on the agricultural habitats.
- 6.3.51 The calculated marsh harrier flight activity for the Sizewell Marshes and Minsmere South Levels is presented in **Table 6.5**, which also includes the mean flight activity intensity for each HVA based on data for previous surveys (in 2014, 2015 and 2016, as presented in Table 6.7 of the **Shadow HRA Report** (Doc Ref. 5.10)) for comparison with the data from the 2020 surveys.

Table 6.5: Calculated marsh harrier flight activity intensity for individual HVAs on the Minsmere South Levels and Sizewell Marshes, based upon the flightline length (m) per hr per ha metric

VP/ HVA	Mean Flightline Length / Hr / Ha (based on 2014, 2015 and 2016 data, as presented in the Shadow HRA Report (Doc Ref. 5.10))	Flightline Length / Hr / Ha (2020 data)
1	8.4	11.3

2	6.1	5.5
3	10.3	9.1
4	3.9	4.4
6	7.8	0.5
7	VP7 was added as part of the 2020 survey to provide increased coverage of HVA 3. The original VP (VP3) also provides coverage of HVA 3.	8.6

6.3.52 Overall, the patterns of flight activity recorded across the HVAs on the Sizewell Marshes and Minsmere South Levels in 2020 are similar to those reported in the **Shadow HRA Report** (Doc Ref. 5.10). Thus, flight activity is notably high on the Minsmere South Levels (with the measured activity from the additional VP 7 being similar to that recorded from the original VP 3), and generally lower across the Sizewell Marshes (**Table 6.5**). Differences in the levels of activity recorded on some of the HVAs covering the Sizewell Marshes are apparent between the 2020 data and the previous data but this is unsurprising given the small areas covered by some of these HVAs.

6.3.53 Agricultural habitats are also used by foraging marsh harrier, with the calculated marsh harrier flight activity in 2020 for the HVAs covering agricultural habitats presented in **Table 6.6**. **Table 6.6** also includes the mean flight activity intensity reported for each of these HVAs on the basis of the data from the previous surveys (in 2015 and 2016, as presented in Table 6.8 of the **Shadow HRA Report** (Doc Ref. 5.10)).

Table 6.6: Calculated marsh harrier flight activity intensity for individual HVAs covering arable land to the south-west of Minsmere, based upon the flightline length (m) per hr per ha metric

VP/ HVA	Mean Flightline Length / Hr / Ha (based on 2015 and 2016 data, as presented in the Shadow HRA Report (Doc Ref. 5.10))	Flightline Length / Hr / Ha (2020 data)
A	6.1	7.1
C	5.9	0.0
D	7.3	9.9
E	3.4	7.4
F	3.9	0.0
5	2.5	4.2

6.3.54 As with the flight activity data for the Sizewell Marshes and Minsmere South Levels, the flight activity levels recorded on agricultural land in 2020 showed broadly similar patterns to those reported by the previous surveys (**Table 6.6**). Thus, although the flight activity levels across the different

HVAs on agricultural land in 2020 were highly variable (which is again unsurprising, given these are derived from relatively small areas and from a single year), the overall pattern was for activity levels on some individual HVAs to be similar to those recorded on the Sizewell Marshes but with the overall level of activity lower than that recorded on either the Minsmere South Levels or the Sizewell Marshes.

Nightjar - breeding

- 6.3.55 There were no records of nightjar during either the May or June surveys. By contrast, three singing nightjars were recorded, and wing clapping was also heard, within a period of five minutes when the same survey method was used at Dunwich Heath.
- 6.3.56 These findings are consistent with those from earlier surveys reported in **Section 6.3 f** of the **Shadow HRA Report** (Doc Ref. 5.10), which indicated an absence of breeding nightjar from potentially suitable habitat within, and close to, the main development site.

Little tern

- 6.3.57 As outlined above for the Alde-Ore Estuary SPA and Ramsar site, records of foraging little terns were concentrated in the near-shore areas around the more northerly VPs, particularly VPs 1 to 14 (e.g. **Appendix 6A, Figure 2**). However, there were relatively few records of foraging little tern overall, with almost all of these (44 individual birds from 11 separate records) occurring during the first survey in May. Foraging little terns were subsequently recorded only during the second survey in May and first survey in June, with a total of three foraging birds in each of these surveys (**Appendix 6A, Figure 2 to Figure 10**).
- 6.3.58 The overall scarcity of records, and their concentration around VPs 1 to 14, was associated with the occurrence of little terns at the Minsmere colony but their subsequent failure to breed at the colony (as detailed in the **Tern Survey Report 2020** (Doc Ref. 6.13) [\[AS-022\]](#)). Thus, the 2020 survey data provide only limited further information on the foraging distribution of the Minsmere-Walberswick SPA and Ramsar site breeding little tern population. The records that were obtained tended to be close inshore and coincident with the predicted distributions of the 2°C and 3°C thermal uplifts and 5µg/l and 10µg/l thresholds for bromoform and Total Residual Oxidants (TRO), respectively, resulting from SZB (**Appendix 6A, Figure 2 to Figure 4**). The coincidence of foraging birds with these existing thermal and chemical plumes cannot be taken to indicate any preferences for them (given they are immediately offshore of the Minsmere colony) but, equally, provides no suggestion of any strong avoidance of them.

c) Outer Thames Estuary SPA

i. Introduction

- 6.3.59 As detailed above for the Alde-Ore Estuary SPA and Ramsar site, further project-specific surveys of tern foraging activity were undertaken during May to August 2020. These are relevant to the breeding little tern and breeding common tern qualifying features for which the Outer Thames Estuary SPA provides supporting foraging habitats. The existing project-specific baseline data used in the Shadow HRA for these qualifying features are as described above for the Alde-Ore Estuary SPA and Ramsar site. The survey area and methods for the 2020 surveys are also as described for the Alde-Ore Estuary SPA and Ramsar site.

ii. Findings from the 2020 surveys

- 6.3.60 The findings from the 2020 VP surveys for little terns are as described for the Alde-Ore Estuary SPA and Ramsar site and the Minsmere-Walberswick SPA and Ramsar site.
- 6.3.61 For common terns, the distribution of foraging birds in relation to the different VP locations was broadly similar to that for little terns but with common terns being more abundant and present over the full survey period (**Appendix 6A, Figure 2 to Figure 10**). As would be expected, a higher proportion of the common tern records were further offshore than for little terns, but they also coincided to a large extent with the distribution of the predicted thermal and chemical plumes. The concentration of foraging activity towards the northerly parts of the survey area was less marked during the final August survey.
- 6.3.62 As for Sandwich terns, common terns may forage considerable distances offshore and well beyond the distances at which birds can be recorded during shore-based surveys. Therefore, these surveys have limited value in determining the full extent of the important marine foraging areas of this species.

6.4 Marine mammals

- 6.4.1 There is no Additional Information relevant to the assessment for marine mammals.

6.5 Fish

- 6.5.1 Twaite shad has no known spawning stock biomass estimates. Therefore, Cefas (Ref. 1.3) has undertaken further work to identify the possible

spawning population and to estimate its size based upon existing monitoring data.

6.5.2 The most likely origin of the twaite shad caught at Sizewell is fish originating from the Elbe and to a lesser extent the Scheldt. Between 2009 and 2017, an estimated annual average of 5.2 million adult twaite shad passed through these two river systems, with the majority being in the Elbe (Ref. 1.3).

6.5.3 No further baseline information is available for allis shad or river lamprey.

7 INFORMATION FOR APPROPRIATE ASSESSMENT: COASTAL, FRESHWATER AND TERRESTRIAL HABITATS

7.1 Introduction

a) Relevant Additional Information

7.1.1 There is no relevant Additional Information to the assessment of potential effects on coastal, freshwater and terrestrial habitats.

b) Relevant changes

7.1.2 The **Shadow HRA Report** (Doc Ref. 5.10) assessed the potential effects of the following elements of the Sizewell C Project on coastal processes (referred to in the Shadow HRA Report as the effect pathway '*alteration of coastal processes / sediment transport*') and, consequently, the implications of such changes for relevant European sites:

- coastal defences;
- Beach Landing Facility (BLF);
- cooling water intakes and outfalls; and
- FRR system and CDO.

7.1.3 It is, therefore, necessary to assess the potential implications of the enhanced permanent BLF and a new, temporary facility on the coastal processes assessment and the conclusions of the **Shadow HRA Report** (Doc Ref. 5.10). The European sites for which this effect pathway is relevant are the same as those assessed in the Shadow HRA Report, namely:

- Alde, Ore and Butley Estuaries SAC.
- Alde-Ore Estuary Ramsar site.
- Benacre to Easton Bavents Lagoons SAC.
- Minsmere to Walberswick Heaths and Marshes SAC.
- Minsmere-Walberswick Ramsar site.
- Orfordness to Shingle Street SAC.

7.1.4 For this effect pathway, **Section 7.3** of the **Shadow HRA Report** (Doc Ref. 5.10) presents an assessment of the potential overarching coastal processes effects associated with the coastal defences, BLF, cooling water intakes and outfalls and FRR system and CDO. That assessment has been revisited in **Section 7.2** of this Addendum to describe the potential effect of the proposed design change.

7.2 Potential overarching coastal process effects

a) Construction

i. Enhancing the design of the permanent BLF

7.2.1 The grillage represents construction of an additional structure for the permanent BLF in the marine environment. The sequence of installation is assumed to comprise:

- Prepare grounding area (approximately 100m x 30m) by trimming the seabed with an excavator.
- Place ground beams in trenches using a crane. Approximately 25 small bore piles would be required to control lateral shift of the grillage.
- Place platform or cross beams on top of ground beams using a crane and secure to ground beams.

7.2.2 The permanent BLF would be approximately 30m longer (100m in total) to better align the barge deck with the platform, making deliveries safer and more efficient. It would require approximately 28 permanent piles in total. The approximate dimensions of the piles are as follows:

- 24 of these piles are expected to have a diameter of approximately one metre.
- Four fender piles are expected to have a diameter of approximately 2.5 metres.

7.2.3 The construction of the enhanced, permanent BLF would not have an effect on the screened in European sites and qualifying features from a coastal process perspective.

ii. Providing a new temporary BLF

7.2.4 As described in **Chapter 2** of the **ES Addendum** (Doc Ref. 6.14), the temporary BLF would be up to approximately 505m in length and comprise a single berth at its seaward end. Approximately 120 piles

would be required to construct the temporary BLF, of which approximately 14 would be located on the beach. They would each be up to approximately 1.2m in diameter, with the exception of two berthing dolphins and two mooring dolphins (each approximately 2.5m in diameter). Six raking piles are assumed at the seaward end of the unloading platform, which are assumed to comprise up to two diagonally driven piles per rake (included within the 120 total figure stated above). Cross braces would be required between some of the piles for stability.

- 7.2.5 Spacing between piles would be no less than 10m on the BLF pier and no less than 12m on the unloading platform, with the exception of where the dolphins and raking piles adjoin the unloading platform.
- 7.2.6 With the exception of the mooring dolphins, which would be installed using a jack-up barge, the temporary BLF would be predominantly constructed without placing construction vehicles into the sea.
- 7.2.7 Given the above, there is minimal potential for increases in suspended sediment as a result of the proposed design change. The construction of the new, temporary BLF would not have an effect on the screened in European sites and qualifying features from a coastal process perspective.

b) Operation

i. Enhancement of the permanent BLF and new, temporary BLF

- 7.2.8 During operation, the low density spacing of the piles means that both the enhancement of the permanent BLF and the new, temporary BLF would allow passage of water and sediment through the structures, and the effect on currents and waves would be minimal.
- 7.2.9 Given the small areas predicted to be affected by the BLF piles with respect to tidal currents, waves and bed shear stress, the operation of the BLFs would not have an effect on the screened in European sites and qualifying features from a coastal process perspective.

7.3 Updated assessment – Change 2 - Enhanced permanent BLF and new, temporary BLF: Minsmere to Walberswick Heaths and Marshes SAC

a) Annual vegetation of drift lines and perennial vegetation of stony banks

i. Alteration of coastal processes / sediment transport

7.3.1 Based on the evidence presented in **Section 7.2**, the proposed design change would have no effect on coastal processes and sediment transport for the ‘annual vegetation of drift lines’ and ‘perennial vegetation of stony banks’ qualifying interest features of the Minsmere to Walberswick Heaths and Marshes SAC.

7.3.2 Suspended sediment concentrations (SSC) created by localised plough dredging operations would reduce to background levels very rapidly (noting that the SSC arising from the more extensive dredging assessed in the **Shadow HRA Report** (Doc Ref. 5.10) was predicted to reduce to background levels within four days after dredging ceases).

7.3.3 Sediment deposited from any plume would be restricted to offshore areas and be too remote to interact with the beaches.

7.3.4 The changes in tidal currents, waves and sediment transport during operation would be confined to the local area around the sources of disturbance and there would be no larger scale change to coastal processes and sediment transport along the regional coast.

7.3.5 The proposed change does not alter the findings of the **Shadow HRA Report** (Doc Ref. 5.10). Therefore, it is concluded that there would not be an adverse effect on the integrity of the Minsmere to Walberswick Heaths and Marshes SAC in view of its conservation objectives.

7.4 Updated assessment – Change 2 - Enhanced permanent BLF and new, temporary BLF: other European sites screened into the assessment

7.4.1 The assessment reported in **Section 7.3** applies to the other screened in European sites and qualifying interest features for which ‘alteration of coastal processes / sediment transport’ was a relevant pathway. This applies to the following European sites:

- Minsmere-Walberswick Ramsar site.
- Alde, Ore and Butley Estuaries SAC.

- Alde-Ore Estuaries Ramsar site.
- Benacre to Easton Bavents Lagoons SAC.
- Orfordness to Shingle Street SAC.

7.4.2 The proposed change does not alter the findings of the **Shadow HRA Report** (Doc Ref. 5.10) for these European sites. Therefore, it is concluded that there would not be an adverse effect on the integrity of these European sites.

8 INFORMATION FOR APPROPRIATE ASSESSMENT: BIRDS

8.1 Introduction

a) Relevant additional information

8.1.1 In relation to SPA (and Ramsar site) bird populations, the Additional Information of relevance comprises the findings from:

- The project-specific baseline surveys which have been undertaken to augment those data presented in the **Shadow HRA Report** (Doc Ref. 5.10) and which are detailed in **Chapter 6** of this document.
- Further noise modelling to provide information on chronic noise levels and night-time noise levels during the construction period was undertaken, together with updates to formally incorporate the construction of the water resource storage area located in the northeast of the main development site into the modelling and to further refine the existing modelling presented in the **Shadow HRA Report** (Doc Ref. 5.10).

8.1.2 This additional information is relevant mainly to the assessment for the Minsmere-Walberswick SPA (and Ramsar site), although elements of the further project-specific baseline survey data also have potential relevant to the assessments for the Alde-Ore Estuary SPA (and Ramsar site) and the Outer Thames Estuary SPA (as detailed below).

b) Relevant changes

8.1.3 Of the design changes that are proposed for the Project, the following are considered to be relevant to assessment for SPA (and Ramsar site) bird populations:

- Potential to increase in the frequency of freight train movements to facilitate bulk material imports by rail (Change 1).
- An enhancement of the permanent beach landing facility and construction of a new, temporary beach landing facility (Change 2).
- Change to the location of the water resource storage area and the addition of flood mitigation measures to lower flood risk (Change 5).

- 8.1.4 The above design changes have the potential to affect the assessments undertaken in the Shadow HRA on the following effect pathways:
- alteration of coastal processes/sediment transport during construction, operation and decommissioning;
 - water quality effects – marine environment, during construction and (potentially) decommissioning;
 - Disturbance effects on species populations, during construction and (potentially) decommissioning.

- 8.1.5 The potential for changes to the assessments for the above effect pathway exists for:
- The Alde-Ore Estuary SPA (and Ramsar site) in relation to coastal processes / sediment transport.
 - The Minsmere-Walberswick SPA (and Ramsar site) in relation to:
 - Coastal processes/sediment transport.
 - Water quality effects – marine environment.
 - Disturbance effects on species populations.
 - The Outer Thames Estuary SPA) in relation to:
 - Water quality effects – marine environment.
 - Disturbance effects on species populations.

c) [Consideration of the Additional Information and relevant changes](#)

- 8.1.6 The remainder of this chapter considers the Additional Information and proposed changes, as outlined above, and determines whether they result in any changes to the conclusions of adverse effects on the relevant qualifying features of the SPAs (and Ramsar sites) identified above. This is undertaken first in relation to the Additional Information (**Section 8.2**) and then for the relevant changes (**Section 8.3**).

8.2 Updated assessment – Additional Information: Alde-Ore Estuary SPA and Ramsar site

a) Breeding Sandwich tern

8.2.1 The Additional Information of relevance to the Alde-Ore Estuary SPA and Ramsar site breeding Sandwich tern population concerns the use of offshore foraging areas. In terms of the effect pathways screened into the assessment for this SPA (and Ramsar site), this information is of potential relevance to the assessment of water quality effects in the marine environment during operation. However, Sandwich terns continue to be absent from this SPA (Ramsar site) as a breeding species and the 2020 surveys provided little information on foraging areas in the vicinity of the SPA (and Ramsar site). Furthermore, as outlined in **section 6.3** of this document, shore-based surveys can provide limited information only on the offshore foraging areas for this species.

8.2.2 Therefore, the additional survey data from 2020 do not add in any significant way to the existing baseline data for this SPA population and do not change the conclusion of no adverse effect on integrity.

b) Breeding little tern

8.2.3 As for Sandwich tern, the additional information of relevance to the Alde-Ore Estuary SPA and Ramsar site breeding little tern population concerns the use of offshore foraging areas and, in terms of the effect pathways screened in for this SPA (and Ramsar site), is of potential relevance to the assessment of water quality effects in the marine environment during operation. However, little terns continue to be absent from this SPA (Ramsar site) as a breeding species and the 2020 surveys provided very few records of foraging birds within the vicinity of the SPA (and Ramsar site).

8.2.4 Across the survey area more widely, there was a paucity of data on little tern occurrence but the records that were obtained indicated that much of the foraging occurred close to shore, with no apparent avoidance of areas predicted to be encompassed by the thermal and chemical plumes associated with discharges from SZB. Therefore, the additional survey data from 2020 do not change the conclusion of no adverse effect on integrity.

8.3 Updated assessment – Additional Information: Minsmere–Walberswick SPA and Ramsar site

a) Introduction

8.3.1 For the SPA (and Ramsar site) breeding waterbirds, marsh harrier and nightjar which may use functionally linked habitats within, or close to, the main development site, the effect pathway of main concern in the **Shadow HRA Report** (Doc Ref. 5.10) is that of noise and visual disturbance during the construction and (potentially also) decommissioning phase (see **Section 8.8** of the **Shadow HRA Report**). This effect pathway is also of main concern for the SPA wintering waterbirds, which likewise use functionally linked habitats within the vicinity of the main development site.

8.3.2 For breeding little tern, the project-specific survey data collected during 2020 relate to the use of offshore foraging areas. In terms of the effect pathways screened in for this SPA (and Ramsar site), these data are of potential relevance to the assessments of:

- Water quality effects in the marine environment during construction, operation and (potentially) decommissioning.
- Disturbance effects during construction and (potentially) decommissioning, specifically as result of increased vessel traffic and underwater noise from the construction and (potentially) decommissioning of the various marine structures (as opposed to airborne noise associated with the construction and (potentially) decommissioning of the main development site).

8.3.3 As described in **Section 1.2** of this document, the Additional Information pertaining to the assessment of the Minsmere-Walberswick SPA and Ramsar site also includes further noise modelling for the construction works associated with the main development site. This modelling is also relevant to the effect pathway for noise and visual disturbance.

8.3.4 The implications of the additional survey data and the further noise modelling are considered below in relation to the assessments of construction-related noise and visual disturbance and (for little tern) water quality effects in the marine environment which have been undertaken in the **Shadow HRA Report** (Doc Ref. 5.10).

- 8.3.5 With regard to recreational disturbance, National Trust have suggested that the figures for the estimated additional visits to Dunwich Heath in the study area, quoted in **Table 3.5** of the **Recreational Disturbance Evidence Base** to the **Shadow HRA Report** (Doc Ref. 5.10), are not precautionary. The National Trust believes this is because the figures do not take account of those people who said they would be displaced, but not where to. The same issue could be applied to the calculations for other displacement locations, including Minsmere.
- 8.3.6 The calculations underpinning the figures in **Table 3.5** of the **Recreational Disturbance Evidence Base** to the **Shadow HRA Report** (Doc Ref. 5.10) do not include the 56 respondents who did not give locations. If the figures are weighted by assuming that a proportion of the 56 people who did not specify locations would displace to Dunwich Heath and Minsmere, the effect on extra visits can be calculated and compared with the figures for the precautionary approach presented in the **Shadow HRA Report** (Doc Ref. 5.10).
- 8.3.7 Eastbridge (where the predicted percentage increase over existing visits changes from 20.1% to 31.8%) and Minsmere Outer (where the predicted percentage increase over existing visits changes from 50.3% to 79.3%) are relevant to the Minsmere-Walberswick SPA.
- 8.3.8 At Minsmere Outer, mitigation is already identified for nightjar and other breeding birds of heathland habitats in relation to potential for increased recreational pressure. It is concluded for other SPA (wetland) species using this area that their key habitats are within the Minsmere RSPB reserve, where access is controlled and increases in visitor numbers are unlikely to cause additional disturbance. These conclusion of the Shadow HRA Report (**Doc Ref. 5.10**) are unaltered.
- 8.3.9 At Eastbridge there is a footpath running south of the Minsmere New Cut between Eastbridge and the coast, which passes through areas of the South Levels outside the SPA where there are be functionally linked waterbird populations. The predicted increase would not change the conclusion of the **Shadow HRA Report** (Doc Ref. 5.10) that, given the existing popularity of this route, predicted increases in visitor numbers during the construction (and decommissioning) are not considered likely to result in any additional recreational disturbance to birds in this area.
- 8.3.10 In summary, it is acknowledged that there will be a level of displacement which will be monitored and, if necessary, mitigated for through delivery of the monitoring and mitigation plan currently being prepared by SZC Co. for Dunwich Heath and Minsmere, which will be agreed with the National Trust and the RSPB.

b) Breeding avocet

i. Disturbance effects on species populations

Additional survey data

8.3.11 For breeding avocet, the 2020 survey data are consistent with the earlier survey data presented in the **Shadow HRA Report** (Doc Ref. 5.10), indicating (at most) a single breeding pair within the Minsmere South Levels and no breeding pairs within the Sizewell Marshes. Furthermore, the few avocet recorded within the Minsmere South Levels were considered to be outside the areas where breeding waterbirds would be susceptible to noise and visual disturbance from the construction (and potentially also decommissioning) activities associated with the main development site, as defined by the footprint of the 64 dB L_{Amax} noise contour (for Phase 1 of the construction period) together with the visual impact zone (as shown in **Figure 8.8** in the **Shadow HRA Report**; Doc Ref. 5.10).

8.3.12 Thus, for breeding avocet, consideration of the 2020 survey data does not change the conclusion of no adverse effect on integrity.

Additional noise modelling

8.3.13 The Shadow HRA concluded that 65dB L_{Amax} represented a suitable threshold below which there are unlikely to be effects of construction noise on breeding waterbirds. The areas encompassed by the 65dB L_{Amax} contour in the updated daytime noise modelling for Phases 1 to 4 are essentially unchanged compared to the modelling outputs used in Shadow HRA, except for Phase 1 in the vicinity of the water storage area in the northeast of the main development site (compare **Appendix 8A, Figure 1** to **Figure 3** with **Figures 8.3** to **8.5** in the **Shadow HRA Report** (Doc Ref. 5.10)). The differences in the Phase 1 modelling associated with the water storage area are not relevant to breeding avocet because the construction of the water storage area would occur during the first winter of the construction period. As such, the noise disturbance from these works would not coincide with the seasonal period relevant to the SPA breeding avocet population (or indeed other SPA breeding bird populations).

- 8.3.14 In terms of chronic noise during the daytime period, predicted levels are lower than for impulsive noise during the same construction phase, as would be expected (**Appendix 8A, Figure 4 and Figure 3**). For Phases 3 and 4, predicted noise levels are relatively low (at 40 - 50dB L_{Aeq}) across much of the Minsmere South Levels but higher across the Sizewell Marshes (where much of the eastern parts are encompassed by values above 55 dB L_{Aeq}). However, the assessment undertaken in the Shadow HRA assumed that potential effects of noise disturbance on breeding avocet (and for other breeding waterbirds) could occur across much of the Sizewell Marshes because most of the area is encompassed by the 65dB L_{Amax} contour during Phases 1 and 2 (**Appendix 8A, Figure 1 and Figure 2**).
- 8.3.15 Night-time construction noise would occur at low levels across the Sizewell Marshes and, particularly, Minsmere South Levels, as indicated by the predicted L_{Amax} and L_{Aeq} values (**Appendix 8A, Figure 5 and Figure 6**). Thus, noise levels would be below 55 dB L_{Amax} and 45 L_{Aeq} across almost all of the Minsmere South Levels, and much of the Sizewell Marshes. Accepting that the relative effects of these noise levels would be greater at night than at day, it is considered highly unlikely that disturbance due to construction noise at night would have the potential to cause effects in areas where potential noise disturbance effects on breeding avocet (and other breeding waterbirds) are already assumed as a result of daytime construction activities.
- 8.3.16 Thus, consideration of the additional noise modelling in relation to breeding avocet does not change the conclusion of no adverse effect on integrity.

c) Breeding bittern

i. Disturbance effects on species populations

Additional survey data

- 8.3.17 For breeding bittern the 2020 survey data are consistent with the earlier survey data presented in the **Shadow HRA Report** (Doc Ref. 5.10), indicating (at most) limited use of Minsmere South Levels and Sizewell Marshes. During the 2020 surveys bittern were recorded only in the Minsmere South Levels, with most records considered to be outside the areas where breeding waterbirds would be susceptible to noise and visual disturbance from the construction (and potentially also decommissioning) activities associated with the main development site, as defined by the footprint of the 64 dB L_{Amax} noise contour (for Phase 1 of the construction period) together with the visual impact zone (as shown in **Figure 8.8** in the **Shadow HRA Report**; (Doc Ref. 5.10)).

- 8.3.18 Thus, for breeding bittern, consideration of the 2020 survey data does not change the conclusion of no adverse effect on integrity.

Additional noise modelling

- 8.3.19 For the reasons outlined above for breeding avocet (**Section 8.2 b**), consideration of the additional noise modelling in relation to breeding bittern does not change the conclusion of no adverse effect on integrity.

d) Breeding marsh harrier

i. Disturbance effects on species populations

Additional survey data

- 8.3.20 The flight activity data for 2020 supports those from the 2014-2016 surveys in that it indicates broadly similar patterns of usage of the Minsmere South Levels, Sizewell Marshes and agricultural land.
- 8.3.21 Consideration of the additional survey data from 2020 in relation to breeding marsh harrier does not change the conclusion of assessment undertaken in the **Shadow HRA Report** (Doc Ref. 5.10).

Additional noise modelling

- 8.3.22 The Shadow HRA concluded that the 70dB L_{Amax} represented a suitable threshold below which there are unlikely to be effects of construction noise on foraging marsh harrier. The areas encompassed by the 70dB L_{Amax} contour in the updated daytime noise modelling for Phases 1 to 4 are essentially unchanged compared to the modelling outputs used in Shadow HRA, except for Phase 1 in the vicinity of the flood compensation and wetland area (formerly the water storage area) in the northeast of the main development site (compare **Appendix 8A, Figure 1 to Figure 3 with Figures 8.3 to 8.5 in the Shadow HRA Report** (Doc ref. 5.10)). The differences in the Phase 1 modelling associated with this area are not relevant to breeding marsh harrier because the construction of the water storage area would occur during the first winter of the construction period. As such, the noise disturbance from these works would not coincide with the seasonal period relevant to the SPA breeding marsh harrier population.
- 8.3.23 Neither chronic noise levels nor night-time noise are considered to be relevant to the assessment of potential disturbance effects on foraging marsh harrier.

- 8.3.24 Thus, consideration of the additional noise modelling in relation to breeding marsh harrier does not change the conclusion of assessment undertaken in the **Shadow HRA Report** (Doc Ref. 5.10).

e) Breeding little tern

i. Water quality effects – marine environment

Additional survey data

- 8.3.25 As outlined above for the Alde-Ore Estuary SPA (and Ramsar site) breeding little tern population (**Section 8.1 b**), the 2020 survey data provided limited information on the occurrence of foraging little tern, with the records that were obtained indicating that much of the foraging occurred close to shore, with no apparent avoidance of areas predicted to be encompassed by the thermal and chemical plumes associated with discharges from SZB.

- 8.3.26 Thus, for little tern, consideration of the 2020 survey data does not change the conclusion of no adverse effect on integrity as a result of potential effects on marine water quality during construction, operation and decommissioning.

ii. Disturbance effects on species populations

Additional survey data

- 8.3.27 For the reasons given above in relation to the 2020 survey data for little tern, consideration of the 2020 survey data does not change the conclusion of no adverse effect on integrity as a result of potential disturbance effects on species populations.

Additional noise modelling

- 8.3.28 The additional noise modelling is considered to have no implications for the SPA (and Ramsar site) breeding little tern population because the breeding colony is beyond the distance at which construction noise from the main development site is predicted to have potential effects on bird populations (**Shadow HRA Report** (Doc Ref. 5.10)).

- f) Breeding gadwall
- i. Disturbance effects on species populations

Additional survey data

- 8.3.29 For breeding gadwall, the 2020 survey data are broadly consistent with the earlier survey data on which the **Shadow HRA Report** (Doc Ref. 5.10) is based. The 2020 surveys confirmed the low abundance of breeding gadwall within the Sizewell Marshes. Thus, although the assessment predicts (on the basis of precautionary assumptions) that breeding gadwall would be susceptible to noise and visual disturbance from construction activities across a large part of the Sizewell Marshes, the potential effects on the relevant SPA populations are predicted to be small (because of the scarcity of this species within the Sizewell Marshes).
- 8.3.30 In relation to the Minsmere South Levels, the 2020 surveys indicated lower numbers of breeding gadwall than in most of the previous years for which abundance estimates are available (although it is notable that the higher counts tended to be from 2010 to 2014). The 2020 surveys also provided data on gadwall distribution, indicating that birds are concentrated in the northeast of the Minsmere South Levels around the large pool system. This is largely beyond the area within which any effects of noise and visual disturbance from the construction activities are considered likely. Overall, these potential disturbance effects are predicted to extend across approximately 40% of the area of the Minsmere South Levels (see **Section 8.8 f (iv)** of the **Shadow HRA Report** (Doc Ref. 5.10)). On this basis (and in the absence of distributional data), the assessment of the effects of construction-related disturbance on breeding gadwall undertaken in the Shadow HRA assumed that 40% of the birds breeding within the Minsmere South Levels would be displaced. As such, the assessment overestimates the likely effects of construction-related disturbance on breeding gadwall within the Minsmere South Levels (and hence on that part of the SPA population which depends upon the functionally linked habitats).
- 8.3.31 Thus, for breeding gadwall, consideration of the 2020 survey data does not change the conclusion of no adverse effect on integrity.

Additional noise modelling

- 8.3.32 For the reasons outlined above for breeding avocet (**Section 8.2 b**), consideration of the additional noise modelling in relation to breeding gadwall does not change the conclusion of no adverse effect on integrity.

- g) Breeding shoveler
- i. Disturbance effects on species populations

Additional survey data

- 8.3.33 For breeding shoveler, the 2020 survey data are broadly consistent with the earlier survey data on which the **Shadow HRA Report** (Doc Ref. 5.10) is based. The 2020 surveys confirmed the scarcity or absence of breeding shoveler within the Sizewell Marshes. Thus, although the assessment predicts (on the basis of precautionary assumptions) that breeding shoveler would be susceptible to noise and visual disturbance from construction activities across a large part of the Sizewell Marshes, the potential effects on the relevant SPA populations are predicted to be small (because of the scarcity of this species within (or its absence from) the Sizewell Marshes).
- 8.3.34 In relation to the Minsmere South Levels, the 2020 surveys indicated lower numbers of breeding shoveler than in most of the previous years for which abundance estimates are available (although it is notable that the higher counts tended to be from 2010 to 2014). The 2020 surveys also provided data on shoveler distribution, indicating that birds are concentrated in the northeast of the Minsmere South Levels around the large pool system. This is largely beyond the area within which any effects of noise and visual disturbance from the construction activities are considered likely. Overall, these potential disturbance effects are predicted to extend across approximately 40% of the area of the Minsmere South Levels (see **Section 8.8 f (iv)** of the **Shadow HRA Report** (Doc Ref. 5.10)). On this basis (and in the absence of distributional data), the assessment of the effects of construction-related disturbance on breeding shoveler undertaken in the Shadow HRA assumed that 40% of the birds breeding within the Minsmere South Levels would be displaced. As such, the assessment overestimates the likely effects of construction-related disturbance on breeding shoveler within the Minsmere South Levels (and hence on that part of the SPA population which depends upon the functionally linked habitats).
- 8.3.35 Thus, for breeding shoveler, consideration of the 2020 survey data does not change the conclusion of no adverse effect on integrity.

Additional noise modelling

- 8.3.36 For the reasons outlined above for breeding avocet (**Section 8.2 b**), consideration of the additional noise modelling in relation to breeding shoveler does not change the conclusion of no adverse effect on integrity.

h) Breeding teal

i. Disturbance effects on species populations

Additional survey data

8.3.37 In contrast to the findings from the earlier surveys reported in the **Shadow HRA Report** (Doc Ref. 5.10), teal were recorded as a probable breeding species within Minsmere South Levels in 2020 (**Table 6.4**). Furthermore, over recent years, teal have been scarce as a breeding species within the Minsmere-Walberswick SPA and Ramsar site (see **Tables 6.5** and **6.9** of the **Shadow HRA Report** (Doc Ref. 5.10)). No effects of construction-related disturbance are predicted on teal that may breed within the Minsmere South Levels because, as for breeding gadwall and breeding shoveler, the main areas used by these birds will be unaffected by noise and visual disturbance from construction activities.

8.3.38 Thus, for breeding teal, consideration of the 2020 survey data does not change the conclusion of no adverse effect on integrity.

Additional noise modelling

8.3.39 For the reasons outlined above for breeding avocet (**Section 8.2 b**), consideration of the additional noise modelling in relation to breeding teal does not change the conclusion of no adverse effect on integrity.

i) Breeding nightjar

i. Disturbance effects on species populations

Additional survey data

8.3.40 Nightjar were not recorded during the dedicated surveys in 2020. This finding is consistent with those from previous surveys as presented in the **Shadow HRA Report** (Doc Ref. 5.10). Thus, for breeding nightjar, consideration of the 2020 survey data does not change the conclusion of no adverse effect on integrity.

Additional noise modelling

8.3.41 For the reasons outlined above for breeding avocet (**Section 8.2 b**), consideration of the additional noise modelling in relation to breeding nightjar does not change the conclusion of no adverse effect on integrity.

j) Non-breeding hen harrier

i. Disturbance effects on species populations

- 8.3.42 No further targeted surveys were undertaken in relation to non-breeding hen harrier in 2019/20 although none were recorded during wintering waterbird surveys in 2019-2020, during which they would be expected to have been detected if they had been using the Minsmere South Levels or the Sizewell Marshes SSSI regularly. Consideration of the additional noise modelling in relation to non-breeding hen harrier does not change the conclusion of no adverse effect on integrity, for the same reasons as outlined above for foraging breeding marsh harrier (**Section 8.2 d**).

k) Non-breeding gadwall

i. Disturbance effects on species populations

Additional survey data

- 8.3.43 The 2019/20 wintering waterbird survey data indicate higher abundance of gadwall in the Minsmere South Levels than indicated by the previous project-specific survey data from 2014/15 and 2018/19 but lower, or similar, levels of abundance in the Sizewell Marshes.
- 8.3.44 Within the Minsmere South Levels, gadwall were found to be concentrated around the largest pool systems, as found in previous winters (see **Figures 6.10 – 6.11** in the **Shadow HRA Report** (Doc Ref. 5.10)). On the basis of the assessment undertaken in the Shadow HRA, this area is considered to be beyond the distance at which impacts from noise and visual disturbance as a result of the construction activities are likely to occur (see **Sections 8.8 k** of the **Shadow HRA Report** (Doc Ref. 5.10)). As such, the higher numbers recorded on the Minsmere South Levels during the 2019/20 surveys do not affect the conclusions of the Shadow HRA in relation to the potential effects of noise and visual disturbance during construction (and decommissioning) on the SPA wintering population of gadwall.
- 8.3.45 The assessment in the Shadow HRA concludes that noise and visual disturbance from construction activities has the potential to affect bird populations across large parts of the Sizewell Marshes. Thus, the assessment considers the extent to which the SPA wintering population of gadwall is likely to depend upon the Sizewell Marshes (see **Sections 8.8 k** of the **Shadow HRA Report** (Doc Ref. 5.10)). This consideration of the likely level of dependence upon the Sizewell Marshes is integral to the conclusion that noise and visual disturbance during construction (and decommissioning) is unlikely to lead to adverse effects upon this SPA

population. As such, the conclusion of no adverse effect on integrity is not affected by the 2019/20 survey data because these data suggest lower dependence upon the Sizewell Marshes than the data from the previous surveys.

Additional noise modelling

- 8.3.46 The Shadow HRA concluded that the 70dB L_{Amax} represented a suitable threshold below which there are unlikely to be effects of construction noise on non-breeding gadwall (and other non-breeding waterbirds). The areas encompassed by the 70dB L_{Amax} contour in the updated daytime noise modelling for Phases 1 to 4 are essentially unchanged compared to the modelling outputs used in Shadow HRA, except for Phase 1 in the vicinity of the water storage area in the northeast of the main development site (compare **Appendix 8A, Figure 1** to **Figure 3** with **Figures 8.3** to **8.5** in the **Shadow HRA Report** (Doc Ref. 5.10)).
- 8.3.47 The differences in the Phase 1 modelling associated with the water storage area are associated with activities which would occur only during the first winter of construction, and they are also consistent with the findings of the initial modelling of the construction of the water storage area in isolation, as reported in the Shadow HRA (see **Section 8.8 k iv** of the **Shadow HRA Report** (Doc Ref. 5.10)). Furthermore, the 70dB L_{Amax} does not extend into the areas of the Minsmere South Levels which are of most importance to wintering gadwall (and other wintering waterbirds) and rarely extends beyond the visual impact zone associated with the construction of the water storage area, and included within the assessment undertaken in the Shadow HRA (**Appendix 8A, Figure 1** and **Figure 7**).
- 8.3.48 Chronic noise levels are not considered to be as relevant as impulsive noise levels to the assessment of potential disturbance effects on wintering waterbirds, whilst the night-time noise levels are not considered to have the potential to cause effects on wintering gadwall for the same reasons as outlined above for breeding avocet (**Section 8.2 b**).
- 8.3.49 Thus, consideration of the additional noise modelling in relation to non-breeding gadwall does not change the conclusion of no adverse effect on integrity.

l) Non-breeding shoveler

i. Disturbance effects on species populations

Additional survey data

8.3.50 The 2019/20 wintering waterbird survey data indicate higher abundance of shoveler in the Minsmere South Levels than indicated by the previous project-specific survey data from 2014/15 and 2018/19 but lower, or similar, levels of abundance in the Sizewell Marshes.

8.3.51 Within the Minsmere South Levels, shoveler were found to be concentrated around the largest pool systems, as found in previous winters (see **Figures 6.12 – 6.13** in the **Shadow HRA Report** (Doc Ref. 5.10)). On the basis of the assessment undertaken in the Shadow HRA, this area is considered to be beyond the distance at which impacts from noise and visual disturbance as a result of the construction activities are likely to occur (see **Section 8.8 I** of the **Shadow HRA Report** (Doc Ref. 5.10)). As such, the higher numbers recorded on the Minsmere South Levels during the 2019/20 surveys do not affect the conclusions of the Shadow HRA in relation to the potential effects of noise and visual disturbance during construction (and decommissioning) on the SPA wintering population of shoveler.

8.3.52 The assessment in the Shadow HRA concludes that noise and visual disturbance from construction activities has the potential to affect bird populations across large parts of the Sizewell Marshes. Thus, the assessment considers the extent to which the SPA wintering population of shoveler is likely to depend upon the Sizewell Marshes (see **Sections 8.8 I** of the **Shadow HRA Report** (Doc Ref. 5.10)). This consideration of the likely level of dependence upon the Sizewell Marshes is integral to the conclusion that noise and visual disturbance during construction (and decommissioning) is unlikely to lead to adverse effects upon this SPA population. As such, the conclusion of no adverse effect on integrity is not affected by the 2019/20 survey data because these data suggest lower dependence upon the Sizewell Marshes than the data from the previous surveys.

Additional noise modelling

8.3.53 For the reasons outlined above for non-breeding gadwall (**Section 8.2 k**), consideration of the additional noise modelling in relation to non-breeding shoveler does not change the conclusion of no adverse effect on integrity.

m) Non-breeding white-fronted goose

i. Disturbance effects on species populations

8.3.54 As noted in **Section 6.3 b**, nocturnal surveys are underway during winter 2020/21 for white-fronted goose because this species uses the SPA and / or the Minsmere South Levels largely as a nocturnal roosting area. Consideration of the additional noise modelling in relation to non-breeding white-fronted goose does not change the conclusion of no adverse effect on integrity, for the same reasons as outlined above for non-breeding gadwall (**Section 8.2 k**). Consequently, the conclusions of the Shadow HRA Report are unchanged for this species.

8.3.55 The SPA white-fronted geese are reported to commute between their main feeding areas and the roosting sites at Minsmere after dusk and before dawn, so that effects of noise and visual disturbance on commuting birds are not predicted. However, as indicated in the **Shadow HRA Report** (Doc Ref. 5.10), should any disturbance effects occur to these commuting birds, they would be likely to result in small deviations to the flight routes only, and are considered highly unlikely to prevent birds from using the roosting areas.

8.4 Updated assessment – Additional Information: Outer Thames Estuary SPA

a) Breeding little tern

8.4.1 The Additional Information relating to the Outer Thames Estuary SPA breeding little tern population concerns the use of offshore foraging areas. In terms of the effect pathways screened into the assessment for this SPA, this information is of potential relevance to the assessments of:

- Water quality effects in the marine environment during construction, operation and (potentially) decommissioning.
- Disturbance effects during construction and (potentially) decommissioning, specifically as result of increased vessel traffic and underwater noise from the construction and (potentially) decommissioning of the various marine structures (as opposed to airborne noise associated with the construction and (potentially) decommissioning of the main development site).

8.4.2 As outlined above for the Alde-Ore Estuary SPA (and Ramsar site) breeding little tern population (**Section 8.1 b**), the 2020 survey data provided limited information on the occurrence of foraging little tern, with the records that were obtained indicating that much of the foraging

occurred close to shore, with no apparent avoidance of areas predicted to be encompassed by the thermal and chemical plumes associated with discharges from SZB.

- 8.4.3 Thus, for little tern, consideration of the 2020 survey data does not change the conclusion of no adverse effect on integrity as a result of potential effects on marine water quality during construction, operation and decommissioning or as a result of potential disturbance effects on species populations.

b) **Breeding common tern**

- 8.4.4 The additional information relating to the Outer Thames Estuary SPA breeding common tern population concerns the use of offshore foraging areas, and has relevance to the same effect pathways as outlined for the SPA little tern population above.
- 8.4.5 As for Sandwich tern, shore-based surveys provide limited information only on the foraging areas used by common tern (**Section 6.3**). Survey data indicated that common terns foraging in near-shore areas showed no apparent avoidance of areas predicted to be encompassed by the thermal and chemical plumes associated with discharges from SZB.
- 8.4.6 Thus, for common tern, consideration of the 2020 survey data does not change the conclusion of no adverse effect on integrity as a result of potential effects on marine water quality during construction, operation and decommissioning or as a result of potential disturbance effects on species populations.
- 8.5 **Updated assessment –Change 1 - Increase in the frequency of freight train movements: Minsmere–Walberswick SPA and Ramsar site**
- 8.5.1 The increase in the frequency of freight train movements could result in greater noise levels during the construction and (potentially) decommissioning periods, with implications for the assessment of disturbance effects on species populations in relation to the Minsmere-Walberswick SPA (and Ramsar site).
- 8.5.2 As described in **Section 8.3** above, the updated noise modelling demonstrates that the areas of land encompassed by the 65dB and 70dB L_{Amax} contours are essentially unchanged compared to the modelling outputs used in Shadow HRA, except for Phase 1 in the vicinity of the water storage area in the northeast of the main development site (compare **Appendix 8A, Figure 1 to Figure 3** with **Figures 8.3 to 8.5** in the **Shadow HRA Report** (Doc Ref. 5.10)). These noise levels represent

the thresholds used for the assessment of potential effects of noise disturbance on SPA (and Ramsar site) qualifying features in the Shadow HRA.

- 8.5.3 Given the above, it can be concluded that the increased frequency of freight train movements will not affect the conclusions of the **Shadow HRA Report** (Doc Ref. 5.10) in relation to potential effects of noise disturbance on the SPA (and Ramsar site) qualifying features.

8.6 Updated assessment –Change 2 - An enhancement of the permanent beach landing facility and construction of a new, temporary beach landing facility: Alde-Ore Estuary SPA and Ramsar site

- 8.6.1 As detailed in **Section 7.2**, no more than minimal effects on coastal processes are predicted to arise as a result of the construction of either the enhanced permanent BLF or of the new temporary BLF. Similarly, once constructed, the low density spacing of the piles for both the enhanced permanent BLF and the new temporary BLF would allow passage of water and sediment through the structures, and the effect on currents and waves would be minimal. Given the small areas predicted to be affected by the BLF piles with respect to tidal currents, waves and bed shear stress, the operation of the BLFs would also have minimal effects from a coastal process perspective.

- 8.6.2 Consequently, no adverse effects are predicted on the qualifying features of the Alde-Ore Estuary SPA (and Ramsar site) as a result of the alteration of coastal processes / sediment transport associated with either the enhanced permanent BLF or the new temporary BLF.

8.7 Updated assessment –Change 2 - An enhancement of the permanent beach landing facility and construction of a new, temporary beach landing facility: Minsmere–Walberswick SPA and Ramsar site

a) Introduction

- 8.7.1 As detailed in **Section 7.2**, the construction of the enhanced permanent BLF would require a total of 28 piles. Construction of the new temporary BLF would require 120 piles. This compares with the maximum of 12 piles (for the permanent BLF) assessed in the **Shadow HRA Report** (Doc Ref. 5.10). Additional dredging for the design change would include localised plough dredging for the installation of the piles. All construction works for both the enhanced permanent BLF and the new temporary BLF

would occur outside the little tern breeding season, which is assumed to be May to August, inclusive (Ref. 8.1).

8.7.2 The design change for the enhanced permanent BLF and new temporary BLF would also involve an increase in vessel traffic during the construction. Up to approximately 100 beach landings by barge on the permanent BLF is assumed between April and October for approximately four years. Each barge would continue to be guided by up to two tug boats and a single barge would continue to moor on the permanent BLF at any one time. For the temporary BLF, up to approximately 400 deliveries between April and October (inclusive) and up to approximately 200 additional deliveries for the remainder of the year is assumed for approximately 8 years with a self-propelled vessel. It is assumed that both BLFs are operational during the same years. This compares with an assumed 180 deliveries to the permanent BLF assessed in the **Shadow HRA Report** (Doc Ref. 5.10), for which the vast majority were assumed to occur between April and October (inclusive).

8.7.3 This proposed change in relation to the BLFs has the potential to affect the qualifying features of the Minsmere-Walberswick SPA (and Ramsar site) via:

- Alteration of coastal processes / sediment transport during construction and (potentially) decommissioning
- Water quality effects – marine environment, during construction and (potentially) decommissioning
- Disturbance effects on species populations, during construction and (potentially) decommissioning.

b) All SPA qualifying features except breeding little tern

i. Disturbance effects on species populations

8.7.4 For all of the SPA qualifying features other than little tern, disturbance effects on species populations is the only pathway of relevance (as determined by the HRA Screening – **Appendix B.2** of the **Shadow HRA Report** (Doc Ref. 5.10)).

8.7.5 For these qualifying features, the construction of the enhanced permanent BLF and new temporary BLF would involve increased piling relative to that assessed in the Shadow HRA, potentially leading to increased disturbance as a result of airborne noise. There may also be greater potential for visual disturbance due to the artificial lighting associated with the new temporary BLF.

- 8.7.6 In relation to potential noise disturbance, the outputs from revised modelling of impulsive noise (i.e. L_{Amax}) for construction phases 1 to 4 (including for the night-time period during phases 3 and 4) which include the new temporary BLF are presented in **Appendix 8A, Figure 8 to Figure 11**. Comparisons of the modelling outputs in these figures with those for the equivalent construction period phases without the 'BLF design change' (i.e. **Appendix 8A, Figure 1 to Figure 3 and Figure 6**) show that higher levels of predicted noise on terrestrial habitats are limited largely to areas immediately to the north and south of the BLF locations. In fact, overall predictions are for less encroachment of the 65dB and 70dB L_{Amax} contours onto the SPA and, particularly, areas of functionally linked habitat in the Minsmere South Levels and Sizewell Marshes. This reduction in the overall levels of predicted impulsive noise during each of these construction phases (when compared with the modelling for the main development site without the 'BLF design change') is due to refinements to the ground absorption areas within the model and updated assumptions on a small number of the construction activities.
- 8.7.7 Standard navigation lights would be required on mooring dolphins and on nearby navigation markers and buoys. Task and ambient lighting would be required along the temporary BLF and would be installed, operated and maintained in general accordance with the controls and limits set out in **section 1.3 of the Lighting Management Plan** (Doc Ref. 6.3) [APP-182].
- 8.7.8 Based on the above considerations, it is concluded that the proposed change for the enhanced permanent BLF and new temporary BLF does not affect the conclusions of the **Shadow HRA Report** (Doc Ref. 5.10) with respect to qualifying features of the Minsmere-Walberswick SPA other than breeding little tern. Consideration of the design change in relation to the breeding little tern qualifying feature is presented below.
- c) Breeding little tern
- i. Alteration of coastal processes / sediment transport
- 8.7.9 As detailed in **Section 7.2**, no more than minimal effects on coastal process are predicted to arise as a result of the construction of either the enhanced permanent BLF or of the new temporary BLF. Similarly, once constructed, the low density spacing of the piles for both the enhanced, permanent, BLF and the new, temporary, BLF would allow passage of water and sediment through the structures, and the effect on currents and waves would be minimal. Given the small areas predicted to be affected by the BLF piles with respect to tidal currents, waves and bed shear stress, the operation of the BLFs would also have minimal effects from a coastal process perspective.

ii. Water quality effects – marine environment

- 8.7.10 In relation to marine water quality, the increased dredging to prepare the seabed could give rise to increased sediment concentrations but the plume would be transitory, short-term in nature, and is likely to be within levels expected as a result of natural variation. Thus, the enhanced permanent BLF and new temporary BLF would not be associated with effects on marine water quality that are greater than those assessed in the **Shadow HRA Report** (Doc Ref. 5.10). As such, this design change will not change the conclusion of the Shadow HRA that no adverse effects on the SPA breeding little tern population are predicted as a consequence of effects on marine water quality.

iii. Disturbance effects on species populations

Disturbance at the colony

- 8.7.11 The factors that could cause the construction and operation of the enhanced permanent BLF and new temporary BLF to have a greater potential to lead to noise and visual disturbance of little terns when attending the breeding colonies are as described above for the other SPA qualifying features (but noting that construction of the BLFs would occur outside the little tern breeding season). As such, this design change will not change the conclusion of the **Shadow HRA Report** (Doc Ref. 5.10) that no adverse effects on the SPA breeding little tern population are predicted as a consequence of noise and visual disturbance affecting birds when they are present at the breeding colony.

Disturbance effects in the marine environment

- 8.7.12 The SPA little tern population could also be affected by noise and visual disturbance when away from the nesting colony and foraging in the marine environment. Such effects could occur as a result of direct disturbance to the birds themselves from increased vessel traffic. Indirect effects due to the effects of underwater noise on the fish prey species of little tern would not result from the construction of the BLFs because these works would occur outside the little tern breeding season. Therefore, the potential for such indirect effects is less than that assessed in the **Shadow HRA Report** (Doc Ref. 5.10), which incorporated the construction of the permanent BLF as a potential impact. No effects from the artificial lighting at the BLFs are predicted on foraging little terns because they do not generally forage during the nocturnal period (Ref. 8.1, Ref. 8.2).

Direct disturbance from vessel traffic

- 8.7.13 The design change for the enhanced permanent BLF and new temporary BLF is associated with a near fourfold increase in the numbers of assumed deliveries of rock armour and abnormal indivisible loads (AILs) compared to that assessed in the Shadow HRA. Much, but not all, of this increase would occur during the little tern breeding season, which coincides with the period of main operation for the BLFs (Ref. 8.3).
- 8.7.14 The approximate estimates of vessel deliveries to the BLFs given above suggest there would be 500 deliveries during each 'summer period' (i.e. April to October, inclusive). Each delivery would involve vessel movements both to and from the BLFs, giving a total of 1000 vessel movements during the 'summer period' and an average of approximately 4.7 vessel movements per day. This is almost three times the level of vessel movements assumed for this period in the assessment undertaken in the **Shadow HRA Report** (Doc Ref. 5.10).
- 8.7.15 Existing marine traffic in the waters adjacent to the main development site (out to 12 nm) include various types of vessels, with the most frequent being cargo, recreational, fishing and wind farm support vessels. During surveys in June an average of 66 unique vessel movements were recorded per day in an area defined by a 12 nm buffer from the main development site (**Volume 2, Chapter 24** of the **ES** (Doc Ref. 6.3)). The majority of these vessel movements occurred some distance beyond the likely foraging range of little tern, which only extends to approximately 2.4 km offshore (Ref. 8.4). Nonetheless, a reasonably high frequency of vessel movements is still expected to occur within the more inshore waters of Sizewell Bay, most of which is attributable to fishing craft (**Figure 24.2** in **Volume 2, Chapter 24** of the **ES** (Doc Ref. 6.3)).
- 8.7.16 The existing usage of the area by vessels, together with the fact that little terns foraging offshore are considered to be relatively insensitive to sources of anthropogenic disturbance, such as vessel traffic (Ref. 8.2), means that the increase in the expected levels of vessel traffic associated with the 'BLF design change' would not change the conclusion of the **Shadow HRA Report** (Doc Ref. 5.10) that no adverse effects on the SPA breeding little tern population are predicted as a consequence of disturbance from increased vessel traffic.

8.8 Updated assessment – Change 2 - An enhancement of the permanent beach landing facility and construction of a new, temporary beach landing facility: Outer Thames Estuary SPA

a) Breeding little tern

i. Water quality effects – marine environment

8.8.1 As detailed in **Section 8.7 c**, the construction and operation of the enhanced permanent BLF and new temporary BLF would not be associated with effects on marine water quality that are greater than those assessed in the **Shadow HRA Report** (Doc Ref. 5.10). As such, this design change will not change the conclusion of the Shadow HRA that no adverse effects on the SPA breeding little tern population are predicted as a consequence of effects on marine water quality.

ii. Disturbance effects on species populations

8.8.2 As detailed in **Section 6.3** of the **Shadow HRA Report** (Doc Ref. 5.10), several little tern colonies (associated with a number of different SPAs) contribute to the Outer Thames Estuary SPA little tern population. Only a proportion of these ‘contributing’ SPA populations are ‘screened into’ the current assessment, with others being too distant from the main development site (and the associated development sites) for there to be any likely pathways to effects.

8.8.3 Specifically, in relation to noise and visual disturbance from the construction, operation and decommissioning of the main development site, potential effects are limited to those colony populations from within (or close to) the Minsmere-Walberswick SPA (which currently comprise a small proportion of the overall little tern population for which the Outer Thames Estuary SPA provides supporting habitat – **Table 6.5** and **Table 6.16** of the **Shadow HRA Report** (Doc Ref. 5.10)). Given this, it follows that the ‘BLF design change’ would not change the conclusion of the Shadow HRA that no adverse effects on the Outer Thames Estuary SPA little tern population are predicted as a consequence of noise and visual disturbance (on the basis that this conclusion is reached for the Minsmere-Walberswick SPA (and Ramsar site) breeding little tern population).

b) Breeding common tern

i. Water quality effects – marine environment

8.8.4 As detailed in **Section 8.7 c**, the construction and operation of the enhanced permanent BLF and new temporary BLF would not be

associated with effects on marine water quality that are greater than those assessed in the **Shadow HRA Report** (Doc Ref. 5.10). As such, this design change will not change the conclusion of the Shadow HRA that no adverse effects on the SPA breeding common tern population are predicted as a consequence of effects on marine water quality.

ii. Disturbance effects on species populations

8.8.5 As for little terns, the effects of disturbance from the construction and operation of the enhanced permanent BLF and new temporary BLF on common terns foraging in the marine environment could arise as a result of direct disturbance to the birds themselves from increased vessel traffic. Indirect effects due to the effects of underwater noise on the fish prey species of common tern would not result from the construction of the BLFs because these works would occur outside the common tern breeding season (which is also May to August – Ref. 8.3). Therefore, the potential for such indirect effects is less than that assessed in the **Shadow HRA Report** (Doc Ref. 5.10), which incorporated the construction of the permanent BLF as a potential impact. No effects from the artificial lighting at the BLFs are predicted on foraging common terns because they do not generally forage during the nocturnal period (Ref. 8.2).

8.8.6 As with the Outer Thames Estuary SPA little tern population, several common tern colonies contribute to the Outer Thames Estuary SPA common tern population, with these colonies located within, or close to, four different SPAs, although breeding common tern is a qualifying feature for only two of these SPAs (see **Table 6.17** of the **Shadow HRA Report** (Doc Ref. 5.10)). Two of these SPAs are ‘screened out’ of the current assessment on the basis that they are too distant from the main development site (and the associated development sites) for there to be any likely pathways to effects. Thus, it is only those SPA common terns from the Orfordness and Minsmere breeding colonies (within the Alde-Ore Estuary SPA (and Ramsar site) and Minsmere-Walberswick SPA (and Ramsar site), respectively) which are potentially susceptible to noise and visual disturbance effects associated with the Project (see **Section 8.10 c** of the **Shadow HRA Report** (Doc Ref. 5.10)).

Direct disturbance from vessel traffic

8.8.7 Based upon the expected number of vessel deliveries to the BLFs during the ‘summer period’ (i.e. April to October, inclusive), it is estimated that there would be an average of approximately 4.7 vessel movements per day within the vicinity of the BLFs during the common tern breeding season (see **Section 8.7 c**). This would represent almost three times the

level of vessel movements assumed for this period in the assessment undertaken in the **Shadow HRA Report** (Doc Ref. 5.10).

8.8.8 As detailed in **Section 8.7 c**, existing levels of vessel movements offshore from the main development site are high, with an average of 66 unique vessel movements recorded per day during June within an area defined by a 12 nm buffer from the main development site (**Volume 2, Chapter 24** of the **ES** (Doc Ref. 6.3)).

8.8.9 The estimated mean maximum foraging range of common terns from their breeding colony is approximately 18 km, whilst their mean foraging range from the colony is estimated to be almost 6 km (Ref. 8.5). Thus, much of the foraging by common terns from the Minsmere and Orfordness colonies already occurs in waters which experience high levels of vessel movements (**Figure 24.2** in **Volume 2, Chapter 24** of the **ES** (Doc Ref. 6.3)). Furthermore, common terns foraging offshore are considered to be relatively insensitive to sources of anthropogenic disturbance, such as vessel traffic (Ref. 8.2).

8.8.10 Consequently, the 'BLF design change' would not change the conclusion of the **Shadow HRA Report** (Doc Ref. 5.10) that no adverse effects on the SPA breeding common tern population are predicted as a result of disturbance from increased vessel traffic.

c) Non-breeding red-throated diver

i. Water quality effects – marine environment

8.8.11 As detailed in **Section 8.7 c**, the construction and operation of the enhanced permanent BLF and new temporary BLF would not be associated with effects on marine water quality that are greater than those assessed in the **Shadow HRA Report** (Doc Ref. 5.10). As such, this design change will not change the conclusion of the Shadow HRA that no adverse effects on the SPA red-throated diver population are predicted as a consequence of effects on marine water quality.

ii. Disturbance effects on species populations

8.8.12 The effects of disturbance from the construction and operation of the enhanced permanent BLF and new temporary BLF on red-throated divers could arise as a result of direct disturbance (from increased vessel traffic or artificial lighting) or from indirect effects of underwater noise on their fish prey species.

Direct disturbance from vessel traffic

- 8.8.13 Red-throated divers are highly sensitive to noise and visual disturbance in their wintering areas, and shipping activity may affect distribution and be associated with lower densities (Ref. 8.2, Ref. 8.6, Ref. 8.7). Thus, vessel traffic is likely to result in disturbance and (potentially) displacement of non-breeding red-throated divers.
- 8.8.14 As outlined in **Section 8.7 c**, the majority of vessel deliveries to the BLFs would occur from April to October (inclusive) and largely outside the main seasonal period for the SPA non-breeding red-throated diver population (October to May). During each 'winter period' (i.e. November to March inclusive), there would be up to approximately 200 deliveries to the BLFs, giving a total of 400 vessel movements. This is equivalent to an average of 2.7 vessel movements per day during the main period of relevance for the SPA red-throated diver population.
- 8.8.15 Existing levels of marine traffic offshore from the main development site are high, with an average of 27 unique vessel movements recorded per day during November within an area defined by a 12 nm buffer from the main development site (**Volume 2, Chapter 24** of the **ES** (Doc Ref. 6.3)). Thus, the additional vessel movements associated with the BLF deliveries would represent a small increase on the existing levels of vessel activity in the waters adjacent to the main development site.
- 8.8.16 However, it is considered likely that the vessels making the BLF deliveries would transit through more of the Outer Thames Estuary SPA than those areas immediately adjacent to the main development site, so there is the potential for disturbance effects to occur across a wider area. To model a (highly unlikely) worst case scenario, it has been assumed all of these vessels could originate from ports near the Inner Thames, which would mean taking a route that maximised the travel distance through the SPA (**Appendix 8A, Figure 12**).
- 8.8.17 If an indicative corridor between 2 nm and 6 nm from the coast is assumed for these vessel movements, this gives a transit distance of approximately 92 km through the SPA for each vessel movement (**Appendix 8A, Figure 12**). It is also assumed that deliveries to the BLFs would be made by ocean going self-propelled barges, which for the currently assumed fleet would have a loaded maximum speed of 10 – 13 knots (equivalent to approximately 18 – 24 km/hour). This means that each vessel movement would involve the vessel being present within the SPA for approximately 4 to 5 hours, so that vessels involved in BLF deliveries would be present within the SPA for a total time of approximately 324 to 405 hours over a 30 day month (based on there being 2.7 vessel movements per day). Given that the SPA extends over

an area of 3,924.5 km², this equates to approximately 0.1 hours of vessel activity per km² per month.

- 8.8.18 Existing levels of vessel activity are highly variable across the extent of the SPA, being greatest within designated shipping lanes and within (and around) wind farm sites (where values are frequently above 5 – 10 hours per km² per month). Outside these areas they are frequently at values of at least 1.5 hours per km² per month (as measured on an annual basis)³. Thus, the vessel activity which would be associated with the BLF deliveries represents a small addition to the existing levels of activity within the SPA.
- 8.8.19 Where the transit routes used by vessels undertaking deliveries to the BLFs coincide with existing heavily used routes then it is likely that relatively small numbers of red-throated divers would be at risk of disturbance (due to the avoidance of such routes by the species – e.g. see Ref. 8.7). In other situations, these vessels may encounter and disturb relatively large numbers of red-throated divers, given the potential length of the corridor through the SPA and the high sensitivity of the species to approaching vessels – Ref. 8.2). However, given the travel speeds of these vessels, any displacement is likely to be of a short-term, temporary, nature and it is reasonable to assume that birds will return following passage of the vessel.
- 8.8.20 Based on the above, vessel deliveries to the BLFs would result in a small increase in the existing levels of vessel traffic within the SPA, whilst birds which are displaced would be subjected to a brief period of effect only. Therefore, it is considered that the 'BLF design change' would not change the conclusion of the **Shadow HRA Report** (Doc Ref. 5.10) that no adverse effects on the SPA non-breeding red-throated population are predicted.

Direct disturbance from artificial lighting at the BLFs

- 8.8.21 As described in **Section 8.7 b**, artificial lighting during the operation of the new temporary BLF would have localised effects only. Therefore, any effects on the SPA non-breeding red-throated diver population would be minimal and would not affect the conclusions of the **Shadow HRA Report** (Doc Ref. 5.10) that no adverse effects on the SPA non-breeding red-throated population are predicted.

³ <https://www.emodnet-humanactivities.eu/view-data.php>

Indirect effects via effects on prey species

- 8.8.22 In relation to indirect effects, the piling required for the enhanced permanent BLF and the temporary BLF has the potential to affect fish prey for red-throated diver.
- 8.8.23 Mortality and recoverable injury of fish are predicted to extend over small areas only. Temporary threshold shift (TTS) in fish are predicted to occur over larger areas, as are behavioural responses in fish.
- 8.8.24 Piling for the installation of the mooring dolphins represents the source of the greatest levels of underwater noise, for both the enhanced permanent BLF and the temporary BLF.
- 8.8.25 During the installation of the mooring dolphins for the enhanced BLF, fish with a swim bladder would be susceptible to mortality or recoverable injury to a range of 19m, with mitigation. With mitigation, cumulative auditory effects are predicted to cause mortality for hearing specialists (those that use a swim bladder for hearing), over an area of up to 2ha (mortality), 4ha (recoverable injury) and 84ha (TTS). The equivalent (mitigated) figures for the installation of the mooring dolphins for the temporary BLF are 5ha (mortality), 15ha (recoverable injury) and 403ha (TTS). Thus, the worst-case effect in terms of TTS would extend across 0.10% of the total area of the SPA.
- 8.8.26 Behavioural responses in fish are predicted to occur over larger areas. Taking a worst-case in terms of underwater noise effects (i.e. as represented by the installation of the mooring dolphins and based on sprat, as a hearing specialist), the range of behavioural effect for the enhanced BLF (with mitigation) is predicted to cover an area of 1,206ha, representing 0.31% of the total SPA area. For the temporary BLF, the area is predicted to be 1,769ha, representing 0.45% of the total SPA area.
- 8.8.27 TTS and behavioural responses are temporary effects (with any reduction in prey availability within the affected area due to the latter response expected to be limited to the duration of the activity), and the piling is anticipated to be of relatively short duration. Furthermore, these activities would occur within (and the effects be restricted to) the north-western block of the SPA, within which densities of red-throated diver are considerably lower than in the southern block of the SPA (see section 6.3 of the **Shadow HRA Report** (Doc Ref. 5.10)). Therefore, any effects of underwater noise from the construction of the BLFs on foraging red-throated diver would affect a smaller proportion of the SPA population than indicated by the extent of spatial overlap between threshold levels of underwater noise and the SPA area.

- 8.8.28 Given the above, the conclusion drawn in the Shadow HRA Report (Doc Ref. 5.10) is unchanged, and no adverse effect on the Outer Thames Estuary SPA red-throated diver population is predicted.
- 8.9 Updated assessment –Change 5 - Change to the location of the water resource storage area and the addition of flood mitigation measures to lower flood risk: Minsmere–Walberswick SPA and Ramsar site
- 8.9.1 This design change would involve relocating the water resource storage area from the far north-east part of the main development site to a location adjacent to a proposed attenuation pond (also known as water management zone 5), and adjacent to the proposed borrow pits and stockpiles. As such, there are implications for the assessment of disturbance effects on species populations in relation to the Minsmere-Walberswick SPA (and Ramsar site).
- 8.9.2 The change in the location of the water resource storage area would mean that any construction works in the far north-east part of the main development site would be limited to those required for the creation of wetland habitats and this area would also provide additional permanent flood mitigation land.
- 8.9.3 This part of the main development site is adjacent to the northern parts of the Minsmere South Levels and is in closest proximity to the key wetland habitats within the Minsmere-Walberswick SPA (and Ramsar site). The assessment in the **Shadow HRA Report** (Doc Ref. 5.10) was undertaken on the basis that the construction of the water resource storage area would occur within this area. It was assumed that this construction would occur during the first winter of the construction period to avoid the potential for adverse effects on the SPA qualifying features for which the Minsmere South Levels provides functionally linked habitat (see **Section 8.3** and **Appendix 8A, Figure 1**).
- 8.9.4 Relocating the water resource storage area as proposed means that the associated construction activities would occur in a less sensitive location and, as such, works associated with the creation of the water resource storage area would have no potential to increase effects of noise and visual disturbance on the SPA (and Ramsar site) qualifying features. However, the excavation works required to create the more extensive wetland habitats and flood mitigation land would occur within this area.
- 8.9.5 Given the above, the conclusions drawn in the Shadow HRA Report (Doc Ref. 5.10) with respect to noise and visual disturbance associated with construction works adjacent to the northern parts of the Minsmere South

Levels are based on a worst case scenario. The change in the location of the water storage area and its replacement with new wetland habitats and flood mitigation land would not, therefore, affect the conclusions of the **Shadow HRA Report** (Doc Ref. 5.10) in relation to the Minsmere-Walberswick SPA (and Ramsar site).

9 INFORMATION FOR APPROPRIATE ASSESSMENT: MARINE MAMMALS

9.1 Updated assessment – Additional Information: Impingement Predictions

- 9.1.1 As outlined in the **Shadow HRA Report** (Doc Ref. 5.10) (**Section 9.3(b)v**), a study of the potential for marine mammal prey species that could be impinged during the operation of the Sizewell C Project was undertaken (Ref. 1.1). The study found that of the species present within the Greater Sizewell Bay area, pelagic species such as sprat, herring and whiting are the most likely to be impinged (with herring being the highest in weight), whilst other species such as seabass, sand goby, sole and dab could also be impinged.
- 9.1.2 The impingement assessment results showed that LVSE intake heads and a FRR system would have negligible effects on the sustainability of the fish populations and, therefore, no effect on the prey of the relevant designated site features. However, as a very precautionary approach, assessments in the **Shadow HRA Report** (Doc Ref. 5.10) for the impingement of marine mammal prey species were conducted based on the Greater Sizewell Bay; a total area of 4,120ha (or 41.2km²). This was considered to be worst-case, as not all prey species within that area would be lost and the effect would be temporary.
- 9.1.3 Since submission of the **Shadow HRA Report** (Doc Ref. 5.10), the impingement predictions have been updated (Ref. 1.1). The updated predictions indicate that local depletion due to impingement is orders of magnitude below natural variability in abundance to which predator-prey relationships are adapted to. Therefore, impingement from Sizewell B and Sizewell C would not have any adverse food-web effects on qualifying interest features of European sites.
- 9.1.4 This conclusion therefore supersedes the assessments for impingement of prey species for grey seal from the Humber Estuary SAC (**Shadow HRA Report** (Doc Ref. 5.10) (**Section 9.4(c)ii, Table 9.22**), harbour porpoise from the Southern North Sea SAC (**Shadow HRA Report** (Doc Ref. 5.10) (**Section 9.5(d)ii, Table 9.33**) and harbour seal from The Wash and North Norfolk Coast SAC (**Shadow HRA Report** (Doc Ref. 5.10) (**Section 9.6(c)ii Table 9.45**).
- 9.1.5 As such, there will be no adverse effect on the integrity of these SACs from the potential loss of prey availability resulting from the operation of the Sizewell C Project. This has not been assessed further in this Addendum.

9.2 Updated assessment – Change 2 - An enhancement of the permanent beach landing facility and construction of a new, temporary beach landing facility

a) Water quality effects

- 9.2.1 The proposed changes to enhance the permanent BLF and for the new temporary BLF, including operational dredging, would not result in potential changes to water quality that could affect marine mammals or their prey greater than those assessed in the **Shadow HRA Report** (Doc Ref. 5.10) for an area up to 7.26km² (726ha).
- 9.2.2 Whilst there could be some increase in suspended sediment concentrations (SSC), the plume would be transitory, short-term in nature and within natural variation and the maximum area previously assessed.
- 9.2.3 As such, there will be no adverse effect on the integrity of the SACs assessed for marine mammals from any changes to water quality as a result of the enhanced permanent BLF and temporary BLF. Therefore, no further assessment is required for this Addendum.

b) Potential for habitat loss

- 9.2.4 In the **Shadow HRA Report** (Doc Ref. 5.10) (**Section 9.3(b)iii**), the total area of long-term habitat loss and potential changes to the habitat as a result of the installation of the intake and outfall tunnels, the BLF and associated infrastructure, the FRR and CDO structures, including areas of scour (or scour protections), and dredging the navigation channel to the BLF was 0.02km².
- 9.2.5 The enhancement of the permanent BLF would involve the installation of grillage, additional piles and larger mooring dolphins which would result in further change in seabed type from soft sediment (fine to medium sand) to a hard surface. However, the spatial extent of the additional habitat change is very small, approximately 0.003km² (0.3ha).
- 9.2.6 The presence of the temporary BLF piles and mooring dolphins in the intertidal and shallow subtidal zones would result in a change in seabed type from soft sediment to a hard surface. However, the spatial extent of change in seabed type due to BLF piles and mooring dolphins is very small, approximately 0.003km² (0.3ha).
- 9.2.7 The enhanced permanent BLF and temporary BLF could result in potential changes to the habitat with an estimated footprint of up to 0.006km². As such the updated total area of long-term habitat loss and potential changes to the habitat is 0.026km². This equates to 0.0002% of

the winter area of the Southern North Sea SAC (12,696km²), the same as assessed in the **Shadow HRA Report** (Doc Ref. 5.10) and below the spatial disturbance threshold of 20% and the seasonal average displacement threshold of 10% of the seasonal component. Consequently, no direct adverse effect on the integrity of the Southern North Sea SAC is predicted due to habitat loss associated with the Sizewell C Project in relation to the conservation objectives for harbour porpoise. This has not been assessed further in this Addendum.

c) Underwater noise from piling

9.2.8 The BLF assessed in the **Shadow HRA Report** (Doc Ref. 5.10) was for an 85m long piled facility, with an additional 11m of fenders and a ramp. Four of the pile pairs would be positioned landward of low tide, one pair would be close to the low tide mark and three pairs would be seaward of low tide. Two piles would also be installed for fenders, as well as two mooring dolphins. In total, 12 piles were assessed.

9.2.9 Underwater noise modelling was undertaken for the **Shadow HRA Report** (Doc Ref. 5.10) based on the following parameters:

- A maximum hammer energy of 90kJ (however, to allow for engineering flexibility, a worst-case scenario is also considered, with a hammer strike energy assumption of 200kJ).
- Pile strike rate of 46 strikes per minute.
- A total of approximately 1,500 strikes per pile.
- A total piling time of 33 minutes per pile.
- Maximum pile diameter of 1m for the BLF piles and 1.52m for the dolphins.
- A maximum of five piles to be installed within any 24-hour period.

9.2.10 **Table 9.1** presents the maximum predicted effect ranges and areas for permanent loss of hearing sensitivity (permanent threshold shift (PTS)) in marine mammals for impact piling assessed in the **Shadow HRA Report** (Doc Ref. 5.10).

9.2.11 **Table 9.2** presents the maximum predicted effect ranges and areas for temporary loss in hearing sensitivity (temporary threshold shift (TTS)) in marine mammals for impact piling assessed in the **Shadow HRA Report** (Doc Ref. 5.10).

9.2.12 The criteria and thresholds used to assess any potential effects of underwater noise on harbour porpoise, grey seal and harbour seal in the **Shadow HRA Report** (Doc Ref. 5.10) were the U.S. National Marine Fisheries Service (NMFS); a part of the National Oceanic and Atmospheric Administration (NOAA) (Ref. 9.2).

Table 9.1: Maximum predicted effect ranges for PTS in marine mammals for impact piling assessed in the Shadow HRA Report (Doc Ref. 5.10)

Species	Threshold and Criteria (Ref. 9.2)	90kJ Hammer Energy Range of Effect (Area of Effect)	200kJ Hammer Energy Range of Effect (Area of Effect)
Harbour porpoise	PTS 202 SPL _{peak}	27m	41m
	PTS 155 SEL _{cum}	Stationary = 1.3km	Stationary = 2.1km
		Fleeing = no effect	Fleeing = no effect
Grey seal and harbour seal	PTS 218 SPL _{peak}	6m	9m
	PTS 185 SEL _{cum}	Stationary = 206m	Stationary = 303m
		Fleeing = no effect	Fleeing = no effect

Table 9.2: Maximum predicted effect ranges for TTS in marine mammals for impact piling assessed in the Shadow HRA Report (Doc Ref. 5.10)

Species	Threshold and Criteria (Ref. 9.2)	90kJ Hammer Energy Range of Effect	200kJ Hammer Energy Range of Effect
Harbour porpoise	TTS 196 SPL _{peak}	45m	67m
	TTS 140 SEL _{cum}	Stationary = 6.6km	Stationary = 12.5km
		Fleeing = 2.8km	Fleeing = 4.8km
Grey seal and harbour seal	TTS 212 SPL _{peak}	10m	16m
	TTS 170 SEL _{cum}	Stationary = 1.9km	Stationary = 3.1 km
		Fleeing = no effect	Fleeing = no effect

9.2.13 As a worst-case, the potential disturbance was assessed in the **Shadow HRA Report** (Doc Ref. 5.10) using the 26km disturbance range, which gives an area of effect of 2,124km². However, the location of the Sizewell C main development site in relation to both the boundary of the Southern North Sea SAC and the coastline mean that this area will be significantly less. For harbour porpoise, the area of effect taking into account both the coastline and the site boundary (and using the worst-case spatial piling location) is 967km². For grey and harbour seal, the area of effect taking into account the coastline (and the worst-case spatial location for piling) is 1,101km².

- 9.2.14 Since completion of the **Shadow HRA Report** (Doc Ref. 5.10) JNCC (Ref. 9.1) has finalised guidance for assessing the significance of noise disturbance against conservation objectives of harbour porpoise SACs. The guidance identifies noise generating activities that can potentially result in disturbance to harbour porpoise and provides recommended Effective Deterrence Ranges (EDR) for these activities. JNCC (Ref. 9.1) recommend an EDR for pin-piles is 15km.
- 9.2.15 The potential area of disturbance could be an area of up to 456.33km², based on an 15km EDR and worst-case pile location, of which up to 341.07km² would overlap the winter area of the Southern North Sea SAC. Therefore, the assessments for potential disturbance for underwater noise during piling based on 26km disturbance range in the **Shadow HRA Report** (Doc Ref. 5.10), are based on a worst-case.
- 9.2.16 The assessments in **Sections 9.3, 9.4 and 9.5** of this Addendum have been updated to reflect this change.
- i. **Piling mitigation**
- 9.2.17 A draft marine mammal mitigation plan (MMMP) was submitted as part of the Application, provided in (**Volume 2, Chapter 22 Appendix 22N of the ES**) (Doc Ref. 6.3) [APP-331]. This includes a defined mitigation zone (500m radius from pile location), Marine Mammal Observer (MMO) conducting visual survey for 30 minutes prior to piling, soft-start and procedure for breaks in piling greater than 10 minutes.
- 9.2.18 To mitigate the potential for impacts on breeding birds, no piling would occur in May to August inclusive.
- 9.2.19 In addition, further mitigation in the form of a noise reduction system on the hammer has been proposed to minimise the effects of underwater noise. It could include the use of a hydrohammer which has two hydraulic plungers filled with water designed to dampen the impact and reduce the source noise of impact piling. Hydrohammers may reduce sound exposure levels (SEL) by 3 to 6dB and sound peak pressure level (SPL) by 9 to 12 dB, the lower values have been assessed as a precaution.
- ii. **Piling for enhanced permanent BLF**
- 9.2.20 The enhancement of the permanent BLF design would require approximately 28 permanent piles in total. The approximate dimensions of the piles are as follows:
- 24 of these piles are expected to have a diameter of approximately one metre.

- Four fender piles are expected to have a diameter of approximately 2.5 metres.

9.2.21 Installation of the permanent BLF would commence from the beach and progress out to sea using a Cantitravel method with a hydraulic hammer for the piles. A maximum of two piles would be installed per day followed by laying the next span, with a typical cycle of one span every three days. A jack-up barge or crane would install the grillage and mooring dolphins.

9.2.22 The piling assumptions used for modelling of instantaneous and cumulative (24-hour) auditory effects for marine mammals are presented in **Table 9.3**. In addition, modelling has been conducted and included for the use of a noise reduction system such as a hydrohammer as part of the mitigation to reduce the potential effects of underwater noise.

Table 9.3: Piling assumptions for the enhanced permanent BLF used in underwater noise modelling.

Parameter	Piles	Dolphins / Fenders
Number (below MHWS)	12	4
Pile diameter	1m	2.5m
Modelled depth of deepest pile (depth includes +1.4m chart datum to encompass a range of tidal conditions)	5.1m	5.1m
Hammer energy	120kJ	280kJ
Strike rate	44 blows / minute	44 blows / minute
Piling duration	45 minutes (+ 20-minute ramp-up)	45 minutes (+ 20-minute ramp-up)
Acoustic conversion efficiency	0.5%	1%
Maximum piles installed in 24-hour period	2	2
Minimum piling interval (worst-case)	15 minutes	15 minutes
Mitigation	<ul style="list-style-type: none"> - Pre-start marine mammal searches. - 20-minute linear ramp-up in hammer strike rate. - Additional mitigation including a 'hydrohammer' to dampen sound exposure level (SEL) and sound pressure level (SPL). 	

9.2.23 The key changes to the piling of the enhanced permanent BLF compared to the BLF assessed in the **Shadow HRA Report** (Doc Ref. 5.10) are detailed in **Table 9.4**. The assessments in the **Shadow HRA Report** (Doc Ref. 5.10) were based on 12 piles below MHWS, this has now

increased to 16 piles, including dolphin/fenders. The maximum piling duration in the assessments for the **Shadow HRA Report** (Doc Ref. 5.10) was assumed to be up to 12 days, based on worst-case of one pile per day.

- 9.2.24 Up to 16 piles (including dolphins / fenders) would be required to be installed for the enhanced permanent BLF in the water below MHWS. Two piles or two dolphins / fenders could be piled per day, therefore 8 days of piling would be required. If it is assumed, as a worst-case, that one pile could be installed per day, piling would require 16 days. However, based on 45 minutes and 20 minute soft-start to install each pile, the total active piling time would be up to 17.5 hours (less than 1 day).

Table 9.4: Key changes to the enhanced permanent BLF

Parameter	DCO Application BLF	Enhanced permanent BLF	Change
Marine piles installed below MHWS	4 pile pairs (8 piles)	6 pile pairs (12 piles)	Additional 4 piles below MHWS.
Dolphins / fenders	4 dolphin/fenders approximately 1.5m in diameter	4 dolphin/fenders approximately 2.5m in diameter	Increase in pile diameter assessed.
Maximum hammer energy	90kJ and 200kJ options for piles and dolphins/fenders.	Piles would be installed with a 120kJ hammer. Dolphins/fenders to be installed with 280kJ hammer.	BLF piles within envelope of the original 200kJ assessment. Increase in maximum hammer energy for larger diameter dolphins/fender piles.
Piling duration	33 minutes	45 minutes	Increase in piling duration per pile.
Maximum piling rate per 24-h period.	Cumulative acoustic assessments assumed five piles and/or dolphins per day. Equating to 3 days of piling.	Maximum installation rate of 2 piles <u>or</u> 2 dolphins per day. Equating to 2 days of piling to install dolphins and 6 days of piling to install piles.	Cumulative (24-hour) auditory effects are reduced due to sequencing and maximum of two pile per day. However, the duration of piling events increases.

- 9.2.25 Updated underwater noise modelling for the enhance permanent BLF indicates that the maximum instantaneous TTS and PTS impact ranges for harbour porpoise are estimated to be 106m and 69m respectively during piling of mooring dolphins and 53m and 32m, respectively, for the piles (**Table 9.5**). This is greater than the predicted impact areas

previously assessed (**Table 9.1** and **Table 9.2**). However, the low energy impact piling or the use of the hydrohammer for the enhanced permanent BLF would not result in instantaneous PTS or TTS beyond the 500m marine mammal mitigation zone at the onset of piling. Therefore, there would be no risk to harbour porpoise and no potential for an adverse effect on the integrity of the Southern North Sea SAC. This has not been assessed further in this Addendum.

- 9.2.26 The cumulative auditory PTS impact ranges for harbour porpoise was predicted as less than 25m for both piles and mooring dolphins for impact piling and the use of the hydrohammer. This is similar to what was previously assessed (**Table 9.1**) and within the marine mammal mitigation zone. Therefore, there would be no risk to harbour porpoise and no potential for an adverse effect on the integrity of the Southern North Sea SAC. This has not been assessed further in this Addendum.
- 9.2.27 The cumulative TTS for harbour porpoise was predicted as 2.4km and 8.7km for piles and mooring dolphins, respectively for impact piling and 1.1km and 4.6km, respectively for the hydrohammer (**Table 9.5**). This is within the previously assessed impact ranges for cumulative TTS in harbour porpoise, based on stationary model (**Table 9.2**). Therefore, there would be no change to the previous assessment in the **Shadow HRA Report** (Doc Ref. 5.10). Taking into account the temporary effects and intermittent and short duration of underwater noise from piling, there are unlikely to be any significant effects on harbour porpoise. Therefore, there would be no potential for an adverse effect on the integrity of the Southern North Sea SAC. This has not been assessed further in this Addendum.
- 9.2.28 The potential impact ranges for grey and harbour seal are within the marine mammal mitigation zone (**Table 9.5**). Therefore, there would be no risk to grey or harbour seal and no potential for an adverse effect on the integrity of the Humber Estuary SAC or The Wash and North Norfolk Coast SAC, respectively. This has not been assessed further in this Addendum.

Table 9.5: Marine mammal auditory impact ranges for piling activities associated with the enhanced permanent BLF

Pile type.	Threshold	Instantaneous		Cumulative (24-hour): fleeing.	
		Harbour porpoise.	Phocid seals.	Harbour porpoise.	Phocid seals.
Pile – impact piling	PTS	32m	5m	<25m	<25m
	TTS	53m	10m	2.4km	<25m

Pile type.	Threshold	Instantaneous		Cumulative (24-hour): fleeing.	
		Harbour porpoise.	Phocid seals.	Harbour porpoise.	Phocid seals.
Mooring dolphin – impact piling	PTS	69m	16m	25m	<25m
	TTS	106m	30m	8.7km	<25m
Pile – hydro-hammer	PTS	11m	2m	<25m	<25m
	TTS	24m	4m	1.1km	<25m
Mooring dolphin – hydro-hammer	PTS	33m	5m	25m	<25m
	TTS	55m	10m	4.6km	<25m

iii. Piling for temporary BLF

- 9.2.29** The temporary BLF would consist of a trestle pier and an enlarged unloading platform with a single berth. The temporary BLF would be up to approximately 505m in length and extend approximately 440m seaward of MHWS. Approximately 120 piles would be required to construct the temporary BLF, of which approximately 14 would be located on the beach. They would each be up to approximately 1.2m in diameter, with the exception of two berthing dolphins and two mooring dolphins (each approximately 2.5m in diameter). Installation of the BLF would be via a Cantitravel. The Cantitravel method means a maximum of two piles would be installed per day for the trestle pier followed by laying the next span. A jack-up barge would install the mooring dolphins/fenders, a maximum of two dolphins could be installed per day.
- 9.2.30** The piling assumptions used for modelling of instantaneous and cumulative (24-hour) auditory effects for marine mammals are presented in **Table 9.6**. In addition, modelling has been conducted and included for the use of a hydrohammer as part of the mitigation to reduce the potential effects of underwater noise.
- 9.2.31** Up to 110 piles (including dolphins / fenders) would be required to be installed for the temporary BLF in the water below MHWS. Two piles or two dolphins / fenders could be piled per day, resulting in 46 days of piling. If it is assumed, as a worst-case, that one pile could be installed per day, piling would require 110 days. However, based on 45 minutes and 20 minute soft-start to install each pile, the total active piling time would be up to 120 hours (5 days).

Table 9.6: Piling assumptions for the temporary BLF used in underwater noise modelling

Parameter	Piles	Mooring dolphins
Number (seaward of MHWS)	106 (24 unloading platform piles and 6 raker piles) (68 trestle piles).	4
Pile diameter	1.2m	2.5m
Modelled water depth of deepest pile (depth includes +1.4m chart datum to encompass a range of tidal conditions)	8.5m at the unloading platform (seaward end) 5.3m within the outer longshore sand bar (trestle pier)	8.5m
Hammer energy	120kJ	280kJ
Strike rate	44 blows / minute	44 blows / minute
Piling duration	45 minutes (+ 20-minute ramp-up)	45 minutes (+ 20-minute ramp-up)
Acoustic conversion efficiency	0.5%	1%
Maximum piles installed in 24-hour period	2 for trestle (approximately 34 days) 3 for unloading platform (approximately 10 days)	2 (2 days of piling)
Minimum piling interval (worst-case)	15 minutes	15 minutes
Mitigation	<ul style="list-style-type: none"> - Pre-start marine mammal searches. - 20-minute linear ramp-up in hammer strike rate from 1 blow per minute to full strike rate. - Additional mitigation including a 'hydrohammer' to dampen SEL and SPL. 	

9.2.32 The maximum instantaneous TTS and PTS impact ranges for harbour porpoise were estimated to be 169m and 93m respectively during impact piling of mooring dolphins; and 66m and 30m during impact piling of the piles, respectively (**Table 9.7**). These ranges are within the marine mammal mitigation zone. Therefore, there would be no risk to harbour porpoise and no potential for an adverse effect on the integrity of the Southern North Sea SAC. This has not been assessed further in this Addendum.

9.2.33 The cumulative PTS impact ranges for harbour porpoise is predicted to be 25m for both piles and mooring dolphins (**Table 9.7**). This is similar to what was previously assessed (**Table 9.1**) and within the marine mammal

mitigation zone. Therefore, there would be no risk to harbour porpoise and no potential for an adverse effect on the integrity of the Southern North Sea SAC. This has not been assessed further in this Addendum.

- 9.2.34 The cumulative TTS impact ranges for harbour porpoise is predicted to be 1.9km and 7.2km for piles and mooring dolphins respectively for impact piling (**Table 9.7**). This is within the previously assessed impacted ranges for cumulative TTS in harbour porpoise, based on stationary model (**Table 9.2**). Therefore, there would be no change to the previous assessment in the **Shadow HRA Report** (Doc Ref. 5.10). Taking into account the temporary effects and intermittent and short duration of underwater noise from piling, there are unlikely to be any significant effects on harbour porpoise. Therefore, there would be no potential for an adverse effect on the integrity of the Southern North Sea SAC. This has not been assessed further in this Addendum.
- 9.2.35 The potential impact ranges for grey and harbour seal are within the marine mammal mitigation zone (**Table 9.7**). Therefore, there would be no risk to grey or harbour seal and no potential for an adverse effect on the integrity of the Humber Estuary SAC or The Wash and North Norfolk Coast SAC, respectively. This has not been assessed further in this Addendum.
- 9.2.36 The underwater noise modelling of the hydrohammer indicates that the potential effects are reduced by 60% to 70% for instantaneous TTS and PTS. TTS cumulative (fleeing) ranges were reduced by approximately 58% for piles and 41% for mooring dolphins (**Table 9.7**).

Table 9.7: Marine mammal auditory impact zones for piling activities associated with the temporary BLF.

Pile type.	Threshold	Instantaneous		Cumulative (24-hour): fleeing.	
		Harbour porpoise.	Phocid seals.	Harbour porpoise.	Phocid seals.
Pile – impact piling	PTS	30m	5m	25m	25m
	TTS	66m	8m	1.9km	25m
Mooring dolphin – impact piling	PTS	93m	2m	25m	25m
	TTS	169m	4m	7.2km	25m
Pile – hydro-hammer	PTS	9m	2m	25m	25m
	TTS	20m	4m	774m	25m
Mooring dolphin – hydro-hammer	PTS	31m	5m	25m	25m
	TTS	68m	8m	4.2km	25m

iv. Piling for enhanced permanent BLF and temporary BLF

- 9.2.37 Installation of the enhanced permanent BLF is anticipated to last six months. Installation of the temporary BLF is anticipated to last nine months.
- 9.2.38 Installation is assumed to start in August 2022 for both BLFs and be completed by April 2023 of the construction phase. No piling would occur in the months of May, June, July or August to minimise the potential for effects on designated breeding birds. Assuming no temporal overlap of piling activities, a total of 60 days piling would occur during this period, based on two piles being installed per day. If piling for the piers for the enhanced permanent BLF and temporary BLF occurred simultaneously, a total of 54 days of piling would be required.
- 9.2.39 It is anticipated that the temporary BLF would not progress seaward beyond the outer longshore sand bar before the enhanced permanent BLF was completed. Therefore, the worst case underwater noise scenario for the combined effects of installation of the two BLFs would be installation of two piles per day at the enhanced permanent BLF and two piles per day within the sand bar for the temporary BLF (four piles in a 24-hour period).
- 9.2.40 A piling restriction to reduce the incidence of marine noise mean no additional piling would occur when mooring dolphins for the enhance permanent BLF are installed. Therefore, the maximum duration for daily overlap between the two BLFs would be six days of piling.

d) Underwater noise effects on prey species

- 9.2.41 The updated noise modelling for the piling of the enhanced permanent BLF indicates that the maximum potential impact range for a startle response in sprat (hearing specialist) is up to 4.2km. For piling of the temporary BLF, the maximum potential impact range for a startle response in sprat (hearing specialist) is up to 4.7km.
- 9.2.42 There would be no additional displacement of marine mammals as a result of any changes in prey resources during piling, as the potential for a behavioural / startle response in fish is less than the previously assessed disturbance range of 26km for harbour porpoise, grey seal and harbour seal in the **Shadow HRA Report** (Doc Ref. 5.10). It is also less than the updated assessment in this Addendum based on 15km disturbance range.
- 9.2.43 Therefore, there would be no potential for an adverse effect on the integrity of the Southern North Sea SAC, Humber Estuary SAC or The

Wash and North Norfolk Coast SAC for harbour porpoise, grey seal or harbour seal, respectively. This has not been assessed further in this Addendum.

e) Underwater noise during decommissioning of the temporary BLF

- 9.2.44 The temporary BLF would be dismantled after eight years. The full superstructure would be dismantled from seaward working back toward land.
- 9.2.45 Piles would be removed by a combination of very short duration impact piling to loosen the pile, followed by vibropiling. As for installation, two piles would be removed per day followed by two days to dismantle the span.
- 9.2.46 Piles and dolphins that are not possible to be removed by vibropiling would be cut off below the seabed.
- 9.2.47 The piling assumptions used for modelling of instantaneous and cumulative (24-hour) auditory effects for marine mammals are presented in **Table 9.8**.

Table 9.8: Assumptions for removing piles during dismantling of the temporary BLF.

Parameter	Piles
Impact piling duration	10 minutes / 50 blows
Hammer energy	120kJ
Vibropiling duration	30 minutes
Maximum piles removed in 24-hour period	2 for trestle
Minimum piling interval (worst-case)	15 minutes

- 9.2.48 The risk of PTS during decommissioning of the temporary BLF in harbour porpoise or seals is low with maximum predicted impacted ranges of 30m or less. Potential impacts will be mitigated by the use of MMOs prior to piling to ensure marine mammals are not in the immediate area.
- 9.2.49 Marine mammals could be displaced from a small area during decommissioning of the temporary BLF. However, any effects would be temporary, and animals would return to the area after the activity ceases.
- 9.2.50 Any potential effects are less than those assessed for installation piling.
- 9.2.51 Therefore, there would be no potential for an adverse effect on the integrity of the Southern North Sea SAC, Humber Estuary SAC or The

Wash and North Norfolk Coast SAC for harbour porpoise, grey seal or harbour seal, respectively. This has not been assessed further in this Addendum.

f) Underwater noise from dredging

- 9.2.52 Dredging would increase from 4,600m³ to up to 9,250m³, but the impact of underwater noise from dredging would differ little from that assessed in the **Shadow HRA Report** (Doc Ref. 5.10), therefore no further assessment is required.

g) Underwater noise from vessels

- 9.2.53 The underwater noise modelling the **Shadow HRA Report** (Doc Ref. 5.10) indicated that the potential increase in ambient noise levels associated with the BLF vessel traffic during the construction period was likely to be very modest (compared to the baseline noise levels) and was well within the typical variability at the site. Therefore, the effect of vessel noise was not assessed further for marine mammals.
- 9.2.54 The enhanced design of the permanent BLF would increase the ability of the permanent BLF to receive vessels, predominantly to import large deliveries, known as Abnormal Indivisible Loads (AILs), on barges more regularly during the construction phase. Up to approximately 100 beach landings per annual campaign (1st April to 31st October) could be achieved in total for approximately four years. Previously approximately 50 beach landings per campaign were assumed. Each barge would be guided by up to two tug boats when mooring at the enhanced permanent BLF.
- 9.2.55 The enhanced permanent BLF would be used infrequently during the operational phase of the power station (i.e. post construction), approximately every 5-10 years for a few weeks at a time.
- 9.2.56 The temporary BLF would be in operation for approximately 8 years. There could be up to approximately 400 deliveries between April and October (inclusive) and up to approximately 200 additional deliveries for the remainder of the year, for each year of operation.
- 9.2.57 The majority of vessel movements would typically travel to the site from the south, following a corridor between approximately two nautical miles and approximately six nautical miles offshore, except where it is necessary to deviate on safety grounds.
- 9.2.58 The increase in vessel traffic due to the enhanced permanent BLF is within the envelope of the original assessment. Therefore, no further assessment is required for this Addendum.

- 9.2.59 The increases in vessel traffic associated with the temporary BLF. The vessel noise assessment assumes sound source levels for an average oceangoing vessel whilst steaming, located at the position of the BLFs for 24 hours (the worst-case for cumulative auditory effects). Vessels on approach to the proposed development would operate at lower speeds, as such the source terms are precautionary.
- 9.2.60 The results of the updated modelling (**Table 9.9**) indicates negligible PTS ranges for harbour porpoise and seals even for stationary animals. TTS was predicated as 1.1km and 0.1km for harbour porpoise and seals, respectively, if they remained stationary within the area for 24 hours, which is highly unlikely.
- 9.2.61 Therefore, there would be no significant effect to harbour porpoise, grey seal or harbour seal and no potential for an adverse effect on the integrity of the Southern North Sea SAC, Humber Estuary SAC or The Wash and North Norfolk Coast SAC, respectively. This has not been assessed further in this Addendum.

Table 9.9: Stationary marine mammal cumulative auditory impact zones in the case of 24-hour vessel activity at the temporary BLF.

Vessel activity.	Threshold	Cumulative (24-hour): no fleeing.	
		Harbour porpoise.	Phocid seals.
Vessel noise including 24-hour utilisation of the temporary BLF.	PTS	(25m)	<25m
	TTS	1.1km	0.1km

h) Potential for increased vessel collision risk

- 9.2.62 The number of vessels which would be used during the construction and operation of the permanent BLF and temporary BLF would increase. However, the assessments in the **Shadow HRA Report** (Doc Ref. 5.10) were based on the area with increased vessels and not the number of vessels.
- 9.2.63 The assessments in the **Shadow HRA Report** (Doc Ref. 5.10) for potential for increased vessel collision risk were based on an area of 6.5km² (the marine area within the Order Limits). The permanent BLF and temporary BLF, including turning circles, are within this area. Therefore, there is no additional vessel collision risk for the permanent

BLF and temporary BLF compared to what was previously assessed in the **Shadow HRA Report** (Doc Ref. 5.10).

- 9.2.64 Vessels on approach to the proposed development would operate at lower speeds prior to mooring. For example, the **Code of Construction Practice (CoCP)** (Doc Ref. 8.11(A)) recommends site speed restrictions of <10 knots. Vessels travelling at high speeds are considered to be more likely to collide with marine mammals, and those travelling at speeds below 10 knots would rarely cause any serious injury (Ref. 9.3).
- 9.2.65 As such, there will be no adverse effect on the integrity of the SACs assessed for marine mammals from any potential for increased vessel collision risk as a result of the enhanced permanent BLF and new temporary BLF.
- 9.2.66 Vessels moving to and from the BLF(s) would use the most direct route using permissible routes, generally maintaining a minimum distance of 2-6 nm from shore with local avoidance of shallows as required. As assumed for the **Shadow HRA Report** (Doc Ref. 5.10), therefore there would be no further change to what was previously assessed in the **Shadow HRA Report** (Doc Ref. 5.10).

9.3 Assessment of effects on grey seal from Humber Estuary SAC

a) Disturbance from underwater noise during piling

- 9.3.1 In the **Shadow HRA Report** (Doc Ref. 5.10), the maximum predicted area of disturbance of foraging grey seal from impact piling, based on 26km, was up to 1,100.66km², which could affect up to 41.8 grey seal (0.48% of the South-East England Management Unit reference population; 0.64% of the Humber Estuary count).
- 9.3.2 For the disturbance area of up to up to 456.33km², based on a 15km EDR and worst-case pile location, although recommended for harbour porpoise SAC, the number of grey seal that could be disturbed is up to 17.34 (based on density estimate of 0.038 per km² as used in the **Shadow HRA Report** (Doc Ref. 5.10). This represents 0.21% of the recent South-East England Management Unit reference population of 8,199 grey seal (Ref. 9.2); 0.28% of the recent Humber Estuary count of 6,288 grey seal (Ref. 9.4).
- 9.3.3 The duration of potential disturbance for impact piling at the two BLFs could be up to 60 days, based on the most likely scenario of two piles installed per day. Although if it is assumed, as a worst-case, that one pile

could be installed per day, piling could require up to 126 days. However, active piling would be 6 days.

9.3.4 It is highly unlikely that all foraging grey seal that could be disturbed as result of underwater noise during piling of the BLFs would be from the Humber Estuary SAC. There would be no direct effect or overlap with the SAC.

9.3.5 Taking into account the temporary disturbance and intermittent duration of underwater noise from piling, along with the relatively low and infrequent number of grey seal in and around the Sizewell C main development site, there are unlikely to be any significant disturbance or barrier effects for foraging grey seal. Therefore, under these circumstances, no direct adverse effect on the integrity of the Humber Estuary SAC is predicted as a result of disturbance during impact piling for the construction of the Sizewell C main development site in relation to the conservation objectives for grey seal. This remains unchanged from the assessment in the **Shadow HRA Report** (Doc Ref. 5.10).

9.4 Assessment of effects on harbour porpoise from Southern North Sea SAC

a) Disturbance from underwater noise during piling

9.4.1 In the **Shadow HRA Report** (Doc Ref. 5.10), the maximum predicted area of disturbance of harbour porpoise from impact piling, based on 26km, was up to 967km², which could affect up to 587 harbour porpoise (0.17% of the North Sea Management Unit reference population). This equates to 7.6% of the winter area of the Southern North Sea SAC.

9.4.2 For the disturbance area of up to 341.07km², based on an 15km EDR from worst-case location and maximum overlap with Southern North Sea SAC, the number of harbour porpoise that could be disturbed is up to 207 (based on density estimate of 0.607 per km² as used in the **Shadow HRA Report** (Doc Ref. 5.10)). This represents 0.06% of the North Sea Management Unit reference population (345,373 harbour porpoise as assessed in the **Shadow HRA Report** (Doc Ref. 5.10)).

9.4.3 The maximum area of effect from disturbance for harbour porpoise as a result of impact piling of up to 341.07km², represents up to 2.69% of the winter area of the Southern North Sea SAC (12,696km²) and is below the spatial disturbance threshold of 20% of the seasonal component of the Southern North Sea SAC.

9.4.4 The maximum piling duration could be up to 60 days in the winter period, based on the most likely scenario of two piles installed per day. Taking

into account the maximum spatial area with the potential for disturbance to harbour porpoise and the maximum proportion of the winter season that may have piling undertaken in it, the seasonal average could be up to 0.9% of the winter season. This is below the seasonal average threshold of 10% of the seasonal component of the Southern North Sea SAC.

9.4.5 As a worst-case, that one pile could be installed per day, piling could require up to 126 days and the seasonal average would be 1.86%. This is below the seasonal average threshold of 10% of the seasonal component of the Southern North Sea SAC.

9.4.6

9.4.7 Therefore, no adverse effect on the integrity of the Southern North Sea SAC is predicted due to disturbance from impact piling associated with the Sizewell C Project in relation to the conservation objectives for harbour porpoise. This remains unchanged from the assessment in the **Shadow HRA Report** (Doc Ref. 5.10).

9.4.8 The potential significant disturbance of harbour porpoise in the Southern North Sea SAC winter area from any in-combination effects with other plans and projects as a result of underwater noise is considered further in the Site Integrity Plan (SIP) (**Appendix 9A**).

9.5 Assessment of effects on harbour seal from The Wash and North Norfolk Coast SAC

a) Disturbance from underwater noise during piling

9.5.1 In the **Shadow HRA Report** (Doc Ref. 5.10), the maximum predicted area of disturbance of foraging harbour seal from impact piling, based on 26km, was up to 1,100.66km², which could affect up to 43 harbour seal (0.87% of the South-East England Management Unit reference population; 1.19% of The Wash count).

9.5.2 For the disturbance area of up to up to 456.33km², based on an 15km EDR and worst-case pile location, although recommended for harbour porpoise SAC, the number of harbour seal that could be disturbed is up to 17.8 (based on density estimate of 0.039 per km² as used in the **Shadow HRA Report** (Doc Ref. 5.10). This represents 0.36% of the recent South-East England Management Unit reference population of 4,961 harbour seal (Ref. 9.2); 0.36% of latest count at The Wash and Blakeney Point haul-out sites of 3,850 harbour seal (Ref. 9.4).

9.5.3 The duration of potential disturbance for impact piling at the two BLFs could be up to 60 days, based on the most likely scenario of two piles

installed per day. Although if it is assumed, as a worst-case, that one pile could be installed per day, piling could require up to 126 days. However, active piling would be 6 days.

9.5.4 It is highly unlikely that all foraging harbour seals that could be disturbed as result of underwater noise during piling of the BLFs would be from The Wash and North Norfolk Coast SAC. There would be no direct effect or overlap with the SAC.

9.5.5 Taking into account the temporary disturbance and intermittent duration of underwater noise from piling, along with the relatively low and infrequent number of harbour seal in and around the Sizewell C main development site, there are unlikely to be any significant disturbance or barrier effects for foraging harbour seal. Therefore, under these circumstances, no direct adverse effect on the integrity of The Wash and North Norfolk Coast SAC is predicted as a result of disturbance during impact piling for the construction of the Sizewell C main development site in relation to the conservation objectives for harbour seal. This remains unchanged from the assessment in the **Shadow HRA Report** (Doc Ref. 5.10).

9.6 Updated assessment – In-combination effects

9.6.1 There would be no change to the in-combination effects as assessed in the **Shadow HRA Report** (Doc Ref. 5.10), as the proposed changes for permanent BLF and temporary BLF are within the worst-case previously assessed.

10 INFORMATION FOR APPROPRIATE ASSESSMENT: MIGRATORY FISH

10.1 Introduction

a) Relevant Additional Information

10.1.1 This section presents the supplementary assessment for European sites with migratory fish qualifying interest features in light of the updated European site scoping (**Section 4**) and LSE screening exercises (**Section 5**).

10.1.2 In addition, the implications of the updated baseline information for the twaite shad population of the Elbe and Scheldt and the updated predictions of fish impingement (as relevant to migratory fish species that are qualifying interest features of relevant European sites) are discussed.

b) Relevant changes

10.1.3 The screened in effect pathway for all migratory fish species due to the influence of the Sizewell C Project is 'physical interaction between species and project infrastructure', with impingement and entrainment of fish in the cooling water infrastructure being the pathway for effect. This predicted effect is considered for the operational phase of the project only (in this context construction and decommissioning are not relevant).

10.1.4 There are no proposed design changes that are relevant to the assessment of potential effects on migratory fish relevant to European sites.

10.2 Updated assessment – Additional Information: Humber Estuary SAC

a) Implications of revised impingement assessment

10.2.1 For river lamprey, the predicted annual impingement, with the proposed intake head design and FRR mitigation, is estimated to be 215 individuals, equating to 0.03% of the estimate of the lamprey population in the Humber catchment (Ref. 1.1). This is a revised (lower) prediction from that which informed the assessment in the **Shadow HRA Report** (Doc Ref. 5.10), which estimated that 0.07% of the lamprey population in the Humber catchment would be impinged.

10.2.2 For sea lamprey, the mitigated annual impingement losses are estimated to be less than one fish (0.36). This is deemed to be ecologically

negligible and negligible in the context of a stock that is widespread throughout the North Sea.

10.2.3 Neither sea or river lamprey were detected in the entrainment sampling. As such, their respective populations are not considered to be at risk from entrainment.

10.2.4 The conclusions of the **Shadow HRA Report** (Doc Ref. 5.10) are unaffected by this additional information; an adverse effect on the integrity of the Humber Estuary SAC due to impingement of river and sea lamprey during the operation of Sizewell C can be excluded.

10.3 Updated assessment – Additional Information: mainland European sites (SACs and SCIs) for river lamprey

a) Introduction

10.3.1 As reported in **Section 5.3**, LSE cannot be excluded for the additional European sites scoped into the assessment for river lamprey:

- Schelde- en Durmeëstuarium van de Nederlandse grens tot Gent SAC.
- Unterems und Außenems SCI.
- Ems SCI.
- Weser bei Bremerhaven SAC.
- Weser zwischen Ochtummündung und Rekum SAC.
- Unterweser SCI.
- Nebenarme der Weser mit Strohauser Plate und Juliusplate SCI.
- Lesum SAC.
- Bremische Ochtum SAC.
- Mühlenberger Loch/Neßsand SAC.
- Rapfenschutzgebiet Hamburger Stromelbe SCI.
- Schleswig-Holsteinisches Elbästuar und angrenzende Flächen SAC.
- Unterelbe SCI.

- Treene Winderatter See bis Friedrichstadt und Bollingstedter Au SAC.
- Untereider SAC.
- Havre de Saint-Germain-sur-Ay et Landes de Lessay SAC.
- Marais Vernier, Risle Maritime SAC.

10.3.2 The predicted impingement of river lamprey is reported in **Section 10.2**. This indicates a very low predicted impingement at Sizewell C for this species and, while there is a theoretical pathway for effect on the European sites listed in this section, the risk of impingement of fish that may derive from these SACs and SCIs is significantly lower than that predicted for the Humber Estuary SAC.

10.3.3 On the basis of the very low predicted impingement and greater distance of these European sites from the Sizewell C site (which results in a weaker pathway for effect compared with that assessed for the Humber Estuary SAC), an adverse effect on the integrity of the mainland European sites due to impingement of river and sea lamprey during the operation of Sizewell C can be excluded.

10.4 Updated assessment – Additional Information: mainland European SACs for twaite shad

a) Implications of revised impingement assessment

10.4.1 As reported in **Section 6.5**, between 2009 and 2017, an estimated annual average of 5.2 million adult twaite shad passed through the Scheldt and Elbe river systems, with the majority being in the Elbe (Ref. 1.3).

10.4.2 Impingement losses of twaite shad for Sizewell C, with mitigation, are predicted to be 1,067 individuals, representing 0.02% of the population (Ref. 1.1). This is the same percentage as reported in the **Shadow HRA Report** (Doc Ref. 5.10) and, therefore, the conclusion is unchanged with respect to the mainland European SACs (i.e. adverse effect on the integrity of the mainland European SACs can be excluded).

b) Assessment of additional European sites for twaite shad

10.4.3 As reported in **Section 5.3**, LSE cannot be excluded for the additional European sites scoped into the assessment for twaite shad:

- Marais du Cotentin et du Bessin - Baie des Veys SAC.
- Tregor Goëlo SAC.

- 10.4.4 The predicted impingement of twaite shad is reported in **Section 10.4 a)**. This indicates a very low predicted impingement at Sizewell C for this species.
- 10.4.5 The Marais du Cotentin et du Bessin - Baie des Veys SAC and Tregor Goëlo SAC are located approximately 400km and 530km from the location of the Sizewell C site respectively. There are no quantified data of population levels of twaite shad linked to these SACs, but it is considered highly unlikely that these river systems support a greater population than the Elbe and Scheldt, with the Elbe known to be one of the most important spawning stocks of twaite shad in the North Sea region (Ref. 1.3). Furthermore, these SACs are located at a substantially greater distance from the location of the Sizewell C site than the Elbe and Scheldt systems.
- 10.4.6 The theoretical predicted impingement of twaite shad derived from the spawning populations of either the Marais du Cotentin et du Bessin - Baie des Veys SAC and Tregor Goëlo SAC can be assumed to be less significant than the predictions made in the context of the populations of the Scheldt and Elbe river systems.
- 10.4.7 On the basis of the very low predicted impingement and greater distance of these European sites from the Sizewell C site, an adverse effect on the integrity of the Marais du Cotentin et du Bessin - Baie des Veys SAC and Tregor Goëlo SAC due to impingement of twaite shad during the operation of Sizewell C can be excluded.
- 10.5 **Conclusion**
- 10.5.1 In conclusion, the updated assessments conclude there would not be an adverse effect on integrity on additional European sites screened into the assessment with migratory fish qualifying interest features.
- 10.5.2 The outcome of the appropriate assessment is reported in **Appendix 10A**, which reproduces the integrity matrices for SACs from **Appendix D1** of the **Shadow HRA Report** (Doc Ref. 5.10) and supplements them with additional integrity matrices for those European sites screened into the appropriate assessment.

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