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1 WITHIN-PROJECT ASSESSMENT

1.1 Item 1a of Schedule 5 (No. 5)

a) Summary of the information request

1.1.1 The Environment Agency requested a within project in-combination assessment, taking account of the three SZC operational permit applications currently being determined.

1.1.2 In a meeting with the Environment Agency on 16 September 2021 there was discussion regarding the use of the term 'in-combination assessment'. It was acknowledged and understood that in the context of the Schedule 5 request, this term was being used to refer to the potential combined effects between different effect pathways resulting from the Sizewell C Project as opposed to in-combination effects between the Sizewell C Project and other plans and projects.

b) Initial screening for potential within project combined effect

1.1.3 As the Schedule 5 request notes, there would be potential for a temporal overlap as all three permits are operational permits. Additionally, there could be a spatial effect (described as layering, spreading or scattering). For example, the proposed activities under the operational WDA and RSA permit applications will both discharge effluents directly to the marine environment and the effects of both permits could, therefore, combine to affect the same receptors.

1.1.4 The Schedule 5 request included an example table (Table 1) to illustrate the potential overlap (temporal and / or spatial) of within-project risks which is intended to identify those requiring further assessment in the HRA process. The structure of Table 1 (contained in the Schedule 5 request) has been modified and presented as Table 1.1 in this response to present the sources of potential effect on designated sites from each of the operational permits and the individual risk (or effect) pathways to qualifying interest features.

Table 1.1: Screening for potential combined effect between the three operational permits

	Operational CA ¹	Operational RSA ²	Operational WDA ³
Source (of potential effect)			
Discharges to atmosphere	Yes	Yes	No
Discharges to marine environment	No	Yes	Yes
Discharges to freshwater environment	No	No	No
Risks			
Radioactive substances	No	Yes	No
Nutrient enrichment	Yes	No	Yes
Acidification	Yes	No	No
Toxic effect of pollutants (chemicals)	Yes	No	Yes
Disturbance (noise)	Yes	No	No
Thermal effects	No	No	Yes

1.1.5 The Schedule 5 request acknowledges that there is unlikely to be a potential for the activities included in the operational WDA permit to influence the freshwater environment, but added that there is a potential pathway via the tidal Minsmere sluice and the risk to designated receptors should be considered.

1.1.6 As stated in paragraph 19.4.52 of Chapter 19 of the Environmental Statement (Groundwater and Surface Water), the sluice is divided into two chambers, each with its own gravity outlet culvert. The northern chamber receives flows from the northern culvert of the Minsmere New Cut, while the southern chamber receives flows from Leiston Drain and Scott's Hall

¹ Combustion Activities (CA) permit application (reference: EPR/MP3731AC/A001)

² Radioactive Substances Activities (RSA) permit application (reference: EPR/HB3091DJ/A001)

³ Water Discharge Activities (WDA) permit application (reference: EPR/CB3997AD/A001)

Drain. The southern chamber is also connected to the Minsmere New Cut through its southern culvert, which includes a penstock at its upstream face. The penstock is opened to alleviate high water levels in the catchment. When river levels exceed sea levels, water flows from river to sea. When sea levels exceed river levels, flow will cease, and water stored upstream of the sluice. Some ingress of seawater into the freshwater system has been factored into the design.

- 1.1.7 Chapter 19 of the Environmental Statement (Groundwater and Surface Water) also notes (at paragraph 19.4.65) that water quality in the surface watercourses is influenced by the input of saline water from Minsmere sluice, which results in elevated salinity and sulphate levels in the immediate vicinity of the sluice. This suggests that saline influence is localised to the sluice and/or that saline intrusion is infrequent and does not have a lasting effect on upstream surface water quality.
- 1.1.8 Modelling of the thermal and chemical plumes indicate that there is the potential for the thermal plume (only) to interact with the coastline at the location of the Minsmere sluice, but the annual surface temperature difference at the coast is predicted to be minimal (less than 1.5°C) (98th percentile).
- 1.1.9 It is concluded that the risk of the operational cooling water discharge resulting in a negative effect on water quality in the watercourses linked to the Minsmere sluice is very low due to the minimal predicted effect on marine water quality at the coastline (i.e. only the thermal plume is predicted to interact with the coastline) and the fact that seawater can only enter the sluice under specific flow conditions.
- 1.1.10 When considering the potential for combined effects between the three operational permits due to the same risk pathway, it can be seen from Table 1.1 that only nutrient enrichment is a relevant consideration (i.e. due to the potential for combined effect between the operational CA permit and operational WDA permit). However, it is also necessary to consider the potential for interaction *between* different risk / effect pathways related to the three permits (e.g. Table 1.1 highlights the potential for a combined risk of acidification from the operational CA permit with radioactive substances from the operational RSA permit).
- 1.1.11 Further analysis of both of these types of interaction to conclude whether or not there is a realistic potential for a combined effect requires more detailed consideration of the nature of the predicted effect and the potentially affected receiving environment (refer to sub-section c).

c) Analysis of potential for combined effects

1.1.12 Although an analysis of combined effects strictly requires consideration of all potential risks / effect pathways together, in this case there is merit in initially considering the effect of the operational RSA permit individually for the following reasons:

- there is a single relevant risk / effect pathway (radioactive substances) associated with this permit;
- this risk / effect pathway is not relevant to the other permits;
- the assessment of this pathway within the HRA process comprises the application of accepted, quantified screening criteria (meaning that there is a clear threshold below which likely significant effect can be excluded).

1.1.13 The Environment Agency (with Natural England) have agreed “a dose rate [of radioactive substances] threshold of 40 microgray/h ($\mu\text{Gy/h}$), below which it has been concluded that there will be no adverse effect on the integrity of a Natura 2000 site” (Environment Agency, 2009)⁴. Furthermore, the assessment undertaken by the Environment Agency (2010) for the UK EPR™ technology⁵ states that “we have adopted a value of 40 $\mu\text{Gy h}^{-1}$ as the level below which no further regulatory attention is warranted”.

1.1.14 The assessment of radiological emissions for the Sizewell C Project (reflected in section 5.4 of the DCO Shadow HRA Report likely significant effect screening assessment) adopted the default screening value included in the internationally accepted ERICA (Environment Risks from Ionising Contaminants: Assessments and management⁶) Integrated Approach of 10 $\mu\text{Gy/h}$. This is the proposed generic screening value below which 95% of all species should be protected from ionising radiation.

1.1.15 The effects due to emissions of radioactive substances for non-human biota is demonstrated using established methodologies against a number of reference organisms. Terrestrial, marine, coastal and freshwater habitats were considered and the assessment considered predicted discharges

⁴ Environment Agency (2009). Habitats assessment for radioactive substances. Science report: SC060083/SR1.

⁵ Environment Agency (2010). Generic design assessment: UK EPR™ nuclear power plant design AREVA NP SAS and Electricité de France SA.

⁶ Beresford, N., Brown, J., Coplestone, D., Garnier-Laplace, J., Howard, B., Larsson, C-M, Oughton, D., Pröhl, G. Zinger, I. (2007) D-ERICA: An Integrated Approach to the Assessment and Management of Environmental Risks from Ionising Radiation. EC Contract FI6R-CT-2004-508847.

from Sizewell C (and also these discharges in combination with discharges at permitted limits from Sizewell B power station).

- 1.1.16 For all of the receptors evaluated, predicted dose rates were lower (by at least one order of magnitude and, for some receptors, up to three orders of magnitude) than the screening value of 10 μ Gy/hour that is considered protective of populations of non-human biota across all ecosystems.
- 1.1.17 In conclusion, the effect of emissions of radioactive substances on non-human biota from the proposed Sizewell C nuclear power plant alone (and in-combination with Sizewell B) are predicted to be trivial and inconsequential. Consequently, it can be concluded that there would be no likely significant effect on designated sites.
- 1.1.18 Given the above, it can be concluded that there is no plausible risk for combined effects between emissions of radioactive substances with other risk / effect pathways related to the other operational permits. The potential effects of the operational RSA are, therefore, excluded from further consideration.
- 1.1.19 As illustrated in Table 1.1, there is potential for interaction between different risk / effect pathways related to the operational CA permit and the operational WDA permit.
- 1.1.20 The Shadow HRA Report for the operational WDA permit concludes (Table 5.3) that the potential effects of the operational WDA permit activities are confined to the marine environment because there is no effect pathway existing for habitats or species located above the level of mean high water spring tides (as evidenced by the discussion in sub-section b) regarding the lack of potential for significant water quality effect at the coastline).
- 1.1.21 Conversely, the potential effects of the operational CA permit activities (air quality and noise) are confined to the terrestrial environment. While aerial emissions could disperse to the marine environment, and therefore represent a theoretical potential for effect, in reality there is no effect pathway to marine mammal and migratory fish qualifying interest features of Special Areas of Conservation (SACs) or to marine supporting habitats of bird qualifying features of Special Protection Areas (SPAs). The conclusion regarding lack of a realistic effect pathway is reached on the basis of the assessment of sensitivity to aerial concentrations of ammonia, NO_x and SO₂ and nutrient nitrogen and acid deposition reported in the air Pollution Information System (APIS) which confirms these features and habitats are not exposed or sensitive to this effect pathway (as reported in more detail in section 5 of the Shadow HRA Report for the operational CA permit).

- 1.1.22 Potential noise effects due to the effects of the operational CA permit activities have been assessed in section 5.3b of the Shadow HRA Report for the operational CA permit application. For SPAs (i.e. sites with bird qualifying features), the noise level is predicted to be below ambient levels (in the case of the Alde-Ore Estuary SPA and Ramsar site and Sandlings SPA). For the Minsmere-Walberswick SPA and Ramsar site and the Outer Thames Estuary SPA, predicted noise levels are also below the day time ambient levels and only very marginally above night time ambient levels. In any event, when compared with the noise disturbance thresholds presented by Mander and Cutts (2004)⁷ and IECS (2008)⁸, the predicted noise levels from the combustion activities are well below the level where any direct disturbance effects on birds may be expected and likely significant effect can be excluded.
- 1.1.23 The operational combustion activities have no potential to generate underwater noise and, therefore, there is no potential for either a direct effect on marine mammal qualifying features of SACs or an indirect effect on the fish prey species for marine birds or marine mammals of SPAs and SACs. Likely significant effect via this pathway can, therefore, be excluded.
- 1.1.24 In the case of habitat qualifying features of SACs and Ramsar sites, there is no pathway for effect and likely significant effect can be excluded.
- 1.1.25 A combined effect on designated sites can, therefore, be ruled out on a precautionary basis, beyond reasonable scientific doubt, due to an absence of spatial overlap of emissions and discharges arising from activities under these two permits, as shown in Table 1.1 (i.e. there is no potential for the effects arising from the permits to interact to cause an combined effect that is different to that identified in the Shadow HRAs that form part of the permit applications).
- 1.2 **Item 1b of Schedule 5 (No. 5)**
- a) **Summary of the information request**
- 1.2.1 The Environment Agency requested an in-combination assessment between the different WDA discharge points and characteristics of the proposed operational WDA permit, these being the combined waste streams A to G (i.e. the trade effluent thermal and chemical plumes and sewage treatment work (STW) discharge components) via the two cooling

⁷ Mander, L. & Cutts, N (2004). Ornithological Monitoring, Thorngumbald: Annual Report #2 January to December 2003. Institute of Estuarine & Coastal Studies, University of Hull.

⁸ Institute of Estuarine and Coastal Studies (IECS) (2008). Conservation goals for waterfowl in estuaries. Report to HARBASINS.

water discharge outlets and the two waste stream H (i.e. the trade effluent from the fish recovery and return (FRR) system) discharge outlets.

1.2.2 In a meeting with the Environment Agency held on 16 September 2021, it was clarified that this request specifically referred to requiring information on the combined effect of thermal and chemical plumes.

b) Initial screening for potential within project combined effect

1.2.3 The Schedule 5 request included Table 2 as an illustrative example of a matrix for identifying the risk of combined effects between pollution sources of the operational WDA permit. This table structure has been reproduced as Table 1.2.

Table 1.2: Risk of potential combined effect between the three operational permits

	WDA waste streams A to F		WDA waste stream G	WDA waste stream H
	Thermal plume	Chemical plume	STW	FRR
Risks				
Thermal	Yes	No	No	No
Chemical	No	Yes	No	No
Nutrient enrichment	No	No	Yes	Yes
Un-ionised ammonia	No	No	Yes	Yes

1.2.4 Table 1.2 illustrates that there is potential for a combined effect between thermal and chemical risks for waste streams A to F, but no potential for a combined effect due to the same risk pathway.

1.2.5 The potential for a combined effect due to the same risk associated with more than one waste stream exists for nutrient enrichment and un-ionised ammonia (arising from waste streams G and H).

c) Synergistic effect of thermal and chemical plumes (WDA waste streams A to F)

i. Consideration of direct effects on marine mammals

1.2.6 There is very little evidence for thermal and chemical discharges having a negative effect on marine mammals. As the Shadow HRA Report for the operational WDA permit application notes (e.g. in section 9.4), marine mammals have the ability to regulate their body temperature during periods of high activity or when the ambient temperature is warm. While the change in temperature associated with the thermal plume would be noticeable to marine mammal species, these species are well adapted and accustomed to the change in water temperature as they dive. Due to the evolved ability of marine mammals to naturally regulate their body temperature, it is concluded that the change in ambient temperature due to the thermal plume would have no direct impact on marine mammal species.

1.2.7 The approach taken to the assessment of potential effects on marine mammals was to estimate the number of individuals that could be present within the area of the thermal and chemical plume and to assume their exclusion from that area. The estimated number of individuals was then expressed as a percentage of the relevant marine mammal reference population and relevant SAC population.

1.2.8 The approach described above is highly precautionary and accounts for any uncertainty that may exist regarding how marine mammals could be directly affected by thermal and chemical plumes. Furthermore, the same approach was adopted to the assessment of effect on prey species for marine mammals (i.e. it was assumed that all prey species would be displaced from within the thermal and chemical plume). This approach to the assessment also means that there is no potential for any synergistic (or combined) effect to alter the conclusions reached when assessing the effect of the thermal and chemical plumes in isolation (because the assessment is based on maximum spatial extent of effect).

ii. Consideration of direct effects on birds

1.2.9 In relation to the potential for direct toxic effects on birds as a result of the chemical discharges, the Shadow HRA Report did not consider this effect pathway on the basis that the lack of evidence for any such effects, together with the lack of a plausible pathway (when considering the likely properties associated with these discharges), meaning that LSE was not identified in relation to this effect pathway at the screening stage (and this conclusion was not challenged by any party).

1.2.10 This matter was, however, raised by the RSPB and Natural England during the DCO examination and a response was prepared, which is summarised below.

1.2.11 In terms of considering the potential for direct toxic effects on birds from the chemical plume (with bromoform and hydrazine discharges being the specific chemicals referred to by the RSPB and Natural England), the position is that such effects are highly unlikely. This conclusion is reached on the basis that:

- The concentrations of both bromoform and hydrazine are low and of a level which is considered unlikely to result in direct toxicity. For example, based upon the available evidence for effects on fish species, the within-plume concentrations are substantially below levels which have been documented to result in lethal or chronic sub-lethal effects.
- Following from the evidence available on fish, although marine birds might be exposed to such chemicals in the water via contact whilst swimming on the surface, diving in the water or through ingestion of seawater, it is considered precautionary to assume that birds would be expected to display similar levels of sensitivity to these chemicals in the water column to that of vertebrates such as fish which have more direct contact with seawater via the skin and across the gill surface.
- The areas over which both bromoform and hydrazine are predicted to exceed their respective Predicted No-Effect Concentration (PNEC) values due to the Sizewell C discharges are small relative to the foraging ranges of the relevant SPA species. Given this, the likelihood of birds being within these plume areas and, therefore, exposed to the chemicals at concentrations above PNEC for any prolonged period is small (making direct contamination unlikely on this basis alone).
- Both bromoform and hydrazine have low bioconcentration factors so that there is a low likelihood for these chemicals to accumulate through the food chain. Furthermore, bromoform rapidly degrades in the marine environment.
- There is no evidence from any other sites (or similar situations) to suggest that direct toxic effects on birds would result from bromoform or hydrazine discharges at the concentrations predicted for the Sizewell C Project. It is also notable that the bromoform plume resulting from discharges at Sizewell B encompasses an area

approximately six times greater than that which is predicted to result from the operation of Sizewell C.

1.2.12 Synergistic indirect effects of the thermal plumes with chemical discharges are relevant to effects on qualifying seabird interest features of SPAs via effects on the fish prey species. While the indirect effect on prey species for marine mammals was assessed in the Shadow HRA Report for the operational WDA permit (section 9.4), any synergistic effect does not have the potential to alter the conclusion of the Shadow HRA Report with respect to marine mammals for the reason explained in sub-section c i) above.

iii. Synergistic effect between temperature and total residual oxidant (TRO)

1.2.13 Temperature elevation has been shown to increase toxicity of chlorine TRO in fish (Cooke, S.J. and J.F. Schreer. 2001)⁹. In one case covered in this review, an approximate halving of the median lethal concentration (LC50) of TRO was observed with an increase of temperature between 10°C and 20°C. For invertebrates a 5°C increase in temperature more than halved the LC50 concentration of free chlorine and chloramine in 30 minute exposures in the rotifer *Brachionus plicatilis*, larvae of the American lobster *Homarus americanus*, and American oyster larvae *Crassostrea virginica* (Capuzzo, 1979)¹⁰. However, the studies reviewed report temperature effects on toxicity in acute studies with durations of hours to a few days and with exposure concentrations in the 100s of micrograms (which are significantly greater than the predicted exposure concentrations at Sizewell C). In the same review, in some cases fish were reported to actively avoid much lower TRO concentrations than would be lethal over several days' continuous exposure. This can be explained by the fact that TRO is more of an irritant than a pollutant and easily detected via the gills.

1.2.14 At the immediate point of discharge, the maximum predicted temperatures at the surface are between 7.5°C and 8°C above ambient. As a 98th percentile, the 5°C above ambient temperature contour is 30.6ha in a relatively symmetrical position around the outfalls. Overlapping this area, TRO concentrations above 50µg/l and 20µg/l occur over sea surface areas of approximately 9ha and 98ha, respectively as a 95th percentile.

1.2.15 Absolute temperature uplifts of 28°C (98th percentile) occur over a very small area (0.11ha) at the sea surface. Absolute thermal uplifts of >23°C

⁹ Cooke, S.J. and J.F. Schreer (2001). Additive Effects of Chlorinated Biocides and Water Temperature on Fish in Thermal Effluents with Emphasis on the Great Lakes. *Reviews in Fisheries Science*, 2001, 9 (2), pp. 69–113

¹⁰ Capuzzo, J.M. (1979). The Effect of Temperature on the Toxicity of Chlorinated Cooling Waters to Marine Animals - A Preliminary Review. *Marine Pollution Bulletin*, 1979, 10 (2), pp. 45–47

occurs over an area of 89.6ha at the surface (and 25.6ha at the seabed) as a 98th percentile.

- 1.2.16 The most sensitive species in the individual assessments showed effect thresholds at ca. 20µg/l. It is therefore unlikely that the synergistic effects of TROs and modest temperature uplifts or absolute temperature would cause adverse effects to extend beyond the TRO EQS contour. In the very small areas of the thermal plume with temperatures of 5°C above background and in which TRO concentrations are >20µg/l, increased TRO toxicity may occur.
- 1.2.17 The conditions under which synergistic effects could arise are transient. Moreover, the exposure times of actively mobile organisms or those passively moving with the tides would be very short. Consequently, while there is the potential for synergistic effects, such an effect would be restricted to a very localised area and would be limited in duration, with fish prey species exposed to such effects over a very limited time only due to their high mobility.
- 1.2.18 The inter-relationship of the TRO and thermal plumes is not predicted to increase the significance of effects as concluded for these pressures acting alone. It is highly unlikely that the inter-relationship between thermal and chlorinated discharges would increase the significance of the effects of localised displacement, beyond the effects predicted for the pressures individually. This conclusion applies to all fish receptors assessed.

iv. Synergistic effect between temperature and hydrazine

- 1.2.19 Hydrazine toxicity has been shown to increase with elevated temperatures. A study by Hunt *et al* (1981)¹¹ showed a 25-40% decrease in 96-h LC50 of hydrazine for bluegill with a 5 – 11°C increase in temperature. However, lethal concentrations are over 1 mg/l and, therefore, more than 14,000 times higher than the potential hydrazine concentration at the initial discharge point of the cooling water before mixing (69 ng/l). Sublethal concentrations based on altered behaviour (Fisher *et al.*, 1980)¹² are approximately 1,400 times higher than the potential hydrazine concentration at the initial discharge point.

¹¹ Hunt, T.P., Fisher, J.W., Livingston, J.M. and Putnam, M.E (1981). Temperature effects on hydrazine toxicity to bluegills. *Bulletin of Environmental Contamination and Toxicology*, 27: 588–595.

¹² Fisher, J., Harrah, C. B. and Berry, W. O. (1980) Hydrazine: Acute Toxicity to Bluegills and Sublethal Effects on Dorsal Light Response and Aggression. *Transactions of The American Fisheries Society*, 109, pp. 304–309.

1.2.20 The inter-relationship of the hydrazine and thermal plumes is therefore not predicted to increase the significance of effects concluded for the pressures alone. It is highly unlikely that this inter-relationship would increase the significance of the effects of localised displacement, beyond the effects predicted for the individual pressures. This conclusion applies to all fish receptors assessed.

v. Conclusion for SPA seabird qualifying features

1.2.21 In relation to the potential for synergistic effects between the thermal and chemical plumes and the resulting implications for effects on SPA seabird qualifying features, it is important to consider the highly precautionary basis for the assessment of the potential effects. The Shadow HRA assumes that, on a precautionary basis, foraging opportunities for seabirds are substantially reduced within the areas encompassed by the plumes. Given that the predicted spatial distributions of the chemical plumes are encompassed by that of the thermal plume (or at least substantially overlapping in the case of the 3°C uplift and TRO for SZC), the assumed large reduction in food availability within the areas of the plumes means that any synergistic effect between the chemical and thermal plumes would not affect the conclusions of the assessment (because this precautionary assumption of a large reduction in food availability is applied irrespective of whether it is assumed to be due to the effects of the thermal plume alone or the thermal plume combined with the chemical plumes).

1.2.22 Furthermore, coastal vantage point surveys demonstrate that little tern, common tern and Sandwich tern do forage within the area encompassed by the thermal plumes from Sizewell B, whilst loafing and foraging red-throated diver also occur within the areas encompassed by these plumes (as evidenced in Plates 6.6 – 6.8, 6.10 and 6.13 and Plate 8.7 in the DCO Shadow HRA Report [APP-145] and Figures 6A.2 – 6A.10 in the DCO Shadow HRA Report Addendum [AS-174] to [AS-177]). As noted above, this area also encompasses the chemical plumes from Sizewell B indicating that the assumption that foraging opportunities for seabirds are substantially reduced within this area is highly precautionary.

d) Nutrient enrichment and un-ionised ammonia (waste streams G and H)

1.2.23 As identified in Table 1.2, there is a risk of nutrient enrichment and un-ionised ammonia from waste streams G and H.

1.2.24 Waste stream G is sanitary effluent (from offices, site restaurant and mess facilities, which will be treated in an appropriate effluent treatment plant (i.e.

sewage treatment works)) before being discharged with the significant flow of waste stream A via the two cooling water discharge outlets.

- 1.2.25 Waste stream G (sewage treatment works discharge) was screened out from the appropriate assessment stage in the Shadow HRA for the operational WDA permit (a point noted in item 1c of the Schedule 5 request). The justification for that screening decision is provided in response to item 1c of the Schedule 5 request (see section 1.4) and, for the reasons provided, any risks from waste stream G (nutrient enrichment and un-ionised ammonia) can be excluded from the further consideration of combined effects.
- 1.2.26 Waste stream H is effluent from the FRR system, discharged to sea continuously through dedicated separate outfalls (one outfall for each UK EPR™ unit).
- 1.2.27 Waste stream H (effluent from the FRR) was screened out of the Shadow HRA process for designated sites with bird and marine mammals qualifying interest features. The basis for that decision is contained in BEEMS Technical Report TR520 (Revision 3, dated 02/04/21) which explains that the combined effect of the operational phase inputs from the waste streams, including the FRR, on water quality are very low magnitude and the HRA concludes that there is no pathway for an effect on bird and marine mammals qualifying interest features. For this reason, the Shadow HRA Report did not present the overlap between the area of organic enrichment arising from the discharge via FRR and bird foraging ranges or, with regard to marine mammals, the Southern North Sea SAC.
- 1.2.28 For the above reasons, this response does not include assessment of the FRR within any consideration of combined effects of the various waste streams. However, the Environment Agency has provided its own modelled area of organic from the FRR and has requested this is used in the assessment. Because the Environment Agency has not provided the supporting input parameters for the calculation of this modelled area, SZC Co. emphasises that it does not recognise or accept the result. Nevertheless, in order to assist the Environment Agency in its HRA process, SZC Co. has agreed to use the Environment Agency's modelled area in calculating the overlaps between foraging ranges and the FRR organic enrichment plume in responding to item 3i of Schedule 5 request No. 6. However, for the reason stated above, no interpretation of these calculations has been made by SZC Co.

1.3 Item 1c of Schedule 5 (No. 5)

a) Summary of the information request

1.3.10 The Environment Agency requested further justification for screening out consideration of the waste stream G (sewage treatment works discharge) from consideration in the appropriate assessment, adding that this effluent can also be screened out of the combined assessment for identified risks (e.g. nutrient enrichment) if sufficient evidence/justification can be provided as to why there is no likely significant effect alone.

b) Characteristics of the discharge (waste stream G)

1.3.11 The maximum volume of effluent (calculated based on the maximum staff numbers on site during an outage, using data from Hinkley Point C) is 190 m³/day based on a population equivalent of 1,900 using 100 litres/day (combined flow for two EPR units). The calculation based on maximum staff numbers on site represent a precautionary approach.

1.3.12 The maximum annual loading (kg yr⁻¹) of nitrogen (in terms of un-ionised ammonia NH₃) from sum of waste streams for the two EPR units is 958 kg yr⁻¹, with a maximum 24 hour loading of 27 kg yr⁻¹.

1.3.13 The maximum 24 hour loading of phosphate is 352.5kg (as PO₄). Converting this loading to PO₄-P gives a value of 115kg.

1.3.14 Calculations for the maximum 24 hour loadings are based on a discharge volume of 66m³sec⁻¹ (discharge volume/rate) under maintenance conditions with a single operational EPR. This lower volume discharge scenario is used as a worst-case for initial dilution.

1.3.15 The maximum annual discharge is based on a single EPR unit having a minimal operational cooling water flow of 58m³sec⁻¹ under low tide conditions (worst-case scenario within 'standard operation') (i.e. 116m³sec⁻¹ for two EPR units).

c) Nutrient enrichment

1.3.16 Inputs of nitrogen and phosphorus can increase growth of aquatic plants. During operation, various sources can contribute to nitrogen and phosphorus inputs and these include the decay of dead fish from the FRR. The influence of nutrient inputs from the FRR and from the cooling water discharge were evaluated in a combined phytoplankton and macroalgal model (CPM).

1.3.17 The results of the CPM show that, when the increase in phytoplankton biomass due to additional nutrients is balanced against loss of biomass to the entrainment mortality, overall biomass decreases by 5%. In the context of annual variations in phytoplankton biomass this level of change is not significant¹³.

d) Un-ionised ammonia

1.3.18 During operation, contributions to ammoniacal nitrogen from treated sewage have been assessed considering a maximum 24 hour loading and annual loading assuming the discharge volumes stated in sub-section b).

1.3.19 Two screening assessments were based on these scenarios and included relevant background concentration of un-ionised ammonia (a 95th percentile for the 24 hour scenario and a mean background for the annual scenario).

1.3.20 In neither case during operation would concentrations of un-ionised ammonia exceed the annual average EQS for unionised ammonia of $21\mu\text{g l}^{-1}$.

1.3.21 Daily (24 hour) concentration (discharge + background) are predicted to be around $7\mu\text{g l}^{-1}$ (approximately 35% of the EQS).

1.3.22 Annual average concentration (discharge + background) is predicted to be less than $1\mu\text{g l}^{-1}$ (or 0.05% of the EQS).

e) Conclusion

1.3.23 The Shadow HRA Report concluded that the discharge of treated sewage would not give rise to LSE for any of the European sites scoped in to the HRA process. This conclusion was based on the predictions of water quality effect as summarised in this response which indicate that there is no pathway for an effect on qualifying interest features of European sites. For this reason, no further assessment of waste stream G is necessary.

1.4 Item 1d of Schedule 5 (No. 5)

a) Summary of the information request

1.4.10 The Environment Agency requested an in-combination assessment with proposed SZC construction-related permits (i.e. WDAs and combustion-

¹³ BEEMS Technical Report TR385 v5. Modelling the effects of SZC on phytoplankton in Sizewell Bay. Cefas, Lowestoft

related activities from diesel generators, etc), together with a timeline of the construction, commissioning and operational phases of the SZC project.

1.4.11 The Schedule 5 request adds that “*because sufficiently detailed supporting information has been provided within the SZC operational WDA application regarding proposed construction related WDAs within Appendix B via TR193 edition 5 (SZC Discharges H1 type assessment) and Appendix E via TR306 (SZC marine water and sediment quality synthesis report MS42/5), an in-combination assessment is required*”.

1.4.12 SZC Co. wishes to emphasise that the above statement does not apply to the combustion-related activities during the construction phase; TR193 and TR306 only discuss potential effects on marine water quality. However, some analysis of combustion-related activities during the construction phase was undertaken as part of the DCO process and this information has been used to inform this response. Furthermore, SZC Co. has not yet applied for any construction-related environmental permits and, therefore, full assessment of those activities has not been undertaken at this point in time.

1.4.13 In the meeting with the Environment Agency on 16 September 2021, it was clarified that this request related to understanding any likely residual effects arising from the activities that would be permitted under construction-related permits that may persist into the operational phase and, therefore, which may interact with effect of activities authorised by the operational permits, with implications for the findings of the Shadow HRA.

b) **Timeline of the construction, commissioning and operational phases**

1.4.14 A timeline of the construction, commissioning and operational phases of the SZC project is provided in the image overleaf (extracted from Annex H of the Deed of Obligation (document REP10-082 in the DCO examination library).

c) Consideration of combined effects with construction-related emissions to air

- 1.4.15 As part of the assessment of the potential effect of emissions to air associated with the proposed desalination plant on designated sites, an overall construction phase assessment was undertaken. This assessment included the combined effects of the desalination plant generators with the impacts from other construction air emissions sources, primarily the Campus CHP and the construction plant on the main development site. This assessment focussed on the Minsmere to Walberswick Heath and Marshes SAC, Minsmere-Walberswick SPA and Minsmere-Walberswick Ramsar site because these are the only sites where effects are predicted to be greater than imperceptible.
- 1.4.16 For annual average NO_x concentration, the construction phase sources represent 4.7% of the annual NO_x Critical Level. The overall impact of the construction phase and existing background concentration would be 30% of the Critical Level and, therefore, well below the threshold for potential significance of 70% of the Critical Level.
- 1.4.17 There would be no emissions of SO₂ and NH₃ from the Campus CHP or the construction plant.
- 1.4.18 For overall nutrient nitrogen deposition during construction, the area of the designated sites predicted to experience N-deposition over 1% of the Critical Load (i.e. the threshold of imperceptibility) is approximately 200m x 200m. Within this area, the contribution of the construction phase represents a maximum of 1.1% of the Critical Load for the coastal stable dunes habitat type. Therefore, the dose of nitrogen deposition is considered to be small (generally defined as less than 5% of the Critical Load), and is only just over the threshold of imperceptibility (1%). It should be noted that the background nutrient nitrogen deposition already far exceeds the minimum Critical Load for this habitat type, such that additional nitrogen would have a limited effect.
- 1.4.19 With regard to acid deposition, it is predicted that the construction phase would result in exceedance of 1% of the Critical Load for the fen, marsh and swamp habitat type (1.8%), which can be assumed to form part of the 'mosaic of marine, freshwater, marshland and associated habitats' qualifying criteria of the Minsmere-Walberswick Ramsar site Ramsar site.
- 1.4.20 The fen, marsh and swamp habitat type is dominated by reedbeds, grazing marsh and woodland, which are vascular plants. APIS states that there is no evidence of acid deposition effects on vascular plants in this habitat. In addition, as the Critical Load is already (in the baseline) so far exceeded

(Background/Critical Load = 194%), further acid deposition, only just over the threshold of imperceptibility, is not considered significant.

- 1.4.21 The Critical Load system assumes decades of continuous exposure and, therefore, the assessment of effects of both the construction phase emissions and the effects of the activities within the operational CA permit on nutrient nitrogen and acid deposition is conservative.
- 1.4.22 It can be concluded from the above analysis that the construction phase emissions would have no negative effect on the habitats within the Minsmere to Walberswick Heath and Marshes SAC, Minsmere-Walberswick SPA and Minsmere-Walberswick Ramsar site.
- 1.4.23 Both the construction and operational phase emissions are predicted to affect the same localised and very small southern part of the Minsmere to Walberswick Heath and Marshes SAC, Minsmere-Walberswick SPA and Minsmere-Walberswick Ramsar site. The magnitude of the construction phase effect on habitats is also very similar to that reported in the Shadow HRA for the operational CA permit (i.e. nutrient nitrogen and acid deposition only just over the threshold of imperceptibility). Given the lack of material effect due to construction phase emissions, it is concluded that the combined effect of the construction phase emissions and the effects of the activities within the operational CA permit would be no different to the predicted effect of the operational CA permit alone.
- d) [Consideration of combined effects with construction-related water discharge activities](#)
- 1.4.24 During the initial dewatering activities through the construction phase, the volume of groundwater to be disposed of has been estimated to be 300,000 m³. Chromium, copper, zinc and iron in the groundwater exceed EQS or equivalent values and fail the initial Test 1 of screening on the H1 Environmental Risk Assessment. Taking account of subsequent dilution upon discharge, further detailed assessment of chromium and zinc was required (using CORMIX modelling).
- 1.4.25 The CORMIX modelling predicted that for zinc the outfall plume would no longer be detectable above background concentrations within 3m. For chromium the outfall plume would fall below the EQS within 25m.
- 1.4.26 The H1 Environmental Risk Assessment also assesses the biological oxygen demand (BOD), dissolved oxygen, un-ionised ammonia and microbiology elements associated with the construction discharge. This shows that all of these elements would be diluted to environmentally acceptable standards within metres of the discharge point.

- 1.4.27 A daily BOD of 121kg was calculated for sewage discharge and contributions from groundwater, which is equivalent to an oxygen requirement of 40.6kg. This demand is very small relative to oxygen transfer as part of the daily exchange for Greater Sizewell Bay.
- 1.4.28 The contribution of dissolved inorganic nitrogen (DIN) and phosphorus from the construction discharges (including additional inputs during commissioning) were assessed. The exchange with the wider environment is much greater than the maximum proposed discharges during construction, so that no change in phytoplankton growth beyond natural variability would be observed.
- 1.4.29 Un-ionised ammonia is expected to be present in the groundwater and sewage discharges, however, the maximum distance to achieve a value below the EQS was 6.3m.
- 1.4.30 Modelling was undertaken to predict the distance from the CDO discharge point at which enough dilution of the sewage treatment discharge would occur to be within microbiological standard levels. The sewage discharge plume would be buoyant and therefore occur on the sea surface. The modelling shows that a concentration of *Enterococci* is likely to exceed the bathing water standard within a worst case of 460m of the discharge, without UV treatment.
- 1.4.31 The above summary indicates that the construction phase discharges are predicted to have a highly localised effect on water quality and are temporary discharges. The potential effects of construction phase discharges were assessed in the Shadow HRA Report for the Sizewell C Project (sections 7, 8 and 9 for the various designated sites) and, for the reasons stated above, it was concluded that that there would not be an adverse effect on integrity. Because of the predicted localised effect and the temporary nature of the discharges, there is no plausible risk of a lasting effect associated with construction-related discharges that could alter the conclusions of the assessment for the operational permits.

1.5 Item 1e of Schedule 5 (No. 5)

a) Summary of the information request

- 1.5.1 The Environment Agency requested confirmation (with sufficient explanation) whether Sizewell B (SZB) as a project has been considered in-combination (from a WDA perspective), or as a baseline for the following scenarios:

- i) SZC operating alone.

ii) SZC and SZB whilst SZB is operational.

iii) SZC alone once SZB decommissions.

1.5.2 The additional explanation provided by the Environment Agency explains that SZB has correctly been considered as part of the baseline, but notes that the baseline will change as SZB will be decommissioned within the lifetime of SZC operation. The Environment Agency considers it is essential to have clear results reported for Sizewell C (SZC) alone, in addition to SZB and SZC acting together whilst SZB is still operational.

1.5.3 As an example to clarify the requirement, the Environment Agency refers to Table 8.3 in the Shadow HRA which is titled "*The maximum and mean instantaneous areas of thermal plumes at the sea surface for the 2°C and 3°C uplifts for Sizewell B alone and for Sizewell B together with Sizewell C for May to August, with the percentage overlap with the predicted foraging ranges of the Orfordness and Minsmere common tern colonies*", noting that there is no separate line presenting the effect for SZC acting alone.

1.5.4 The Environment Agency asked for more clarity over the current date SZB is expected to cease to become operational, and also whether the effects of the SZC discharge once SZB is no longer operating is the same effect as SZC acting alone if SZB was not part of the baseline (i.e. are there any residual effects that could be additive).

1.5.5 Finally, the Environment Agency asked whether Sizewell A (SZA) as a project has been considered in-combination, noting that permit PR4CS1516 at SZA was varied on 15/07/2021 and includes several active water discharge activities, including 400 m³/day of treated sewage effluent and 980 m³/day of active effluent (for which a TRO (expressed as chlorine) compliance limit of 0.5 mg/l) is specified.

b) Explanation of the assessment scenarios for SZB and SZC

1.5.6 The following explains how the thermal and chemical plumes from SZC and SZB have been assessed as part of the Shadow HRA for the scenarios requested by the Environment Agency:

- i) SZC operating alone – this scenario would only arise when SZB decommissions and its residual effects have subsided. The data for this scenario are provided in response to the Schedule 5 No. 6 request.
- ii) SZC and SZB whilst SZB is operational – this is the main scenario used in the modelling and assessments. In this scenario, the effect of SZB is included in the baseline.

- iii) SZC alone once SZB decommissions – this scenario is not specifically assessed in the Shadow HRA, but scenario ii) captures the worst-case. In response to the Environment Agency's questions, it is expected that SZB would be decommissioned around 2035. It would be expected that the effect of SZB would persist for a period of time after it is decommissioned, but any residual effect of SZB with the effect of SZC would be no worse than that assessed under scenario ii). Eventually, the effects of the SZC discharge once SZB is no longer operating would be the same effect as SZC acting alone.

1.5.7 The Shadow HRA has, therefore, assessed the combined effect of the operation of SZB and SZC and no further assessment is required.

1.5.8 It appears from the Environment Agency's request that the key point is that the Shadow HRA does not present the percentage overlap between the foraging ranges of SPA bird species with the extent of thermal and chemical plumes for SZC operating alone. These data are provided in response to the Schedule 5 No. 6 request.

c) [Consideration of water discharge activities authorised by the Sizewell A permit](#)

1.5.9 SZA was not considered as a separate plan or project as part of the in-combination assessment because its effects would be reflected in the baseline conditions.

1.5.10 The WDA permit for SZA (PR4CS1516) was varied on 15/07/2021 ('the July 2021 permit'). This was after the submission of the WDA application for SZC and, therefore, any effect of the varied permit for SZA could not have been reflected in the Shadow HRA for SZC WDA permit application.

1.5.11 The potential effect of permit PR4CS1516 (15/07/2021) has been considered by analysing the operations authorised by that permit with the activities authorised by the permit as previously varied on 26/02/2009 ('the February 2009 permit'). The following summarises the key points of this analysis:

- Both the July 2021 permit and the February 2009 permit authorise the discharge of secondary treated sewage from Sizewell A and Sizewell B, active effluent, trade effluent and site drainage.
- The outfall location is the same for the July 2021 permit and the February 2009 permit (TM 47786 63013).

- Secondary treated sewage: both permits authorise a maximum daily discharge volume of 400m³/day. The compliance parameter is no significant trace of visible oil or grease, so far as is reasonably practicable.
- Active effluent: both permits authorise a maximum daily discharge volume of 980 m³/day, with a pH of between 6 and 10 and a TRO ((expressed as chlorine) compliance limit of 0.5 mg/l.
- Trade effluent: the February 2009 permit authorise the maximum daily discharge of 788,820m³/day of trade effluent at a rate of 9.2m³/s. The maximum daily discharge is reduced to 400m³/day in the July 2021 permit, with a maximum rate of discharge of 20 litres/s. The compliance parameters are a pH of between 6 and 10 and no significant trace of visible oil or grease, so far as is reasonably practicable.
- Site drainage: both permits authorise the discharge of site drainage derived from an area of approximately 53,000m² of hard surface. The compliance parameter is 'visible oil or grease'.

1.5.12 In conclusion, the discharges authorised by the varied (July 2021) SZA permit do not have the potential to affect the conclusions of the Shadow HRA because the compliance conditions are the same as those in the February 2009 permit (with the only difference being a decrease in the maximum daily discharge volume of trade effluent, but with the same compliance requirement in terms of pH and visible oil or grease).

1.6 Item 1f of Schedule 5 (No. 5)

a) Summary of the information request

1.6.1 The Environment Agency requested that relevant marine plans are included within the in-combination assessment of other plans and projects.

b) In-combination assessment with the East Inshore and Offshore marine plans

1.6.2 The East Inshore and Offshore marine plans are the relevant marine plans for consideration of the potential for in-combination effects with the Sizewell C Project. The Marine Management Organisation's (MMO) appropriate assessment of the marine plans (2013)¹⁴ shows the area covered by these marine plans (reproduced below).

¹⁴ Available at: <https://www.gov.uk/government/publications/east-marine-plan-habitats-regulations-assessment>



1.6.3 The MMO's appropriate assessment records that a screening process reviewed the draft marine plan policies for LSE via identified ecological impact pathways to identify those policies likely to have a significant effect on European sites and therefore which needed to be subject to appropriate assessment. Three 'screening criteria' questions were considered as part of the screening process:

1. Is the policy general or 'criteria-based' such that it has no specific, discernible implications for activities (i.e. it does not direct, influence, or

clarify the nature and location of activities) within the marine plan areas? The MMO states that policies within the plan which are so general in nature (i.e. they are statements of general policy and there is no discernible link between the policy and effects on individual sites) are not subject to an appropriate assessment.

2. Has the policy been subject to previous HRA (e.g. encapsulated with a sectoral plan such as Round 3 offshore wind)? Policies in the plan which are not statements of general policy and which relate to activities that have not previously been subject to HRA were assessed as part of the MMO's appropriate assessment.
3. Does the policy change what was previously assessed or bring greater clarity to elements such as the location of cable alignments or landfalls? Following on from question (2), this question tests whether or not a policy related to an activity which has been previously subject to HRA changes the impact that the activity will have.

1.6.4 The MMO's appropriate assessment for the marine plans concludes that, without mitigation, it is not possible to conclude that there will be no adverse effect upon the integrity of any of the relevant European sites identified in the screening review. The following overriding reasons were quoted for that conclusion:

- Because the draft marine plan policies are strategic in nature, it is not possible to quantify their influence on *"individual authorisation and enforcement decisions within the East Inshore and East Offshore Marine Plan areas"*.
- It is not possible at a strategic level to identify specific effects on European sites arising from the implementation of future individual plans or projects.
- Even where there is pre-existing information on the potential effects of certain types of activity, it is not possible to fully identify the effects of future plans and projects of a similar kind. For some emerging sectors (tidal energy generation and carbon capture and storage are given as examples), there is very little or no previous development in the marine plan areas and, therefore, lack of understanding of their potential impacts.
- Similar reasons as those captured above prevent the identification of specific effects on European sites arising from the influence of the draft plan policies in-combination with the influence of other draft plan policies. The MMO's appropriate assessment notes that this is typical of all strategic

coastal and offshore plans, but is particularly the case for the draft marine plans given their broad spatial extent and multi-sectoral nature.

- 1.6.5 In light of the above conclusion (that adverse effect on integrity cannot be excluded), the MMO's appropriate assessment considers mitigation measures. This concludes that *"the main mitigation measure identified is that, as a matter of law, a project or plan will be required to undergo a project-level HRA where there is a likelihood of a significant effect on a European site"*.
- 1.6.6 The MMO's appropriate assessment therefore defers any detailed consideration of the effects of activities arising from authorisation and enforcement decisions which are influenced and directed by draft plan policies (whether alone or in combination with other draft plan policies) to the point when *"the specific nature and scope of the individual plan or project has been identified"*.
- 1.6.7 The appropriate assessment goes on to state that *"any adverse effects arising from authorisation and enforcement decisions which are influenced by relevant draft plan policies can be identified and suitably mitigated at the individual project level"* and that *"through appropriate consideration at the individual project level, the influence of policies scoped into this appropriate assessment and for which adverse effect on site integrity cannot be excluded will be mitigated"*.
- 1.6.8 The appropriate assessment also identifies a further mitigation measure - 'Iterative Plan Review' (IPR) process. This is described as a phased and iterative approach to implementation of the marine plans, with monitoring work connected with developments being fed into the next phases of plan implementation, providing assurances that developments affecting the marine plan area are being managed to avoid adverse effects (especially in-combination effects).
- 1.6.9 The MMO's overall conclusion is that *"taking into account the mitigation measures outlined above and in particular future project level appropriate assessments, this assessment concludes that there will be no adverse effect on the integrity of a European site arising from the draft plans"*.
- 1.6.10 Given the findings of the MMO's appropriate assessment for the marine plans, it is not feasible to undertake meaningful assessment of the potential for in-combination effect with the operational permits for the Sizewell C Project. However, on the basis of the findings of the HRA process for the marine plans, it can be concluded that the MMO is satisfied that there is a suitable mechanism to conclude that adverse effect on integrity can be excluded due to the implementation of the marine plans.

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- 1.6.11 A document providing a checklist against the policies in the East Inshore and East Offshore Marine Plans to test and demonstrate the Sizewell C Project's compliance the polices was submitted to the DCO examination (REP7-074). The checklist demonstrates that the Sizewell C Project area does not coincide with many of the spatially explicit marine plan policies.
- 1.6.12 On this basis, given the very localised zone of influence of the activities included in the operational permits relative to the spatial extent of the area covered by the marine plans, it is reasonable to conclude that adverse effect on designated sites will not arise. In light of the mitigation approach identified for the marine plans, it would be necessary for developments undertaken in line with the marine policies to demonstrate that their impacts could be successfully mitigated to the point where no adverse effect could be demonstrated, alone and in-combination with other plans and projects (including the Sizewell C Project).

2 CONSERVATION OBJECTIVES AND SUPPLEMENTARY ADVICE

2.1 Introduction

2.1.1 This section presents the findings of the assessment of combined effects of the operational permits in the context of the conservation objectives and Natural England's supplementary advice for the conservation objectives. The designated sites considered are those listed in item 1 i) of the Schedule 5 request, as follows:

- Minsmere to Walberswick Heaths and Marshes SAC (section 2.2).
- Minsmere-Walberswick SPA (section 2.3).
- Southern North Sea SAC (section 2.4).
- Outer Thames Estuary SPA (section 2.5).
- Alde, Ore and Butley Estuaries SAC (section 2.6).
- Alde – Ore Estuaries SPA (section 2.7).

2.1.2 For each of the above sites, the various targets for each attribute / sub-attribute of the qualifying feature are listed. For completeness, all attributes / sub-attributes are included in the analysis, even where it is clear that there is no potential for effect (e.g. landform or landscape).

2.2 Minsmere to Walberswick Heaths and Marshes SAC

2.2.21 The conservation objectives for the Minsmere to Walberswick Heaths and Marshes SAC (Natural England, 2019a) are as follows:

“With regard to the SAC and the natural habitats and/or species for which the site has been designated, and subject to natural change, ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:

- *The extent and distribution of qualifying natural habitats and habitats;*

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- *The structure and function (including typical species) of qualifying natural habitats, and,*
 - *The supporting processes on which qualifying natural habitats rely”.*

2.2.22 A conclusion regarding the potential for combined effects of the operational permits are summarised in Table 2.1.

Table 2.1: Supplementary Advice on Conservation Objectives for Minsmere to Walberswick Heaths and Marshes SAC (Natural England, 2019a)

Feature	Attribute / sub-attribute	Target	Summary conclusion of potential for combined effects
Extent and distribution			
H1210: Annual vegetation of drift lines	Extent of the feature within the site	Restore the total extent of H1210 and H1220 features to 59 hectares (ha).	The response to item 1a) confirms that there is no potential for a combined effect of the operational permit activities to influence the current or future extent and distribution of this qualifying feature and, therefore, no potential to compromise these 'restore' targets. Furthermore, the responses to the other items confirms that there is no potential for combined effects due to the various elements of the operational WDA permit acting together, or effects of construction phase activities to interact with the operational permits, to compromise the ability to achieve the 'restore' targets for this qualifying feature.
	Future extent of habitat within the site and ability to respond to seasonal changes	Restore the ability of this habitat to re-establish itself in response to coastal processes and recolonise after natural events.	
	Spatial distribution of the feature within the site	Restore the distribution and continuity of suitable beach conditions such that this habitat has the greatest opportunity to colonise annually.	

Feature	Attribute / sub-attribute	Target	Summary conclusion of potential for combined effects
H1220: Perennial vegetation of stony banks	Extent of the feature within the site	As per H1210.	The response provided for 'annual vegetation of drift lines' equally applies to this qualifying feature.
	Future extent of habitat within the site and ability to respond to seasonal changes	Restore the ability to respond to natural seasonal or longer term changes in extent of habitat.	
	Spatial distribution of the feature within the site	Restore the distribution and continuity of the habitat and its natural transitions within the site that enable the full succession from older to younger ridges to be represented.	
H4030: European dry heaths	Extent of the feature within the site	Maintain the total extent at 306 ha.	The response provided for 'annual vegetation of drift lines' equally applies to this qualifying feature.
	Adaptation and resilience	Maintain the feature's ability, and that of its supporting processes, to adapt or evolve to wider environmental change.	

Feature	Attribute / sub-attribute	Target	Summary conclusion of potential for combined effects
	Spatial distribution of the feature within the site	Maintain the distribution and configuration of the feature, including where applicable its component vegetation types.	
Structure and function			
H1210: Annual vegetation of drift lines	Key structural, influential and distinctive species	Maintain the abundance of the species listed to enable each of them to be a viable component of the Annex I habitat feature: <i>Honckenya peploides</i> , <i>Cakile maritima</i> , <i>Atriplex prostrata</i> , <i>A. glabriuscula</i> , <i>A. laciniata</i> .	The response to item 1a) confirms that there is no potential for a combined effect of the operational permit activities to influence the various attributes contributing to maintaining or restoring the structure and function of this qualifying feature. Furthermore, the responses to the other items confirms that there is no potential for combined effects due to the various elements of the operational WDA permit acting together, or effects of construction phase activities to interact with the operational permits, to compromise the ability to achieve the maintain and
	Niches for seedling establishment	Restore the availability of niches which provide the potential for seedling establishment.	
	Nutrient availability	Maintain the input of nutrients from tidally-derived organic matter and ensure these are able to break down <i>in situ</i> .	
	Sediment size range and type	Maintain the availability and size range of those sediments typical of the feature.	

Feature	Attribute / sub-attribute	Target	Summary conclusion of potential for combined effects
			restore targets for this qualifying feature.
H1220: Perennial vegetation of stony banks	Key structural, influential and distinctive species	Restore the abundance of the species listed to enable each of them to be a viable component of the Annex I habitat feature: <i>Beta vulgaris</i> ssp. <i>maritima</i> , <i>Crambe maritima</i> , <i>Glaucium flavum</i> , <i>Helminthotheca echioides</i> , <i>Lathyrus japonicus</i> , <i>Silene uniflora</i> .	The response provided for 'annual vegetation of drift lines' equally applies to this qualifying feature.
	Nutrient availability	Maintain the low nutrient status of the sediment and soils that support the specialised vegetation communities.	
	Sediment size range and type	Maintain the availability and size range of those sediments typical of the feature.	
H4030: European dry heaths	Functional connectivity with wider landscape	Maintain the overall extent, quality and function of any supporting features within the local landscape	The response provided for 'annual vegetation of drift lines' equally applies to this qualifying feature.

Feature	Attribute / sub-attribute	Target	Summary conclusion of potential for combined effects
		which provide a critical functional connection with the site.	
	Key structural, influential and distinctive species	Maintain the abundance of the species listed to enable each of them to be a viable component of the Annex I habitat feature: silver-studded blue <i>Plebeius argus</i> , antlion <i>Euroleon nostras</i> , Dartford warbler <i>Sylvia undata</i> .	
	Bare ground	Maintain the cover of bare ground within the H4010 feature to within 1-10%.	
	Soils, substrate and nutrient cycling	Maintain the properties of the underlying soil types, including structure, bulk density, total carbon, pH, soil nutrient status and fungal: bacterial ratio, to within typical values for the habitat.	
Vegetation			

Feature	Attribute / sub-attribute	Target	Summary conclusion of potential for combined effects
H1210: Annual vegetation of drift lines	Vegetation community composition	Restore the component vegetation communities of the feature to the following characteristic National Vegetation Classification (NVC) type: SD2: <i>Honckenya peploides</i> – <i>Cakile maritima</i> strandline community.	The response to item 1a) confirms that there is no potential for a combined effect of the operational permit activities to influence the vegetation component of this qualifying feature. Furthermore, the responses to the other items confirms that there is no potential for combined effects due to the various elements of the operational WDA permit acting together, or effects of construction phase activities to interact with the operational permits, to compromise the ability to achieve the maintain and restore objectives for this qualifying feature.
	Vegetation: undesirable species	Maintain the frequency/cover of undesirable species to within acceptable levels and prevent changes in surface condition, soils, nutrient levels or hydrology which may encourage their spread: <i>Centranthus ruber</i> , <i>Cirsium vulgare</i> , <i>Lupinus arboreus</i> , <i>Senecio jacobaea</i> , <i>Tamarix gallica</i> .	
	Zonations and transitions	Restore the natural patterns of zonation across the drift line and between this and vegetation of more stable shingle landward that reflect the coastal processes and substrate type typical of the site.	

Feature	Attribute / sub-attribute	Target	Summary conclusion of potential for combined effects
H1220: Perennial vegetation of stony banks	Vegetation community composition	Ensure the component vegetation communities of the feature are referable to and characterised by the following NVC type: SD1: <i>Rumex crispus</i> – <i>Glaucium flavum</i> shingle community.	The response provided for ‘annual vegetation of drift lines’ equally applies to this qualifying feature.
	Vegetation: undesirable species	Maintain the frequency/cover of undesirable species [as set out for H1210] to within acceptable levels and prevent changes in surface condition, soils, nutrient levels or hydrology which may encourage their spread.	
	Zonations and transitions	Restore the range of vegetation communities and transitions characteristic of this feature with other habitats present on the site (e.g. saltmarsh, wetland, lagoons).	
	Patterns of vegetation with naturally bare ground	Restore temporal and spatial zonation of vegetation that reflects pattern of beach ridges across the site, from the active beach ridge, to	

Feature	Attribute / sub-attribute	Target	Summary conclusion of potential for combined effects
		recently accreted ridges and through to the different-aged more stable ridges and the ongoing natural succession of these communities over time.	
H4030: European dry heaths	Vegetation community composition	Ensure the component vegetation communities of the feature are referable to and characterised by the following NVC type: H1: <i>Calluna vulgaris</i> – <i>Festuca ovina</i> heath.	The response provided for ‘annual vegetation of drift lines’ equally applies to this qualifying feature.
	Vegetation: undesirable species	Restore the frequency / cover of the following undesirable species to within acceptable levels and prevent changes in surface condition, soils, nutrient levels or hydrology which may encourage their spread. There should be <1% of the following species: <i>Chamerion angustifolium</i> , <i>Cirsium arvense</i> , ‘coarse grasses’, <i>Digitalis purpurea</i> , <i>Epilobium</i> spp. (excluding <i>E. palustre</i>), <i>Fallopia japonica</i> , <i>Gaultheria shallon</i> , <i>Juncus</i>	

Feature	Attribute / sub-attribute	Target	Summary conclusion of potential for combined effects
		<i>effusus</i> , <i>J. squarrosus</i> , <i>Ranunculus</i> spp., <i>Rhododendron ponticum</i> , <i>Rumex obtusifolius</i> , <i>Senecio</i> spp., <i>Urtica dioica</i> .	
	Zonations and transitions	Maintain any areas of transition between this and communities which form other heathland-associated habitats (e.g. dry and humid heaths, mires, acid grassland, scrub, woodland).	
	Bracken cover	Restore a cover of dense bracken to a low level typically of less than <10%.	
	Cover of dwarf shrubs	Maintain an overall cover of dwarf shrub species which is typically between 25-90%.	
	Cover of gorse	Restore cover of common gorse <i>Ulex europaeus</i> at <25% and the combined cover of <i>U. Europaeus</i> and <i>U. gallii</i> at <50%.	

NOT PROTECTIVELY MARKED

Feature	Attribute / sub-attribute	Target	Summary conclusion of potential for combined effects
	Heather age structure	Maintain a diverse age structure amongst the ericaceous shrubs typically found.	
	Tree cover	Restore the open character of the feature, with a typically scattered and low cover of trees and scrub (<15% cover).	
Supporting processes			
H1210: Annual vegetation of drift lines	Aeolian processes	Maintain the operation of natural sedimentary processes.	The activities included in the operational permits do not have the potential to affect coastal processes or hydrology and, therefore, there is no pathway for combined effect on the qualifying feature.
	Beach morphology and structure	Maintain a natural profile, elevation and slope of the beach and foreshore.	
	Functionality and sediment supply	Maintain adequate sediment supplies to and across the site from source (e.g. the beach, offshore deposits, eroding cliffs).	
H1220: Perennial	Sedimentary processes	Maintain the natural sedimentary processes that sustain the form of the shingle structure, including the	

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Feature	Attribute / sub-attribute	Target	Summary conclusion of potential for combined effects
vegetation of stony banks		natural supply of sediment from outside.	The response provided for 'annual vegetation of drift lines' equally applies to this qualifying feature.
	Shingle morphology	Maintain the natural surface morphology and elevation of the shingle structure.	
	Functionality and sediment supply	Maintain adequate sediment supplies to and across the site from source (e.g. the beach, offshore deposits, eroding cliffs).	
H4030: European dry heaths	Hydrology	At a site, unit and/or catchment level as necessary, maintain natural hydrological processes to provide the conditions necessary to sustain the feature.	The response provided for 'annual vegetation of drift lines' equally applies to this qualifying feature.
Air quality			
H1220: Perennial vegetation of stony banks;	Air quality	Restore the concentrations and deposition of air pollutants to at or below the site-relevant Critical Load or Level values given for this feature on the Air Pollution Information System (APIS).	Only the operational CA permit has the potential to affect air quality and therefore there is no potential for a combined effect with other operational permits. Furthermore, as explained in response to item 1d), the

Feature	Attribute / sub-attribute	Target	Summary conclusion of potential for combined effects
H4030: European dry heaths			combined effect of the construction phase emissions and the effects of the activities within the operational CA permit would be no different to the predicted effect of the operational CA permit alone. Consequently, the 'restore' target for this attribute would not be compromised.
Water quality			
H1210: Annual vegetation of drift lines; H4030: European dry heaths	Water quality	Where the feature is dependent on surface water and/or groundwater, maintain water quality and quantity to a standard which provides the necessary conditions to support the feature	The activities included in the operational permits do not have the potential to affect water quality of surface or groundwater that supports these qualifying features and, therefore, there is no pathway for combined effect on the qualifying features.
Conservation			
H1210: Annual vegetation of drift lines	Conservation measures	Restore the recreational access management measures which are necessary to maintain the structure,	The activities included in the operational permits do not have the potential to affect management

Feature	Attribute / sub-attribute	Target	Summary conclusion of potential for combined effects
		functions and supporting processes associated with the feature.	measures necessary to support these qualifying features and, therefore, there is no pathway for combined effect on the qualifying features.
H1220: Perennial vegetation of stony banks		Restore the management measures which are necessary to restore the structure, functions and supporting processes associated with the feature.	
H4030: European dry heaths		Maintain the management measures which are necessary to maintain the structure, functions and supporting processes associated with the feature.	

2.3 Minsmere - Walberswick SPA

2.3.1 The conservation objectives for the Minsmere - Walberswick SPA (Natural England, 2019b) are as follows:

“Ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring:

- *the extent and distribution of the habitats of the qualifying features.*
- *the structure and function of the habitats of the qualifying features.*
- *the supporting processes on which the habitats of the qualifying features rely.*
- *the populations of each of the qualifying features.*
- *the distribution of qualifying features within the site”*

2.3.2 A conclusion regarding the potential for combined effects of the operational permits are summarised in Table 2.2.

Table 2.2: Supplementary Advice on Conservation Objectives for Minsmere-Walberswick SPA (Natural England, 2019b)

Attribute / sub-attribute	Feature(s)	Target	Summary conclusion of potential for combined effects
Breeding population			
Abundance	Avocet	Maintain the size of the breeding population at a level which is above 47 breeding pairs, whilst avoiding deterioration from its current level.	The assessment of potential for combined effects confirms that there is no potential for a combined effect on supporting habitats of the waterbird species, marsh harrier or nightjar and, therefore, no potential to compromise the maintain or restore targets for the breeding populations of these species. With regard to little tern, the assessment concludes that there would not be a combined effect due to the various waste streams of the operational WDA permit that would alter the conclusion of the Shadow HRA Report. The 'restore' target for breeding little tern would not be compromised due to combined effects of the operational permits.
	Bittern	Maintain the size of the breeding population at a level which is above 5 breeding pairs, whilst avoiding deterioration from its current level.	
	Gadwall	Maintain the size of the breeding population at a level which is above 24 pairs, whilst avoiding deterioration from its current level.	
	Little tern	Restore the size of the breeding population to a level which is above 32 breeding pairs, whilst avoiding deterioration from its current level.	
	Marsh harrier	Maintain the size of the breeding population at a level which is above	

Attribute / sub-attribute	Feature(s)	Target	Summary conclusion of potential for combined effects
		15 breeding females, whilst avoiding deterioration from its current level.	
	Nightjar	Restore the size of the breeding population to a level which is above 24 breeding pairs, whilst avoiding deterioration from its current level.	
	Shoveler	Maintain the size of the breeding population to a level which is above 23 pairs, whilst avoiding deterioration from its current level.	
	Teal	Restore the size of the breeding population to a level which is above 73 breeding pairs, whilst avoiding deterioration from its current level.	
Non-breeding population			
Abundance	Gadwall	Maintain the size of the non-breeding population at a level which is above 90 individuals, whilst avoiding deterioration from its current level.	The supporting habitats for the non-breeding bird populations are non-marine habitats. Only the operational CA permit has the potential to affect

Attribute / sub-attribute	Feature(s)	Target	Summary conclusion of potential for combined effects
	Greater white-fronted goose	Restore the size of the non-breeding population at a level which is above 100, whilst avoiding deterioration from its current level.	supporting habitats (e.g. via nutrient nitrogen and acid deposition) and therefore there is no potential for a combined effect with other operational permits. Furthermore, as explained in response to item 1d), the combined effect of the construction phase emissions and the effects of the activities within the operational CA permit would be no different to the predicted effect of the operational CA permit alone. The assessments conclude that the supporting habitats for birds would not be detrimentally affected by changes in air quality and consequently, the 'maintain' and 'restore' targets for non-breeding bird populations would not be compromised.
	Hen harrier	Restore the size of the non-breeding population to a level which is above 15, whilst avoiding deterioration from its current level.	
	Shoveler	Maintain the size of the non-breeding population at a level which is above 100, whilst avoiding deterioration from its current level.	
Connectivity with supporting habitats			

Attribute / sub-attribute	Feature(s)	Target	Summary conclusion of potential for combined effects
Connectivity with supporting habitats	All features	Maintain safe passage of birds moving between nesting and feeding areas.	The operational permits have no potential to affect connectivity with supporting habitats and, therefore, there is no potential for combined effects.
Disturbance			
Disturbance caused by human activity	Avocet, bittern, gadwall, greater white-fronted goose, hen harrier, marsh harrier, nightjar, shoveler, teal	Restrict the frequency, duration and / or intensity of disturbance affecting roosting, foraging, feeding, moulting and/or loafing birds so that they are not significantly disturbed.	The operational permits have no potential to result in disturbance or to increase predation to bird populations and, therefore, there is no potential for combined effects.
	Little tern	Reduce the frequency, duration and / or intensity of disturbance affecting roosting, foraging, feeding, moulting and/or loafing birds so that they are not significantly disturbed.	
Predation – all habitats	Avocet, bittern, gadwall, little tern, marsh	Restrict predation and disturbance caused by native and non-native predators.	

Attribute / sub-attribute	Feature(s)	Target	Summary conclusion of potential for combined effects
	harrier, nightjar, shoveler, teal		
Supporting habitat			
Extent and distribution of supporting habitat for the breeding season	Avocet, bittern, gadwall, little tern, marsh harrier, nightjar, shoveler, teal	Maintain the extent, distribution and availability of suitable habitat which supports the feature for all necessary stages of its breeding cycle. There are no quantified baseline figures for extent and distribution of supporting habitat at Minsmere-Walberswick SPA.	The operational permits have no potential to affect the extent, distribution and availability of suitable supporting habitat for bird populations and, therefore, there is no potential for combined effects.
Extent and distribution of supporting habitat for the non-breeding season	Gadwall, greater white-fronted goose, hen harrier, shoveler	Maintain the extent, distribution and availability of suitable habitat which supports the feature for all necessary stages of the non-breeding/wintering period. There are no quantified baseline figures for extent and distribution of supporting habitat at Minsmere-Walberswick SPA.	
Food availability	Avocet	Maintain the distribution, abundance and availability of key food and prey	The assessment of potential for combined effects confirms that there

Attribute / sub-attribute	Feature(s)	Target	Summary conclusion of potential for combined effects
		items (eg. Gammarus, Corophium, flies, beetles, Nereis, Hydrobia, Cardium, gobies) at preferred sizes (eg. fish or worms between 4-15 mm long).	is no potential for a combined effect on supporting habitats of the waterbird species, marsh harrier or nightjar and, therefore, no potential to compromise the maintain or restore targets related to food availability for the populations of these species. With regard to little tern, the assessment concludes that there would not be a combined effect due to the various waste streams of the operational WDA permit that would alter the conclusion of the Shadow HRA Report. The 'maintain' target for the key food and prey items for little tern would not be compromised due to combined effects of the operational permits.
	Bittern	Maintain the distribution, abundance and availability of key food and prey items (eg. eel, rudd, roach, frogs, toads) at preferred sizes (eg. roach of 6-35 cm).	
	Gadwall	Maintain the distribution, abundance and availability of key food and prey items (eg. hatching midges, <i>Glyceria fluitans</i> , <i>Agrostis stolonifera</i> , Chara, Potomageton, Ceratophyllum spp., Ruppia) at preferred sizes.	
	Greater white-fronted goose	Maintain the distribution, abundance and availability of key food and prey items (eg. cereal grains and potatoes, <i>Puccinellia marima</i> , <i>Hordeum marinum</i> , <i>Lolium perenne</i> , <i>Festuca rubra</i> , <i>Alopecurus bulbosus</i> , <i>Trifolium</i>	

Attribute / sub-attribute	Feature(s)	Target	Summary conclusion of potential for combined effects
		<i>repens, Lolium perenne, Poa trivialis, Holcus lanatus</i>) at preferred sizes.	
	Hen harrier	Maintain the distribution, abundance and availability of key food and prey items (eg. mammals, birds) at preferred sizes (eg. pipits to gamebirds; voles to young rabbit size).	
	Little tern	Maintain the distribution, abundance and availability of key food and prey items (eg. crustacea, annelids, sandeel, herring, clupeidae) at preferred sizes.	
	Marsh harrier	Maintain the distribution, abundance and availability of key food and prey items (eg. mammals, birds) at preferred sizes (eg. voles, mice, rabbit; birds of pipit to duck size).	
	Nightjar	Maintain the distribution, abundance and availability of key food and prey	

Attribute / sub-attribute	Feature(s)	Target	Summary conclusion of potential for combined effects
		items (eg. Lepidoptera) at preferred sizes.	
	Shoveler	Maintain the distribution, abundance and availability of key food and prey items (eg. Scirpus, Eleocharis, Carex, Potamogeton, Glyceria, surface plankton, hatching midges, Hydrobia, crustaceans, caddisflies, diptera, beetles) at preferred sizes.	
	Teal	Maintain the distribution, abundance and availability of key food and prey items (eg. Salicornia, Atriplex, cereal grains, Polygonum, Eleocharis, Rumex, Ranunculus, Hydrobia, flies, caddisfly, beetles, bugs, hatching midges) at preferred sizes.	
Landform	Avocet	Maintain the availability of shallow sloping nesting sites, grading to above water level, restricting the probability that they will flood.	The operational permits have no potential to affect landform and, therefore, there is no potential for combined effects.

Attribute / sub-attribute	Feature(s)	Target	Summary conclusion of potential for combined effects
	Bittern	Maintain the extent of wet ditches and/or pools with suitable profiles (typically, with a deep central channel of 1.5-2.5 m deep and one or more 1 m deep with 5 m wide shallow margins).	
	Little tern	Maintain the availability of shallow sloping nesting sites, grading to <30 cm above water level, restricting the probability that they will flood.	
Landscape	Avocet	Maintain the area of open and unobstructed terrain around roosting and feeding sites.	The operational permits have no potential to affect landscape and, therefore, there is no potential for combined effects.
	Bittern	Maintain the supporting habitats within an open landscape which provides safe passage for birds moving between roosting and feeding areas across the site.	
	Greater white-fronted goose	Maintain open and unobstructed terrain and overall field sizes within at	

Attribute / sub-attribute	Feature(s)	Target	Summary conclusion of potential for combined effects
		least 0.5 km of roosting and feeding areas.	
	Hen harrier	Maintain the amount of open and unobstructed terrain, with short vegetation, for hunting.	
	Marsh harrier	Maintain continuous reed cover over large areas avoiding fragmentation of extensive reedbeds.	
	Nightjar	Maintain the amount of open and unobstructed patches within nesting and foraging areas, including areas of clear-fell, windfall, wide tracks, open forest and heath.	
Hydrology			
Hydrology/flow within standing water	Avocet	Maintain the stability of standing water levels (<2 cm fluctuation) in order to prevent flooding of nests.	The operational permits have no potential to affect hydrology, flow water area or depth and, therefore, there is no potential for combined effects.
	Bittern	Maintain the stability of standing water levels in order to prevent flooding of nests.	

Attribute / sub-attribute	Feature(s)	Target	Summary conclusion of potential for combined effects
	Gadwall, shoveler, teal	Maintain the hydrology of a waterbody used as a feeding site such that water levels reduce (or are reduced) by 5-15% each month from the time of mean hatch date to the end of the breeding season.	
Hydrology/flow within grassland (marsh)	Shoveler	Maintain water availability in feeding sites to provide shallow surface water and damp field condition.	
Water area	Bittern	Maintain the number of open waterbodies of optimal size (>0.5 ha), and the percentage cover of pools overall, with shallow water extending at least 30 m landward into surrounding dense vegetation.	
	Gadwall, shoveler, teal	Maintain the number of waterbodies of optimal size.	
	Greater white-fronted goose	Maintain the number and size of waterbodies of optimal size (>20 ha).	
Water depth	Avocet	Maintain the availability and area of standing water of 3-5 cm deep.	

Attribute / sub-attribute	Feature(s)	Target	Summary conclusion of potential for combined effects
	Bittern	Maintain the overall depth of swamp and marginal water which is typically between 30 – 100 cm, and/or within pools and dykes at typically 200-400 cm deep.	
	Gadwall	Maintain the availability of standing water of optimal depth, typically <0.1 m deep, over at least 22 hectares.	
	Marsh harrier	Maintain the availability of water over the entire reedbed area, with a high proportion of the area with a water depth of 0.1 m to 0.3 m.	
	Shoveler	Maintain the availability of standing water at optimal depth, typically <0.3 m deep.	
	Teal	Maintain the availability of standing water of optimal depth, typically <0.1 m deep.	
Water quality			

Attribute / sub-attribute	Feature(s)	Target	Summary conclusion of potential for combined effects
Contaminants	All features	Restrict aqueous contaminants to levels equating to High Status according to Annex VIII and Good Status according to Annex X of the Water Framework Directive, avoiding deterioration from existing levels.	<p>There is no potential for an effect on water quality that could have consequences for the qualifying features that do not rely on the marine environment.</p> <p>For little tern, the assessment concludes that there would not be a combined effect due to the various waste streams of the operational WDA permit that would alter the conclusion of the Shadow HRA Report. The 'restrict' or 'maintain' targets for water quality would not be compromised due to combined effects of the operational permits.</p>
Dissolved oxygen (DO)	All features	Maintain the DO concentration at levels equating to high ecological status (specifically $\geq 5.7 \text{ mg L}^{-1}$ (at 35 salinity) for 95 % of year) avoiding deterioration from existing levels.	
Nutrients	All features	Maintain water quality at mean winter dissolved inorganic nitrogen levels where biological indicators of eutrophication (opportunistic macroalgal and phytoplankton blooms) do not affect the integrity of the site and features, avoiding deterioration from existing levels.	
Turbidity	All features	Maintain natural levels of turbidity across the habitat.	

Attribute / sub-attribute	Feature(s)	Target	Summary conclusion of potential for combined effects
Salinity	Avocet	Maintain water salinity at <2.5%.	
	Bittern	Maintain water salinity at <0.5%.	
Air Quality			
Air quality	Avocet, bittern, little tern, marsh harrier, nightjar	Restore concentrations and deposition of air pollutants to at or below the site-relevant Critical Load or Level values given for the feature's supporting habitat on the APIS.	Only the operational CA permit has the potential to affect air quality and therefore there is no potential for a combined effect with other operational permits. Furthermore, as explained in response to item 1d), the combined effect of the construction phase emissions and the effects of the activities within the operational CA permit would be no different to the predicted effect of the operational CA permit alone. Consequently, the 'restore' or 'maintain' target for this attribute would not be compromised.
	Gadwall, greater white-fronted goose, hen harrier, shoveler, teal	Maintain concentrations and deposition of air pollutants to at or below the site-relevant Critical Load or Level values given for the feature's supporting habitat on the APIS.	
Vegetation characteristics			
Vegetation characteristics for nesting	Avocet	Maintain the proportion of vegetated to bare ground within nesting areas with generally <40%.	The response to item 1a) confirms that there is no potential for a combined effect of the operational

Attribute / sub-attribute	Feature(s)	Target	Summary conclusion of potential for combined effects
	Bittern	Maintain the cover of scrub-free areas of reed-bed with common reed <i>Phragmites australis</i> at or above 90% cover and with a diverse age structure.	permit activities to influence the vegetation of supporting habitats for bird populations.
	Gadwall, shoveler, teal	Maintain the overall heights of vegetation patches (20-60 cm) within nesting areas that are typically <50 m from the water's edge.	
	Little tern	Maintain vegetation cover (generally <15%) throughout areas used for nesting, providing sufficient bare ground for the colony as a whole.	
	Marsh harrier	Maintain a management regime that ensures the constant availability of areas of dense reed stands as nesting cover.	
	Nightjar	Maintain the mix of vegetation (optimal conditions normally with vegetation mostly of 20-60 cm with frequent bare patches of >2 m ² , 10-	

Attribute / sub-attribute	Feature(s)	Target	Summary conclusion of potential for combined effects
		20% bare ground and <50% tree/scrub cover overall; trees c.2 m in height) throughout the nesting area.	
Vegetation characteristics for feeding	Greater white-fronted goose	Maintain vegetation heights at between 10-20 cm in areas used for feeding.	
	Hen harrier	Maintain optimal mix of vegetation to provide open, prey rich, areas for hunting.	
Vegetation characteristics for roosting	Hen harrier	Maintain an optimal mix of vegetation in areas used for roosting.	
Conservation			
Conservation measures	All features	Maintain the structure, function and supporting processes associated with the feature and its supporting habitat through management or other measures and ensure these measures are not being undermined or compromised.	The activities included in the operational permits do not have the potential to affect management measures necessary to support these qualifying features and, therefore, there is no pathway for combined effect on the qualifying features.

2.4 Southern North Sea SAC

2.4.1 The three overarching conservation objectives for the Southern North Sea SAC (JNCC, 2019) are as follows:

“To ensure that the integrity of the site is maintained and that it makes the best possible contribution to maintaining Favourable Conservation Status (FCS) for harbour porpoise in UK waters.

In the context of natural change, this will be achieved by ensuring that:

- 1. Harbour porpoise is a viable component of the site;*
- 2. There is no significant disturbance of the species; and*
- 3. The condition of supporting habitats and processes, and the availability of prey, is maintained.”*

2.4.2 Unlike the other designated sites referred to in this document, Natural England has not issued supplementary advice in the form of attributes / targets that contribute to achievement of the above conservation objectives.

2.4.3 However, JNCC has provided further information on the conservation objectives, as summarised in Table 2.3.

Table 2.3: Conservation objectives for Southern North Sea SAC (JNCC, 2019)

Conservation objective	JNCC guidance	Summary conclusion of potential for combined effects
Harbour porpoise is a viable component of the site	This objective is primarily concerned with operations that would result in unacceptable levels of injury / mortality, defined as levels that would have an unacceptable impact on the FCS of harbour porpoise within the marine unit in which the SAC is situated.	The activities included in the operational permits do not have the potential to result in unacceptable levels of injury / mortality and, therefore, there is no pathway for combined effect on the qualifying features.
There is no significant disturbance of the species	Noise disturbance from a plan / project (either individually or in combination) is significant if it excludes harbour porpoise from more than: <ol style="list-style-type: none"> 1. 20% of the relevant area of the site (i.e. the part of the SAC that was designated on the basis of higher persistent densities in a given season) in any given day; 2. An average of 10% of the relevant area of the site over a season (summer is defined as Apr to Sep, winter is defined as Oct to Mar). 	The activities included in the operational permits do not have the potential to result in noise disturbance to harbour porpoise and, therefore, there is no pathway for combined effect on the qualifying features.
The condition of supporting habitats and processes, and	Plans and projects should be considered, both alone and in combination with other projects and existing pressures in the site, in	As explained in response to item 1b, the highly precautionary approach to the assessment means that there is no potential for any synergistic (or combined) effect to

Conservation objective	JNCC guidance	Summary conclusion of potential for combined effects
the availability of prey, is maintained	terms of potential impacts on habitats and prey within the SAC.	alter the conclusions reached when assessing the effect of the thermal and chemical plumes in isolation (because the assessment is based on maximum spatial extent of effect).

2.5 Outer Thames Estuary SPA

2.5.1 The conservation objectives for the Outer Thames Estuary SPA (Natural England, 2019c) are as follows:

“Ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring:

- *the extent and distribution of the habitats of the qualifying features.*
- *the structure and function of the habitats of the qualifying features.*
- *the supporting processes on which the habitats of the qualifying features rely.*
- *the populations of each of the qualifying features.*
- *the distribution of qualifying features within the site”*

2.5.2 A conclusion regarding the potential for combined effects of the operational permits are summarised in Table 2.4.

Table 2.4: Supplementary Advice on Conservation Objectives for Outer Thames Estuary SPA (Natural England, 2019c)

Attribute / sub-attribute	Feature(s)	Target	Summary conclusion of potential for combined effects
Breeding population			
Abundance	Common tern	Maintain the size of the breeding population at a level which is at or above 532 breeding individuals, whilst avoiding deterioration from its current level.	<p>With regard to common and little tern, the assessment concludes that there would not be a combined effect due to the various waste streams of the operational WDA permit that would alter the conclusion of the Shadow HRA Report. The ‘maintain’ targets for the size of breeding tern species would not be compromised due to combined effects of the operational permits.</p> <p>Furthermore, the assessment confirms that there is no potential for combined effects on supporting habitats of the tern species at the colony locations.</p>
	Little tern	Maintain the size of the breeding population at a level which is at or above 746 breeding individuals, whilst avoiding deterioration from its current level.	
Non-breeding population			

Attribute / sub-attribute	Feature(s)	Target	Summary conclusion of potential for combined effects
Abundance	Red-throated diver	Maintain the size of the non-breeding population at a level which is at or above 18,079 individuals, whilst avoiding deterioration from its current level.	The assessment concludes that there would not be a combined effect due to the various waste streams of the operational WDA permit that would alter the conclusion of the Shadow HRA Report. The 'maintain' target for the size of the non-breeding red-throated diver would not be compromised due to combined effects of the operational permits.
Connectivity with supporting habitats			
Connectivity with supporting habitats	Common tern; little tern	Maintain safe passage of birds moving between nesting and feeding areas.	The operational permits have no potential to affect connectivity with supporting habitats and, therefore, there is no potential for combined effects.
Disturbance			
	Common tern; little tern	Restrict the frequency, duration and / or intensity of disturbance affecting roosting, nesting, foraging, feeding,	The operational permits have no potential to result in disturbance or to increase predation to bird populations

NOT PROTECTIVELY MARKED

Attribute / sub-attribute	Feature(s)	Target	Summary conclusion of potential for combined effects
Disturbance caused by human activity		moulting and/or loafing birds so that they are not significantly disturbed.	and, therefore, there is no potential for combined effects.
	Red-throated diver	Reduce the frequency, duration and / or intensity of disturbance affecting roosting, foraging, feeding, moulting and/or loafing birds so that they are not significantly disturbed.	
Predation – all habitats	Common tern; little tern	Restrict predation and disturbance caused by native and non-native predators.	
Supporting habitat			
Extent and distribution of supporting habitat for the breeding season	Common tern; little tern	Maintain the extent, distribution and availability of suitable habitat which supports the feature for all necessary stages of its breeding cycle (courtship, nesting, feeding).	The operational permits have no potential to affect the extent, distribution and availability of suitable supporting habitat for bird populations and, therefore, there is no potential for combined effects.
Extent and distribution of supporting habitat for the	Red-throated diver	Maintain the extent, distribution and availability of suitable habitat which supports the feature for all necessary stages of the non-breeding/wintering period (moulting, roosting, loafing,	

NOT PROTECTIVELY MARKED

Attribute / sub-attribute	Feature(s)	Target	Summary conclusion of potential for combined effects
non-breeding season		feeding) at the following levels: subtidal sand (220,295.55 ha); subtidal coarse sediment (73,606.64 ha); subtidal mixed sediments (62,100.63 ha); subtidal mud (12,549.14 ha); circalittoral rock (335.2 ha); and water column.	
Food availability	Common tern	Maintain the distribution, abundance and availability of key food and prey items (eg. sandeel, sprat, coarse fish, crustacea, annelids) at preferred sizes.	The assessment concludes that there would not be a combined effect due to the various waste streams of the operational WDA permit that would alter the conclusion of the Shadow HRA Report. The 'maintain' target for the key food and prey items for tern species and red-throated diver would not be compromised due to combined effects of the operational permits.
	Little tern	Maintain the distribution, abundance and availability of key food and prey items (eg. crustacea, annelids, sandeel, herring, clupeidae) at preferred sizes.	
	Red-throated diver	Maintain the distribution, abundance and availability of key food and prey items (eg. fish) at preferred sizes.	

Attribute / sub-attribute	Feature(s)	Target	Summary conclusion of potential for combined effects
Landform	Common tern	Maintain the availability of shallow sloping nesting sites, grading to <30 cm above water level, restricting the probability that they will flood.	The operational permits have no potential to affect landform and, therefore, there is no potential for combined effects.
	Little tern	Maintain the availability of shallow sloping nesting sites, grading to above water level, restricting the probability that they will flood.	
Hydrology			
Water depth	Red-throated diver	Maintain the depth of inshore waters currently used as feeding or moulting sites.	The operational permits have no potential to affect water depth and, therefore, there is no potential for combined effects.
Water quality			
Contaminants	Common tern; little tern; red-throated diver	Reduce aqueous contaminants to levels equating to High Status according to Annex VIII and Good Status according to Annex X of the Water Framework Directive, avoiding deterioration from existing levels.	The assessment concludes that there would not be a combined effect due to the various waste streams of the operational WDA permit that would alter the conclusion of the Shadow HRA Report. The 'reduce' or

NOT PROTECTIVELY MARKED

Attribute / sub-attribute	Feature(s)	Target	Summary conclusion of potential for combined effects
DO	Common tern; little tern; red-throated diver	Maintain the DO concentration at levels equating to High Ecological Status (specifically ≥ 5.7 mg per litre (at 35 salinity) for 95 % of the year), avoiding deterioration from existing levels.	'maintain' targets for water quality would not be compromised due to combined effects of the operational permits.
Nutrients	Common tern; little tern; red-throated diver	Maintain water quality at mean winter dissolved inorganic nitrogen levels where biological indicators of eutrophication (opportunistic macroalgal and phytoplankton blooms) do not affect the integrity of the site and features, avoiding deterioration from existing levels.	
Turbidity	Common tern; little tern; red-throated diver	Maintain natural levels of turbidity (e.g. concentrations of suspended sediment, plankton and other material) across the habitat.	
Air Quality			
Air quality	Common tern;	Maintain concentrations and deposition of air pollutants at below	Only the operational CA permit has the potential to affect air quality and

NOT PROTECTIVELY MARKED

Attribute / sub-attribute	Feature(s)	Target	Summary conclusion of potential for combined effects
	little tern; red-throated diver	the site-relevant Critical Load or Level values given for this feature of the site on the APIS.	therefore there is no potential for a combined effect with other operational permits. Furthermore, as explained in response to item 1d), the combined effect of the construction phase emissions and the effects of the activities within the operational CA permit would be no different to the predicted effect of the operational CA permit alone. Consequently, the 'maintain' target for this attribute would not be compromised.
Vegetation characteristics			
Vegetation characteristics for nesting	Common tern	Maintain the mix or heights of vegetation types within and immediately adjacent to nesting areas.	The response to item 1a) confirms that there is no potential for a combined effect of the operational permit activities to influence the vegetation of supporting habitats for bird populations.
	Little tern	Maintain vegetation cover (generally <15%) throughout areas used for nesting, providing sufficient bare ground for the colony as a whole.	

Attribute / sub-attribute	Feature(s)	Target	Summary conclusion of potential for combined effects
Conservation			
Conservation measures	Common tern; little tern; red-throated diver	Maintain the structure, function and supporting processes associated with the feature and its supporting habitat through management or other measures and ensure these measures are not being undermined or compromised.	The activities included in the operational permits do not have the potential to affect management measures necessary to support these qualifying features and, therefore, there is no pathway for combined effect on the qualifying features.

2.6 Alde, Ore and Butley Estuaries SAC

2.6.1 The conservation objectives for the Alde, Ore and Butley Estuaries SAC (Natural England, 2017) are as follows:

“Ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the Favourable Conservation Status of its qualifying features, by maintaining or restoring:

- *the extent and distribution of qualifying natural habitats and habitats of the qualifying species.*
- *the structure and function (including typical species) of qualifying natural habitats.*
- *the structure and function of the habitats of the qualifying species.*
- *the supporting processes on which qualifying natural habitats and the habitats of qualifying species rely.*
- *the populations of each of the qualifying species.*
- *the distribution of qualifying species within the site.”*

2.6.2 A conclusion regarding the potential for combined effects of the operational permits are summarised in Table 2.5.

Table 2.5: Supplementary Advice on Conservation Objectives for Alde, Ore and Butley Estuaries SAC (Natural England, 2017)

Feature	Attribute / sub attribute	Target	Summary conclusion of potential for combined effects
Extent and distribution			
H1330 Atlantic salt meadows	Extent of the feature within the site	Maintain the total extent of the feature.	The response to item 1a) confirms that there is no potential for a combined effect of the operational permit activities to influence the current or future extent and distribution of this qualifying feature and, therefore, no potential to compromise these targets. Furthermore, the responses to the other items confirms that there is no potential for combined effects due to the various elements of the operational WDA permit acting together, or effects of construction phase activities to interact with the operational permits, to compromise the targets for this qualifying feature.
	Future extent of habitat within the site and ability to respond to seasonal changes	Maintain the ability to achieve long-term fluctuations in the extent of habitat in response to coastal processes.	
	Distribution of the feature, including associated transitional habitats, within the site	Maintain the range and continuity of the habitat and its natural transitions within saltmarsh types and to other habitats seaward and landward.	
H1130 Estuaries	Presence and spatial	Maintain the presence and spatial distribution of estuary communities.	

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Feature	Attribute / sub attribute	Target	Summary conclusion of potential for combined effects
	distribution of biological communities		The response provided for 'Atlantic salt meadows' equally applies to this qualifying feature.
	Extent and distribution	Maintain the total extent and spatial distribution of the estuary to ensure no loss of integrity, while allowing for natural change and succession.	
H1140 Mudflats and sandflats not covered by seawater at low tide	Presence and spatial distribution of biological communities	Maintain the presence and spatial distribution of mudflat and sandflat communities.	The response provided for 'Atlantic salt meadows' equally applies to this qualifying feature.
	Extent and distribution	Maintain the total extent, spatial distribution and types of mudflats and sandflats.	
Structure and function			
H11330 Atlantic salt meadows	Key structural, influential and distinctive species	Maintain the abundance of the species listed to enable each of them to be a viable component of the Annex I habitat feature: <i>Limonium vulgare</i> ; <i>Armeria maritima</i> ; <i>Glaux</i>	The response to item 1a) confirms that there is no potential for a combined effect of the operational permit activities to influence the various attributes contributing to

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Feature	Attribute / sub attribute	Target	Summary conclusion of potential for combined effects
		<i>maritima; Puccinellia maritima; Spartina maritima; Atriplex portulacoides; Artemisia maritima; Elymus pungens; E. pycnanthus.</i>	maintaining the structure and function of this qualifying feature. Furthermore, the responses to the other items confirms that there is no potential for combined effects due to the various elements of the operational WDA permit acting together, or effects of construction phase activities to interact with the operational permits, to compromise the targets for this qualifying feature.
	Presence and patterning of creeks and salt pans	Maintain naturally-occurring patterns of creeks and salt pans.	
	Presence of unvegetated surfaces	Maintain the degree of patterning of patches of bare mud of varying sizes in a mosaic with saltmarsh vegetation.	
	Sediment size and availability	Maintain the availability and size range of those sediments typical of the feature at the site.	
	Surface elevation and topography	Maintain any desirable variation in elevation and/or topography across the site that supports the habitat type.	
H1130 Estuaries	Connectivity	Maintain connectivity of estuarine features to surrounding rivers, freshwater, marine and coastal	

Feature	Attribute / sub attribute	Target	Summary conclusion of potential for combined effects
		habitats, to ensure larval dispersal and recruitment, maintain nursery grounds for mobile species, and to allow movement of migratory species.	The response provided for 'Atlantic salt meadows' equally applies to this qualifying feature.
	Presence and abundance of key structural and influential species	[Maintain OR Recover OR Restore] the abundance of [key structural and influential species], to enable each of them to be a viable component of the habitat.	
	Freshwater sources	Restore the natural freshwater flow / volume into the estuary.	
	Habitat zonation	Maintain the estuary zonation, which is affected by both changes in salinity gradient and tides in the estuary from river to sea (horizontally) and with shore height (vertically) from terrestrial to subtidal.	
	Morphology	Maintain the characteristic morphology of the estuary.	

Feature	Attribute / sub attribute	Target	Summary conclusion of potential for combined effects
	Non-native species and pathogens	Reduce the introduction and spread of non-native species and pathogens, and their impacts.	
	Sediment movement, sources and sinks	Maintain the sediment regime and budget within the estuary, including sediment sources, sinks and movement.	
	Composition of component communities	Maintain the species composition of component communities.	
	Substrate composition and distribution	Maintain the composition and character of substrate, across the feature (and each of its subfeatures), compared to an established baseline, to ensure continued structural habitat integrity and connectivity.	
	Tidal regime	Maintain natural tidal range (2.75m springs neaps), and tidal currents, within the main estuary, tributaries and creeks.	

Feature	Attribute / sub attribute	Target	Summary conclusion of potential for combined effects
	Topography	Maintain characteristic physical form (eg coastal plain, bar built, ria, complex), topographic features of the estuary and the overall topography on which the morphology relies.	
	Water density	Maintain the natural water density or gradient across the feature (and each of its subfeatures).	
H1140 Mudflats and sandflats not covered by seawater at low tide	Presence and abundance of key structural and influential species	[Maintain OR Recover OR Restore] the abundance of [key structural and influential species], to enable each of them to be a viable component of the habitat.	The response provided for 'Atlantic salt meadows' equally applies to this qualifying feature.
	Non-native species and pathogens	Reduce the introduction and spread of non-native species and pathogens, and their impacts.	
	Sediment composition and distribution	Maintain the distribution of sediment composition across the feature.	

Feature	Attribute / sub attribute	Target	Summary conclusion of potential for combined effects
	Sediment total organic carbon content	Maintain total organic carbon (TOC) content in the sediment at existing levels.	
	Composition of component communities	Maintain the species composition of component communities.	
	Topography	Maintain the presence of topographic features, while allowing for natural responses to hydrodynamic regime, by preventing erosion or deposition through human induced activity.	
Vegetation			
H1330 Atlantic salt meadows	Undesirable species	The frequency/cover of the following undesirable species are maintained at acceptable levels and are not encouraged by changes in surface condition, soils, nutrient levels or changes to hydrology: <i>Spartina anglica</i> .	The response to item 1a) confirms that there is no potential for a combined effect of the operational permit activities to influence the vegetation component of this qualifying feature. Furthermore, the responses to the other items confirms that there is no potential for combined effects due to the various elements of
	Community composition	Ensure the component vegetation communities of the feature are	

Feature	Attribute / sub attribute	Target	Summary conclusion of potential for combined effects
		<p>referable to and characterised by the following NVC types: SM10 Transitional low-marsh vegetation; SM11 <i>Aster tripolium</i> var. <i>discoideus</i> salt-marsh community; SM12 Rayed <i>Aster tripolium</i> salt-marsh community; SM13 <i>Puccinellia maritima</i> salt-marsh community; SM14 <i>Halimione portulacoides</i> saltmarsh community; SM15 <i>Juncus maritimus</i> – <i>Triglochin maritima</i> salt-marsh community; SM16 <i>Festuca rubra</i> salt-marsh community; SM17 <i>Artemisia maritima</i> salt-marsh community; SM24 <i>Elymus pycnanthus</i> salt-marsh community.</p>	<p>the operational WDA permit acting together, or effects of construction phase activities to interact with the operational permits, to compromise the ability to achieve the maintain targets for this qualifying feature.</p>
	<p>Zonation of salt marsh vegetation</p>	<p>Maintain the full range of zonations (low-mid, mid, mid-upper and transitional zones) between component saltmarsh communities found in H1330.</p>	
<p>Supporting processes</p>			

Feature	Attribute / sub attribute	Target	Summary conclusion of potential for combined effects
H1330 Atlantic salt meadows	Adaptation and resilience	Maintain the feature's ability, and that of its supporting processes, to adapt or evolve to wider environmental change, either within or external to the site.	The activities included in the operational permits do not have the potential to affect coastal processes and, therefore, there is no pathway for combined effect on the qualifying feature.
	Functional connectivity with wider coastal sedimentary system	Maintain adequate inputs of sediment in the water column from the sediment sources (offshore/eroding cliffs etc).	
	Morphological setting	Maintain the morphological setting of the habitat within the wider estuarine and coastal system.	
	Sediment nutrient status and nutrient cycling	Maintain both the sediment nutrient status to within typical values for the habitat and the processes that sustain effective nutrient cycling by the saltmarsh feature.	
	Sedimentary processes	Maintain the sedimentary processes (suspended sediment, sediment transfer, etc) that sustain the	

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Feature	Attribute / sub attribute	Target	Summary conclusion of potential for combined effects
		elevation and topography of the marsh surface.	
	Tidal processes	Maintain the degree of tidal immersion and emersion that supports the function of the habitat type.	
H1130 Estuaries	Energy / exposure	Maintain the natural physical energy resulting from waves, tides and other water flows, so that the exposure does not cause alteration to the biotopes, natural disturbance levels and stability, across the feature.	The activities included in the operational permits do not have the potential to affect coastal processes or sediment contaminants at this site and, therefore, there is no pathway for combined effect on the qualifying feature.
	Sediment contaminants	Restrict surface sediment contaminant levels to concentrations where they are not adversely impacting the infauna of the feature.	
H1140 Mudflats and sandflats not covered by	Energy / exposure	Maintain the natural physical energy resulting from waves, tides and other water flows, so that the exposure does not cause alteration to the	The activities included in the operational permits do not have the potential to affect coastal processes, physico-chemical properties of the

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Feature	Attribute / sub attribute	Target	Summary conclusion of potential for combined effects
seawater at low tide		biotopes, natural disturbance levels and stability, across the feature.	water or sediment contaminants at this site and, therefore, there is no pathway for combined effect on the qualifying feature.
	Physico-chemical properties	Maintain the natural physico-chemical properties of the water.	
	Sediment contaminants	Restrict surface sediment contaminants (<1cm from the surface) to below the OSPAR Environment Assessment Criteria (EAC) or Effects Range Low (ERL) threshold.	
	Sediment movement and hydrodynamic regime	Maintain sediment transport pathways to and from the feature to ensure replenishment of the feature, and / or replenishment of habitats that rely on the sediment supply from the feature.	
Air quality			
H1330 Atlantic salt meadows	Air quality	Maintain concentrations and deposition of air pollutants at below the site-relevant Critical Load or Level	Only the operational CA permit has the potential to affect air quality and therefore there is no potential for a

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Feature	Attribute / sub attribute	Target	Summary conclusion of potential for combined effects
		values given for this feature of the site on the APIS.	combined effect with other operational permits. Furthermore, as explained in response to item 1d), the combined effect of the construction phase emissions and the effects of the activities within the operational CA permit would be no different to the predicted effect of the operational CA permit alone. Consequently, the 'maintain' target for this attribute would not be compromised. In any event, the process contribution due to the operational CA permit is predicted to be insignificant at this site when assessed against relevant Critical Levels and Critical Loads.
Water quality			
H1330 Atlantic salt meadows	Water quality	Where the feature is dependent on estuarine water, ensure water quality and quantity is maintained to a standard which provides the	The activities included in the operational permits do not have the potential to affect estuarine water quality at this site and, therefore,

Feature	Attribute / sub attribute	Target	Summary conclusion of potential for combined effects
		necessary conditions to support the feature.	there is no pathway for combined effect on the qualifying features.
H1130 Estuaries; H1140 Mudflats and sandflats not covered by seawater at low tide	Contaminants	Restrict aqueous contaminants to levels equating to High / Good Status (according to Annex VIII and X of the Water Framework Directive), avoiding deterioration from existing levels.	
	DO	Maintain the DO concentration at levels equating to High Ecological Status (specifically ≥ 5.7 mg per litre (at 35 salinity) for 95 % of the year), avoiding deterioration from existing levels.	
	Nutrients	Maintain water quality at mean winter dissolved inorganic nitrogen levels where biological indicators of eutrophication (opportunistic macroalgal and phytoplankton blooms) do not affect the integrity of the site and features avoiding deterioration from existing levels.	

Feature	Attribute / sub attribute	Target	Summary conclusion of potential for combined effects
	Turbidity	Maintain natural levels of turbidity (eg concentrations of suspended sediment, particulates, plankton and other material) across the habitat.	
Conservation			
H1330 Atlantic salt meadows	Conservation measures	Maintain the management measures that are necessary to restore the structure, functions and supporting processes associated with the feature.	The activities included in the operational permits do not have the potential to affect management measures necessary to support these qualifying features and, therefore, there is no pathway for combined effect on the qualifying features.

2.7 Alde – Ore Estuaries SPA

2.7.21 The conservation objectives for the Alde – Ore Estuaries SPA (Natural England, 2021) are as follows:

“Ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring:

- *the extent and distribution of the habitats of the qualifying features.*
- *the structure and function of the habitats of the qualifying features.*
- *the supporting processes on which the habitats of the qualifying features rely.*
- *the populations of each of the qualifying features.*
- *the distribution of qualifying features within the site”.*

2.7.22 A conclusion regarding the potential for combined effects of the operational permits are summarised in Table 2.6.

Table 2.6: Supplementary Advice on Conservation Objectives for Alde-Ore Estuary SPA (Natural England, 2021)

Attribute / sub-attribute	Feature(s)	Target	
Breeding population			
Abundance	Avocet	Restore the size of the breeding population at a level to be agreed whilst avoiding deterioration from its current level [citation population of 104 pairs].	The assessment of potential for combined effects confirms that there is no potential for a combined effect on supporting habitats of avocet and marsh harrier and, therefore, no potential to compromise the maintain or restore targets for the breeding populations of these species. With regard to lesser black-backed gull, little tern and Sandwich tern, the assessment concludes that there would not be a combined effect due to the various waste streams of the operational WDA permit that would alter the conclusion of the Shadow HRA Report. The 'restore' targets for these species would not be compromised due to combined effects of the operational permits.
	Lesser black-backed gull	Restore the size of the breeding population to a level which is above 14,074 whilst avoiding deterioration from its current level.	
	Little tern	Restore the size of the breeding population at a level to be agreed whilst avoiding deterioration from its current level [citation population of 48 pairs].	
	Marsh harrier	Maintain the size of the breeding population at a level to be agreed whilst avoiding deterioration from its current level [citation population of 3 pairs].	

Attribute / sub-attribute	Feature(s)	Target	
	Sandwich tern	Restore the size of the breeding population at a level to be agreed* whilst avoiding deterioration from its current level [citation population of 170 pairs].	
Non-breeding population			
Abundance	Avocet	Maintain the size of the non-breeding population at a level which is above 824 whilst avoiding deterioration from its current level.	The supporting habitats for the non-breeding bird populations are non-marine habitats. Only the operational CA permit has the potential to affect supporting habitats (e.g. via nutrient nitrogen and acid deposition) and therefore there is no potential for a combined effect with other operational permits. Furthermore, as explained in response to item 1d), the combined effect of the construction phase emissions and the effects of the activities within the operational CA permit would be no different to the predicted effect of the operational CA permit alone. The assessments
	Redshank	Maintain the size of the non-breeding population at a level which is above 1,662 whilst avoiding deterioration from its current level.	
	Ruff	Maintain the size of the non-breeding population at a level which is above 13 whilst avoiding deterioration from its current level.	

Attribute / sub-attribute	Feature(s)	Target	
			<p>conclude that the supporting habitats for birds would not be detrimentally affected by changes in air quality and consequently, the 'maintain' targets for non-breeding bird populations would not be compromised.</p> <p>In any event, the process contribution due to the operational CA permit is predicted to be insignificant at this site when assessed against relevant Critical Levels and Critical Loads.</p>
Connectivity with supporting habitats			
Connectivity with supporting habitats	All features	Maintain safe passage of birds moving between nesting, roosting and feeding areas.	The operational permits have no potential to affect connectivity with supporting habitats and, therefore, there is no potential for combined effects.
Disturbance			

Attribute / sub-attribute	Feature(s)	Target	
Disturbance caused by human activity	All features	Reduce the frequency, duration and / or intensity of disturbance affecting roosting, nesting, foraging, feeding, moulting and/or loafing birds so that they are not significantly disturbed.	The operational permits have no potential to result in disturbance or to increase predation to bird populations and, therefore, there is no potential for combined effects.
Predation – all habitats	Avocet; marsh harrier	Restrict predation and disturbance caused by native and non-native predators.	
	Lesser black-backed gull; little tern; Sandwich tern	Reduce predation and disturbance caused by native and non-native predators.	
Supporting habitat			
Extent and distribution of supporting habitat for the breeding season	Avocet; lesser black-backed gull; little tern; marsh harrier; Sandwich tern	Maintain the extent, distribution and availability of suitable habitat which supports the feature for all necessary stages of its breeding cycle (courtship, nesting, feeding). The area of the supporting habitats is currently understood to be: intertidal mixed sediments (21.9 ha); intertidal	The operational permits have no potential to affect the extent, distribution and availability of suitable supporting habitat for bird populations and, therefore, there is no potential for combined effects.

Attribute / sub-attribute	Feature(s)	Target	
		mud (537.8 ha); intertidal sand and muddy sand (1.5 ha); coastal lagoons (5.7 ha); freshwater and coastal grazing marsh (150.7 ha); intertidal biogenic reef (unknown extent); intertidal coarse sediment (unknown extent); intertidal rock (unknown extent); water column; saltmarsh (298.7 ha).	
Extent and distribution of supporting habitat for the non-breeding season	Avocet; redshank; ruff	Maintain the extent, distribution and availability of suitable habitat which supports the feature for all necessary stages of the non-breeding/wintering period (moulting, roosting, loafing, feeding). See above for areas.	
Food availability	Avocet	Maintain the distribution, abundance and availability of key food and prey items (eg. Gammarus, Corophium, flies, beetles, Nereis, Hydrobia, Cardium, gobies) at preferred sizes (eg. Fish or worms between 4-15 mm long).	The assessment of potential for combined effects confirms that there is no potential for a combined effect on supporting habitats of the waterbird species or marsh harrier and, therefore, no potential to compromise the 'maintain' targets

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Attribute / sub-attribute	Feature(s)	Target	
	Lesser black-backed gull	Maintain the distribution, abundance and availability of key food and prey items (eg. voles, small seabirds, waders, sandeel, sprat, cod, herring, roach, rudd, beetles, flies, earthworm, shellfish) at preferred sizes.	related to food availability for the populations of these species. With regard to lesser black-backed gull, little tern and Sandwich tern, the assessment concludes that there would not be a combined effect due to the various waste streams of the operational WDA permit that would alter the conclusion of the Shadow HRA Report. The 'maintain' target for the key food and prey items for these species would not be compromised due to combined effects of the operational permits.
	Little tern	Maintain the distribution, abundance and availability of key food and prey items (eg. Crustaceans, annelids, sandeel, herring, clupeidae) at preferred sizes.	
	Marsh harrier	Maintain the distribution, abundance and availability of key food and prey items (eg. mammals, birds) at preferred sizes (eg. voles, mice, rabbit; birds of pipit to duck size).	
	Redshank	Maintain the distribution, abundance and availability of key food and prey items (eg. earthworm, leatherjacket, grassland/marsh invertebrates, Hydrobia, Macoma, Corophium, Nereis) at preferred sizes.	

Attribute / sub-attribute	Feature(s)	Target	
	Ruff	Maintain the distribution, abundance and availability of key food and prey items (eg. Caddis flies, crustaceans, molluscs, worms dipteran flies, beetles, earthworms) at preferred sizes.	
	Sandwich tern	Maintain the distribution, abundance and availability of key food and prey items (eg. sandeel, sprat) at preferred sizes.	
Landform	Avocet	Maintain the availability of shallow sloping nesting sites, grading to above water level, restricting the probability that they will flood.	The operational permits have no potential to affect landform and, therefore, there is no potential for combined effects.
	Little tern; Sandwich tern	Maintain the availability of shallow sloping nesting sites, grading to <30 cm above water level, restricting the probability that they will flood.	
	Redshank	Maintain a high density of channel networks within intertidal feeding areas and shallow slope gradients to	

Attribute / sub-attribute	Feature(s)	Target	
		the length/perimeter of ditches, drains, pools and scrapes.	
	Ruff	Maintain shallow slope gradients to the length/perimeter of ditches, drains, pools and scrapes.	
Landscape	Avocet; redshank; ruff	Maintain the area of open and unobstructed terrain around roosting and feeding sites.	The operational permits have no potential to affect landscape and, therefore, there is no potential for combined effects.
	Marsh harrier	Maintain continuous reed cover over large areas avoiding fragmentation of extensive reedbeds.	
Hydrology			
Hydrology/flow within standing water	Avocet	Maintain the stability of standing water levels (<2 cm fluctuation) in order to prevent flooding of nests.	The operational permits have no potential to affect hydrology, flow water area or depth and, therefore, there is no potential for combined effects.
Hydrology/flow within intertidal	Avocet (non-breeding); redshank	Maintain the availability of fresh water on mudflats within feeding and resting areas.	
	Redshank	Maintain water availability within feeding areas to maintain moderately	

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Attribute / sub-attribute	Feature(s)	Target	
Hydrology/flow within grassland (marsh)		high water tables that provide shallow surface water.	
	Ruff	Maintain water availability within nesting areas to provide moderately high water tables that provide shallow surface water and/or damp field conditions between 1st March - 1st June inclusive.	
Water depth	Avocet	Maintain the availability and area of standing water of 3-5 cm deep over at least 50% of the total standing water area.	
	Marsh harrier	Maintain the availability of water over the entire reedbed area, with a high proportion of the area with a water depth of 0.1 m to 0.3 m.	
	Redshank	Maintain the availability of standing water of 1-5 cm deep, over at least 50% of the total standing water area.	
	Ruff	Maintain the availability of water at optimal depths, typically 1-3 cm deep,	

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Attribute / sub-attribute	Feature(s)	Target	
		over at least 50% of the total water area (non-tidal).	
Water quality			
Contaminants	All features	Reduce aqueous contaminants to levels equating to High Status according to Annex VIII and Good Status according to Annex X of the Water Framework Directive, avoiding deterioration from existing levels.	<p>There is no potential for an effect on water quality that could have consequences for the qualifying features that do not rely on the marine environment.</p> <p>For lesser black-backed gull, little tern and Sandwich tern, the assessment concludes that there would not be a combined effect due to the various waste streams of the operational WDA permit that would alter the conclusion of the Shadow HRA Report. The 'reduce' or 'maintain' targets for water quality would not be compromised due to combined effects of the operational permits.</p>
DO	All features	Maintain the DO concentration at levels equating to High Ecological Status, avoiding deterioration from existing levels.	
Nutrients	All features	Maintain water quality at mean winter dissolved inorganic nitrogen levels where biological indicators of eutrophication (opportunistic macroalgal and phytoplankton blooms) do not affect the integrity of the site and features avoiding deterioration from existing levels.	

Attribute / sub-attribute	Feature(s)	Target	
Turbidity	All features	Maintain natural levels of turbidity (e.g. concentrations of suspended sediment, plankton and other material) across the habitat.	
Salinity	Avocet	Maintain water salinity at <2.5%.	
Air Quality			
Air quality	All features	Maintain concentrations and deposition of air pollutants at below the site-relevant Critical Load or Level values given for this feature of the site on the APIS.	Only the operational CA permit has the potential to affect air quality and therefore there is no potential for a combined effect with other operational permits. Furthermore, as explained in response to item 1d), the combined effect of the construction phase emissions and the effects of the activities within the operational CA permit would be no different to the predicted effect of the operational CA permit alone. Consequently, the 'maintain' target for this attribute would not be compromised.

Attribute / sub-attribute	Feature(s)	Target	
			In any event, the process contribution due to the operational CA permit is predicted to be insignificant at this site when assessed against relevant Critical Levels and Critical Loads.
Vegetation characteristics			
Vegetation characteristics for nesting	Avocet	Maintain the proportion of vegetated to bare ground within nesting areas with generally <40% vegetated.	The response to item 1a) confirms that there is no potential for a combined effect of the operational permit activities to influence the vegetation of supporting habitats for bird populations.
	Lesser black-backed gull	Maintain the extent and distribution of predominantly medium to tall (i.e. 20-60 cm) grassland swards.	
	Little tern	Maintain vegetation cover (generally<15%) throughout areas used for nesting, providing sufficient bare ground for the colony as a whole.	
	Marsh harrier	Maintain a management regime that ensures the constant availability of	

Attribute / sub-attribute	Feature(s)	Target	
		areas of dense reed stands as nesting cover.	
	Sandwich tern	Maintain vegetation cover which should be <10% throughout areas used for nesting, providing sufficient bare ground for the colony as a whole.	
Vegetation characteristics for feeding	Ruff	Maintain the extent and distribution of predominantly short (<10 cm) grassland swards or arable fields in areas used for feeding.	
Vegetation characteristics for roosting	Redshank; ruff	Maintain a vegetation structure of key roost sites dominated by bare ground or a short sparsely-vegetated sward.	
Conservation			
Conservation measures	Avocet (breeding)	Restore the structure, function and supporting processes associated with the feature and its supporting habitat through management or other measures and ensure these	The activities included in the operational permits do not have the potential to affect management measures necessary to support these qualifying features and, therefore,

Attribute / sub-attribute	Feature(s)	Target	
	<p>measures are not being undermined or compromised.</p>	<p>measures are not being undermined or compromised.</p>	<p>there is no pathway for combined effect on the qualifying features.</p>
	<p>Avocet (non-breeding); lesser black-backed gull; little tern; marsh harrier; redshank; ruff; Sandwich tern</p>	<p>Maintain the structure, function and supporting processes associated with the feature and its supporting habitat through management or other measures and ensure these measures are not being undermined or compromised.</p>	

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SIZEWELL C PROJECT:
RESPONSE TO SCHEDULE 5 NO. 5
NOT PROTECTIVELY MARKED
