



Round 4 Compensation

Appendix D – Compensation Measures Long List

The Crown Estate

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1 Introduction

- 1.1.1 The Crown Estate, as the Competent Authority for Offshore Wind Leasing Round 4 (Round 4 Plan), completed a Habitats Regulations Assessment (HRA). The HRA could not rule out an adverse effect on site integrity (AEOSI) of the Annex I habitat 'sandbanks slightly covered by seawater all of the time' (hereafter sandbank), a feature of Dogger Bank Special Area of Conservation (SAC).
- 1.1.2 Notwithstanding that conditions (mitigation measures) were imposed to minimise the impact, the Round 4 Plan HRA concluded an AEOSI in relation to sandbank due to the footprint of subsea infrastructure resulting in habitat loss, and construction methods with potential to damage seabed habitats, associated with offshore wind leasing Round 4 projects Dogger Bank South East and Dogger Bank South West. The Crown Estate decided to progress with the Round 4 Plan, putting forward a derogation case to the Secretary of State for the Department of Business, Energy and Industrial Strategy (BEIS). In the absence of any alternative solutions to achieve the objectives of the Plan, it was considered that the Plan should progress for reasons of over-riding public interest (IROPI). It was agreed with the BEIS that The Crown Estate would proceed with the Round 4 Plan on the basis of the derogation, subject to appropriate strategic environmental compensation plans being developed. There was no objection from Welsh Ministers.
- 1.1.3 A Round 4 strategic Steering Group for habitat compensation (hereafter referred to as the "Steering Group") was formed by The Crown Estate in accordance with the Secretary of State's approval letter of the derogation case. Strategic measures to compensate for loss and physical damage to sandbank feature of the Dogger Bank SAC as a result of the Round 4 Plan were investigated through the Steering Group on behalf of The Crown Estate. This document presents the long list of measures considered and summarises the conclusions reached as to which measures should be progressed as potential options to deliver sandbank compensation for the Round 4 Plan. Key areas of agreement have been captured within the agreement log (see Appendix C). These conclusions do not represent comment on the wider suitability of any measure to provide sandbank or other habitat compensation, particularly in the case of measures which are not currently being progressed for the purpose of strategic compensation for the Round 4 Plan.

2 Compensation hierarchy

- 2.1.1 The long list was initiated from a previous study (NIRAS, 2022) and added to during the decisions of the Steering Group. A fundamental consideration for each measure is its position in a preference hierarchy which, for the purposes of the Steering Group, was based on guidance by Defra (2021), also taking into account as far as reasonably possible the potential future direction of this guidance and policy updates afforded through the participation of Defra on the Steering Group. This guidance provides a framework to help advisors, regulators and developers devise and evaluate appropriate compensation. The guidance recognises that, in the marine environment, the highest preference compensation measures that address the same impact at the same location cannot always be delivered. Defra's framework presents definitions for a hierarchy for compensation measures (Table 2.1). Each step down the hierarchy moves further from the optimum solution, in this case a measure that provides sandbank habitat within Dogger Bank SAC.

Table 2.1 Compensation hierarchy (Defra, 2021)

Level	Hierarchy of Measures	Description
1	Address same impact, same location	Address the specific impact caused by the permitted activity in the same location (within the site boundary). <i>e.g. On-site creation, restoration or relocation of feature that will be harmed/lost.</i>
2	Same ecological function, different location	Provide the same ecological function as the impacted feature; if necessary, in a different location (outside of the site boundary). <i>e.g. Off-site creation or restoration of feature that will be harmed/lost.</i>
3	Comparable ecological function, same location	Provide ecological functions and properties that are comparable to those that originally justified the designation in the same location as the impact. <i>e.g. On-site creation or restoration of a similar feature to the one that will be damaged/lost.</i>
4	Comparable ecological function, different location	Provide ecological functions and properties that are comparable to those that originally justified designation; if necessary, in a different location (outside of the site boundary). <i>e.g. Off-site creation or restoration of a similar feature to the one that will be damaged or lost.</i>

2.1.2 At the time of writing there is ongoing consultation on policies to inform updated guidance for Marine Protected Area (MPA) assessments, including approaches to compensation. Documentation circulated as part of this consultation includes an updated compensation hierarchy which emphasises the ecological effectiveness of measures (Defra, 2024). Having reviewed this documentation it is considered that the Dogger Bank Strategic Compensation Plan (DBSCP) aligns with the proposed new hierarchy in prioritising the ecological effectiveness of measures; however, noting that the proposed new hierarchy is contained within a consultation document which may undergo further changes this document refers to the Defra (2021) draft guidance.

3 Compensation measures

3.1 Overview

- 3.1.1 For each of the potential measures identified, evidence and expert opinion were compiled and assessed by the Steering Group. Measures were evaluated in relation to the five principles of compensatory measures set out in Defra (2021) guidance, namely: link to the conservation objectives for Dogger Bank SAC; provision of the same or comparable ecological function to Annex I sandbank; not negatively impacting any other sites or features; ensuring the overall coherence of designated sites and the integrity of the MPA network; and ability to be monitored.
- 3.1.2 When measures were evaluated in relation to the five principles of compensatory measures this was done on the basis that each measure would be successfully implemented; however, other factors which were considered for each longlist measure included delivery risk, expected timeframe to deliver, and the scale of compensation which could be provided. Attention was also given to the practicality of implementation.
- 3.1.3 Measures remain under consideration to provide compensation for the Round 4 Plan unless concluded otherwise by the Steering Group. Each measure in the longlist thus either:
1. Remains under consideration; or,

2. Is not currently under consideration for the DBSCP at this time.

3.1.4 A short statement of current status is made following a description of each measure, below, followed by a summary of the overall position and affirmation of the measures currently being progressed. It should be noted that where it has been concluded that measures will not be considered further for inclusion in the DBSCP, this should not be taken to imply that those measures might not be appropriate strategic compensation measures in other contexts.

3.1.5 For context, the conservation objectives for Dogger Bank SAC are *'For the feature to be in favourable condition thus ensuring site integrity in the long term and contribution to Favourable Conservation Status of Annex I Sandbanks which are slightly covered by seawater all the time'* (JNCC, 2022).

3.2 New site designation or extension of an existing site

3.2.1 New site designation or extension aims to provide at least the same level of protection to Annex I sandbank habitat outside of the existing network as the sandbank that is subject to loss and damage in the Round 4 plan. In doing so, the integrity of the marine protected area (MPA) network can be maintained despite the loss and damage to sandbank habitat within Dogger Bank SAC as a result of the Round 4 Plan.

3.2.2 The following forms of site designation or extension have been explored:

- Extension of Dogger Bank SAC;
- Designation of a new SAC or extension to an SAC for the protection of sandbank feature;
- Designation of a new MCZ for the protection of a sandbank feature; and
- Amending SAC citation to protecting or enhance associated habitat (e.g. troughs between sandbanks).

3.2.3 Should Dogger Bank SAC be extended, this measure would be at Level 1 on the Defra hierarchy, but a new designation elsewhere or an extension of another SAC would be Level 2 (Table 2.1). Designation of a marine conservation zone (MCZ) on Dogger Bank would also be at Level 2 on the Defra hierarchy because sandbank would be defined differently in a MCZ compared to SAC, and as such this would not contribute directly to the protection of the feature in the National Sites Network. Were the citation for Dogger Bank SAC to be amended to include associated habitat, this measure would be at Level 3. However, given that Dogger Bank SAC is a large relic sandbank and the entirety of the SAC is designated for the Annex I sandbank feature, this form of site extension would be implemented at another designated site. In such a circumstance the measure would be at Level 4.

3.2.4 Designation of a new site or extension of an existing site as a measure of compensation can be delivered and there is a high probability of success. Ultimately, the measure must be delivered by Defra's Secretary of State with the support of Defra and statutory nature conservation bodies (SNCBs) and regulators, as per the current UK practice and guidance. Defra have advised that this is an available strategic compensation measure that can be used to compensate for habitat loss and damage caused by the Round 4 Plan. Contributions by the developer, e.g. in terms of providing information on area(s) of search and surveying/gathering evidence are still to be agreed.

3.2.5 The process for measuring the success of a new site designation or the extension of an existing site will be determined by Defra. There are no prior examples of site designation or extension for the purpose of compensation, and monitoring requirements have not yet been determined. As the new

or extended sites become part of the network monitoring requirements may fall under the responsibility of Natural England or the JNCC as part of statutory condition assessment obligations. Under such a scenario it is expected that funding to support monitoring of the newly designated area will be secured from the developer. Any such additional monitoring, should be appropriate to monitoring of similar habitats within the MPA network. As this measure is a strategic measure with sites selected to cover multiple projects, including but not limited to Round 4, contribution to monitoring requirements will be agreed during the development of the Dogger Bank Strategic Implementation and Monitoring Plan (DBSIMP) in conjunction with the Marine Recovery Fund and the Collaboration on Offshore Wind Strategic Compensation (COWSC), who will establish how this cost is shared across the multiple projects. This will also need to consider how that contribution may change over time if the compensation measure is shared with additional projects.

3.2.6 An established mechanism for new designation or extension of an existing site exists (there being an existing network of sites protected by designations under the Conservation of Habitats and Species Regulations (as amended) 2017 and The Conservation of Offshore Habitats and Species Regulations (as amended) 2017 (Habitats Regulations) and Marine and Coastal Access Act 2009) and there is evidence that the measure could provide compensation at a ratio greater than 1:1.

3.2.7 The Steering Group have agreed that new site designation or site extension be taken forward as part of the package of compensation measures for inclusion in the DBSCP.

3.3 Reduce pressures from existing/ future activities

3.3.1 The Steering Group has examined whether Annex I Sandbank could be protected by limiting future licenced activities, such as aggregate extraction, oil and gas activities, renewable energy construction and fishing, and considered potential delivery mechanisms by not issuing seabed leases in certain areas. This measure would be at Level 2 on the Defra hierarchy (Table 2.1).

Dogger Bank SAC

3.3.2 To reduce pressures and allow for the recovery of the sandbank, removal of other activities from within Dogger Bank SAC was proposed as a compensation measure. This measure would be at Level 1 on the Defra hierarchy (Table 2.1). However, there may be limited options to reduce activities within Dogger Bank SAC. On the 13th of June 2022, the Dogger Bank Special Area of Conservation (Specified Area) Bottom Towed Fishing Gear Byelaw 2022 came into force, banning bottom towed fishing from the entire Dogger Bank SAC as such methods of fishing have been determined to be adversely affecting the conservation status of the sandbank habitat.

3.3.3 Therefore, the measure does not remain under consideration.

Other sites designated for sandbanks

3.3.4 To reduce pressures and allow for the recovery of the sandbank, removal of activities at other SACs designated for the protection of sandbank was considered. This measure would be at Level 2 on the Defra hierarchy (Table 2.1). Sandbank habitat is sensitive to fishing, aquaculture, aggregate extraction and subsea cables (Natural England, 2023) and any other activity which occupies or damages the feature, including renewable energy and oil and gas.

Oil and Gas & Carbon Capture Storage (CCS)

3.3.5 Whilst there are other activities such as oil and gas and CCS, it is unlikely that these activities will be restricted. DESNEZ have confirmed that based on the knowledge that geological stores are fixed

assets and the current energy targets to meet net zero it is unlikely this would be possible for CCS. Consequently, the measure is not currently under consideration for the DBSCP at this time.

Aggregates

- 3.3.6 A desk study was undertaken to determine if there are any designated sites where sandbank is a qualifying feature which have overlapping aggregate licences. Five sites had such an activity. During the discussions it was noted that the actual extraction volumes and areas within the licence area would need to be identified but is likely to be very small. The SNCBs and DESNEZ also raised that recovery following extraction should be expected provided that extraction is managed in line with current best practice. In particular, this best practice guidance recommends leaving part of the resource when dredging ceases: the remaining layer of seabed sediment must be a minimum of 0.5m in depth on average across the dredged area and must be similar to that which existed before dredging began (The Crown Estate, 2020). Therefore it is not clear whether restricting this activity would compensate for the habitat loss at Dogger Bank SAC. Consequently, the measure is not currently under consideration for the DBSCP at this time.

Offshore wind

- 3.3.7 It was determined that removal/ prevention of future activities from building on sandbank areas would be beneficial. The Crown Estate have undertaken an initial high level assessment and have considered areas where they would consider restricting future leasing of offshore wind. Some of these areas fall within existing SACs designated for sandbank features and therefore would protect against future damage to designated sandbank features. There is also potential for offshore wind to be leased on areas identified as Annex 1 sandbanks outside protected sites which could also be removed from future offshore wind leasing rounds. The Crown Estate would prevent such extension through marking these areas as hard constraints in future offshore wind plans.
- 3.3.8 This measure would be delivered on a 1:1 spatial scale against both loss and damaged habitat as assessed in the Round 4 plan level HRA, however, there are arguments that, as damage has potential to recover during the lifetime of the project, a ratio of less than 1:1 may be appropriate for damage.
- 3.3.9 Despite the potential benefits of this measure The Crown Estate must consider its obligations as a public authority; The Crown Estate is a public authority for the purposes of subsidy control. A subsidy occurs when a public authority provides financial assistance (which is defined very broadly) to a specific enterprise or group of enterprises that gives them an economic advantage. Were The Crown Estate to enter into commitments to sterilise other parts of its estate to enable the relevant Round 4 Project Companies' projects to proceed, that may be construed as a subsidy.
- 3.3.10 As such, The Crown Estate is not able to take this measure forward for the projects specific to this DBSCP. However, The Crown Estate will continue to explore the feasibility of this measure should compensation be required under HRA for the impacts of future offshore wind leasing rounds.

Fishing

- 3.3.11 Using byelaws to reduce fishing activities that damage the seabed is a potential compensatory measure that is currently being explored by COWSC. While this measure shows potential promise to compensate for benthic impacts there are still evidence gaps and uncertainties to work through. This measure would need to be agreed by Defra's Secretary of State and can only be delivered by Defra in conjunction with the MMO. Fishing restrictions are already in place to protect the Dogger Bank SAC so, if taken forward, this measure would need to be delivered elsewhere to protect an area of Annex I

Sandbank that is not currently protected. These sites would need to be determined by Defra in conjunction with the MMO, in consultation with stakeholders.

- 3.3.12 Through this measure there may be scope to allow for the recovery of sufficient sandbank area to deliver compensation at a ratio greater than 1:1.
- 3.3.13 As data evidence includes the use of multiple types of fishing gear, further work may be needed to understand where different fishing gear are being deployed. Nonetheless, confidence is high that the area of sandbank currently being impacted by fishing activities exceeds the area of loss or damage as a result of DBSE and DBSW.
- 3.3.14 The Steering Group has agreed that reduction of pressures from future activities be taken forward as part of the package of compensation measures for inclusion in the DBSCP.

3.4 Seagrass meadow restoration

- 3.4.1 Seagrass is not a sub-feature of the sandbank within Dogger Bank SAC, nor would it be able to grow within the site owing to the depth of the water. Therefore, seagrass restoration can only be implemented outside of Dogger Bank SAC, in coastal locations.
- 3.4.2 Although, lower on the compensation hierarchy than the other measures, seagrass meadows do occur on some sandbanks within coastal subtidal and intertidal zones and seagrass is a sub-feature of other designated Annex I sandbanks, such as those within Fal and Helford SAC and Plymouth Sound and Estuaries SAC (Natural England, 2023a; Natural England, 2023b). Suitability as compensation for sandbank is supported by the listing of seagrass as a flora associated with sandbank in Natura 2000 (now National Sites Network) guidance habitat guidance (European Commission, 2013). The Steering Group has judged the measure to be at Level 4 on the Defra hierarchy (Table 2.1), however a case could be made that seagrass restoration is at Level 2 in certain cases. The Steering Group has expressed a clear preference for subtidal seagrass over intertidal habitat; the latter is not universally supported by the whole Steering Group even if only a minor part of a wider package of compensation.
- 3.4.3 The restoration of seagrass meadows has been identified as a potentially suitable measure of compensation, but only when considered as a minor part of a compensation package with other higher ranked measures. Seagrass restoration involves harvesting adult shoots from an existing seagrass meadow and transplanting them at the restoration site. Replanting must be done by hand by divers, so it is labour-intensive and time consuming (MMO, 2019; Potouroglou *et al.*, 2021). Reseeding involves collecting wild seed and performing targeted redistribution of that seed. To generate a self-sustaining meadow, seagrass restoration must occur at sufficient scale to facilitate positive feedbacks (van Katwijk *et al.*, 2016).
- 3.4.4 There are two possible routes for the delivery of seagrass restoration as part of a strategic compensation package. Seagrass restoration could be led by the developer, as part of a strategic compensation package. For this option, in the first instance, further investigation of the site conditions and pressures would be required before final site selection. This approach would require public consultation and engagement with stakeholders, and this may be costly and time consuming. Alternatively, compensation could be delivered through ongoing seagrass restoration projects. Under this scenario the developer would secure funding to support existing seagrass restoration initiatives. One example may be Life restoration ReMEDIES (Save Our Seabed, 2023), however there are other

initiatives that could be supported through compensation. The advantage to this approach is compensation would be delivered through a wider programme which is managed by those with the most experience, who have already been through the site selection process and project planning stages. Furthermore additional funds or work could be provided to support with activities that can aid success, such as the development of less damaging anchor systems, or activities to improve water quality.

- 3.4.5 The Steering Group have agreed that seagrass restoration be taken forward as part of the package of compensation measures for inclusion in the DBSCP.

3.5 Lease an area of seabed in place of formal designation

- 3.5.1 The formal process to designate a new marine protected area (MPA), or extending an existing MPA, is time consuming. As such, as a potential measure it was proposed that The Crown Estate (TCE) could lease an area of the seabed for the purpose of conservation to provide a level of protection within a contracted timeframe. This measure would be at Level 2 on the Defra hierarchy (Table 2.1).

- 3.5.2 The Crown Estate has considered this measure and outlined their position. The Crown Estate manages the seabed of England, Wales and Northern Ireland within UK territorial seas (within 12 nm from the coast). Outside of UK Territorial Waters, the Energy Act 2004 (the 2004 Act) vests certain rights in The Crown Estate within the Renewable Energy Zone, as defined by the 2004 Act, which fall under part V of the United Nations Convention on the Law of the Sea (UNCLOS) regarding:

- a. Exploitation of areas for the purpose of energy from wind or water;
- b. Exploitation of these areas in connection with the production of energy; and
- c. Other purposes connected with exploitation for production of energy (including transmission, distribution, and supply of electricity).

- 3.5.3 Although these rights allow for the issue of leases for compensation, outside of 12 nm any lease for this purpose would need to be associated with an energy project. A lease cannot be issued pre-emptively for strategic compensation to be assigned to a project at a later date. The Crown Estate is also concerned that leasing an area of the seabed for compensation would conflict with its other obligations, and that it would not offer the same level of protection as formal designation. Negotiations on leasing could proceed on a case by case basis once further detail on the requirements of the lease are available. Until specific details of the proposed compensation are known and understood, proper consideration against The Crown Estate's decision cannot be undertaken.

- 3.5.4 Furthermore, the use of conservation covenants was also considered. art 7 of the Environment Act 2021 which deals with conservation covenants extends only to England and Wales. Under the Interpretation Act 1978, in absence of anything to the contrary, the terms "England" and "Wales" are to be defined by reference to local government areas and do not include the seabed.

- 3.5.5 The measure is not under consideration for the DBSCP at this time.

3.6 Removal of structures

- 3.6.1 The footprint of artificial structures installed on a sandbank reduce the availability of sandbank habitat. Therefore, decommissioning those structures would effectively restore sandbank habitat. Artificial structures that remain on the seabed include, oil and gas structures, rock protection and mattresses, as well as redundant exposed cables and pipelines.

3.6.2 Evidence from the oil and gas sector raised concerns around the safety and feasibility of decommissioning infrastructure on the seabed (Peritus International Ltd, 2022). Data indicated that, with the exception of grout bags and concrete mattresses, most infrastructure was not totally removed. Decisions regarding whether infrastructure should be decommissioned were made through a comparative assessment process. Many structures, including pipelines and some mattresses, were left in place as the structure was buried, and leaving them in situ would minimise seabed disturbance and reduce risks to personnel (Peritus International Ltd, 2022). Some structures were left in place to maintain stabilisation of pipelines (Peritus International Ltd, 2022). Conversely, where rock dump was placed on the seabed it was left in situ because total removal of this loose material would be expensive and very time consuming (Peritus International Ltd, 2022).

From Dogger Bank SAC

3.6.3 This measure would be at Level 1 on the Defra hierarchy (Table 2.1). However, the Department for Energy Security and Net Zero (DESNZ) advised there were no oil and gas structures that within Dogger Bank SAC that can be decommissioned. There may be some rock but this is unfeasible to remove. A report is due to be published from OPRED and it is expected to formally confirm this. Consequently, the measure is not under consideration for the DBSCP at this time.

From other sandbanks

3.6.4 This measure would be at Level 2 on the Defra hierarchy (Table 2.1). However, as with Dogger Bank SAC, it was considered that there are too few structures in place on other sandbanks that can be decommissioned in this area of the north sea. DESNEZ advised there are no structures identified and a report from OPRED is expected to confirm this from the oil and gas industry. For cables, there is now a requirement for decommissioning and it is only beneficial to remove historic cables if they are on the surface and are not largely associated to with rock placement. It was deemed by the Steering Group that removal of the small quantities that would be available would be too impractical. Consequently, the measure is not under consideration for the DBSCP at this time.

3.7 Removal of debris

3.7.1 Removal of debris was proposed as a potential measure of compensation, which included an awareness raising campaign which intended to reduce discarded fishing gear. If this measure were implemented within Dogger Bank SAC it would be at Level 1 of the Defra hierarchy (Table 2.1). However, if it were implemented within another SAC designated for the protection of sandbanks, or an area that has not been designated for the protection of sandbanks, it would be at Level 2 or 4 respectively.

3.7.2 During discussions with the Steering Group, a number of issues were raised in regard to this measure by Defra and the statutory nature conservation bodies (SNCBs) (Natural England and JNCC). Defra and the SNCBs do not consider removal of marine litter to be a compensation measure (JNCC 2021). In addition, developers note that removal of debris would be costly and time consuming with a significant carbon footprint associated with the very large areas which may potentially need to be searched in order to identify and then recover sufficient material. Furthermore, the amount of debris that could be removed, in combination with that which could be prevented, would not allow for recovery of Annex I sandbank habitat at the scale required. The measure is not under consideration for the DBSCP at this time.

3.8 Restoration of sandbanks

3.8.1 Possible mechanisms for restoring sandbanks were explored. These included recharging the sandbanks using material such as crushed shell or gravel. This technique has been trialled by the aggregates industry to accelerate recovery. This measure is not applicable to the type of Sandbank within Dogger Bank SAC. If implemented elsewhere it would be at level 2 of the Defra hierarchy (Table 2.1). A desk study was undertaken to identify the category D sandbanks that potentially could be restored to category A-C. The reasons for why they were categorised as category D was investigated to determine if this was due to the quality of the feature and therefore where restoration was possible. It was identified that this was not the case and therefore there were no sites that could easily be restored in this way and that any restoration to degraded sites would be through removal of activities or structures.

3.8.2 The measure is not under consideration for the DBSCP at this time.

3.9 Eradication of invasive non-native species

3.9.1 In respect to the eradication of invasive non-native species (INNS) from sandbanks the two species of concern are slipper limpets (*Crepidula fornicata*) and Pacific oysters (*Magallana gigas*). Slipper limpets are an invasive species of gastropod, native to the US eastern seaboard, that was transported and introduced to Europe on the hulls of ships. Dense communities of slipper limpets can contain several thousand individuals per m² (Thieltges, 2005). Pacific oysters are an invasive gastropod, native to the northwest Pacific and sea of Japan. Pacific oysters were introduced to Europe, North America, Australia and New Zealand, mainly for the purposes of aquaculture for human consumption (Miossec *et al*, 2009; Syvret *et al*, 2021). Pacific oysters preferentially settle on sheltered intertidal rocky substrates, but settlement can also occur in predominantly soft sediment habitats. In Europe, Pacific oysters have spread to large parts of all coastal biotopes (Hansen *et al.*, 2023).

Eradication of non-native species from Dogger Bank SAC

3.9.2 If this measure were implemented within Dogger Bank SAC then it would allow for restoration of sandbank habitat and would be at Level 1 of the Defra hierarchy (Table 2.1). In considering this measure, the Steering Group noted that the INNS is not an issue effecting the condition of Dogger Bank and therefore conservation objectives for Dogger Bank SAC do not include a target to reduce the introduction or spread of non-native species and their impacts. As such, this measure would not support the conservation objectives. The measure is not under consideration for the DBSCP at this time.

Eradication of invasive species from other designated sites

3.9.3 Consideration was given to other sites designated for the protection of sandbanks. Supplementary advice for conservation objectives and site improvement plans were reviewed. A list of SACs for which the conservation objectives include a target to reduce the introduction or spread of non-native species and their impacts were compiled. This list was filtered to exclude sites where slipper limpets and Pacific oysters had not been recorded. This generated a list of five SACs (Table 3.1).

Table 3.1 SACs with targets to reduce the introduction or spread of Pacific oysters and slipper limpets

Site	Invasive species present
Essex Estuaries SAC	Pacific oyster and slipper limpet
Fal and Helford SAC	Pacific oyster and slipper limpet
Morecambe Bay SAC	Pacific oyster
Solent SAC	Pacific oyster
The Wash and North Norfolk Coast SAC	Pacific oyster and slipper limpet

- 3.9.4 Action to eradicate slipper limpets and Pacific oysters from these SACs would be in line with their conservation objectives and would be at Level 2 on the Defra hierarchy (Table 2.1). Action to eradicate INNS from other areas, that are not designated for the protection of sandbanks, would be at Level 4 on the Defra hierarchy.
- 3.9.5 Physical removal of slipper limpets and Pacific oysters relies on people, often volunteers, to completely remove pacific oysters by hand from soft sediments. Physical removal or culling by hand in intertidal habitats is limited to the lowest spring tides. Another alternative for removing wild INNS is dredging (RAPID Life Project, 2018), although the impact to the habitat would outweigh the benefit of removing INNS.
- 3.9.6 Few costs estimates have been given for INNS management and control programmes. Natural England have provided (through personal correspondence) costs that range from £5,000 for Pacific oysters in Fal and Helford SAC over an unspecified time, to £30,000 for Pacific oysters in Essex Estuaries SAC over 2 years.
- 3.9.7 To date, there has been little success in eradicating invasive species from marine habitats. During a Steering Group meeting it was highlighted that Natural Resource Wales (NRW) had successfully eradicated slipper limpet from a site in Wales. As such, some questions were put to NRW regarding the mechanism for delivery, practicalities of implementation, and maintaining habitat free of invasive species. NRW responded to confirm that work had been done to eradicate slipper limpet from the Menai Strait. However, whilst it had been thought to have been successful slipper limpet was reported in high numbers in 2020. It is unclear whether slipper limpet has re-invaded the Menai Strait, or if after efforts to eradicate, slipper limpet had remained in low numbers and had recently increased in abundance.
- 3.9.8 It is thought that once Pacific oysters have become established they cannot be eradicated (Natural England personal correspondence; Hansen et al, 2023). Owing to high densities of Pacific oysters in the UK sufficient brood stock is likely to remain so that settlement will continue following any removal activities (RAPID Life Project, 2018). It was noted that there is evidence that local control has some positive effects in the short term (McKnight and Chudleigh, 2012; Morgan et al., 2021), but no long-term assessment of control measures has been undertaken and any gains could be eroded by a good year for spatfall.
- 3.9.9 It was agreed within the Steering Group that active intervention would be labour intensive. Moreover, any intervention would need to be repeated at regular intervals, possibly in perpetuity, to maintain sandbanks that are free of invasive species. Moreover, in order to reduce the risk of re-invasion, *slipper limpet and Pacific oyster* would also need to be eradicated from adjacent habitats and the surrounding area (over 10s of kms), and this will also have to be maintained. Given the practical challenges and low rates of success, the Steering Group agreed that investigation of invasive species

eradication should not be progressed further. The measure is not under consideration for the DBSCP at this time.

3.10 Reef creation/restoration

- 3.10.1 Reef creation/restoration was separated in to two main groups, creation of a stony reef and restoration of biogenic reefs. Both groups were investigated as potential compensation measures for Round 4 projects DBSE and DBSW.
- 3.10.2 Dogger Bank SAC has been designated in its entirety for the protection of sandbank habitat. As such, were any form of reef creation or restoration implemented within Dogger Bank SAC it would be at the expense of the designated feature. Therefore, reef creation or restoration could only be implemented outside of Dogger Bank SAC. Also, reef creation or restoration would not provide sandbank habitat. Conversely, were reef creation or restoration undertaken within a site designated for the protection of sandbanks, location would have to be carefully considered to ensure that the reef habitat did not result in a loss of sandbank habitat. Thus, this measure is at Level 4 on Defra hierarchy (Table 2.1).

Stony reef

- 3.10.3 Creation of a stony reef amounts to laying stony material (e.g. boulders or concrete blocks) on the seabed to create hard substrate for settlement by epibenthic communities and to provide shelter for mobile fauna. During Steering Group meetings, it was noted that hard stony substrate is not limited in the southern North Sea. In addition to stony reefs or bedrock, there are a variety of submerged artificial structures as well as boulders placed for cable and scour protection. Artificial reefs differ from Annex I bedrock and stony reefs and creating artificial stony reef as a measure of compensation is not supported by SNCBs. The measure is not under consideration for the Plan at this time.

Biogenic reef

- 3.10.4 Of the potential options for generating biogenic reef, the restoration of European oyster (*Ostrea edulis*) beds would be the most appropriate, as a measure of compensation. The main methods for restoring oyster beds involve laying shell cultch to provide suitable substrate for settlement before seeding the habitat with sprat (juvenile oysters) or translocating adult oysters (MMO, 2019). Oyster supply is a limiting factor in restoration efforts and sourcing oysters outside of the restoration area can present biosecurity risks (e.g. introduction of invasive species or disease) (Helmer et al, 2020). In addition, if translocating oysters from another site, the impact on the donor population must be considered (Helmer et al, 2020). Sourcing oysters or sprat from farmed stocks is an alternative and potentially better solution in the long-term (Helmer et al, 2020).
- 3.10.5 There are ongoing European oyster restoration projects. The preferred pathway to delivering compensation through oyster restoration would be for the developer to pay in to a fund to support existing restoration projects. The advantage to this approach is that compensation would be delivered through a wider programme which is managed by those with the most experience, who have already been through the site selection process and project planning stages.
- 3.10.6 As a compensation measure for sandbank habitat, oyster reef restoration was not supported by the Steering Group for the principal reason that the ecological benefits were not considered to be sufficiently similar to sandbank habitat.
- 3.10.7 Other forms of biogenic reef restoration, such as: *Sabellaria spinulosa* reef restoration were explored. *S. spinulosa*, is a tube building polychaete which, in dense concentrations with a good supply of

suspended sand grains, can build reef like structures at least several centimetres thick (Maddock, 2008). There is no mechanism by which *S. spinulosa* reefs can be actively created without other pressures, such as trawling, being restricted. Therefore, restoration would amount to removal of other activities. The measure is not under consideration for the DBSCP at this time.

4 Conclusion

- 4.1.1 Through the Steering Group meetings, and the evaluation of current evidence, it was agreed by the Steering Group that four compensation measures were to be included in the DBSCP, which must be adhered to by the Round 4 projects DBSE and DBSW. These are presented in order of preference according to the Defra (2021) hierarchy in Table 4.1.
- 4.1.2 Where possible, compensation will be fully delivered by one or more measures high in the compensation hierarchy. The preferred method recommended by the Steering Group is designation of a new site or extension of a designated site. Other measures would only be incorporated to provide increased confidence in the overall success of the package and to ensure the package compensates for the impacts.
- 4.1.3 Seagrass restoration is the least preferred option and would only be incorporated should new site designation or extension and the reduction of future activities provide insufficient compensation. Work was done to compare seagrass meadows, along with oyster reefs, to Annex I sandbank habitat in order to demonstrate comparable function and determine equivalent scale for the delivery of ecosystem services. However, it was agreed that more work was needed to further develop the methodology. Due to evidence gaps this could not be achieved in the timeframe available. Significant uncertainties around deliverability for seagrass restoration were also noted.
- 4.1.4 It is noted that SNCBs will only support subtidal seagrass only as part of a package, as is captured in the agreement log (Appendix C).

Table 4.1 Measures determined to be suitable to form part of a package of compensation.

Measure (ranked in order of preference)	Hierarchy Level (Defra, 2021)
Extension to Dogger Bank SAC	Level 1
Other new site designation or extension of an existing site	Level 2
Reduce pressures from other/ future activities (fishing)	Level 2
Seagrass meadow restoration	Level 4

5 References

Defra (2021). Best practice guidance for developing compensatory measures in relation to Marine Protected Areas. https://consult.defra.gov.uk/marine-planning-licensing-team/mpa-compensation-guidance-consultation/supporting_documents/mpacompensatorymeasuresbestpracticeguidance.pdf [Accessed March 2024]

Defra (2024). Consultation on policies to inform updated guidance for Marine Protected Area (MPA) assessments. https://consult.defra.gov.uk/offshore-wind-environmental-improvement-package/consultation-on-updated-guidance-for-environmental/supporting_documents/090224%20OWEIP%20Consultation%20on%20updated%20policies%20to%20inform%20guidance%20for%20MPA%20assessments_.pdf [Accessed April 2024]

European Commission (2013). Interpretation manual of European Union habitats.

Hansen, B., Dolmer, P., and Vismann, B. (2023). Too late for regulatory management on Pacific oysters in European coastal waters? *Journal of sea research*, 191, 102331. <https://doi.org/10.1016/j.seares.2022.102331> [Accessed March 2024]

Helmer, L., Hancock, B., Bonacic, K., Bromley, C., Fabra, M., Frankić, A., Hayden-Hughes, M., Holbrook, Z., Kean-Hammerson, J., McAfee, D., Mountain, C., Nedosyko, A., Preston, J., Rodriguez-Perez, A., Sanderson, W., Smyth, D., Uttley, M. and zu Ermgassen, P. (2020). Chapter 3. Native Oyster Restoration In Practice. *European Native Oyster Habitat Restoration Handbook, UK & Ireland*. pp 29 – 44

JNCC (2021). Statutory Nature Conservation Body joint advice on marine debris removal as compensation for impacts to benthic habitats from development. *Natural England Research Report NERR100*.

JNCC (2022). Conservation objectives for Dogger Bank Special Area of Conservation.

Maddock, A., (2008). UK biodiversity action plan priority habitat descriptions (updated 2011). <https://data.jncc.gov.uk/data/2728792c-c8c6-4b8c-9ccd-a908cb0f1432/UKBAP-PriorityHabitatDescriptions-Rev-2011.pdf> [Accessed March 2024]

Mcknight, W. and J. Chudleigh, I. (2015). Pacific oyster *Crassostrea gigas* control within the inter-tidal zone of the North East Kent Marine Protected Areas, UK. *Conservation Evidence*. <https://www.conservazionevidence.com/reference/pdf/5500> [Accessed March 2024]

Miossec, L., Le Deuff, R-M., and Gouilletquer, P. (2009). Alien species alert: *Crassostrea gigas* (Pacific oyster). *ICES Cooperative Research Report No. 299*. 42 pp.

MMO (2019). Identifying sites suitable for marine habitat restoration or creation. A report produced for the Marine Management Organisation by ABPmer and AER, MMO Project No: 1135, February 2019, 93pp

Morgan, A., Slater, M., Mortimer, N., McNie, F., Singfield, C., Bailey, L., Covey, R., McNair, S., Waddell, C., Crundwell, R., Gall, A., Selley, H. and Packer, N. (2021). Partnership led strategy to monitor and manage spread of Pacific oyster populations in south Devon and Cornwall. *Natural England Research Reports, NERR100*

NIRAS (2022). Round 4: Technical Compensation Note. Offshore Wind Leasing Round 4 Plan Level HRA. February 2022.

Peritus International Ltd (2022). Scour and Cable Protection Decommissioning Study. NECR403. Natural England.

Potouroglou, M., D. Whitlock, L. Milatovic, G. MacKinnon, H. Kennedy, K. Diele & M. Huxham, (2021). The sediment carbon stocks of intertidal seagrass meadows in Scotland. *Estuarine, Coastal and Shelf Science* 258: 107442.

RAPID Life project (2018). Good Practice Management: Pacific oyster (*Crassostrea gigas*). [https://www.nonnativespecies.org/assets/Good Practice Management - Pacific oyster.pdf](https://www.nonnativespecies.org/assets/Good_Practice_Management_-_Pacific_oyster.pdf) [Accessed March 2024]

Royal Haskoning DHV (2020). Norfolk Vanguard Offshore Wind Farm: Habitats Regulations Derogation, Provision of Evidence. Appendix 3 – Haisborough, Hammond and Winterton Special Area of Conservation (SAC) – In Principle Compensation Measures. Technical report.

Save Our Seabed, 2023. <https://saveourseabed.co.uk> [Accessed March 2024]

Syvret, M., Horsfall, S., Humphreys, J., Williams, C., Woolmer, A. and Adamson, E. (2021). The Pacific Oyster: Why we should love them. Report of the Shellfish Association of Great Britain. <https://doi.org/10.13140/RG.2.2.22441.72806> [Accessed March 2024]

The Crown Estate (2020). The area involved – 23rd annual report. Marine aggregate extraction 2020. Available at: <https://www.thecrownestate.co.uk/media/3912/2021-area-involved-report.pdf> [Accessed March 2024]

The Dogger Bank Special Area of Conservation (Specified Area) Bottom Towed Fishing Gear Byelaw 2022

Thieltges, D. (2005). Impact of an invader: epizootic American slipper limpet *Crepidula fornicata* reduces survival and growth in European mussels. *Marine Ecology Progress Series*. 286: 13–19.

van Katwijk, M., Thorhaug, A., Marba, N., Orth, R., Duarte, C., Kendrick, G., Althuizen, I., Balestri, E., Bernard, G., Cambridge, M., Cunha, A., Durance, C., Giesen, W., Han, Q., Hosokawa, S., Kiswara, W., Komatsu, T., Lardicci, C., Lee, K., Meinesz, A., Nakaoka, M., O'Brien, K., Paling, E., Pickerell, C., Ransijn, A. and Verduin, J. (2016). Global analysis of seagrass restoration: the importance of large-scale planting. *Journal of Applied Ecology*, 53 (2), pp: 567-578. <https://doi.org/10.1111/1365-2664.12562> [Accessed March 2024]