Document Control

Title	**Poole Harbour Special Protection Area (SPA) Appropriate Assessment - Issue of Leases under the Poole Harbour Fishery Order 2015 for 2025-2030**
SIFCA Reference	SIFCA/HRA_PP/PooleOrder202530
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Approver	Southern IFCA
Owner	Southern IFCA
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Revision History

Date	Author	Version	Status	Reason	Approver(s)
28/04/25	W Meredith-Davies	1.0	Draft	Initial draft for review by Southern IFCA TAC and submitted to NE for Formal Advice	S Birchenough
08/05/25	W Meredith-Davies	1.1	Final	Formal Advice received from Natural England, no changes required, HRA approved by Southern IFCA Technical Advisory Sub-Committee on 8th May 2025	S Birchenough

This document has been distributed for information and comment to:

Title	Name	Date sent	Comments received
Marine and Coastal Higher Officer	Elanor James	24/04/25	HRA was sent to NE on 24th April 2025 and that Formal Advice was received on 13th May 2025, no changes were required.

Southern Inshore Fisheries and Conservation Authority (IFCA)

Habitat Regulations Assessment for Plans/Projects

European Marine Site: Poole Harbour SPA

Plan/Project: Issue of leases for 2025-30 under the Poole Harbour Fishery Order 2015

Feature(s): Common tern, Sandwich tern, Mediterranean gull, Little egret, Spoonbill, Avocet, Shelduck, Black-tailed godwit (Icelandic Race), Water bird assemblage (all waterbirds using the site including Dunlin, Dark-bellied Brent goose, Teal, Goldeneye, Red-breasted merganser, Curlew, Spotted redshank, Greenshank, Redshank, Pochard, Black-headed gull [excluding non-native species, vagrants, non-named gull species and terns])

Site Specific Sub-feature(s)/Supporting Habitat(s): Coastal lagoons, Freshwater and coastal grazing marsh, Mediterranean and thermo-Atlantic halophilous scrubs, Atlantic salt meadows, Spartina swards, Intertidal seagrass beds, Intertidal mixed sediments, Intertidal mud, Intertidal sand and muddy sand, Water column

1 Technical Summary

Duties under Regulation 9 of the Conservation of Habitats and Species Regulations 2017, as amended by the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 require Southern IFCA, as a competent authority, to make an appropriate assessment of a plan or project likely to have a significant effect on a site that is part of the National Site Network (either alone or in combination with other plans or projects).

As such, Southern IFCA undertakes an appropriate assessment for the issuing of leases under The Poole Harbour Fishery Order 2015 ('The Order'). The Order manages aquaculture activity within a defined area of Poole Harbour by conferring on the Southern IFCA the right of several fishery for the cultivation of shellfish of any kind for a period of twenty years from 1st July 2015. The Order covers an area of 837.8 hectares and allows for the cultivation of aquaculture species, namely 'shellfish' as defined in the Marine and Coastal Access Act 2009 (MaCAA) as "crustaceans and molluscs of any kind". The main species harvested are Pacific oyster (*Magallana gigas*) and common mussel (*Mytilus edulis*) with other species including native oyster (*Ostrea edulis*), clam species (primarily the Manila clam, *Ruditapes philippinarum*) and common cockle (*Cerastoderma edule*) having been farmed and/or cultivated historically. The definition provided in MaCAA allows the Southern IFCA to retain flexibility for shellfish species that could potentially be the subject of future aquaculture activity within the Harbour. Leases are issued under the Order for a period of five years. To date leases have been issued for two periods; 2015-2020 and 2020-2025. The purpose of this assessment is to determine, whether or not in the view of Southern IFCA, the issue of leases for the period 2025-2030 will hinder the achievement of the conservation objectives of the Poole Harbour SPA and lead to an adverse effect on site integrity.

A review of research into aquaculture activity and associated fishing practices identifies the activity occurring as a result of the issuing of a lease has the potential to disturb bird populations and lead to changes in prey availability and the extent and distribution of supporting breeding and non-breeding habitat. These potential impacts and risks to the integrity of the site are however mitigated through the provisions and management measures which must be observed by the lessee as detailed in The Poole Harbour Several Order 2015 Management Plan (2025 revision), each leaseholder's Business Plan, a Biosecurity Plan and the lease. These conditions include; requirement for leaseholders to use and manage lease beds in accordance with the provisions submitted in the leaseholder's Business Plan, restrictions on removal of shellfish, compliance with species specific measures, operating in line with a biosecurity risk assessment, vessel length requirements and temporal measures, requirement for lease beds to be marked and limits maintained and a requirement to facilitate inspections.

Based on the mitigation measures, in the form of provisions and management measures outlined in The Poole Harbour Several Order Management Plan 2015 (2025 revision), the Business Plan, the Biosecurity Plan and the lease for each leaseholder, it was concluded that the issuing of leases for 2025-30 under the Poole Harbour Fishery Order 2015 will not hinder the site from achieving its conservation objectives and as such will not have an adverse effect upon the integrity of the Poole Harbour SPA and Ramsar site.

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2 Introduction

2.1 Need for a Habitats Regulations Assessment (HRA)

The National Site Network[1] is a network of protected sites which are designated for rare and threatened species and rare natural habitat types. These sites include Special Areas of Conservation (SAC) and Special Protection Areas (SPA), designated under the EC Habitats Directive 1992 and EC Wild Birds Directive 2009 (amended), respectively. The Conservation of Habitats and Species Regulations 2017[2], as amended by The Conservation of Habitats and Species Regulations (Amendment) (EU Exit) Regulations 2019[3], transposes the land and marine aspects of the Habitats Directive and Wild Birds Directive into domestic law, and outlines how the National Site Network will be managed and reflect any changes required by EU Exit.

Southern IFCA has duties under Regulation 9 of the Conservation of Habitats and Species Regulations 2017 as a competent authority, with functions relevant to marine conservation to exercise those functions so as to secure compliance with the Habitats Directive and Birds Directive.

Article 6(3) of the Habitats Directive requires any plan or project likely to have a significant effect on a European site (SPA or SAC) within the National Site Network, either individually or in combination with other plans or projects, to undergo an Appropriate Assessment to determine its implications for the site.

Article 4(4) of the Birds Directive states that 'Member states shall take appropriate steps to avoid …deterioration of habitats or any disturbances affecting the birds, in so far as these would be significant having regard to the objectives of this Article'.

Regulation 63 of the Conservation of Habitats and Species Regulations 2017 requires Southern IFCA, as the competent authority, to make an appropriate assessment of a plan or project which is likely to have a significant effect on a European site that forms part of the National Site Network (either alone or in combination with other plans or projects) and is not directly connected with or necessary to the management of the site in question. The implications of any plan or project must be assessed in view of the site's conservation objectives.

This document forms the basis of an appropriate assessment for the issue of leases under the Poole Harbour Fishery Order 2015 for the period 2025-30. The purpose of this document is to assess whether or not in the view of Southern IFCA, the issue of leases under the Poole Harbour Fishery Order 2015 will have a likely significant effect on the bird features and supporting habitats of the Poole Harbour SPA alone, an in combination with other plans or projects. The assessment ensures Southern IFCA meets its responsibilities as a competent authority by ensuring that they conservation objectives of the Poole Harbour SPA will be met and the integrity of the site is not adversely affected.

2.2 Documents reviewed to inform this assessment

- Reference list (Annex 1)
- Natural England's Conservation Advice[4]
- Site map(s) – sub-feature/feature location and extent (Annex 2)
- Maps of the Poole Harbour Fishery Order 2015 extent and location of lease beds (Annex 4)
- Natural England's advice on the potential impacts of aquaculture on the nature conservation features of Poole Harbour SPA, Ramsar site and SSSI (received 3rd June 2014) (Annex 3)
- Natural England's advice on the Appropriate Assessment for the issuing of leases under the Poole Harbour Fishery Order 2015 for 2020-25
- Fisheries Impact Evidence Database (FIED)/SPA Tool Kit

[1] The National Site Network is the network of sites in the United Kingdom's territory consisting of such sites as immediately before EU Exit day formed part of the Natura 2000 site network.
[2] The Conservation of Habitats and Species Regulations 2017
[3] The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019
[4] NE Designated Sites View - Poole Harbour

3 Poole Harbour Designations

- Poole Harbour Special Protection Area (SPA) (Site Code: UK9010111)
- Poole Harbour Site of Special Scientific Interest (SSSI)
- Poole Harbour Ramsar Site

3.1 Poole Harbour SPA

3.1.1 Overview and qualifying features

The site qualifies under **Article 4** of the Birds Directive (2009/147/EC) for the following reasons (summarised in Table 1):

- The site regularly supports more than 1% of the Great Britain populations of five species listed in Annex I of the EC Birds Directive.

- The site regularly supports more than 1% of the biogeographic population of two regularly occurring migratory species not listed in Annex I of the EC Birds Directive.

Table 1: Summary of qualifying features present in the Poole Harbour SPA under Article 4 of the Birds Directive (2009/147/EC)

Feature		**Interest Type**
A193	Common tern *Sterna hirundo*	Annex I Breeding
A191	Sandwich tern *Sterna sandvicensis*	Annex I Breeding
A176	Mediterranean gull *Larus melanocephalus*	Annex I Breeding
A026	Little egret *Egretta garzetta*	Annex I Non-breeding
A034	Spoonbill *Platalea leucorodia*	Annex I Non-breeding
A132	Avocet *Recurvirostra avosetta*	Annex I Non-breeding
A048	Shelduck *Tadorna tadorna*	Regularly occurring migrant Non-breeding
A156	Black-tailed godwit, Icelandic-race *Limosa limosa islandica*	Regularly occurring migrant Non-breeding

- The site qualifies under **Article 4** of the Birds Directive (2009/147/EC) as it used regularly by over 20,000 waterfowl (waterfowl as defined by the Ramsar Convention) or 20,000 seabirds in any season.
  - During the non-breeding season the area supports 25,176 individual waders and waterfowl including (in addition to the species which qualify as features in their own right (Table 1)): dunlin (*Calidris alpine)*, great cormorant (*Phalacracorax carbo)*, dark-bellied Brent goose (*Branta bernicla bernicla)*, teal (*Anas crecca),* goldeneye (*Bucephala clangula)*, red-breasted merganser (*Mergus serrator)*, curlew (*Numenius arquata),* spotted redshank (*Tringa erythropus)*, greenshank (*Tringa nebularia)*, redshank (*Tringa tetanus)*, pochard (*Aythya farina)* and black-headed gull (*Chroicocephalus ridibundus),* all of which are present in nationally important numbers. The features; little egret, spoonbill, black-tailed godwit and shelduck are also included within the water bird assemblage.

3.1.2 Supporting Habitat

Natural England's Conservation Advice details the supporting habitats as follows. No breakdown of supporting habitats is given per qualifying species.

- Coastal lagoons
- Freshwater and coastal grazing marsh
- Mediterranean and thermo-Atlantic halophilous scrubs
- Atlantic salt meadows
- Spartina swards
- Intertidal seagrass beds
- Intertidal mixed sediments
- Intertidal mud
- Intertidal sand and muddy sand
- Water column

Poole Harbour is a bar-built estuary of nearly 4,000 ha located on the coast of Dorset in southern England. The Harbour occupies a shallow depression towards the south-western extremity of the Hampshire Basin which has flooded over the last 5,000 years as a result of rising sea levels. The unusual micro-tidal regime means that a significant body of water is retained throughout the tidal cycle. The Harbour therefore exhibits many of the characteristics of a lagoon. There are extensive intertidal mud-flats and, away from the north shore that has become urbanised through the growth of the town of Poole, there are fringes of saltmarsh and reedbed. As a whole, the Harbour supports important numbers of water birds in winter and is also an important breeding site for terns and gulls, whilst significant numbers of Little Egret *Egretta garzetta* and Aquatic Warbler *Acrocephalus paludicola* occur on passage. Several river valleys converge on the Harbour, notably the Frome and the Piddle, and these support grazing marshes that contribute to the importance of the SPA for wintering waterbirds. Parts of the Harbour, especially along the western and southern shores, adjoin the Dorset Heathlands SPA. Where the two areas meet, there are unusual transitions from saltmarsh and reedbed to valley mire and heath habitats. The Harbour is separated from Poole Bay by the Studland Dunes (part of the Dorset Heaths [Purbeck and Wareham] and Studland Dunes SAC) and the SPA includes Littlesea, a large oligotrophic dune-slack lake of importance for wintering wildfowl.

In 2016 Natural England held a consultation on a proposed extension to the Poole Harbour SPA to include all areas below the Mean Low Water mark which lie within the Harbour entrance, an additional landward extension in Lytchett Bay and the addition of three qualifying species; Sandwich tern, spoonbill and little egret. The rationale between the extension was to ensure that all areas of marine habitat which are exploited for resting, roosting or feeding by protected bird species were included. Poole Harbour regularly supports more than 1% of each of the populations of the three additional species. The proposed extension became a potential SPA (pSPA) on 21st January and as such the features and species proposed for inclusion were considered as part of the 2017/18 appropriate assessment. On 30th November 2017, the pSPA was included in the Register of European Sites in England (as required as Regulation 17 of The Conservation of Habitats and Species Regulations 2010) and as such was confirmed as part of the Poole Harbour SPA.

The full site citation is available at: http://publications.naturalengland.org.uk/publication/6625771074355200

3.1.3 Conservation Objectives

The site's Conservation Objectives[5] apply to the site and the individual species and assemblages of species for which the site has been classified.

[5] NE Designated Sites View - Poole Harbour SPA Conservation Objectives

The Objectives are to 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 population of each of the qualifying features, and,
- The distribution of the qualifying features within the site.

3.2 Poole Harbour SSSI

Section 28G of the Wildlife and Countryside Act 1981 (as amended) defines 'section 28G authorities', including the Southern IFCA, who have a duty to take reasonable steps, consistent with the proper exercise of their functions, to further the conservation and enhancement of the flora, fauna or geological or physiological features by reason of which the site is of special scientific interest.

In May 2018 Natural England notified additional land as a part of the Poole Harbour SSSI. The largest of which includes the estuarial open water below mean water. The other three areas comprise saltmarsh, wetland and supporting habitats around the fringes of Lytchett Bay and Holes Bay respectively. All four additional areas have been included as they support estuarine habitats and/or wintering wildfowl and waders for which the site is designated. The area below MLW is also seen to support other features for which the site is designated including foraging habitat for breeding seabirds and subtidal benthic habitats.

In order to ensure the protection of the entirety of the re notified SSSI Southern IFCA worked with Natural England to produce and agree a 'Site Management Statement' (SMS) for the Poole Harbour SSSI[6]. This includes the ongoing management of aquaculture within the Harbour.

3.3 Poole Harbour Ramsar Site

Poole Harbour is a Ramsar site, and as such is recognised as a wetland of international importance designated under the Ramsar Convention. The site was designated for the following reasons:

- Regularly supports 20,000 waterfowl
- Regularly supports over 1% of avocet, black-tailed godwit, common tern, Mediterranean gull and shelduck
- Supports an appreciable assemblage of rare, vulnerable or endangered species including a nationally scarce hydroid species *Hartlaubella gelatinosa* and nationally rare sponge *Suberites massa*
- Is of special value for maintaining the genetic and ecological diversity of a region because of the quality and peculiarities of its flora and fauna including supporting the nationally scarce plants narrow leaved eelgrass *Zostera augustifolia* and dwarf eelgrass *Zostera noltii*

4 Plan/Project Description

In accordance with Section (1) of the Sea Fisheries (Shellfish) Act 1967, Southern IFCA manage aquaculture activity within a defined area of Poole Harbour under The Poole Harbour Fishery Order 2015 ('The Order'). The Order confers on Southern IFCA the right of several fishery for the cultivation of shellfish of any kind for a period of twenty years from 1st July 2015. Leases are issued under the Order for a period of five years. The current leases (2020-25) will terminate on 30th June 2025 and therefore an HRA is required for the issuing of leases for the period 2025-30.

[6] Available from Southern IFCA on request

4.1 The Poole Harbour Fishery Order 2015

The Order covers an area of 837.8 hectares (Figure 1) and allows for the cultivation of aquaculture species, namely 'shellfish' as defined in the Marine and Coastal Access Act 2009[7] (MaCAA) as "crustaceans and molluscs of any kind". The main species harvested are Pacific oyster (*Magallana gigas*) and common mussel (*Mytilus edulis*) with other species including native oyster (*Ostrea edulis*), clam species (primarily the Manila clam, *Ruditapes philippinarum*) and common cockle (*Cerastoderma edule*) having been farmed and/or cultivated historically. The definition provided in MaCAA allows the Southern IFCA to retain flexibility for shellfish species that could potentially be the subject of future aquaculture activity within the Harbour. Leases are issued under the Order for a period of five years.

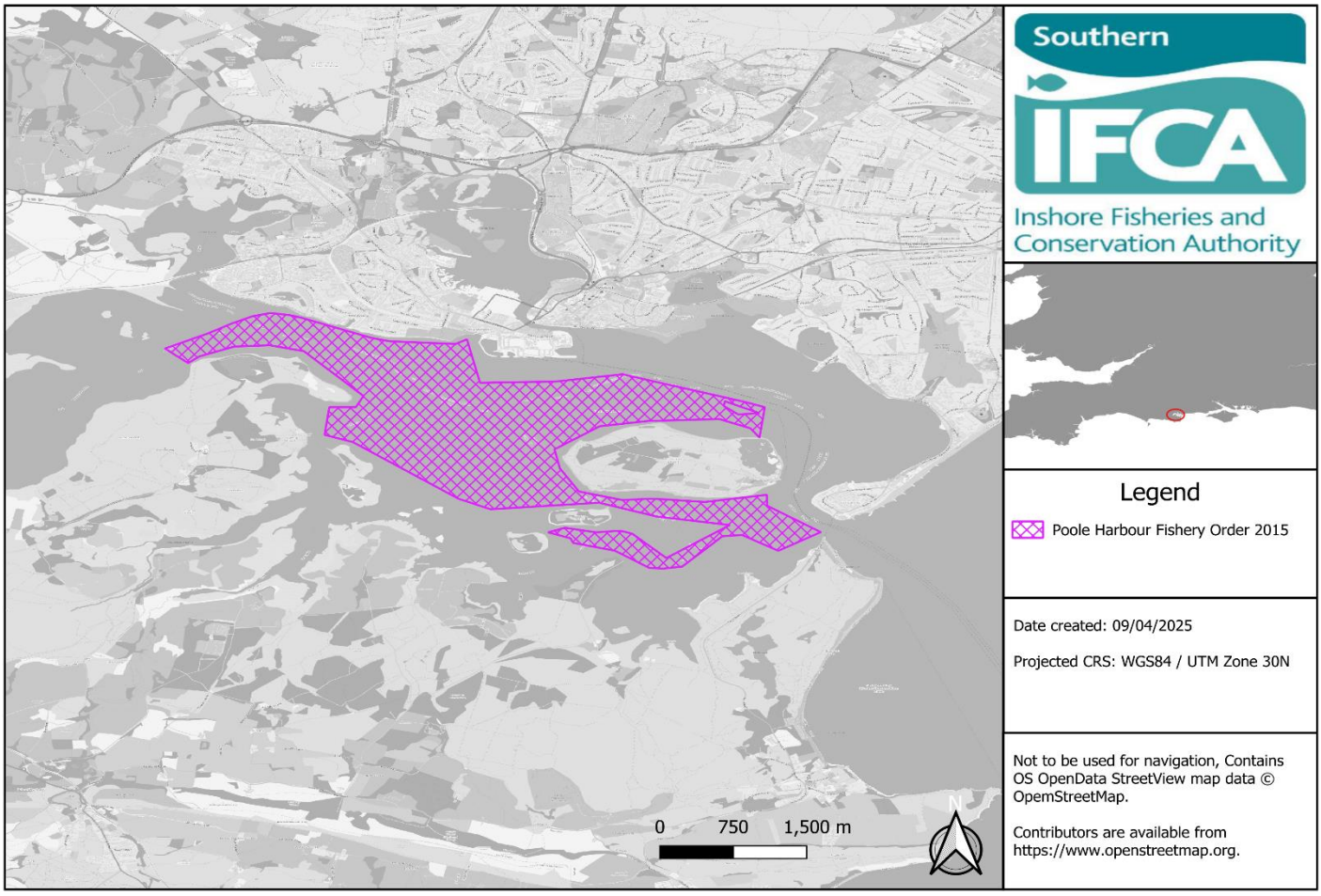

Figure 1: Extent of The Poole Harbour Fishery Order 2015 (purple hatched area)

4.1.1 Management of aquaculture activity under previous tranches of lease allocation

4.1.1.1 Tranche 1, 2015-2020

In 2015, under The Order, the first tranche (T1) of lease beds were allocated to nine companies or individuals for a period of five years, under the Terms of the Lease of Right of Several Fishery of Shellfish Laying in Poole Harbour. Under these Terms the T1 leases terminate on the 30th June 2020.

[7] http://www.legislation.gov.uk/ukpga/2009/23/pdfs/ukpga_20090023_en.pdf

The footprint of the T1 beds (Figure 2) replicated the lease bed allocations under the former Poole Fishery Order 1985 (which expired in 2015). Under T1, 31 lease beds were sub-leased from Southern IFCA with the consent of the Commissioners of Crown Lands under the provisions of the Southern IFCA lease from the Crown.

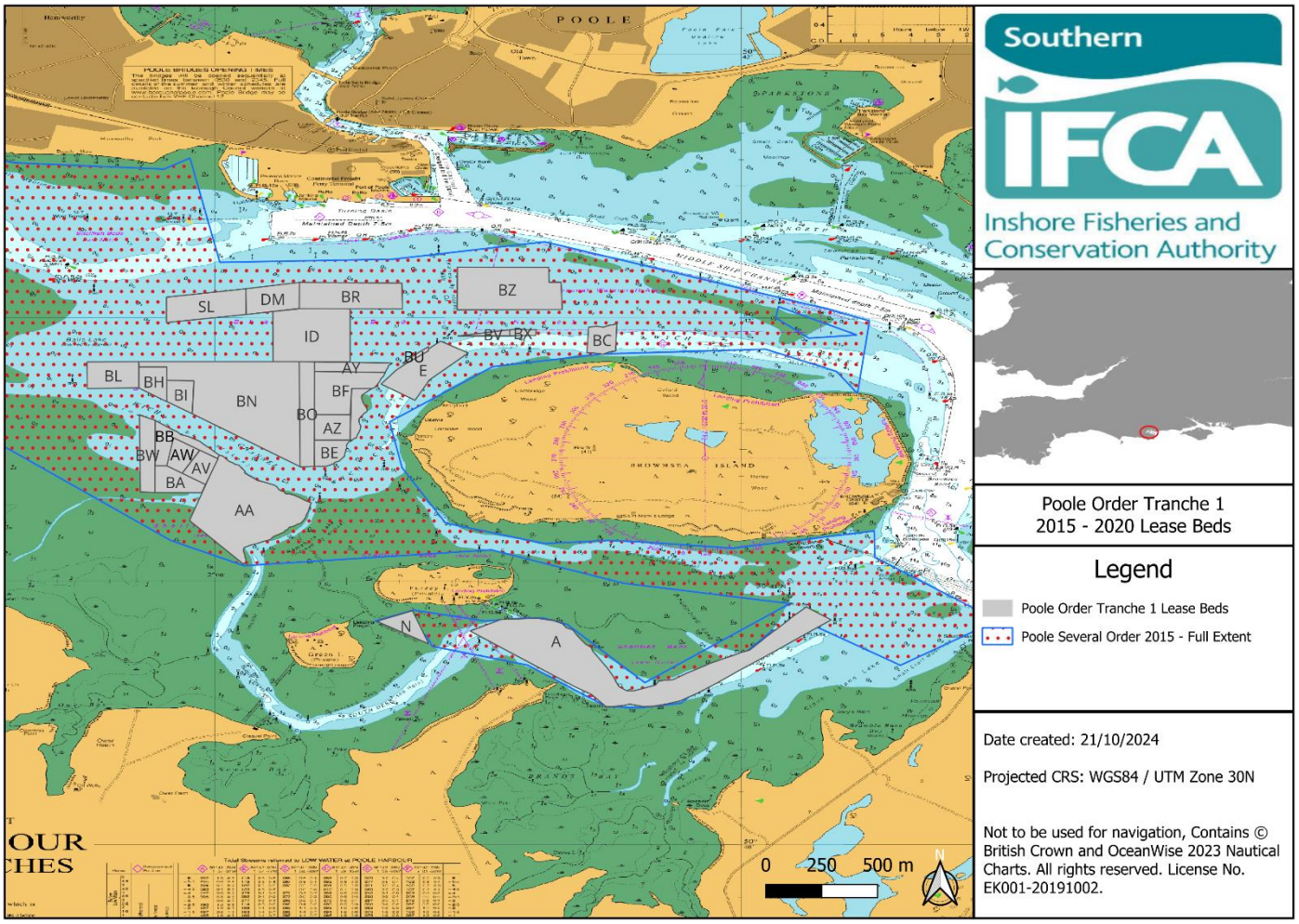

Figure 2: Extent of the Poole Harbour Fishery Order 2015 (dotted area enclosed by a blue line) and the Tranche 1 lease beds (grey), leased for a period of five years from 2015-20.

4.1.1.2 Tranche 2, 2020-2025

In 2020, under The Order, the second tranche (T2) of lease beds were allocated to six companies or individuals for a period of five years, under the Terms of the Lease of Right of Several Fishery of Shellfish Laying in Poole Harbour. Under these Terms the T2 leases terminate on the 30th June 2025.

T2 Lease Bed Reallocation Programme

Following the Poole Harbour SSSI extension in 2018; below MLW, encompassing subtidal estuarial waters and lower shore intertidal mudflats, which support subtidal benthic habitats such as *Sabella pavonina* and intertidal sediments; advice from NE was that no aquaculture is to be allowed to operate in areas of *S. pavonina* beds and in areas of associated sponge communities including *Suberites massa*. In addition, where lease beds overlay areas of intertidal sediments the impact of aquaculture must be considered to ensure that there is no adverse effect on the integrity of the site.

In direct response to the advice received by NE, as documented in Section 7.1 of the Site Management Statement for Poole Harbour which was formalised in 2018 between Southern IFCA and NE[8], the T2 Lease Bed Reallocation Programme was implemented, through which Southern IFCA closed three of the T1 lease beds highlighted by NE to be affected by *S. pavonina.* The total area of these closures equated to 32.4 hectares.

In addition, following Southern IFCAs undertaking of a *S. pavonina* survey in the vicinity of the Poole Harbour T1 lease beds:

- One other T1 lease bed required full closure and reallocation (to coincide with the second tranche of lease bed allocation), due to the presence of *S. pavonina*. The total area equated to 9.8 Hectares.
- Two T1 lease beds required part closure and reallocation (to coincide with the second tranche of lease bed allocation), due to the presence of *S. pavonina.* The total area equated to 1.77 Hectares;
- One T1 lease bed required part closure and reallocation due to its location on intertidal sediments. The total area equated to 7.09 Hectares.

Figures showing the presence and absence of *S. pavonina* from the Southern IFCA survey and the resulting reallocation of lease beds under the Lease Bed Reallocation Programme are provided in Annex 2. The footprint of lease beds under Tranche 2 is shown in Figure 3.

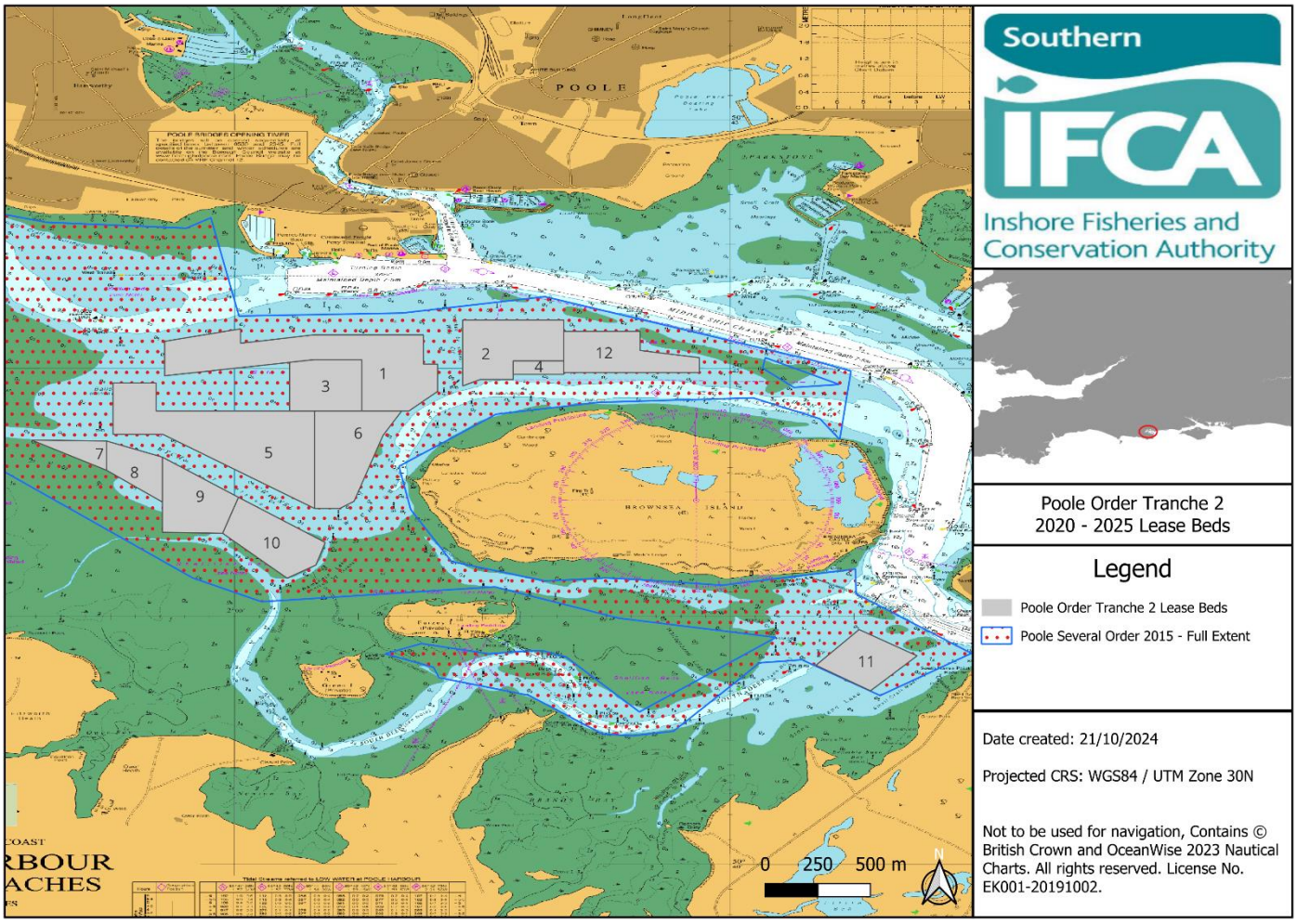

Figure 3: Extent of the Poole Harbour Fishery Order 2015 (dotted area enclosed by a blue line) and the Tranche 2 lease beds (grey), leased for a period of five years from 2020-25.

[8] Available from Southern IFCA on request.

4.1.2 Management under Tranche 3: 2025-2030

The third tranche (T3) of lease bed allocation will begin on the 1st July 2025 and expire on the 30th June 2030.

4.1.2.1 Tranche 3 Lease Application Process

In December 2024 Expressions of Interest (EOI) were invited from leaseholders who had leased ground from Southern IFCA during T2 (2020-25). This was to determine whether T2 leaseholders intended to apply for lease ground under T3 (2025-30). In addition, the EOI sought to provide confirmation that any T2 leaseholders wishing to apply for a T3 lease had a full understanding of the process and terms under which applications would be considered. Full information on these terms is available in the 'Poole Harbour Several Order 2015 Management Plan, 2025 Revision'.

Consideration of the allocation of lease beds under T3 is subject to the production of specified documentation including;

- A comprehensive Business Plan for Tranche 3 must be provided that includes the following criteria:

i. **Executive summary** providing an overview of the proposed business and plans.
ii. **Company structure** providing details of the structure of any company related to the application.
ii. **Operational Activities**
   a. Details of leaseholder and any other personnel involved in aquaculture operations including responsibilities and relevant qualifications.
   b. Specification of **vessel(s)**, **platforms** and **fishing gear** to be used including intended activities for each and relevant PHC vessel number(s);
iii. **Methodology** section to include:
   a. The target **species** to be grown and harvested including a rationale of why this species;
   b. Details of **equipment** used in both laying of seeds and harvesting of seeds (noting that the proposed activity **must not** place any structure on the seabed).
   c. Details of any other equipment used in the aquaculture operations for each species.
   d. The **projected quantities** of each species to be broken down into annual forecasts for the next 5 years (2025 to 2030):
      - kg/year seeding and harvesting forecast; and
      - Identification of any variables which may compromise achievement of annual forecasts.
iv. **Financial Forecast**
   a. **Funding** and demonstrable sources of funding including relevant operation **investments**.
   b. Details of **supplier** of seeds for laying;
   c. Details of **buyers/target market** of harvested product;
v. **Safety**
   a. A **Safety Plan** to demonstrate that appropriate safety measures are in place for the proposed activity;
   b. To provide evidence of permissions granted by Poole Harbour Commissioners (PHC) for the use of a commercial vessel within Poole Harbour, under the **Registration of Small Commercial Craft**[9], registration via https://phc.co.uk/webforms/register/
vi. **Biosecurity Plan** detailing the processes by which the lease bed operator will ensure that their activities are consistent with best practice and the legal requirements.
   a. Details of designated **Biosecurity Manager**, other **relevant contacts** and **staff training**.
   b. A **Risk Assessment** to outline measures taken to mitigate biosecurity risks.

- A comprehensive End of T2 Lease Report must be provided to reflect on the expectations and progress of a T2 Business Plan by including the following criteria:

i. **Summary of business operations** under the T2 lease.

[9] '*…For the purpose of promoting or securing conditions conducive to the… safety of navigation…persons and property in the harbour, PHC seek to ensure that all commercial craft operating within Poole Harbour are properly maintained, equipped and manned and used only for the purposes for which they are capable…*' Extract taken from the General Direction – Registration of Small Commercial Craft.

a. Leaseholder details and summary of **Business Operations** in Poole Harbour
b. Summary of T2 **Aquaculture Operations** including any Business Plan changes.

ii. **Tranche 2 Results**

a. Projected Forecasts
   i. Whether projected seeding and harvesting forecasts were met throughout Tranche 2 and details of annual seeding and harvesting quantities outlining how these related to forecasts
   ii. Whether there were any unexpected changes to forecasts
   iii. Details of any mitigation measures employed in relation to changes in forecasts,
   iv. Whether any changes in seeding or harvesting resulted in changes to aquaculture practices within the lease period
   v. Whether there were any changes which have influenced future aquaculture operations
b. Suppliers and Markets
   i. Which suppliers were used during the lease period
   ii. Whether any changes to suppliers were required
   iii. A summary of all target markets used in the lease period including depuration facilities and companies involved in the supply chain process
   iv. Whether any changes to markets, depuration facilities or other companies involved in the supply chain process were required during the lease period
c. Future Mitigations
   i. Any outcomes from the T2 lease period which have influenced future aquaculture practices

4.1.2.2 Tranche 3 Lease Bed Allocation

The Authority considered the exploration of a Lease Bed Expansion Programme following T2. Subsequently, the Authority considered that this programme was not in a position to be progressed, due to non-compatibility of additional lease bed allocations with SPA and SSSI objectives as well as a number of factors specific to Poole Harbour. In order to re-confirm this position for T3, an analysis was carried out on any areas within the footprint of The Order where lease ground is not currently located. Taking into account the designation of Poole Harbour as an SPA, SSI and Ramsar Site, associated designated features/supporting habitats and the Southern IFCA's relevant legal duties, the location of wild fisheries, the location of other Harbour activities, navigation, management under other Southern IFCA byelaws and input from aquaculture operators on the suitability of different seabed areas from discussions under the T2 Lease Bed Reallocation Programme and input on aquaculture practices, it was determined that there are currently no suitable areas for additional lease ground to that established under T2. As a result, Southern IFCA is not pursuing a lease bed expansion programme for T3. The position on the suitability of this programme will be reviewed in line with the Tranche 4 lease bed allocation in 2030.

The footprint of the T3 lease beds (Figure 4) replicates the lease bed allocations under T2. There are 12 lease beds sub-leased from Southern IFCA, full detail of each of these 12 lease beds is provided in the 'T3 Poole Harbour Shellfish Biosecurity Plan'. Consideration of lease allocation under T3 is subject to applicants meeting the criteria detailed in this Management Plan. Following submission of relevant documentation, all applicants will be subject to an assessment undertaken by Southern IFCA. This process will be carried out with each application being considered on its own merits, and Southern IFCA reserve the right to consider the proposals contained within the required documentation in accordance with statutory responsibilities.

4.1.2.3 Leases under the Poole Harbour Fishery Order 2015

Each leaseholder is managed under the terms of a 'Lease of the Right of Several Fishery of Shellfish Laying'. The lease documents the provisions and management measures that the Lessee must observe. These may be general conditions, or specific to individual lease beds and may include, but are not limited to:

The requirement for leaseholders to use and manage the lease beds in accordance with the provisions submitted in the leaseholder's Business Plan (as submitted at the time of application);

a) The requirement for leaseholders to use and manage the lease beds in accordance with the provisions submitted in the lease holders Business Plan;
b) Restrictions on the removal of shellfish, to include compliance with minimum conservation reference sizes and the identification of persons permitted to remove shellfish;

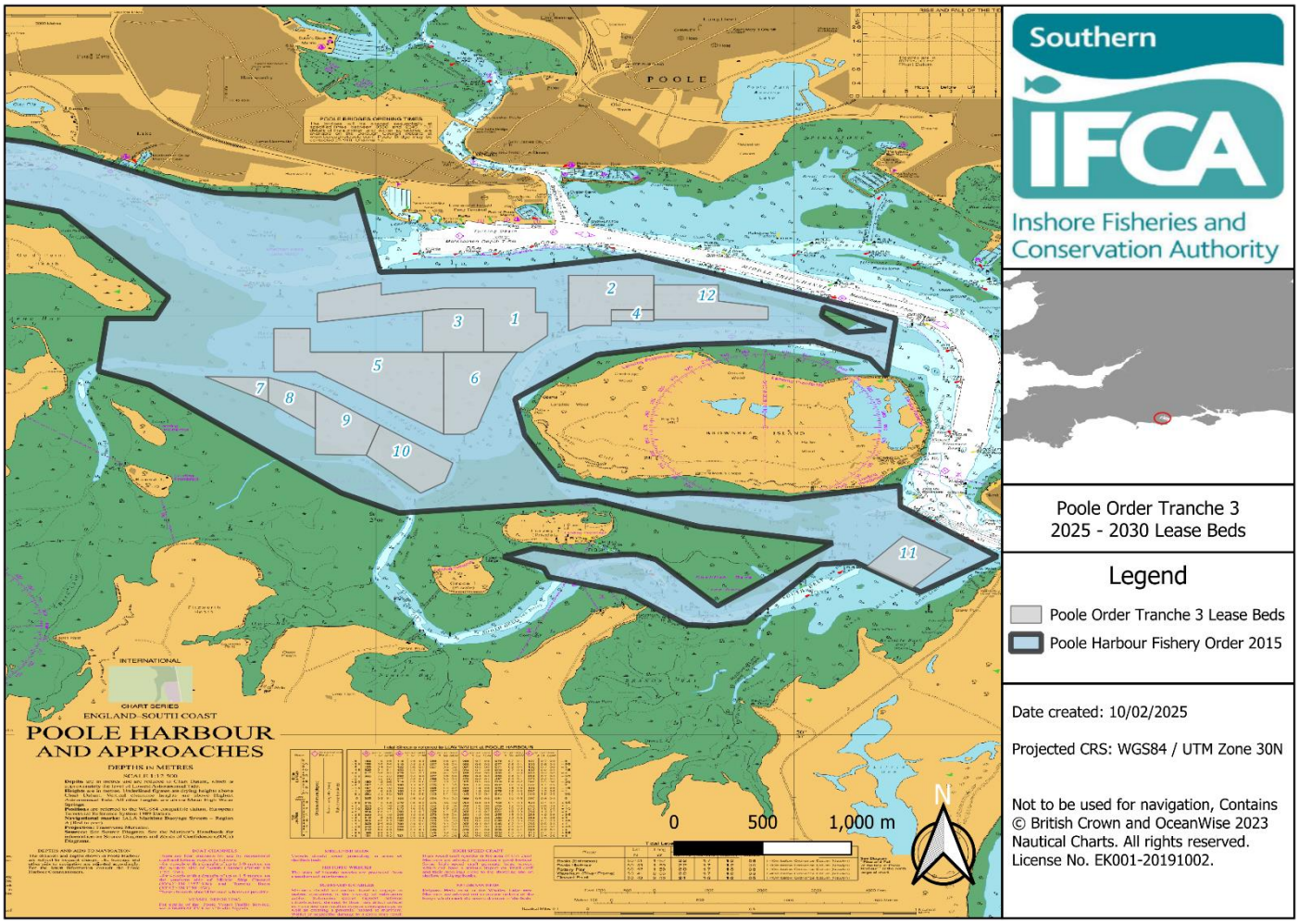

Figure 4: The location of Tranche 3 lease beds within the extent of The Poole Harbour Fishery Order 2015.

c) Compliance with species-specific measures, such as measures specific to the farming of Pacific oysters;
d) Compliance with vessel length requirements;
e) The requirement for leaseholders to specify in writing any proposed changes in new Business Plan operations, including new aquaculture methodologies and species, a minimum of **8 weeks** prior to the intended implementation of the proposed changes, to enable Southern IFCA to ensure compatibility of methodologies with the conservation objectives and biosecurity objectives of the site;
f) Compliance with temporal or spatial measures, in order to reduce water user interactions in Poole Harbour;
g) Compliance with temporal or spatial measures, in order to mitigate against interactions between conservation objectives of the SPA and the specific methodologies employed by leaseholders;
h) The requirement for leaseholders to mark and maintain the limits of lease bed boundaries;
i) Compliance with any issues detailed in the HRA within a given timeframe;
j) The requirement for leaseholders to facilitate inspections;

k) The requirement for leaseholders to provide information to Southern IFCA in relation to shellfish movements;
l) Requirement for all relevant leaseholder(s) who relay shellfish from the wild fishery in Poole Harbour to provide documentation and notify Southern IFCA prior to undertaking any activity, in line with conditions specified in the lease;

Leaseholders will be required to comply with all conditions outlined in the lease issued by the Authority. These conditions may be specific to a particular area of lease ground. Any leaseholder that contravenes any conditions may, at the discretion of the Authority, have the lease revoked and any lays shall return to the possession of the Authority.

4.1.2.4 Dispensations

The Authority, in its sole discretion, may consider issuing a dispensation, following an application made in writing to The Authority, from the leaseholder. Leaseholders may apply for dispensations for the following purposes:

a) The replacement of a Main Vessel;
b) The use (to be time-limited and activity specific) of an Ancillary Vessel;
c) The replacement of an Ancillary Vessel;
d) The removal of shellfish less than the MCRS specified in the lease.

4.1.2.5 Compliance with Conditions

Under Section (166) of the Marine and Coastal Access Act 2009, an Inshore Fisheries and Conservation Officer (IFCO) has the powers to enforce any provision made by or under Section 1 of the Sea Fisheries (Shellfish) Act 1967 conferring the right of regulating a fishery and whilst enforcing The Order, has common enforcement powers. Any person operating under The Order is subject to the provisions under section 292 of MaCAA (2009).

Southern IFCA Officers may monitor the area covered under The Order at any time and formal inspections of areas leased will be conducted as appropriate with additional inspections forming part of routine compliance patrols of the Harbour.

4.2 Aquaculture Activity Specifications for Tranche 3

Based on the Business Plans submitted by applicants under the Tranche 3 allocation of lease beds process there are a number of proposed species to be farmed and fishing practices to be used on lease beds for the period of 2025-30 under the Poole Harbour Fishery Order 2015. A summary of these species and fishing practices is given below. Due to commercial sensitivity there will be no information relating activities to a specific applicant or to the individual lease ground to which each activity pertains.

It is noted that the species and fishing practices detailed below do not differ from those undertaken under Tranche 2. There are no proposals for additional species to be farmed nor any changes to methodologies for farming.

4.2.1 Species farmed

The species which will be farmed under the 2025-30 leases fall within the definition of aquaculture species that can be farmed under the Order, namely ‘shellfish’ as defined in the Marine and Coastal Access Act 2009[10] (MaCAA) as “crustaceans and molluscs of any kind”. Specifically, these species are:

[10] http://www.legislation.gov.uk/ukpga/2009/23/pdfs/ukpga_20090023_en.pdf

- Blue Mussel (*Mytilus edulis*)
- Pacific oyster (*Magallana gigas*)
- Manila clam (*Ruditapes philippinarum*)
- Native oyster (*Ostrea edulis*)
- Common cockle (*Cerastoderma edule*)
- American hard-shelled clam (*Mercenaria mercenaria*)

4.2.2 Fishing practices and technical gear specifications

All aquaculture practices in Poole Harbour involve the direct laying of shellfish on to the seabed, no leaseholder will be permitted to place or erect any structure on the seabed. Activity on the lease beds has the potential to occur all year round however some practices can be more seasonal depending on markets and demand for product.

Harvesting of shellfish from lease ground will be carried out using either a water-assisted dredge or a box dredge. There are two types of water-assisted dredge which will be used; a pump-scoop dredge of the same type used in the wild fishery for shellfish in Poole Harbour and a conveyor dredge system, specifically designed for shellfish farming in Poole Harbour.

A pump-scoop dredge consists of a toothed dredge basket which is towed through the seabed alongside a vessel (Jensen *et al*., 2005). Attached to the front end of the dredge is a series of water jets which direct a flow of water to the rear of the dredge basket (Jensen *et al*., 2005). The water jets, powered by a hydraulic pump, allow sediment to be moved through the dredge basket (Jensen *et al*., 2005). In 2012, the use of a trailed pump-scoop dredge, which uses the aid of a davit arm and winch, was introduced. This type of dredge evolved from the previously used and more physically demanding hand-held dredge or scoop, pushed into the sediment and pulled along by a vessel (Jensen *et al*., 2005). The pump-scoop dredge is deployed from small (less than 10 metre in length) and shallow drafted vessels. This gear type is unique to Poole Harbour and differs from suction or hydraulic dredging techniques which both fluidise the sediment by spraying water in front of the dredge (Jensen *et al*., 2005). Dredges of this type which will be used on lease ground are the same dredges which are used for fishing the wild fishery therefore, the specifications of the gear are such that they comply with regulations under the Poole Harbour Dredge Permit Byelaw with the configuration of the pump-scoop dredge dictated by the conditions of the permit. These include restrictions on the dimensions of a dredge basket to a maximum of 460 mm in width, 460 mm in depth and 30 mm in height (excluding any poles or attachment). Dredges must be constructed on rigid bars having spaces of no less than 18 mm between them.

The conveyor system designed specifically for shellfish farming in Poole Harbour is of a similar design to the pump-scoop dredge. The dredge is attached to a conveyor belt and lowered to the seabed. The vessel moves forward causing the dredge to move through the sediment, jets of water flush the shellfish toward the rear of the dredge and on to the conveyor belt which delivers shellfish to the vessel above. The same system allows for rapid return of any species not be taken for aquaculture to the seabed in the area from which it was taken with minimal interaction with equipment resulting a very low risk of damage to any species harvested and returned.

The box dredge system is a mechanical dredge typical of that used for the harvesting of wild clam and cockle species in the Solent area (Williams and Davies, 2018). This type of dredge typically consists of a metal frame with a row of metal teeth which is towed through the sediment using a boat (Wheeler *et al*., 2014). The dredge is characterised by skis which sit on the base of the dredge and allow it to sit on the seabed whilst being towed. There are no current management measures in the Southern IFCA District which specify a required configuration for a box dredge and as a result the size of a box dredge can vary. Box dredges typically vary from 82 to 122 cm in width, 111 to 130 cm in length and 20 to 36 cm in depth. Some box dredges have a diving plate which helps to stabilise the dredge during deployment. The metal teeth typically range from 9 to 14 cm (16 cm diagonally) and are situated on the base of the dredge mouth opening. Teeth can be orientated vertically or angled diagonally forward to help the dredge cut through the sediment. These teeth penetrate into the sediment collecting the shellfish which are subsequently retained in the dredge. The posterior metal box is made up of bars, with spacing typically varying from 1.4 to 3.4 cm. This allows the dredge to pass through the sediment and unwanted debris can escape through the bars. Typically, either

one dredge or two dredges side by side are deployed, depending on the size of the vessel, from the stern. The dredge is typically deployed using a mechanized winch to lower the gear to the seabed and lift it back onto the vessel. The dredge is attached to the vessel using a rope which is typically tied to the tow riddle. The angle at which the dredge is towed depends on the tow riddle configuration; the further forward the rope is attached to the dredge, the steeper the angle it will penetrate the sediment. The dredge is towed along the seabed in straight lines in the direction of the boat.

4.2.3 Aquaculture Operations

For each lease bed there can be operations undertaken which involve cleaning, seeding and harvesting. For the T2 period, there were new lease grounds introduced as a result of the Lease Bed Reallocation Programme. These beds have now been in place and utilised for aquaculture activity for a period of five years. Under T2 farming on three specific lease beds was carried out in line with bed specific specifications which included undertaking preparation works for aquaculture. In order to ensure compatibility with Conservation Objectives for Poole Harbour, specific time periods for preparation of new ground were defined which were met by each relevant leaseholder.

For T3, as all new lease beds established under T2 have now been subject to aquaculture activity for a five-year period, there is no longer a requirement for preparation of ground. Activities across all lease beds focus primarily on seeding and harvesting, a certain amount of ‘cleaning’ taking place during harvesting practice by virtue of removal of debris and other detritus during the process of dredging, any additional cleaning will be carried out using existing harvesting fishing gear and will be minimal due to the establishment of these areas as lease beds during the T2 period.

There is therefore no requirement under T3 to specify periods for undertaking a specific activity such as cleaning due to the lower risk posed by lower levels of activity across lease beds which are all well established for aquaculture activity and that there is no longer a need for extensive preparatory cleaning on any bed, it is therefore not anticipated that any activity on the lease beds will have any greater impact than normal operations.

4.2.3.1 Temporal Restrictions

Water User Interactions

As part of the development of The Order, full assessments of interactions with other water uses (navigation, wild fisheries and shellfish beds, personal watercraft interactions e.g. jet ski designated areas), small craft moorings, Port of Poole operations) was undertaken during the consultation phase. A risk assessment was specifically undertaken for T2 to quantify the interaction of aquaculture operations (vessel being on site) on Lease Bed 12 with personal watercraft users. The outcome of this process was specific lease conditions introduced to mitigate any identified risk; this is detailed in full in Management Plan 5 in the ‘Poole Harbour Several Order 2015 Management Plan: 2025 Revision’.

Lease Conditions:

- Prohibition of aquaculture activities inside of the hours 08:00 – 20:00 during the months of April to September
- A requirement for the leaseholder to have functional AIS onboard the vessel and active during hours of operations

Rafting Bird Species

For all lease beds, a seasonal and temporal restriction will be implemented under lease conditions as follows:

- No activity between 18:00 and 06:00 for the months of November to March inclusive.

This ensures that all activities which may be undertaken are minimising risk to rafting species such as red-breasted merganser and goldeneye and aligns with management (agreed by NE through Formal Advice as appropriate mitigation) applied to the wild dredge fishery.

4.2.4 Biosecurity

The 'T3 Poole Harbour Shellfish Biosecurity Plan' outlines measures that need to be taken by leaseholders to ensure that correct biosecurity is maintained within Poole Harbour. The Plan sets out overarching requirements which are then mirrored and risk assessed according to activities and processes outlined in specific business plans for each leaseholder. The overarching risk assessment is included in Annex 5.

The practices set out to reduce biosecurity risk posed by the introduction of diseases (microbial pathogens) and Invasive Non-Indigenous Species (INIS) as a result of aquaculture activity in Poole Harbour are summarised below.

Purchase of seed from any areas outside the UK

The seed must come from Cefas approved hatcheries and be accompanied by the appropriate paperwork to indicate this. Seed can only be brought into Poole Harbour, for the purposes of aquaculture, after the appropriate application has been made to the Southern IFCA and verified by Cefas. Any seed that shows any signs of disease will not be accepted onto the site and seed imports will be thoroughly washed and checked for INIS. All imports must be recorded and, following receipt, seed must be separated from other stocks for two weeks.

Seed moved or purchased from another shellfish farming area within the UK

The seed must come from an area with equal or higher water quality status than Poole Harbour (currently this is a long-term B or higher classification but may change if changes in classifications occur within Poole Harbour). Leaseholders are required to keep abreast of any changes in classification with the local Environmental Health department. Any seed movements or purchases must be accompanied by the appropriate paperwork and movement documents and, where required, advice must be sought from Cefas before any movements take place. Seed must not be accepted onto the site if any signs of disease are noted, and seed will be thoroughly washed and checked for INIS. All movements and purchases must be recorded.

Relaying of wild seed or animals

For any seed or animals taken from wild stocks and relayed onto lease ground in Poole Harbour, the location from which the seed/animals are taken must first be verified with Cefas. Leaseholders must inform Southern IFCA in advance of any on-site shellfish movements from outside of Molluscan Deposit Area 12b (Figure 5), so that SIFCA can register the movement on FHI online. No seed or animals are to be accepted onto the site if any signs of disease are noted and seed/animals will be thoroughly washed and checked for INIS. All seed/animals relayed from wild stocks must be separated from all other stocks for a two-week period. Seed/animals may only be relayed in Poole Harbour if they come from an area of equal or higher water quality status (currently this is a long-term B or higher classification but may change if changes in classifications occur within Poole Harbour). Leaseholders are required to keep abreast of any changes in classification with the local Environmental Health department.

Any stock (seed/animals) from any area where the disease history is unknown is not permitted to be moved, imported, purchased or relayed into Poole Harbour.

Exported Product

All exported product from lease ground in Poole Harbour can only be sent to Cefas approved and bio-secure depuration and processing plants. Any destination for exported product must hold the appropriate licences. All exports must be recorded and documented.

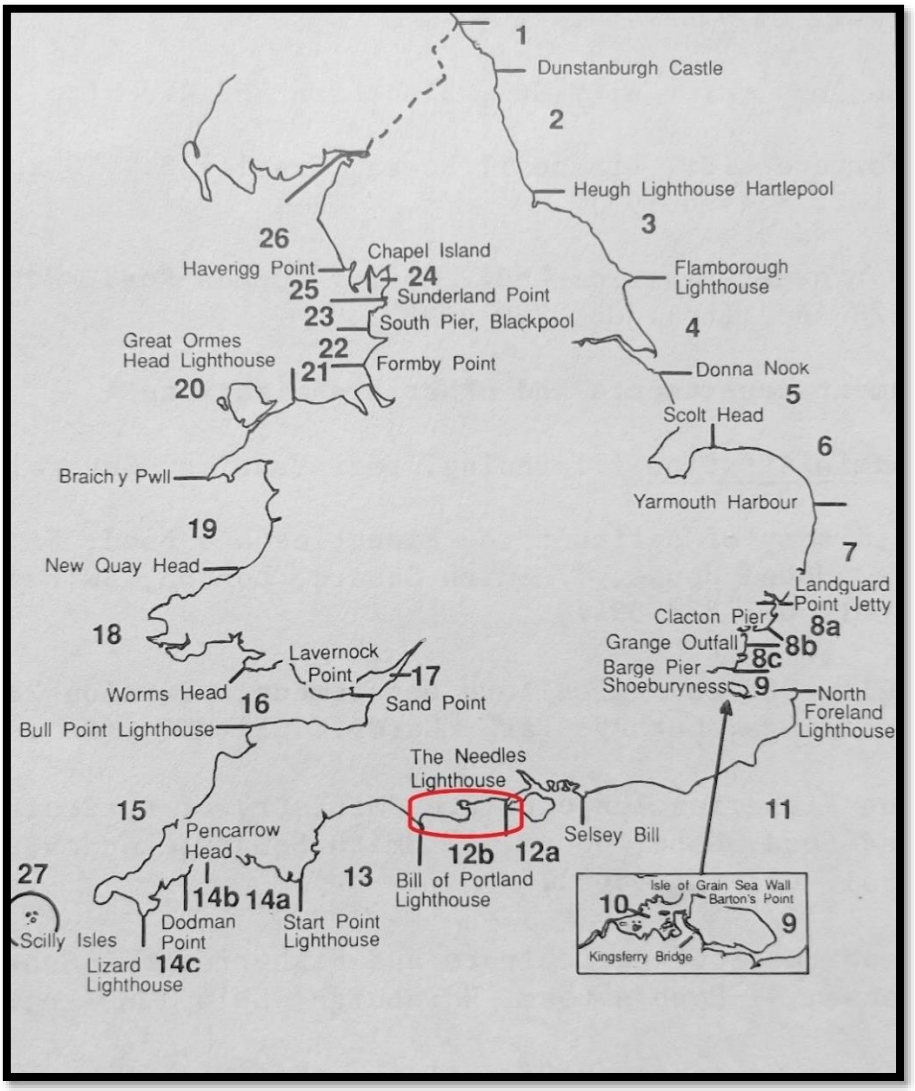

Figure 5: Map of CEFAS Molluscan deposit Areas in England and Wales. Area 12b, which lies between the Bill of Portland Lighthouse and The Needles Lighthouse, is highlighted within the red circle.

Use of vessels and equipment

All vessels, equipment and staff PPE used on the lease ground in Poole Harbour must be checked, cleaned and dried each day (please see check, clean, dry protocol below). Where cleaning of vessels is taking place in an area other than the lease ground of the particular leaseholder, the deck of the vessel should be sealed to prevent runoff. Any public or other visitors to any lease ground or associated vessels should be by invite only and appropriate, disinfected PPE should be provided.

Any equipment brought in from another area should be subject to the check, clean, dry protocol and thoroughly examined before use. Any rubbish materials must be disposed of on-board the vessel and taken ashore to be disposed of. All staff operating on any lease ground must be made aware of the protocols relating to biosecurity, overseen by the site manager.

Protocols for activity on lease ground

Lease beds must be seeded or harvested independently of one another and stock from individual beds kept separate to avoid contamination between areas. Any mortality events observed must be reported to the Southern IFCA and Cefas with samples provided so that the cause of mortality can be investigated and any mortality arising from disease can be identified.

Any instances of INIS on lease ground must be reported to the Southern IFCA. Photographs, date of discovery and precise geographic location must be provided to enquiries@southern-ifca.gov.uk. In addition, leaseholders are encouraged to use INNS Mapper https://ywt-data.org/INNS-mapper/ to record any INNS into a wider database.

Check, Clean, Dry
The check, clean dry protocol is provided by www.nonnativespecies.org/checkcleandry as follows:

- **Check** equipment and clothing for live organisms – particularly in areas that are damp or hard to inspect
- **Clean** and wash all equipment, footwear and clothes thoroughly, use hot water where possible. If you do come across any organisms, leave them at the water body where you found them.
- **Dry** all equipment and clothing – some species can live for many days in moist conditions. Make sure you don't transfer water elsewhere.

4.2.4.1 Pacific oyster (*Magallana gigas*)
The Pacific oyster *(Magallana gigas*) is a filter feeding bivalve native to Japan and Korea (Mills, 2016). The species has been used for aquaculture in a number of European countries including the UK, the Netherlands, Germany, Denmark, Sweden, France and Norway (Mills, 2016).

The Pacific oyster is defined as an invasive non-native species (INIS), categorised as a 'Medium Risk' on the Water Framework Directive list by the UK Technical Advisory Group and a 'Moderate' risk by the GB non-native species secretariat (NNSS).

National Position
In September 2022 a new national position on Pacific oysters was published by Defra. This position includes the following points:

- Pacific oysters are currently considered to be established in England south of latitude 52°N and therefore, with current technology, cannot be prevented from establishing in, or be successfully or economically eradicated from this area;
- Defra does not support the expansion of the Pacific oyster farming industry north of latitude 52°N;
- Authorisations for farms south of 52°N within 5km of an MPA will continue to be granted only after the regulator has considered the outcome of site-based environmental impact assessments. These must take into account the impact of the Pacific oyster on the current condition of local MPAs if there is a likely adverse impact, Defra supports regulators to introduce mitigating authorisation conditions such as using triploidy or monitoring;
- Cefas are working to carry out all outstanding environmental assessments for existing Pacific oyster farms near MPAs.

Poole Harbour lies south of latitude 52°N, Southern IFCA undertake the environmental assessment for the existing Pacific oyster farming in Poole Harbour within the Poole Harbour MPA.

Poole Harbour Specific Species Management
Advice provided by NE in 2017, detailed in the SSSI Site Management Statement[11] stated:
Due to the proximity of the Poole Harbour lease beds to the SSSI, SPA and Ramsar site, we believe that there is a risk that wild oyster settlement could adversely affect the features and supporting habitats of these sites. It is Natural England's view that in most cases, the risk of wild settlement can be minimised by using triploid oysters…on this basis we would support revised management measures to prohibit the laying of diploid oysters under the terms of the Poole Harbour Several Order. The advice provided above is consistent with Natural England's general guidance on Pacific oyster aquaculture within or adjacent to designated sites. However, in the absence of formal policy guidance, there may be circumstances where an applicant

[11] Available from Southern IFCA on request.

specifically requests the use of diploid oysters. In such cases, we would review the request on a site-specific basis with regard to local environmental conditions and seek assurance that any potential impacts of wild settlement are adequately mitigated.

Further clarity was provided that as there had been no evidence of Pacific oysters spreading over the intertidal mudflats in Poole Harbour as a result of cultivation, Pacific oysters may be laid on lease beds provided the oysters are of triploid stock or are subject to another method of sterilization including but not limited to the laying of quadriploid stock. The Poole Harbour Several Order 2015 Management Plan which accompanied Tranche 1 reflected this advice and associated requirements for lease holders.

Additional advice was provided for T2, which resulted in the development of the 'Evidence Package and Proposed Management Measures for the farming of Pacific oyster (*Magallana gigas*)', annexed to the Appropriate Assessment for the issuing of leases for the period 2020-2025[12]. The following lease conditions were included as part of T2 leases:

- The stock of Pacific oysters laid onto lease ground in Poole Harbour must be of triploid stock or subject to another method of sterilisation
- Applications to farm Pacific oysters using a type of stock different to that stipulated above will be considered on a case-by-case basis, with the proposed methodology subject to an Appropriate Assessment

The Evidence Package also outlined that the farming of Pacific oysters would be undertaken by two leaseholders who had historically farmed this species at this site. Under The Poole Harbour Several Order 2015 Management Plan (2020 Revision), and accordingly the Terms of the Lease, any leaseholder who does not currently farm the species being required to provide the Authority with a request to do so and associated methodology, in writing, 8 weeks before the intended date at which this activity would commence. During this 8-week period, Southern IFCA would assess the request and liaise with NE to determine if the request can be granted. This process may also involve the undertaking of a separate HRA specific to the request and leaseholders will understand that their request may not be granted.

The management measures implemented under T2 are to be maintained under T3.

Details of management for aquaculture and species interactions can be found in Management Plan 4 in The Poole Harbour Several Order 2015 Management Plan (2025 Revision).

Poole Harbour Specific Species Monitoring

Advice was provided by NE in 2020:

'…(1) NE advise the need to establish and demonstrate that the current levels of Pacific oyster production are not causing an impact. To that end and in order to conclude no adverse effect on site integrity beyond reasonable scientific doubt, NE advises that 2 further aspects (in addition to the lease conditions introduced) are considered:

(a) That current levels of effort i.e. the amount of stock laid should be capped until it can be demonstrated that there is no risk to the Poole Harbour SPA and RAMSAR site;

(b) that robust annual monitoring and reviews will be implemented to demonstrate that no feral populations have or will become established – the annual monitoring to be of particular relevance in light of expected CEFAS Pacific oyster analysis due in 2021…'

Monitoring of Pacific oyster populations in Poole Harbour has been reviewed, looking at most recent survey data and historic data from studies monitoring the location, extent and size frequency distribution of wild populations. In addition, data from monitoring in Poole Harbour has been compared to wild population monitoring from Southampton Water where no aquaculture inputs exist. The Southern IFCA *Magallana gigas* Monitoring Report: Analysis of the methods and results of historic monitoring surveys in Poole Harbour and Southampton Water is available from the Southern IFCA website[13].

[12] HRA for Issuing of Leases under The Poole Harbour Fishery Order 2015 for 2020-2025
[13] Pacific-Oyster-Monitoring-Report

The outcomes of the review in summary:

- Most recent survey data (2021-2022) indicates there has been an increase in Pacific oyster density in two out of five sites in Poole Harbour which have been surveyed in multiple years, however, densities remain low (1.3 and 1.5 per m^2).
- For one site where there is a higher density of Pacific oysters (Pottery Pier, 3.54 per m^2), there is no data available from previous surveys to demonstrate whether there is a change from previous status.
- There has been an observed decline in one area (Lake Pier/Drive) resulting in a lower classification zone being applied.
- The area which historically demonstrated the highest densities (Blue Lagoon) has remained consistent in classification with densities not increasing, and in the most recent survey being lower (7.64 per m^2) than in studies from 2012-2014 (>10 per m^2).

It is recognised that there are limitations to survey methods, however considering the available data, comparisons to Southampton Water where there are generally greater densities more consistently across a wider area with no associated aquaculture activity, there is no indication that the presence of aquaculture activity in Poole Harbour is causing large increases in the presence of wild Pacific oysters, and there is no indication that the presence of wild Pacific oysters in Poole Harbour is resulting in large scale habitat change or the formation of reefs.

Additional monitoring is likely to be beneficial within the T3 period (2025-2030) to maintain the timeseries dataset, at the time at which a new round of monitoring is determined to be appropriate, the potential for future monitoring methods can be explored more fully.

4.3 The Benefits of Aquaculture

Shellfish aquaculture provides a number of beneficial ecosystem services, both relevant to MPAs and the broader marine environment through nutrient cycling, including nitrogen, phosphorus and carbon, blue carbon benefits, natural capital benefits and food security. A literature review has been carried out, presenting information from peer-reviewed literature and reports on the beneficial ecosystem services provided specifically by bivalve aquaculture, as the form of aquaculture occurring in Poole Harbour, this literature review can be viewed on the Southern IFCA website[14].

[14] Poole-Order-Literature-Review

5 Test of Likely Significant Effect (TLSE)

The Habitats Regulations Assessment (HRA) is a step-wise process and is first subject to a coarse test of whether the plan or project will cause a likely significant effect on a National Site Network Site. Each feature/sub-feature was subject to a TLSE[15]. The operations considered under the TLSE, based on the activities outlined in the business plans for the 2025-30 leases, were; i) Shellfish aquaculture: bottom culture, ii) Shellfish aquaculture: suspended mussel rope culture, iii) Dredges and iv) Hydraulic dredges. Where it was identified that a feature or supporting habitat was sensitive to a particular pressure exerted by a certain operation, the interaction was recommended for further assessment. The interactions requiring further assessment are shown in tables 2 (Shellfish aquaculture: bottom culture) and 3 (Dredges and Hydraulic dredges).

The TLSE for shellfish aquaculture: suspended mussel rope culture was carried out in 2024 following the addition of a new activity to a lease under T2. The TLSE was submitted to NE for Formal Advice which was received on 12th March 2024 and supported the outcome of the TLSE that this method would not have a significant effect on the SPA or Ramsar site, individually or in combination with other plans or projects and therefore agreed with the conclusion of Southern IFCA that an Appropriate Assessment for this activity is not required. The separate TLSE has been added to the overall TLSE for operations under The Order, however the conclusions have not changed since the 2024 TLSE for this activity and therefore all potential pressure/feature interactions have been screened out from requiring further consideration.

Table 2: Potential pressures on features and supporting habitats of the Poole Harbour SPA from shellfish aquaculture: bottom culture, identified as sensitive and requiring further assessment in the TLSE

Feature/Supporting Habitat	Potential Pressure	Relevant Attributes
Non-Breeding Bird Features		
Avocet Black-tailed godwit Little egret Shelduck Spoonbill	Introduction of microbial pathogens	Non-breeding population: abundance; Supporting Habitat; water quality – contaminants
	Visual disturbance	Non-breeding population abundance; Disturbance caused by human activity; Connectivity with supporting habitats
	Above water noise	Disturbance caused by human activity; Connectivity with supporting habitats
	Collision ABOVE water with static or moving objects not naturally found in the marine environment (e.g. boats, machinery, and structures)	Supporting habitat: landscape

[15] The Test of Likely Significant Effect is a stand-alone document which can be viewed on request from Southern IFCA.

Breeding Bird Features		
Common Tern Sandwich tern	Changes in suspended solids (water clarity)	Supporting habitat: water quality – turbidity; Connectivity with supporting habitats
Common Tern Sandwich tern Mediterranean gull	Introduction of microbial pathogens	Breeding population: abundance; Supporting Habitat; water quality – contaminants
	Visual disturbance	Breeding population: abundance; Disturbance caused by human activity; Predation - all habitats; Connectivity with supporting habitats
	Above water noise	Disturbance caused by human activity; Connectivity with supporting habitats
	Collision ABOVE water with static or moving objects not naturally found in the marine environment (e.g. boats, machinery, and structures)	Supporting habitat: landscape
Supporting Habitats		
Coastal lagoons	Introduction of microbial pathogens	Supporting habitat: water quality – contaminants
	Introduction or spread of invasive non-indigenous species (INIS)	Supporting habitat: extent and distribution of supporting habitat; Supporting habitat: food availability; Connectivity with supporting habitats
Intertidal seagrass beds	Changes in suspended solids (water clarity)	Supporting habitat: water quality – turbidity
	Genetic modification & translocation of indigenous species	Supporting habitat: extent and distribution of supporting habitat; Supporting habitat: food availability; Connectivity with supporting habitats
	Introduction of microbial pathogens	Supporting habitat: food availability; Supporting habitat: extent and distribution of supporting habitat;
	Introduction or spread of invasive non-indigenous species (INIS)	Supporting habitat: extent and distribution of supporting habitat; Supporting habitat: food availability; Connectivity with supporting habitats
	Smothering and siltation rate changes (Light)	Supporting habitat: water quality – turbidity
Intertidal mud	Abrasion/disturbance of the substrate on the surface of the seabed	Supporting habitat: extent and distribution of supporting habitat;

		Supporting habitat: food availability
	Introduction of microbial pathogens	Supporting habitat: food availability
	Introduction or spread of invasive non-indigenous species (INIS)	Supporting habitat: extent and distribution of supporting habitat; Supporting habitat: food availability;
	Penetration and/or disturbance of the substratum below the surface of the seabed, including abrasion	Supporting habitat: extent and distribution of supporting habitat; Supporting habitat: food availability
	Physical change (to another sediment type)	Supporting habitat: extent and distribution of supporting habitat
Water Column	Changes in suspended solids (water clarity)	Supporting habitat: water quality - turbidity; Supporting habitat: food availability.
	Genetic modification & translocation of indigenous species	Supporting habitat: food availability
	Introduction or spread of invasive non-indigenous species (INIS)	Supporting habitat: extent and distribution of supporting habitat; Supporting habitat: food availability;
	Visual disturbance	Disturbance caused by human activity; Connectivity with supporting habitats; Breeding population: abundance

It is noted that no Advice on Operations is provided for Waterbird Assemblage – on this basis this feature is determined to be sensitive to the same pressures as listed for other bird features, excluding any pressures specific to Common Tern or Sandwich Tern due to different feeding methods

Table 3: Potential pressures on features and supporting habitats of the Poole Harbour SPA from dredges and hydraulic dredges, identified as sensitive and requiring further assessment in the TLSE

Feature/Supporting Habitat	Potential Pressure	Relevant Attributes
Non-Breeding Bird Features		
Avocet Black-tailed godwit Little egret Shelduck Spoonbill	Visual disturbance	Non-breeding population abundance; Disturbance caused by human activity; Connectivity with supporting habitats
	Above water noise	Disturbance caused by human activity; Connectivity with supporting habitats
	Collision ABOVE water with static or moving objects not naturally found in the marine environment (e.g. boats, machinery, and structures)	Supporting habitat: landscape

Breeding Bird Features		
Common Tern Sandwich tern	Changes in suspended solids (water clarity)	Supporting habitat: water quality – turbidity; Connectivity with supporting habitats
Common Tern Sandwich tern Mediterranean gull	Visual disturbance	Breeding population: abundance; Disturbance caused by human activity; Predation - all habitats; Connectivity with supporting habitats
	Above water noise	Disturbance caused by human activity; Connectivity with supporting habitats
	Collision ABOVE water with static or moving objects not naturally found in the marine environment (e.g. boats, machinery, and structures)	Supporting habitat: landscape
Supporting Habitats		
Intertidal seagrass beds	Changes in suspended solids (water clarity)	Supporting habitat: water quality – turbidity
	Smothering and siltation rate changes (Light)	Supporting habitat: water quality – turbidity
Intertidal mud	Abrasion/disturbance of the substrate on the surface of the seabed	Supporting habitat: extent and distribution of supporting habitat; Supporting habitat: food availability
	Changes in suspended solids (water clarity)	Supporting habitat: water quality – turbidity; Supporting habitat: food availability
	Penetration and/or disturbance of the substratum below the surface of the seabed, including abrasion	Supporting habitat: extent and distribution of supporting habitat; Supporting habitat: food availability
	Smothering and siltation rate changes (Light)	Supporting habitat: water quality – turbidity
	Physical change (to another sediment type)	Supporting habitat: extent and distribution of supporting habitat
	Removal of non-target species	Supporting habitat: food availability
Water Column	Changes in suspended solids (water clarity)	Supporting habitat: water quality - turbidity; Supporting habitat: food availability.
	Visual disturbance	Disturbance caused by human activity; Connectivity with supporting habitats; Breeding population: abundance

6 Appropriate Assessment

6.1 Co-location of Bird Features (and their supporting habitats) and Project/Plan(s)

Key areas favoured by designated bird species in Poole Harbour SPA are summarised in table 4.

Table 4: Key areas for designated bird species in the Poole Harbour SPA. Information taken from the draft supplementary advice on conserving and restoring site features, Natural England's Conservation Advice Package and Poole Harbour Aquatic Management Plan (Bird Sensitive Areas in Poole Harbour).

Common Name	Latin Name	Favoured Area(s)
Avocet	*Recurvirostra avosetta*	Roosting areas include Brownsea Lagoon, towards the end of Wych and Middlebere channel and on the Spartina saltmarsh in north Holes Bay. Main feeding areas include Wych and Middlebere channels, Brownsea Lagoon, East Fitzworth.
Black-tailed godwit	*Limoa limosa islandica*	To feed, flocks tend to congregate in one bay, including Holes Bay or Lytchett Bay and roosting is limited to the area in which they are feeding. Preferred feeding sites also include Brownsea Lagoon. Arne Bay, Brands Bay, Wych Lake, Newton Bay, Ower Bay and Middlebere Lake and Brownsea Lagoon are important roost sites for waders, including black-tailed godwit.
Common tern and Sandwich tern	*Sterna hirundo*	Brownsea Island lagoon is the site of the principal and probably only nesting colony of common terns and Sandwich terns within the Poole Harbour SPA. During the spring, between mid-April and the end of June, Common terns breed at Gull Island and Brownsea Lagoon
Mediterranean gull	*Larus melanocephalus*	Only confirmed breeding colony in Poole Harbour is saltmarsh islands off of Holton Heath where the species nests alongside black-headed gulls. During the spring, between mid-April and the end of June, Mediterranean gulls and common terns breed at Gull Island and Brownsea Lagoon
Shelduck	*Tadorna tadorna*	Feeding takes place throughout the harbour, although favoured areas include Keysworth, Hole Bay and Brands Bay. Keysworth is reported to be an important area for feeding, with the food requirements for the numbers of shelduck recorded to exceed food availability.
Eurasian spoonbill	*Platalea leucorodia*	Brownsea Lagoon and Middlebere channel represent favoured feeding sites. Species is also recorded at other locations including Arne and Holes Bay. but also recorded at other locations e.g. Arne and Holes Bay
Little egret	*Egretta garzetta*	Occurs throughout the harbour. Known to roost in trees around Littlesea (the dune slack lake on Studland) and Plantation trees in Arne.
Curlew	*Numenius arquata*	Keysworth is reported to be an important area for feeding, with the food requirements for the numbers of curlew recorded to exceed food availability.
Redshank	*Tringa totanus*	Arne Bay, Brands Bay, Wych Lake, Newton Bay, Ower Bay and Middlebere Lake are important roost sites for waders, including redshank.

Greenshank	*Tringa nebularia*	Arne Bay, Brands Bay, Wych Lake, Newton Bay, Ower Bay and Middlebere Lake are important roost sites for waders, including greenshank.
Waterbird assemblage, non-breeding	Over 20,000 waterbirds over the winter	All of the above sensitive areas are utilised by bird species comprising the waterbird assemblage. Saltmarsh habitats, seagrass beds and reedbed are all important supporting habitats.

A map of the extent of the Poole Harbour Fishery Order 2015 and the T3 lease beds alongside the supporting habitats for the SPA can be found in Annex 4. This reveals where the lease beds under T3 are located in relation to designated supporting habitats of the site and shows how lease beds have been positioned to aim to avoid overlap with supporting habitats of the SPA and notified features of the SSSI. **Using knowledge presented in table 4, aquaculture activity under T3 is likely to have minimal to no effect on the sites used by the bird features in Poole Harbour. The location of lease beds does not overlap with any of the breeding areas or areas highlighted as bird sensitive, in addition all roosting areas are avoided excepting overnight rafting roosts and the majority of feeding areas are avoided.**

6.2 Potential Impacts

A list of pressures identified through the TLSE process as requiring further assessment is shown below. In this section, these pressures and associated potential impacts are explored further through a review of available scientific literature and relevant research studies.

- Removal of non-target species
- Introduction of microbial pathogens
- Visual disturbance
- Above water noise
- Collision ABOVE water with static or moving objects not naturally found in the marine environment (e.g. boats, machinery, and structures)
- Changes in suspended solids (water clarity)
- Introduction or spread of invasive non-indigenous species (INIS)
- Genetic modification & translocation of indigenous species
- Smothering and siltation rate changes (Light)
- Abrasion/disturbance of the substrate on the surface of the seabed
- Penetration and/or disturbance of the substratum below the surface of the seabed, including abrasion
- Physical change (to another sediment type)

6.2.1 Removal of non-target species

Generic pressure description

This pressure addressed the effects caused by fishing, hunting or harvesting of marine resources including direct removal of individuals and physical resources (e.g. aggregates, cooling water, etc.). Ecological consequences include food web dependencies, population dynamics of fish, marine mammals, turtles and sea birds (including survival threats in extreme cases). Includes entrapment in static fishing gear and power plants as a form of by-catch on aquatic fauna.

Overview of potential impacts

Fishing activity can have an indirect impact upon bird species by affecting the availability of prey through pathways that do not include targeted removal (Natural England, 2014). Bottom towed fishing gears have been shown to reduce biomass, production and species richness as well as diversity of benthic communities and result in alterations to the size structure of populations and communities in areas subject to fishing pressure (Veale *et al.,* 2000; Hiddink *et al.,* 2003; Roberts *et al.,* 2010). Impacts to benthic communities can occur from the direct action of towing a dredge, whereby surface-dwelling organisms can be removed, crushed, buried or exposed, with particular impacts for sessile organisms (Mercaldo-Allen and Goldberg, 2011). Burial and smothering of infaunal and epifaunal species can also occur due to enhance suspended sediments from dredging (Mercaldo-Allen and Goldberg, 2011), this aspect is covered in section 6.2.7.

In a meta-analysis of 39 studies on the effects of bottom towed fishing gear, there was an overall reduction in abundance of individuals within a disturbed (fished) plot of 46% (Collie *et al.,* 2000). In a separate meta-analysis of 28 studies looking at the impacts of intertidal harvesting on benthic invertebrate communities (representing bird prey sources), the average abundance across all taxa in the first 10 days following harvesting disturbance declined by 42% (Clarke *et al.,* 2017). A simultaneous increase in species diversity (39% increase) was noted in the first 10 days following disturbance, however this was followed by a significant reduction in diversity between 51 and 500 days post fishing with no significant effect after 500 days (Clarke *et al.,* 2017). The magnitude of the response of fauna to bottom towed fishing gear varied with the gear type, habitat type (including sediment type) and among different taxa (Collie *et al.,* 2000). This is also noted by Mercaldo-Allen and Goldberg (2011) who stated that the relative impact of shellfish dredging on benthic organisms is species-specific and is largely related to the biological characteristics of the species and their physical habitat. The vulnerability of an organism is ultimately seen to be related to whether or not it is infaunal or epifaunal, mobile or sessile and soft-bodied or hard-shelled (Mercaldo-Allen and Goldberg, 2011) with soft-bodied, deposit feeding crustaceans, polychaetes and ophiuroids to be the most affected by dredging activities (Constantino *et al.,* 2009). The meta-analyses discussed previously predicted a reduction in anthozoa, malacostraca, Ophiuroidea and polychaete species of 93% after chronic exposure to dredging (Collie *et al.,* 2000) and a decline in annelida (39.17%), mollusca (33.76%) and crustacea (29.61%) in the first 10 days following dredging (Clarke *et al.,* 2017). These findings are supported by an additional study investigating the effects of mechanical cockle harvesting in intertidal muddy sand and clean sand where annelids were seen to decline by 74% in intertidal muddy sand and 32% in clean sand and molluscs declined by 55% in intertidal muddy sand and 45% in clean sand (Ferns *et al.,* 2000). EMU (1992) also found a distinct reduction in polychaetes but a less distinct difference in bivalves between dredged and control sites.

In areas that are intensively fished (more than three times per year), the faunal community is likely to be maintained in a permanently altered state and inhabited by fauna that are adapted to frequent physical disturbance (Collie *et al.,* 2000). Communities are likely to be dominated by small-sized organisms compared to relatively high biomass species in less disturbed areas (Collie *et al.,* 2000). A study around the Isle of Man indicated that regular fishing activity resulted in the exclusion of large-bodied individuals with the resulting benthic community dominated by smaller bodied organisms more adapted to physical disturbance (Kaiser *et al.,* 2000; Johnson, 2002). The mortality of both target and non-target species may also be affected due to an increase in opportunistic and scavenging species in recently disturbed areas (Gaspar *et al.,* 1995; Wheeler *et al.,* 2014). Whilst dredging can cause direct mortality of some infaunal and epifaunal organisms, many small benthic organisms including crustaceans, polychaetes and molluscs have short generation times and high fecundities, both of which enhance their capacity for rapid recolonization (Coen, 1995). With such species, the effect of dredging may only be short lived and therefore it is thought that short-term and localised depressions in infaunal populations is not a primary concern for subtidal habitats (Coen, 1995).

Examples of impacts

There has been a significant amount of research conducted into the impacts of fishing activity on the removal of non-target species and the resultant impact on bird species and other food web dependencies.

A number of studies have highlighted species that are particularly vulnerable to dredging as well as those which appear to be more tolerant. For example, the polychaete *Lanice conchilega* is highly incapable of movement in response to disturbance and therefore a significant period of time is required for recolonization of disturbed habitats (Goss-Custard, 1977). Deep burrowing molluscs, such as *Macoma balthica*, also have limited capability to escape. Following suction dredging for the common cockle on intertidal sand, the abundance of *Macoma* declined for 8 years from 1989 to 1996 (Piersma *et al*., 2001). Ferns *et al*. (2000) reported reductions of 30% in the abundance of *Lanica conchilega* in intertidal muddy sand after mechanical cockle harvesting (using a tractor) took place, although abundances of *Macoma balthica* increased. The same study also revealed large reductions of 83% and 52% in the abundance of the polychaetes *Pygospio elegans* and *Nephtys hombergii*, respectively (Ferns *et al*., 2000). The former species remained significantly depleted in the area of muddy sand for more than 100 days after harvesting and the latter for more than 50 days (Ferns *et al*., 2000).

In a study by Ferns *et al.,* (2000), bird feeding activity increased shortly after the mechanical harvesting of cockles using a tractor, particularly in areas of muddy sand when compared to areas of clean sand. Gulls and waders were noted to take advantage of the invertebrates made available by the harvesting. Dunlin (80 individuals) and curlew (7 individuals) were observed feeding in harvested areas 6 days after harvesting took place. Following this initial increase however the level of bird activity was seen to decline in areas of muddy sand when compared to control areas at 21 and 45 days after harvesting (Ferns *et al.,* 2000). Levels of feeding activity by bird species remained low in curlews and gulls for more than 80 days post-harvesting and for more than 50 days for oystercatchers. Any initial benefit observed by harvesting was matched by decreased feeding opportunities in the winter. It was noted that harvesting of large areas would not result in a neutral effect as the initial bird population would not be large enough to fully exploit the enhanced feeding opportunities provided by initial harvesting activity and the subsequent reduction in feeding opportunities would persist for a greater period of time (Ferns *et al.,* 2000). Other effects are thought to include the migration of birds into unharvested areas, thereby increasing bird densities over smaller spatial scales (Sutherland and Goss-Custard 1991; Goss-Custard, 1993).

Site-Specific Studies

There are a number of studies which have specifically investigated the impacts of pump-scoop dredging on non-target species removal in Poole Harbour.

Jensen *et al*. (2005) reported on the preliminary results of an MSc project looking at the potential impact of pump-scoop dredge fishing (for clam species) in Poole Harbour. At thirteen sites, three replicate sediment samples were taken before and after the 2002/03 clam fishing season (late October to early January). Preliminary results from four sites, including data from a site experiencing 'high' fishing pressure (Seagull Island in the Wareham Channel) were analysed and presented. The results show the infaunal community at Seagull Island to have a similar level of disturbance before and after the fishing season, with no significant differences at all four sites. Some quantitative changes were observed in the fine sediment granulometry at Seagull Island, however sediment samples from all four sites showed no significant differences before and after the season. From the preliminary results it was concluded that there was no significant additional disturbance to the infaunal community before and after the 2002/03 fishing season occurred and whilst not statistically significant, changes to sediment granulometry at the site subject to high fishing pressure did occur.

Parker and Pinn (2005) investigated the impacts of pump-scoop dredge fishing (for cockles) on the intertidal sedimentary environment and macro-infaunal community at two sites located within the Whitley Lake area of Poole Harbour. The study area was characterised by sandy mud with some patches of shingle ground occurring close inshore. Samples from each site were collected in April prior to the cockle fishing season opening (fishing season ran from 1st May to 31st January), and then again in May, June and July during the season. The results showed little change in the sediment particle size distribution on a monthly basis, with no significant differences observed. After three months of dredging, species richness had declined by from 17.2±1.1 to 12.6±0.9 at the first site and 17.0±2.3 to 14.8±2.3 at the second site. A decline in abundance was also observed, with reductions of 42.3% at the first site and 50.6% at the second site, with post-hoc tests revealing differences between April and July. No significant differences were found in infaunal communities between April and May, indicating either low fishing effort or no initial impact of pump-scoop dredging. After three months, significant differences were detected, with changes between June and July potentially attributable to sudden temperature changes, reproduction-induced mortality or disturbance from another source (hand gathering of cockles or bait digging), although there is the potential that results were indicative of an effect caused by pump-scoop dredging. The species characterising the faunal assemblage in April consisted of *Scoloplos armiger*, *Cingula trifasciata* and *Hydrobia* spp., with May and June similar to April, although with the additional of *Arenicola marina*. In July the dominant species characterising faunal assemblage were *Urothoe* spp., *C. trifasciata*, *A. marina* and *Corophium* spp. *S. armiger* abundance showed the most change, with abundance decreasing to zero in July at both sites. Over the duration of the study *Hydrobia* spp. abundance declined at both sites, *Corophium* abundance and *Urothoe* spp. increased at both sites and *A. marina* abundance increased at the first site and remained constant at the second site. It was noted by the authors that two species commonly cited as important prey species for bird populations, *Arenicola marina* and *Corophium* spp., did not observe any obvious reductions in response to pump-scoop dredging and as such it was concluded that dredging may not have an obvious adverse impact on bird populations through impacts on the infaunal community.

Clarke *et al*. (2018) used a Before-After-Control-Impact (BACI) sampling design to assess the impacts of pump-scoop dredging on the benthic community structure and physical characteristics of the sediment. Core samples were taken from separate areas representing different levels of dredging intensity: an area that had historically been intensively dredged and remained open for a seven-month season; an area that had historically been closed to dredging but was opened for a four-month season and an area that remained permanently closed to dredging (control site). The samples were taken in June, prior to the start of the fishing season in 2015 and November, before the end of the season. Throughout the study period significant changes were noted in community structure at

both dredged sites, with a significant effect of both site and time before and after fishing, indicating a variation in the magnitude of change in the overall assemblage between sites. The overall community structure of the newly dredged site shifted during the study period from a community resembling the control site to one more similar to that at the intensively dredged site. The community structure of the intensively dredged site, and to some extent that of the newly dredged site in November, were characterised by a high abundance of polychaete worms, in particular *Hediste diversicolor*, *Aphelochaeta marioni*, *Streblospio shrubsolii* and *Tubificoides* spp.; with the former three species showing notable increases in the newly dredged site (Figure 6). Densities of *H. diversicolor* more than doubled in the newly dredged site and were largely dominated by smaller (<10mm) individuals. Control sites were largely dominated by *Peringia ulvae* and *Abra tenuis*, which declined at both dredged sites, a trend also observed for *A. tenuis*, and there was also a general absence of *A. marioni*.

Throughout the study period, densities of all species at the control site were generally lower but more stable than at both dredged sites, at which the magnitude of change was larger. Across both sampling months, species richness was also found to be significantly higher in both dredged sites compared to the control site. Biotic indices indicate all sites to be classed as 'moderately disturbed', with the control site and newly dredged site classified as 'good' quality and the intensively dredged site classified as 'moderate' quality. Despite the significant changes in community structure in the newly dredged site, as described above, no change in the biotope or ecological quality of either of the dredged sites were identified. It is worth noting that prior to the opening of the fishing season statistical analyses showed site differences in community structure, likely to be driven by a gradient in sediment type. Throughout the study period there were also clear seasonal changes in species abundance. The BACI sampling design allows for assessment of seasonally-induced changes however, and the greatest changes in community structure were observed in the newly dredged site with significant increases in species richness and total abundance.

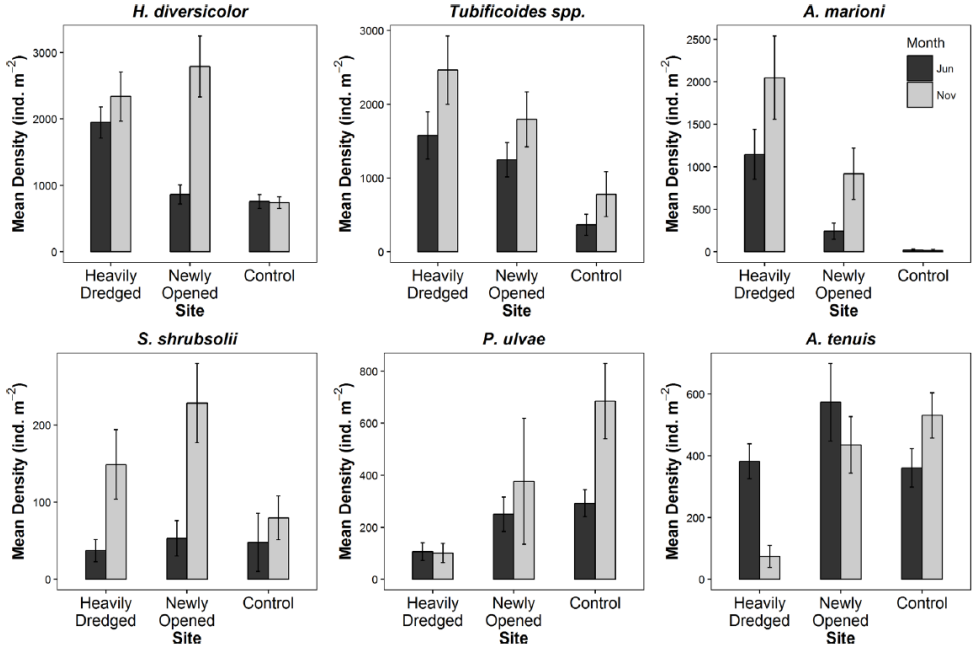

Figure 6: Mean densities of common benthic species in June (dark grey) and November (light grey) 2015 at three sites representing different intensities of pump-scoop dredging (heavily dredged, newly opened, control) in Poole Harbour. Source: Clarke *et al*., 2018.

Species-specific diets

With regard to the potential impact to bird species from removal of non-target species, there is a need to understand the important prey species in relation to features of a protected site. While birds will typically eat a range of different prey species including molluscs and annelids, the preferential species will vary according to the particular bird species (Natural England, 2014). The variations in prey preference will, to a certain extent, dictate the vulnerability of a particular bird species to the effects of fishing activity. The plasticity of a particular bird species diet will also vary, along with the value of particular prey items in terms of energetic value. It is therefore important to consider alternate prey species as well. Table 5 below indicates the prey items taken by bird species specifically designated under the Poole Harbour SPA and those included in the waterbird assemblage. Considerations need to include the availability of alternative prey species, which bird species may be forced to seek out due to lack of availability of primary food sources, for example prey species which burrow further into the sediment will require a higher energy expenditure by the bird (Zwarts *et al.,* 1996). In addition, bird may directly compete with fisheries where the target species and prey species are the same. The key bird species at risk from changes in prey availability are non-breeding overwintering species as food requirements are considerably greater during the winter period due to increased thermoregulatory needs and increased metabolic costs (Wheeler *et al.,* 2014).

Table 5: Typical prey items known to be taken by designated bird species in Poole Harbour SPA. Information on general prey preference was obtained from the SPA Tool Kit and Natural England's Poole Harbour Conservation Advice Package. Specific information on prey species was taken, where available, from the draft supplementary advice on conserving and restoring site features and also from other conservation advice packages from nearby SPAs with the same bird features

Common Name	Latin Name	General Prey Preference	Prey Species
Avocet	*Recurvirostra avosetta*	Fish, molluscs, crustaceans, insects, worms	*Gammarus, Corophium, Nereis, Hydrobia, Cardum,* gobie spp.
Little egret	*Egretta garzetta*	Fish, amphibians, insects	
Eurasian spoonbill	*Platalea leucorodia*	Insects, small fish, crustaceans, frogs and tadpoles, worms, leeches	
Black-tailed godwit	*Limosa limosa islandica*	Insects, worms, plants/grasses/seeds	*Scrobicularia, Macoma, Hediste, Arenicola, Cardium, Nereis*
Shelduck	*Tadorna tadorna*	Molluscs, crustaceans, worms, insects	*Hydrobia ulvae, Macoma, Corophium, Hediste, Enteromorpha, Nereis*
Dunlin	*Calidris alpina*	Molluscs, insects, worms	*Macoma, Hydrobia* spp., *Nereis, Crangon, Carcinus, Scrobicularia, Corophium, Hediste*
Dark-bellied brent goose	*Branta bernicla bernicla*	Plants/grasses/seeds	*Zostera* spp., *Enteromorpha, Ulva lactuca*
Goldeneye	*Bucephala clangula*	Fish, molluscs, crustaceans, insects	
Teal	*Anas crecca*	Plants/grasses/seeds	*Enteromorpha* spp., *Ulva* spp.

Curlew	*Numenius arquata*	Molluscs, crustaceans, insects, worms	*Mya, Cerastoderma, Scrobicularia, Macoma, Hediste, Arenicola, Carcinus*
Red-breasted merganser	*Mergus serrator*	Fish	Gobies, flatfish, herring fry (<11cm), shrimp, sticklebacks, *Nereis* spp.
Spotted redshank	*Tringa erythropus*	Insects, worms	
Greenshank	*Tringa nebularia*	Fish, crustaceans, worms	
Redshank	*Tringa totanus*	Molluscs, crustaceans, insects, worms	*Mya, Scrobicularia, Macoma, Hydrobia, Corophium, Hediste, Nereis*
Pochard	*Aythya farina*	Fish, insects, plants/grasses/seeds	

Additional information was also obtained from Durrell & Kelly (1990), Cox *et al*. (2014), European Commission (2009), Brearey (1982) & Clarke *et al*., (2017) (Supplement 1)

Recovery

The timescale for recovery of benthic communities and therefore potential prey species will depend on the sediment type, the associated faunal assemblage and the rate of natural disturbance (Roberts *et al.,* 2010). Where levels of natural disturbance are high, the faunal assemblage is characterised by species adapted to and able to withstand a greater level of disturbance promoting faster recovery (Collie *et al.,* 2000; Roberts *et al.,* 2010). Less disturbed habitats, often distinguished by high species diversity and epifaunal species are likely to take a longer time to recover (Roberts *et al.,* 2010). A 10-year monitoring study on gravel habitats located close to the Isle of Man following closure of the area to scallop dredging showed that the recovery time for this habitat type was in the order of 10 years (Collie *et al.,* 2005; Bradshaw *et al.,* 2000). Recovery periods for muddy sands were also estimated to take years with studies discovering that this sediment type was particularly vulnerable to fishing activities (Kaiser *et al.,* 2006). Sandy habitats are quicker to recovery with recovery periods estimated at days to months (Kaiser *et al.,* 2006).

Recover of particular populations is known to be species specific (Roberts *et al.,* 2010). Long-lived bivalve species and other megafauna are found to take longer to recover from disturbance, especially for sessile species, as a result of slow growth (Roberts *et al.,* 2010). Macrofaunal species are seen to recover quicker and in particular, short-lived and small benthic organisms exhibit excellent recolonization abilities as a result of rapid generation times and high fecundities (Coen, 1995). For example, sponges and soft-corals are estimates to take up to 8 years to recolonise following disturbance whilst polychaetes take less than a year (Kaiser *et al.,* 2006).

A meta-analysis of 38 studies, investigation the recovery of invertebrate communities from intertidal harvesting showed that recovery of non-target species did not occur for more than 500 days following disturbance across all habitat types, with further reductions in abundance also occurring over this timescale (Clarke *et al.,* 2017). Recovery trends for the majority of gear-habitat interactions were shown to be unstable and highly variable. Recovery after hydraulic dredging in mud habitats showed relatively short-term impacts with respect to abundance, with reductions seen in the first 10 days following disturbance and then close to no effect after this (Clarke *et al.,* 2017). There was a difference in the recovery of different species following mechanical dredging in mud habitats with mollusc abundance supressed for more than 60 days post-fishing but annelid and crustacean species demonstrating near recovery over the same period (Clarke *et al.,* 2017). Time taken for partial recovery in sand habitats was observed after 400 days. Selected surveys on the recovery rate for biological and physical disturbance

caused by shellfish dredging indicated that rates varied from no effect up to 12 months with intermediate recovery rates reported at 56 days and 7 months (Peterson *et al.,* 1987; Kaiser *et a.,* 1996; Hall and Harding, 1997; Spencer *et al.,* 1998; Ferns *et al.,* 2000).

6.2.1 Summary

- Bottom-towed fishing gear can impact bird species by directly or indirectly altering prey availability. Benthic communities are particularly sensitive in this kind of disturbance.
- Areas that are intensively fished show a permanently altered environment dominated by relatively smaller, opportunistic scavenging species that are better adapted to physical disturbance.
- Although bird feeding activity has been shown to increase shortly after cockle harvesting, bird activity declined and remained below average levels post-harvest.
- Despite changes in the structure of infaunal communities at dredged sites, studies suggest that pump-scoop dredging does not cause any significant additional disturbance to the biotope of sites in Poole Harbour, although changes in granulometry were observed at tested sites. Generally, important annelid bird prey species were not shown to directly decrease after pump-scoop dredging.
- The recovery time of benthic communities, and therefore important prey species, is heavily influenced by sediment type. Studies suggest that gravel habitats and muddy sand habitats took significantly more time to recover from fishing pressure than sandy habitats.
- The vulnerability of organisms depends on their biological characteristics. Larger, immobile, soft bodied organisms, with low fecundity and slower generation times appear to be the most affected by fishing disturbance. In muddy habitats, Crustacean and annelid abundance has been shown to recover faster than molluscs following mechanical dredging.
- Recovery after hydraulic dredging in mud habitats showed relatively short-term impacts with respect to abundance, with reductions seen in the first 10 days following disturbance and then close to no effect after this.
- The recovery trends for most gear-habitat interactions were shown to be highly variable.

6.2.2 Disturbance (Visual and Noise)

Generic pressure description

For visual disturbance, the pressure relates to the disturbance of biota by anthropogenic activities, e.g. increased vessel movements, such as during construction phases for new infrastructure (bridges, cranes, port building, offshore platforms, offshore wind farms etc.), increase personnel movements, increased tourism, moving wind turbine blades, increased vehicular movements onshore and offshore disturbing bird roosting areas, rafting areas, feeding areas, seal haul out areas etc.

For noise disturbance, the pressure relates to any loud noise made onshore or offshore by construction, vehicles (including aircraft), vessels, tourism, mining, blasting etc. that may disturb birds and reduce time spent in feeding or breeding areas.

Overview of potential impacts

Human disturbance to birds can be defined as 'any situation in which human activities cause a bird to behave differently from the behaviour it would exhibit without presence of that activity' (Wheeler *et al.,* 2014). The response by birds to disturbance can be influenced by a number of factors including proximity to the disturbance source, scale of the disturbance and the time of year (Stillman *et al.,* 2009). Disturbance resulting from many small-scale sources is thought to be more detrimental than fewer, large-scale sources (West *et al.,* 2002).

One of the main impacts of disturbance is displacement, where birds are unable to use an area due to the magnitude of the disturbance present (Natural England, 2014). Under certain circumstances the impacts of disturbance may be equivalent to habitat loss, although such effects are reversible (Madsen, 1995; Hill *et al*., 1997; Stillman *et al*., 2007; Natural England *et al*., 2012). The impacts of habitat loss through disturbance can include a reduction in the survival of displaced individuals and effects on the overall population size (Goss-Custard *et al*., 1995; Burton *et al*., 2006). Sites with high levels of anthropogenic activity are often characterised by lower densities of birds when compared with sites that have low levels (Burger, 1981; Klein *et al*., 1995). The movement of birds to alternate, and potentially less suitable, feeding areas as a result of disturbance can lead to increased shorebird density and thus interspecific competition; with alternate sites becoming depleted in food resources if used for prolonged periods of time (Goss-Custard et al., 2006; Wheeler *et al*., 2014). Disturbance can affect wintering bird populations in a number of ways including reduced food intake a result of enhanced vigilance (Riddington 1996; Goss-Custard *et al*. 2006; Klaassen *et al*. 2006) and physiological impacts such as stress (Thiel *et al*., 2011). Such impacts can affect the fitness of individuals and have knock-on effects at a population scale (Natural England, 2011). Furthermore, disturbance can cause birds to take flight which increases the demand for energy and reduces the opportunity for food intake. Both of these factors have potential consequences for survival and reproduction.

Birds have been noted to modify their behaviour in order to compensate for disturbance (Stillman *et al*., 2009). Some bird species may become habituated to particular disturbance events or types of disturbance (Walker *et al*., 2006, Nisbet, 2000, Baudains & Lloyd, 2007; Blumstein *et al*., 2003) and can do so over short periods of time (Rees *et al*., 2005; Stillman *et al*., 2009). The frequency of the disturbance will be a factor in determining the extent to which birds can become habituated and thus the distance at which they respond (Stillman *et al*., 2009). The behavioural response of a bird to disturbance is also dependent on the time of year (Stillman *et al*., 2009). Towards the end of winter, when migratory birds need to increase feeding rates to provide energy for migration, behavioural response to disturbance is less (Stillman *et al*., 2009). Under these circumstances, birds have been documented to approach a disturbance source more closely and return more quickly after a disturbance has taken place (Stillman *et al*., 2009). In the context of shellfish harvesting from a vessel, there is limited evidence on the potential effects for bird populations through disturbance. It is thought that shellfish dredging has very little direct impact on disturbance of waders since it occurs at high tide (Sewell *et al*., 2007). Sewell *et al*. (2007) stated that 'We know of no evidence that dredging will have a direct impact in terms of disturbance on seabirds since most dredging occurs subtidally or at high-tide'. Wheeler *et al*. (2014) however stated, like other forms of disturbance, it could cause relocation and therefore increased energy expenditure of birds.

Examples of impacts

Disturbance to birds as a result of fishing activity has been assessed for a variety of species/gear interactions including both hand worked and vessel operated gear types. Results are mixed and highlight the number of factors including the species involved, the habitat/location and the fishing gear type in determining the level of impact seen.

In the mid-1980s, a study was carried out at the Lindisfarne National Nature Reserve where it was considered that localised and sustained disturbance from bait diggers was responsible for a significant decline in the numbers of Wigeon, Bar-tailed godwit and Redshank (Townsend and O'Connor, 1993). Further work in 1996/97 on human-induced disturbance to Black-tailed godwits across 20 sites on the east coast of England found no significant relationship between the number of birds and human activity across a range of spatial scales (Gill *et al.,* 2001). The presence of marinas and public footpaths adjacent to mudflats also showed no effect on the number of birds.

Durrell *et al.* (2005) used a behaviour-based model to investigate the potential effect of an extension to the port at Le Havre and proposed mitigation measures on the mortality and body condition of three overwintering bird species; curlew, dunlin and oystercatcher. There was a significant effect of disturbance to feeding birds with impacts to the mortality and body condition of all three species. Similar effects were demonstrated for roosting birds with increased energy costs as a result of an extra 10 minutes or more flying time each day (Durrell *et al.,* 2005). If the model was limited to just daytime, the effect of disturbance was removed for curlew and oystercatcher and a reduced disturbance effect was seen for dunlin, however this species still indicated a significant effect on mortality and body condition. Introducing a buffer zone of 150m from the seawall in to the model reduced the effects of disturbance and levels of mortality and body condition were similar to pre-disturbance levels.

Disturbance studies conducted in the Solent have reported disturbance levels of 30% during the winter of 1993/4 based on disturbance events observed during low tide counts. Sources of disturbance included dog walking, walking, bait digging and kite flying (Thompson, 1994). More recent work on the period between December 2009 and February 2010, which formed Phase II of the Solent Disturbance and Mitigation Project, found that 25% of observations of water-based recreational activities and 41% of observations of intertidal activities resulted in disturbance (Liley *et al.,* 2010). Activities found most likely to cause disturbance to birds were surfing, rowing and horse riding. Over half the incidences where major flight was observed involved activities on the intertidal, with dog walking accounting for 47% of major flight events (Liley *et al.,* 2010). Oystercatcher and Wigeon had the highest proportion of observations involving a disturbance response. Primary data collected by Liley *et al*. (2010) as part of this study was used to predict if disturbance could reduce the survival of birds using computer models (Stillman *et al*., 2012). Dunlin, ringed plover, oystercatcher and curlew were predicted to be the species most vulnerable to disturbance due to a combination of disturbance distances (table 6), night-time feeding efficiency and vulnerability to food competition at high competitor densities (Stillman *et al*., 2012). Redshank, grey plover and black-tailed godwit typically had the shortest disturbance distances and were able to feed relatively effectively at night, meaning that these species were less affected by visitors (Stillman *et al*., 2012). Disturbance was predicted to result in an increase to the time spent feeding intertidally by dunlin, ringed plover, redshank and grey plover, with no effect on black-trailed godwit and a reduction in time spent by oystercatcher and curlew (Stillman *et al*., 2012). This was related to the ability of modelled birds to feed in terrestrial habitats, with those unable to do so spending longer feeding in intertidal habitats (Stillman *et al*., 2012).

Site-specific impacts

A study by Liley and Fearnley (2012) surveyed a total of 15 sites located within the vicinity of Poole Harbour between November and February, recording access levels, bird counts and bird response to disturbance, in addition to paired night and day counts at 13 of the sites. During the survey period there was 1981 potential disturbance events, generating a total of 3755 species-specific observations. Of the disturbance events recorded, 87% resulted in no visible change in behaviour or response and 12% resulted in some form of disturbance, with 6% of these involving birds undertaking major flight. Disturbance was found to have a significant effect on the number of waders and wildfowl present. Overall, 5.6 potential disturbance events were recorded per hour and responses occurred 1.7 times per hour, with birds flushed approximately once per hour. In December, the number of disturbance events resulting in a response, particularly birds being flushed, was markedly higher, with locations where birds were more frequently flushed including Arne and Studland. In areas with the highest levels of access, birds were found less likely to respond to a disturbance event. Dog walkers without a lead accounted for 40% of birds being flushed, followed by walkers (17%) and canoeists (17%).

A number of variables were found to influence the probability of major flight including distance and length of disturbance time, with a shorter disturbance more likely to result in major flight. Other factors included flock size, with a larger flock less likely to result in major flight, the presence of a dog, availability of alternate foraging or roosting sites, temperature and the bird species present. A higher probability of major flight was recorded for curlew, oystercatcher and shelduck. The highest proportion of flushing in response to a disturbance event was seen in the species red-breasted merganser and sanderling. Water-based activities, including canoeing, pump-scoop dredging, small sailing boats and kite surfing were more likely to cause disturbance, relative to other activities. These activity types made up a relatively small proportion of all recorded activities and it is worth noting the low sample sizes for water-based activities, with, for example, only 2 observations of pump-scoop dredging throughout the survey period. This is important as it distorts the likelihood of disturbance occurring, for example if major flight occurred for 1 out of 2 observations for pump-scoop dredging, disturbance would be considered to occur 50% of the time.

Species-specific disturbance response

Responsiveness to disturbance by birds is thought to be a species-specific trait (Yasué, 2005). Gathe and Hüppop (2004) developed a wind farm sensitivity index (WSI) for seabirds based on nine factors derived from species attributes, including; flight manoeuvrability, flight altitude, percentage of time flying, nocturnal flight activity, sensitivity towards disturbance by ship and helicopter traffic, flexibility in habitat use, biogeographical population size, adult survival rate and European threat and conservation status. Each factor was scored on a 5-point scale from 1 (low vulnerability of seabirds) to 5 (high vulnerability of seabirds). The WSI was used by King *et al*. (2009) to develop sensitivity scores for species likely to be susceptible to cumulative impacts of offshore wind farm development. Table 6 provides available sensitivity scores of species within Poole Harbour SPA, with details of scores given for the species vulnerability to disturbance by ship and helicopter traffic.

Table 6: Sensitivity scores for bird species designated under the Poole Harbour SPA taken from scores assigned in relation to offshore wind farm developments. Higher scores are indicative of a greater sensitivity. Information on species vulnerability to disturbance by ship or helicopter traffic is also provided. Scores were taken from King *et al*. 2009 who calculated scores using methods by Garthe & Hüppop (2004)

Species	Total sensitivity score	Disturbance by ship and helicopter traffic (1 – very flexible in habitat use to 5 – reliant on specific habitat characteristics)
Sandwich tern	25.0	2
Dark-bellied Brent goose	21.7	2
Red-breasted merganser	21.0	3
Goldeneye	15.8	3
Common tern	15.0	2
Black-tailed godwit	9.9	1
Black-headed gull	7.5	2
Redshank	6.7	1
Curlew	5.7	1
Shelduck	5.3	1
Teal	3.8	1
Dunlin	3.3	1

In considering disturbance response, there is great variation in the escape flight distances between species (Kirby *et al*., 2004). The distance at which birds fly away from a disturbance can be viewed as a species-specific trait (Blumstein *et al*., 2003), with response distances dependent on a number of factors, including; the time of year, tide, frequency, regularity and severity of disturbance, flock size and age of bird (WWT Consulting, 2012). Body mass has also been shown to be positively related to response distance (Liley *et al*., 2010). Table 7 provides details of the distance from a disturbance stimuli (m) at which bird species took flight, data is taken from seven different studies as outlined in Kirby *et al.* (2004). The data also indicates the activity causing the disturbance and the type of distance measured i.e. minimum versus mean distance.

Table 7: Distances from disturbance stimuli (m) at which studied bird species took flight. Taken from Kirby *et al*., 2004.

	Study						
	Tydeman 1978	Cooke 1980	Tensen and van Zoest	Watmough 1983a,b	Smit and Visser 1993	Smit and Visser 1993	Smit and Visser 1993
Activity	Boats	Researcher	People	Researcher	People	Kayaks	Surfers
Distance measure	Min	Mean	Mean	Mean	Mean	Mean	Mean
Brent goose					105		
Shelduck		126			148/250	220	400
Teal	400	86					
Pochard	60						
Goldeneye	100	168		280			
Dunlin		30			71/163		
Redshank		92	95			175	260

Mitigation

The negative effects of disturbance on the usage of a particular area important for birds are reversible (Natural England *et al*., 2012). Studies have shown that bird numbers increase when either the source of disturbance is removed or is mitigated (Natural England *et al*., 2012). Modelling overwintering oystercatchers in the Exe estuary showed that by preventing disturbance during late winter, when the ability to find food is harder and the energetic demands of a bird are higher, predicted consequences to a species' population can be largely eliminated (West *et al.,* 2002). The results of this study suggested that competent management authorities could successfully mitigate against adverse impacts by preventing disturbance during this key period (West *et al.,* 2002).

An understanding of the distance at which flight response is initiated is considered a good first step for management authorities to help minimise the adverse effects caused by disturbance (Wheeler *et al.,* 2014). The establishment of buffer areas to address this are possible but dependent on a number of factors including; population densities, food availability, the time of year and the behaviour of particular bird species (Wheeler *et al.,* 2014). In the study looking at the impacts of the port development at Le Havre, a buffer of 150m was seen to reduce adverse effects on the mortality and body condition of dunlin, curlew and oystercatcher back to pre-disturbance levels (Durrell *et al.,* 2005). The disturbance study in the Solent however indicated that there was no clear buffer distance

that would be applicable to all species within a single site due to differences in the distance at which flight behaviour was initiated (Liley *et al.,* 2010). This has been echoed in other literature (Stillman *et al.,* 2009) where there can be variation between species as well as between individuals of the same species (Beale and Monaghan, 2004; Blumstein *et al.,* 2005). Other factors such as habitat type, flock size and temperature will also affect the ability of and the degree to which a bird responds to disturbance (Rees *et al.,* 2005; Stillman *et al.,* 2001). In addition, there are other adverse effects which may result from disturbance and it would need to be confirmed that a distance buffer would have benefits for a multitude of different potential consequences (Gill *et al.,* 1996; Gill *et al.,* 2001). The large variability in the distance at which flight response is initiated suggests that management bodies should be conservative in developing buffer zones although published distance information for specific species provides a good guideline (Blumstein *et al.,* 2003).

6.2.2 Summary

- There are a range of anthropogenic activities that can disturb biota including, vessel movements, infrastructure, personnel movement, tourism, wind turbine blades, offshore and onshore vehicle movements etc. These effects are reversable however.
- The response by birds to disturbance can be influenced by a number of factors including proximity to the disturbance source, scale of the disturbance and the time of year, with disturbances from many small-scale sources thought to be more detrimental than fewer, large-scale sources.
- Disturbance can modify bird behaviours in ways that affect food intake and energy consumption. Increased vigilance, stress, and increased flight, particularly among wintering birds, negatively impact population survival and reproduction. Disturbances can sometimes have an equivalent impact to habitat loss, inducing reduced survival rates in displaced individual birds and their overall population. This is largely due to increased interspecific competition between birds as they are driven to alternative sites with higher bird densities and potentially less valuable feeding grounds.
- Bird species can become habituated to particular disturbances, however the time taken for this to occur varies greatly depending on the time, disturbance, frequency, and species.
- The behavioural response to disturbance for migratory birds is less during the winter periods when birds show increased feeding rates. Birds have been documented approaching a disturbance source more closely and returning more quickly after a disturbance has taken place.
- Bait digging disturbance has been shown to be a major cause of disturbance for some birds however this is very species-specific, whilst the presence of marinas and public footpaths adjacent to mudflats also showed no effect on the number of birds.
- The level of disturbance caused by pump-scoop dredging is contested. Although less frequent, water-based activities such as canoeing, pump-scoop dredging, small sailing boats and kite surfing were identified as likely to cause a disturbance, relative to other activities. *Wheeler et al*. (2014) suggests that, like other forms of disturbance, shellfish dredging could cause relocation and therefore increased energy expenditure. However, another study suggests that shellfish dredging has little evidence of disturbing wading birds primarily due to dredging occurring at high tide.
- Onshore and near-shore activities found most likely to cause disturbance to birds were surfing, rowing, horse riding and especially dogs. Disturbance was found to have a significant effect on the number of waders and wildfowl present in Poole Harbour, with birds being flushed on average every hour. Dogs off leads are the most common source of disturbance, accounting for 40% of recorded disturbances.
- Preventing disturbance during late winter, when the ability to find food is harder and the energetic demands of a bird are higher, can significantly mitigate population-level impacts. Adopting buffer zones have the capacity to decrease the impacts of disturbances, however its effectiveness depends on several factors. Restricting disturbances to only daytime also reduced disturbance levels, but this is also species-specific.

6.2.3 Collision ABOVE water with static or moving objects not naturally found in the marine environment (e.g. boats, machinery, and structures)

Generic pressure description

This pressure relates to the injury or mortality of biota from collisions with both static and/or moving structures. Examples include collisions with; rigs (e.g. birds), screens in intake pipes (e.g. fish at power stations), wind turbine blades (e.g. birds), tidal devices (e.g. fish and mammals) and shipping (e.g. fish and mammals). Activities increasing the number of vessels transiting areas, e.g. new port development or construction works will influence the scale and intensity of this pressure.

Overview of potential impacts

Most man-made structures have the potential to pose a collision risk for bird species (Blew *et al.,* 2008). Collisions have been recorded for lighthouses, electricity pylons, communication masts, plate glass windows, offshore marine research facilities and oil and gas rigs (Huppop *et al.,* 2006). However, collisions with vessels are rare. Most of the current research on this topic focuses around collision with wind farms (Exo *et al.,* 2003; Camphuysen *et al.,* 2004; Garthe and Huppop, 2004; Desholm *et al.,* 2006; Huppop *et al.,* 2006; Larsen and Guillemette, 2007; Blew *et al.,* 2008; Furness *et al.,* 2013; Brabant *et al.,* 2015). While this research can give an indication of potential impacts from collision, it should be noted that wind turbines introduce additional risk than that posed by fixed structures due to the moving element of the turbines introducing a collision risk to flight paths otherwise free from obstruction (Blew *et al.,* 2008).

Behavioural studies indicate that birds will avoid flying close to vertical structures (Blew *et al.,* 2008) and that likelihood of collision is related to a number of factors including weather conditions, time of day and species-specific traits such as flight altitude (Exo *et al.,* 2003; Camphuysen *et al.,* 2004). Collision risk is also seen to be more of a factor when structures, such as wind farms, are placed on migration routes (Huppop *et al.,* 2006). Avoidance has been seen to occur at three different levels; i) large-scale avoidance where birds become aware of large structures or multiple objects in a landscape traditionally without obstacles and evading action is taken at distances of >2000m. This is mostly during good migration conditions and good visibility, ii) medium to small scale avoidance where evading action is taken at 1000m to 150m mostly during good to medium visibility, avoidance action in this case may be vertical or horizontal and iii) last second avoidance which result from birds either not seeing the obstruction due to low visibility or being in a flight formation. This type of avoidance is thought to be rare and are more likely to occur during inclement weather (Blew *et al.,* 2008).

Examples of impacts

As outlined above, the majority of studies on collision with seabirds look at impacts caused by wind farms and the majority use modelling techniques or vulnerability assessments to determine risk and sensitivity of particular species. In a study of North Sea wind farms where potential effects were modelled using a collision risk model, the number of interactions for a particular bird species depended on the species concerned and the distance of the wind farm from the

shore with fewer interactions the further offshore the farm (Brabant *et al.,* 2015). It was noted that there is the potential for site-specific avoidance effects resulting from the wind farm having been in place for a time before the study was carried out. Further work in the North Sea found that over 50% of the collisions recorded at a wind farm occurred over the period of two nights characterized by inclement weather and very poor visibility (Huppop *et al.,* 2006). It is thought that, in areas where there are limited if any resting places, installations attract sea birds, particularly at night (Huppop *et al.,* 2006; Huppop *et al.,* 2016). For this study, it was postulated that the illumination from the wind farm in the inclement conditions at night attracted the birds but that the poor visibility prevented appropriate avoidance of the turbines (Huppop *et al.,* 2006). This was also seen in a study of an offshore platform in the North Sea where light was seen to be a dominant factor in attracting birds to the installation thus increasing the risk of collision (Huppop *et al.,* 2016). A reduction the number of lights as well as reducing the use of light intensity and steady burning lights was seen to be a way forward in trying to reduce the number of collisions (Huppop *et al.,* 2016). Night-time activity was seen to pose the biggest risk, linked to the presence of artificial light, with areas in migratory routes and at frequent risk of fog and drizzle increasing the risk further (Huppop *et al.,* 2016).

A study specifically on the common eider at a Danish wind farm found that the birds largely avoided offshore wind parks, postulating that their reluctance to approach human-made structures likely influences this behaviour (Larsen and Guillemette, 2007). This species has also been observed to alter flight altitude to avoid ships, wind turbines and peninsulas and that, with regard to wind parks, collision was more likely to occur with the structure than the wind turbine due to flying height (Larsen and Guilemette, 2007). A study by Furness *et al.* (2013) ranked bird species according to their vulnerability to offshore wind farms in the context of collision risk, and found that primarily gull species (herring, great black-backed, lesser black-backed), white-tailed eagle and northern ganet were most vulnerable. Several of the species for which Poole Harbour is protected were also studied but all fell outside the top 10 for vulnerability (Furness *et al.,* 2013). The study did note that analyses such as this, where species traits are used to define vulnerability, should be treated with caution as many of the relative avoidance responses of individual bird species are not yet well known.

6.2.3 Summary

- Most man-made structures have the potential to pose a collision risk for bird species including lighthouses, electricity pylons, communication masts, plate glass windows, offshore marine research facilities, and oil and gas rigs. Wind turbines in particular are the most researched structure regarding bird collision risk.
- Behavioural studies indicate that birds avoid flying close to vertical structures and that Ship collisions are very rare.
- The likelihood of collision is related to several factors including weather conditions, time of day, and species-specific traits such as flight altitude. One study found that up to 50% of wind farm collisions in the North Sea were characterised by poor visibility caused by weather.
- Collision risk is also seen to be more of a factor when structures, such as wind farms, are placed on migration routes. Although wind farms further offshore appear to have fewer interactions than near-shore wind farms, offshore wind farms may also act as resting spots and attract birds, especially well-lit wind farms.
- Vulnerability to wind farm collision is species dependant as common eider have been found to largely avoid wind farms as well as other manmade structures and vessels. Gull species, eagles and gannets were found to be the most at risk of turbine collision.

6.2.4 Introduction of microbial pathogens and Introduction of Invasive Non-Indigenous Species

Generic pressure description

For the introduction of microbial pathogens, the pressure relates to the untreated or insufficiently treated effluent discharges and run-off from terrestrial and offshore sources and vessels. It may also be a consequence of ballast water releases. In aquaculture where seed stocks are imported, 'infected' seed could be introduced, or microbial pathogens could be introduced from accidental releases of effluvia. Escapees, e.g. farmed salmon, could be infected and spread pathogens to the indigenous populations. Aquaculture may release contaminated faecal matter, from which pathogens could enter the food chain.

For introduction of Invasive Non-Indigenous Species (INIS), the pressure refers to the direct or indirect introduction of non-indigenous species e.g. Chinese mitten crabs, slipper limpets, Pacific oyster and their subsequent spreading and out-competing of native species. Ballast water, hull fouling, stepping stone effects (e.g. offshore wind farms) may facilitate the spread of such species. This pressure could be associated with aquaculture, mussel or shellfishery activities due to imported seed stock or from accidental releases. Introduction of predators such as mink, weasels, rats, hedgehogs and domestic cats can result in predation of nesting birds.

Overview of potential impacts

Introduction of Non-Indigenous Species (INIS) as a result of aquaculture can occur in two ways; either by INIS being intentionally introduced for the purposes of aquaculture (i.e. Pacific oyster and historically, the Manila clam) or being accidentally introduced with aquaculture species (i.e. with seed or in batches of adult stock). Intentional introductions are normally due to the species providing economic benefit, fast growth and adaptation to a wide ecological niche (Cook *et al.,* 2008), factors which often outweigh the potential ecological risk (Gozlan, 2010). Intentional introductions are usually subject to some form of testing prior to introduction to reduce the risk of environmental impacts but this does not always eliminate the risk entirely. The biggest risk comes from the accidental introduction of INIS to the marine environment. This can be through spill-over, escape or accidents in operation when farming INIS (Cook *et al.,* 2008). This is seen to be common for farmed Atlantic salmon with up to 2 million escaping each year into the North Atlantic Ocean and mass escapes of Pacific white shrimp have also been noted in the United States and Thailand (Cook *et al.,* 2008). Accidental introduction can also occur with species being introduced with seed or animal imports.

Introductions, by whatever method can affect species diversity, cause habitat modification, change ecosystem functioning, outcompete native flora and fauna, transfer disease and result in hybridisation with native species (Cook *et al.,* 2008). Non-indigenous aquatic species are seen as one of the top four anthropogenic threats to the world's oceans (Gollasch, 2006) and the second most important reason for biodiversity loss worldwide (Collins *et al.,* 2019). Changes to ecosystems and the response of native communities is complex and can be positive, negative or insignificant depending on the species involved, the location, the type of habitat and the scale of the introduction (Cook *et al.,* 2008). Although there can be biodiversity loss as a result of INIS, there can also be a net increase in diversity at the ecosystem level and benefits to ecosystem function (Stachowicz and Tilman, 2005). Other benefits can come through increased

sources for fishing (Gollasch, 2006) or in creating a new food source i.e. the Manila clam in Poole Harbour reducing the mortality of oystercatcher (Caldow *et al.,* 2007).

Effects on native species are seen as a big risk to native ecosystems. Competition between introduced and native species has been documented to occur to differing degrees with this posing more of a risk with aquatic plant species or invertebrates that attached to a substrate (Hill, 2008). Competition for spawning sites has been documented for non-native tilapia and carp where the spawning process of native fish is disrupted (Hill, 2008). Predation may also occur where non-native species predate on native species, this is most noticeable when a novel predator is introduced which is larger and more efficient for example the flathead catfish in US river systems which has reduce the abundance of redbreast sunfish *Lepomis auratus* and bullhead catfish *Ameiurus* spp. due to its large size (Hill, 2008). Other impacts involve changes to habitat which can affect community structure and water quality (Hill, 2008). The introduction of grass carp *Ctenopharyngodon Idella* changed the diversity of plant communities through its feeding preferences, thus reducing water clarity and ultimately changing the abundance and size of fish and invertebrate species (Hill, 2008). Extinction of native species is often attributed to the presence of non-native species however there are other environmental factors which are also likely to play a role in the distribution of different species such as habitat loss, changes in land use, eutrophication, over harvesting (Cook *et al.,* 2008). Of the 762 species globally document to have become extinct as a result of human activities in the past few hundred years (up to 2008), less than 2% is attributed to non-native species (Gurevitch and Padilla, 2004). Species in the marine environment are considered to be at lower risk of extinction due to larger more continuous habitats and the life history characteristics of many species including extensive dispersal potential increasing the ability for recolonization (Gurevitch and Padilla, 2004). However, where populations are declining for other reasons and exploitation of marine species has increased in the recent past, native species may be more susceptible to INIS introductions.

Movements of stock in to aquaculture areas have the potential to introduce pests, parasites and diseases (Gozlan *et al.,* 2006; Cook *et al.,* 2008). Diseases can also be introduced via species causing biofouling on the hulls of ships and by being carried in the water and sediments in ballast tanks (Cook *et al.,* 2008; Crego-Prieto *et al.,* 2015) as well as by natural means (Elston and Ford, 2011). There are mixed views on the ability of shellfish to introduce disease as a result of aquaculture. Transport of bivalves as juveniles, to be grown, on has been stated to be responsible for the spread of infectious shellfish diseases but this is not always well documented (Elston and Ford, 2011). In some cases, it is clear that the shellfish has been the vector for the disease i.e. the spread of *Bonamia ostreae* in Europe via oyster shipments from the US West Coast, however in others it is less clear cut i.e. the introduction of Pacific oysters to the US East Coast was blamed for introducing *Haplosporidium nelsoni* yet imports occurred in regions where the disease was not found and/or well before or after outbreaks (Elston and Ford, 2011). The ability of a disease introduced by aquaculture to infiltrate local populations is related to the discrepancy between potential high prevalence of infection in farmed animals when compared to lower or absent prevalence in wild populations (Gozlan *et al.,* 2006). If a disease becomes established in aquaculture stock then high stocking densities are a strong factor in that pathogen spreading within the stock (Gozlan *et al.,* 2006).

Examples of impacts

Whether accidental or intentional, the introduction of non-indigenous species has shown mixed impacts on the local marine ecology. Where species have been introduced for aquaculture such as *A. melas*, *Procambarus clarkia* or *P. parva* there have been documented ecological impacts on native fauna via disease introduction and direct competition with native species with no associated ecosystem benefits (Gozlan, 2010). The intentional introduction of the Pacific oyster (*Crassostrea edulis*) to the Pacific north west (USA) resulted in the unintentional introduction of the invasive smooth cordgrass *Spartina alterniflora* as packing

material for the transplanted oysters (Feist and Simenstad, 2000). *S. alterniflora* can re-engineer a habitat by providing biogenic structures that allow for fish, invertebrate and macroalgal recruitment and sediment accumulation (Ruesink *et al.,* 2006). Habitat modification was also caused in South African waters following the accidental introduction of the Mediterranean mussel *Mytilus galloprovincialis* (Robinson *et al.,* 2005). The species became the dominant intertidal mussel and modified the natural community composition by dominating rock surfaces. In addition, the faster growth, greater tolerance to desiccation and higher fecundity led to it being more dominant than the native mussel species (Robinson *et al.,* 2005).

Predation from an introduced species has been demonstrated in the green crab *Carcinus maenas* when it was introduced to North America in association with aquaculture species. The predatory preference for bivalves has led to suggestions that it is responsible for the decline in softshell clam populations and has also been seen to feed on mussel lines and in scallop cages (McKindsey *et al.,* 2007).

Bivalve species are used heavily for aquaculture and have been grown and transported for this purpose for hundreds of years. The introduction of oyster species including *Crassostrea gigas* and *Crassostrea virginica* have been suggested as one of the greatest single modes of introduction for other INIS species around the world and are well suited to establishing wild populations (McKindsey *et al.,* 2007). In the Netherlands and the German Wadden Sea, *C. gigas* introduced for aquaculture has formed natural, self-sustaining populations which have caused issues for mussel culture and conservation (McKindsey *et al.,* 2007). However, the introduction of *C. gigas* has also been documented to have benefits to local ecosystems. The presence of *C. gigas* on the intertidal was seen in increase the abundance of infauna and epifauna as well as bird species relative to a control site (Escapa *et al.,* 2004). Also, a study in Washington State showed that diversity and abundance of benthic organisms in mud flats were increased by the presence of *C. gigas* and on rocky shores in British Columbia, *C. gigas*, occupying the high intertidal zone, increased the surface area for barnacle species (Ruesink *et al.,* 2005). The slipper limpet *Crepidula fornicata* is another introduced species in Europe, believed to have arrived with imports of the oyster *Crassostrea virginica*. It is now widely spread across Europe, including the UK, and is considered a pest, changing the topography of the seabed, affecting commercial beds of oyster species and competing with other species for suspended food (Blanchard, 1997; Padilla *et al.,* 2011).

With regard to disease, the introduction of the trematode *Gyrodactylus salaris* with the Atlantic salmon into Norway led to serious salmon mortalities (Cook *et al.,* 2008). Importation of Japanese eels *Anguilla japonica* for cultivation trials in Europe also resulted in the release of a nematode that cause significant internal damage in other eel species including the native freshwater eel *Anguilla Anguilla* (Peeler *et al.,* 2011). The nematode then became dispersed by copepods and other hosts, becoming widely dispersed in Europe resulting in unknown implications for the population of the North Atlantic eel (Cook *et al.,* 2008). There are a number of examples from freshwater aquaculture which accounts for 80% of the aquatic species introductions (Gozlan *et al.,* 2006). The introduction of the topmouth gudgeon *Pseudorasbora parva* into an English fish farm carried with it an intracellular eukaryotic parasite. The escape of these farmed fish into the connected river system has introduced the potential for this pathogen to reach native fish populations. The crayfish plague also occurred as a result of aquaculture with imports of North American signal crayfish, which are resistant to the disease, introducing the oomycete fungus *Aphanomyces astaci* (Gozlan *et al.,* 2006). Native European crayfish species are highly susceptible to the pathogen which has led to eradication of populations in certain areas (Gozlan *et al.* 2006). Shellfish diseases have also been demonstrated to be spread by movement of animals. A paramyxean parasite, *Marteilia refringens* has been documented to cause mass mortalities in the European native oyster *Ostrea edulis* where movements of shellfish appear to have spread the disease between France, Spain and the Netherlands. Bonamiasis, caused by the haplosporean parasite *Bonamia ostreae* was also introduced to Europe via introduction of

infected *Ostrea edulis* from North America. First mapped in France, it has spread across Europe including the UK and is regarded as a major threat to oyster stocks (Gozlan *et al.,* 2006).

6.2.4 Summary

- Aquaculture is a common source of INIS, whether by intentional introduction as the species provides an economic benefit such as the pacific oyster and Manila clam (*no longer classified as INIS*), or by accidental introduction through accidents, escapes, or spill-over instances.
- Regardless of the method of introduction, INIS can modify habitats and species assemblages. INIS are the second biggest cause of global biodiversity loss through predation and competition with native species as seen with the introduction of the larger invasive flathead catfish and its detrimental effect on its native competitors and prey, providing no discernible ecosystem benefit.
- Despite the pressure INIS can exert on native populations, extinctions are usually the result of multiple factors with less than 2% of recorded anthropogenic-based fish extinctions primarily attributed to INIS.
- Studies suggest that marine species are at a lower risk of extinction due to living in larger more contiguous environments. However, INIS are still responsible for population declines.
- In the right circumstances, INIS can increase biodiversity at ecosystem levels through ecosystem services. Despite INIS Pacific oysters competing with native mussel populations in the Netherlands, its introduction has provided multiple ecosystem services. In Poole Harbour, the introduction of Manila clam for fishing has reduced the mortality of oystercatchers by creating a new food source.
- Transport for aquaculture, biofouling and natural migrations are all major sources of disease and parasite introduction. Shellfish aquaculture has been recorded as a notable vector for economically damaging diseases such as *Bonamia ostreae*. However, many marine diseases have multiple vectors making it difficult to confirm a source for emerging diseases.
- Overstocking and escapees has led to multiple instances of disease spread from relatively resistant farmed species to native species. The import of Japanese eels Anguilla to Europe resulted in the release of a nematode that harmed the populations of other eel species including the native freshwater eel.

6.2.5 Genetic modification & translocation of indigenous species

Generic pressure description

Genetic modification can be either deliberate (e.g. introduction of farmed individuals to the wild, GM food production) or a by-product of other activities (e.g. mutations associated with radionuclide contamination). The former is related to escapees or deliberate releases e.g. cultivated species such as farmed salmon, oysters and scallops if GM practices are employed. The scale of the pressure is compounded if GM species are ‘captured’ and translocated in ballast water. Mutated organisms as by-products could be transferred on ships hulls or in ballast water, with imports for aquaculture, aquaria and live bait, with species traded as live seafood or as part of ‘natural’ migration.

Overview of potential impacts

There is an increasing practice of selecting and modifying species for aquaculture to improve performance (Cook *et al.,* 2008). It is often seen as a method of aquaculture businesses being able to compete. Genetic modification in aquaculture results in the genetic variation residing at the population level rather than below the family level which is where variation in natural populations is found (Cook *et al.,* 2008). This can result in genetic complexes as a function of the environment in which the modified population has developed causing spatial, behavioural or temporal isolating mechanisms (Cook *et al.,* 2008). Select genetic modification results in the magnification of such genetic complexes within a species' population. Hybridization, introducing foreign DNA/genes into local populations as a result of breeding between native and genetically modified species is known as introgression (Crego-Prieto *et al.,* 2015). Modified animals breeding with natural populations and resulting hybridisation can result in the breakdown of these genetic complexes reducing fitness in the hybrid individuals (Skaala *et al.,* 2006). This can increase the risk of extinction in the hybridised natural population. This is seen to occur more for rare native species with some species showing hybridization with no negative effects. However, the extent of genomic introgression will depend on the degree of domestication of cultivated stocks and the quality and abundance of native populations (Crego-Prieto *et al.,* 2015). There is the potential for introgression to result in a loss of biodiversity and changes in the adaptation of native species to their local environment (Manchester and Bullock, 2000). The long-term effects of introgression are not well known and the modification of the gene pool of native species may cause unpredictable effects over longer time scales (Crego-Prieto *et al.,* 2015).

Examples of impacts

The driver for genetic modification is almost always improvements in performance of farmed species. Examples include Coho salmon *Oncorhynchus kisutch* introduced with growth hormones from Chinook salmon *Oncorhynchus tshawytscha* that then showed faster growth and hybridization between the Yesso scallop *Patinopecten yessoensis* and a local species *Chlamys farreri* improving growth performance (Cook *et al.,* 2008).

The occurrence of hybridisation has also been studied and the effects documented. In Spain, where farmed brown trout with a different genetic strain have bred with native brown trout the lower spawning success of cultured fish has entered into native populations with 25% of native populations showing genes of hatchery origin (Cook *et al.,* 2008). Trout species in the US also showed similar patterns where rainbow trout *Oncorhynchus mykiss* introduced into waters containing cutthroat trout *Oncorhynchus clarkia* passed genes from the introduced into the native fish, swamping rare stocks with new genetic material resulting in extinction of the original species (Hill, 2008). An assessment of mussel (*Mytilus*) populations on rocky shores on Vancouver Island showed a significant association between mussel farms and introduction of non-native species with between 0.6 and 8.7% of individuals carry genes from the non-native population, the 8.7% being in areas with more mussel farming (Crego-Prieto *et al.,* 2015). The study noted that the spread of non-natives and as such hybridization effects are strongly affected by currents with areas that have no nearby farms still showing some non-native species (Crego-Prieto *et al.,* 2015). Because this is a relatively new practice, the overall impacts on native populations are not well studied and although there are a number of studies demonstrating that genetic transfer and hybridization can occur, the long-term effects are not yet known.

6.2.5 Summary

- Genetic modifications can either be deliberate through modifying farmed species to be more commercially attractive or disease resistant, or contaminant-based mutations as a by-product of other activities.
- Modified animals can potentially breed with wild stock creating hybrids and introducing modified genes to native population (introgression). Hybridised populations can exhibit reduced fitness, increasing their risk of extinction. One study in Spain revealed that 25% of native brown trout showed genes of hatchery origin, with hybridised populations showing reduced spawning success.
- The long-term effect of introgression is poorly understood and may risk unpredictable population effects over longer time scales. Cutthroat trout have disappeared from some areas of the USA following the introduction of rainbow trout aquaculture. The native population was swamped with genetic material from farmed rainbow trout, leading to localised extinctions.

6.2.6 Abrasion/disturbance of the substrate on the surface of the seabed and penetration and/or disturbance of the substratum below the surface of the seabed; including abrasion

Generic pressure description

Physical disturbance or abrasion at the surface of the substratum in sedimentary or rocky habitats. The effects are relevant to epifloral and epifauna living on the surface of the substratum. In intertidal and sublittoral fringe habitats, surface abrasion is likely to result from recreational access and trampling (inc. climbing) by human or livestock, vehicular access, moorings (ropes, chains), activities that increase scour and grounding of vessels (deliberate or accidental). In the sublittoral, surface abrasion is likely to result from pots or creels, cables and chains associated with fixed gears and moorings, anchoring of recreational vessels, objects placed on the seabed such as the legs of jack-up barges, and harvesting of seaweeds (e.g. kelps) or other intertidal species (trampling) or of epifaunal species (e.g. oysters). In sublittoral habitats, passing bottom gear (e.g. rock hopper gear) may also cause surface abrasion to epifaunal and epifloral communities including epifaunal biogenic reef communities. Acivities associated with surface abrasion can cover relatively large spatial areas e.g. bottom trawls or bio-prospecting or be relatively localised activities e.g. seasweed harvesting, recreation, potting and aquaculture.

Overview of potential impacts

The use of mechanical and hydraulic dredges can cause physical damage to the sediment. This can be through a number of mechanisms including increased suspended sediment, increased turbidity, creation of sediment plumes, changes in sediment composition and alterations to seabed topography (Mercaldo-Allen and Goldberg, 2011; Natural England, 2014; Wheeler *et al.,* 2014). Changes in suspended solids, smothering and siltation are discussed in section 6.2.7.

Resulting impacts to the sediment can be in a change to the layering structure and corresponding grain size fractions as well as release of contaminants from underlying sediment layers (Jones, 1992; Kaiser *et al.,* 2003; Contessa and Bird, 2004; Roberts *et al.,* 2010; Cooper *et al.,* 2011). Changes to these aspects of

the sediment can result in a change to the benthic community and the ability of certain organisms to colonise in a specific area (Weiser, 1959; Ozolin'sh, 2000). Impacts resulting from anthropogenic activities are most evidence where the disturbance causes changes to the sediment which are elevated above normal background changes resulting from biotic and abiotic factors i.e. changes caused by benthic organisms through burrow formation and the deposition of faecal material (Probert, 1984). The creation of depressions can result in an accumulation of suspended sediment leading to greater proportions of fine-grained sediment fractions. This has been noted for bait pumping and digging where depressions persist after the activity has taken place (McClusky *et al.,*1983; Wynberg and Branch, 1994; Contessa and Bird, 2004).The scale over which changes can be seen, and therefore the overall impact on the associated community varies with, in some cases, the differences to the sediment being noticeable over small spatial scales i.e. between the centre and the top edge of a depression (Birchenough, 2015). It has been shown that changes to habitat structure in the immediate vicinity of certain macrofauna species (within 30cm2) was not closely related to changes in species diversity (Thrush *et al.,* 2001). In addition, communities within intertidal habitats will often exhibit a greater resilience to disturbance due to long-term adaptations as a result of higher levels of natural disturbance and a greater range of anthropogenic inputs (Dernie *et al.,* 2003).

Examples of impacts

One of the main potential impacts to the sediment from dredge activity is the creation of trenches and depressions in areas of mud or the smoothing of ripples and creation of ridges in sandier sediments (Wheeler *et al.,* 2014). The depth of penetration and the width of the resulting depression is largely determined by the type of fishing gear and how it is set up (i.e. tooth length), fishing practice (frequency, method of deployment and towing speed) and the target species (Mercaldo-Allen and Goldberg, 2011; Wheeler *et al.,* 2014). Mobile gears can penetrate from 5-30cm into the sediment with normal fishing practice (Johnson, 2002) with dredges documented to disturb the top 2-6cm (Thrush and Dayton, 2002). Specific studies on intertidal shellfish dredging found resulting furrows up to tens of centimetres deep (Kaiser *et al.,* 2006), while studies of the effects of clam dredging in Langstone Harbour, UK, based on the use of a modified oyster dredge, found a clear disturbance of muddy gravel sediment down to a depth of 15-20cm (EMU, 1992). A study in southern Portugal showed that the passage of a clam dredge produced a depression 30cm wide and 10cm deep (Constantino *et al.,* 2009) and trawling has been shown to leave tracks of 1-8cm in depth in mixed sediment habitats (Freese *et al.,* 1999; Roberts *et al.,* 2010). These depressions and tracks may persist for days (Gasper *et al.,* 2003), weeks (Manning and Dunnington, 1955; Mercaldo-Allen and Goldberg, 2011) or months (Wheeler *et al.,* 2014). The degree to which tracks persist may be dependent on the depth to which the gear has penetrated the sediment. The Portugal based study of impacts caused by clam dredging indicated that tracks at a depth of 6cm were no longer distinguishable after 24 hours but at a depth of 18cm remained visible for 13 days (Constantino *et al.,* 2009).

Studies on the impacts to the sediment composition have shown mixed results. Experimental clam dredging in Langstone Harbour using a modified oyster dredge led to the removal of the coarse grained, larger sand fractions with minor differences in the silt component (EMU, 1992). However, a study on the impacts of cockle suction dredging in the Dutch Wadden Sea showed a loss of fine silts and increase in the median grain size (Piersma *et al.,* 2001). It was postulated that the loss of adult shellfish as a result of the fishing practice may have resulted in a reduction in the production of faeces and pseudo-faeces which contribute to the fine-grained sediment fraction (Piersma *et al.,* 2001).

Parker and Pin (2005) assessed the effects of pump-scoop dredging for cockles in Poole Harbour and found that tracks were visible on the sediment at low tide. The time over which these marks disappeared was not assessed but it was postulated that they may only persist for a short time based on evidence from other surveys which showed no detectable effect on the sediment from suction dredging after 40 days (Hall and Harding, 1997) and in the Solway Firth, trenches from

tractor dredges disappearing after one day (Hall and Harding, 1997). Scar marks from pump-scoop dredging were also detected in Poole Harbour using aerial photographs (Clarke *et al.,* 2018; Clarke *et al.,* 2019) but no assessment was made of the time taken for these marks to disappear. Studies of the impacts on the macrobenthos have also been studied for pump-scoop dredging in Poole Harbour where an increase in colonisation by opportunistic species was found following disturbance and a decline in smaller mollusc species (Clarke *et al.,* 2018). The study documented no impact on the organic content of the sediment but did note reduction in fine sediments in a heavily dredged site however there was no large-scale shift in the overall biotope or habitat quality (Clarke *et al.,* 2018).

Clarke *et al.,* (2018b) undertook a similar study to assess the impacts of mechanical shellfish dredging using a box dredge and a ladder dredge on the sediment characteristics of Langstone Harbour in areas subject to three different management regimes for bottom towed fishing gear. Samples taken from areas seasonally open to shellfish dredging, recently closed permanently to shellfish dredging and areas historically closed to bottom towed fishing gear (since January 2014) showed an increase in organic content and volume of fine grained sediment in the control samples throughout the study period but no significant difference between the control and dredged sites.

6.2.6 Summary

- Mechanical and hydraulic dredges can cause physical damage to the sediment by increasing sediment suspension and turbidity, the creation of sediment plumes, changes in sediment composition and alterations to seabed topography.
- These impacts can have knock-on effects on the biota that depend on them. Dredging activity often creates trenches and depressions in muddy areas which can lead to changes in sediment gradient, limiting the colonisation of certain organisms,
- The depth, size and longevity of these depressions are gear-dependent, with studies showing mixed results. Experimental clam dredging in Langstone Harbour using a modified oyster dredge led to the removal of large coarse-grained sand, whilst another study on cockle suction dredging in the Wadden Sea showed a loss of fine silt and an overall increase in median grain size. The increase in grain size was attributed to the loss of adult shellfish whose faeces and pseudo-faeces formed part of the fine grains.
- Pump-scoop dredge tracks are suggested to disappear after 40 days. An increase in colonisation by opportunistic species was recorded following dredging at the expense of smaller mollusc species. Although fine sediment loss was recorded, no major shifts in habitat quality were detected.
- A similar result was found in a study based in Langstone Harbour by Clarke *et al*., (2018b) where despite a decrease in organic content and fine gradient sediment, no significant differences were found between the control, and sites dredged using a box dredge and ladder dredge.

6.2.7 Changes in suspended solids (water quality) and Smothering and siltation rate changes (light)

Generic pressure description

Changes in suspended solids (water quality) relates to changes in water clarity from changes in sediment and organic particulate matter concentrations. It is related to activities disturbing the sediment and/or organic particulate mater thereby mobilising it into the water column. Anthropogenic activities such as all forms of dredging, disposal at sea, cable and pipeline burial, secondary effects of construction work e.g. breakwaters all affect water clarity. Particle size, hydrological energy (current speed and direction) and tidal excursion are all influencing factors on the spatial extent and temporal duration. This pressure also relates to changes in turbidity from suspended solids of organic origin. Salinity, turbulence, pH and temperature may result in flocculation of suspended organic matter. Anthropogenic sources are mostly short lived and occur over relatively small special extents but could affect species that rely on underwater vision for hunting.

For smothering and siltation rate changes (light) refers to when the natural rates of siltation are altered (increased or decreased). Siltation (or sedimentation) is the settling out of silt/sediments suspended in the water column. Activities associated with this pressure type include mariculture, land claim, navigation dredging, disposal at sea, marine mineral extraction, cable and pipeline laying and various construction activities. It can result in short lived sediment concentration gradients and the accumulation of sediments on the sea floor. This accumulation of sediments is synonymous with 'light' smothering, with relates to the depth of vertical overburden. 'Light' smothering relates to the deposition of layers of sediment on the seabed. It is associated with activities such as sea disposal of dredged material where sediments are deliberately deposited on the sea bed. For 'light' smothering most benthic biota may be able to adapt i.e. vertically migrate through the deposited sediment.

Overview of potential impacts

Resuspension of sediment can impact benthic communities through smothering, burial and increased turbidity. Depending on the scale and spatial extent of the activity, effects may extend to organisms living a distance away from the fished area (Kyte and Chew, 1975; Vining, 1978). The severity of impacts may increase with increased levels of sediment being resuspended and regular exposure to such events (Mercaldo-Allen and Goldberg, 2011). Increased water turbidity can inhibit respiratory and feeding functions as well as burrowing capacity for benthic organisms and clog the gills of fish (Dorsey and Penderson, 1998; Johnson *et al.,* 2002). Smothering on the sea floor can also result in the creation of hypoxic or anoxic conditions in the sediment (Morgan and Chuenpagdee, 2003). Small and immobile species are most vulnerable to smothering (Manning, 1957) and the redistribution/increase in the deposition of finer grained sediment can hinder the settlement of certain organisms that cannot access shell or cultch materials (Tarnowski, 2006). The severity of impacts from these pressures is largely determined by the sediment type, the level of sediment burden and the tolerance of organisms (largely related to their biology i.e. mobility, relationship to substrate, life history) (Coen, 1995). Shallow water environments with sediments that have a high silt and clay content are thought to be more likely to experience larger plumes and therefore greater turbidity (Ruffin 1995; Tarnowski, 2006).

Examples of impacts

Studies conducted in England and in Florida found that the redistribution of sediments caused by dredging activity did not result in the smothering of benthic organisms within the nearby area, with any impacts limited to the directly disturbed area of the dredge (Schroeder, 1924; Spencer *et al.,* 1998). Estuarine ecosystems, where small-scale dredging often takes place, are high variable environments with elevated and variable suspended sediment loads and organisms which are therefore well adapted to such conditions (Coen, 1995). Organisms commonly associated with estuarine environments are therefore generally considered to be tolerant to short-term perturbations in sediment loads (Lutz, 1938; Kyte *et al.,* 1975). Experiments under laboratory conditions have shown that the majority of estuarine infaunal species are able to survive burial depths of up to 20cm or more, however epifaunal and non-mobile species were seen to suffer high mortality rates after burial (Coen, 1995). Seagrass beds are also at risk of burial by suspended sediments, a study on the species *Zostera noltii* showed 50% shoot mortality after burial with 2cm of sediment and 100% mortality at 8cm (Cabaco *et al.,* 2008). The occurrence and growth of the seagrass species *Zostera marina* was also found to be highly dependent on the transparency of the water column (Giesen *et al.,* 1990) with a clear relationship between transparency and the maximum depth at which sublittoral strands of *Z. marina* were found (de Jonge and de Jong, 1992).

Visual predators also rely on light in order to find, recognize and capture prey (Karel, 1999). The degree to which visual predators will be affected by increased turbidity is related to the tolerances of the predator as well as the characteristics of the prey (i.e. size, enhanced ability to escape in turbid waters) (Karel, 1999). For fish species, herring and sprat were noted to avoid turbid waters while dab was seen to decline in the Dutch Wadden Sea after 1960, replaced by young plaice, a changed seen to be related to an increase in turbidity in the western part of the Sea (de Jonge *et al.,* 1993). Common tern and Sandwich tern are also visual feeders, commonly targeting young herring, sprat and sand-eel, and are directly affected by the turbidity of the water column. The increase in the turbidity of the water in the Dutch coastal zone since the 1960s was considered a possible cause of the reduction in breeding success of Sandwich terns in the Wadden Sea area with the decline attributed to the birds having to fly a greater distance in order to find clear water and obtain prey (Karel, 1999).

Particle tracking models have been used to determine the effect of towing dredges on suspended sediments and smothering (Dale *et al.,* 2011). For a vessel towing 8 dredges each side in a water current of 0.1m per second, the model suggested that the majority of all sediment size classes suspended in the water column settled within 100m of the dredge (Dale *et al.,* 2011). For sand and large particles, all but 3.6% of the particles settled within 10m of the dredge however for the silt fraction, 92.5% was seen to persist in the water column 100m away from the dredge site (Dale *et al.,* 2011). The total sediment accumulation immediately outside the dredging areas was documented at 1.6mm and, after 1 hour, only 8.2% of the suspended silt remained in suspension, 315m from the dredge site. These figures are comparable to low suspended sediment levels found naturally (Dale *et al.,* 2011). It was documented that if suspended sediment from multiple fishing vessels coincided, it would take more than 15 tows for silt concentrations to match low natural levels and more than 200 tows for levels to equal those seen during storm conditions (Dale *et al.,* 2011). The model was assessing impacts on adjacent reef features and determined that the reefs were only at risk if they were within 10m of the dredge site and that those at a distance further than this would not be significantly affected beyond natural levels.

Additional studies have found similar results, with sediment plumes documented up to 30m beyond the dredge site in some cases (Manning, 1957; Haven, 1979; Manzi *et al.,* 1985; Maier *et al.,* 1998). In most cases however, the suspended sediment rapidly returns to low levels with the rate of return increasing with distance from the dredge activity (Kyte *et al.,* 1976; Maier *et al.,* 1998) with one study showing 98% resettling within 15m (Mercaldo-Allen and Goldberg, 2011). The effects caused by sediment plumes and enhanced turbidity levels appear to be temporary, with the majority of sediment plumes disappearing within 30 minutes to 24 hours of dredging taking place (Lambert and Goudreau, 1996; Maier *et al.,* 1998).

It is thought that the resuspension of sediment caused by clam dredging in comparison to long-term wild-induced suspension of sediments may be relatively minor (Auster and Langton, 1999). Natural levels of turbidity, generated by wind and tide action, has been shown to produce particle loads equal to or exceeding those caused by dredging disturbance (Tamowski, 2006). Organisms living in inshore environments are therefore more adapted to tolerating the resuspension of sediment to a certain level (Tarnowski, 2006). The limitation of shellfish dredging to discrete areas also results in the effects of resuspension occurring over a much smaller spatial scale than those caused by natural disturbance (Wilber and Clarke, 2001).

6.2.7 Summary

- Anthropogenic activities such as all forms of dredging, disposal at sea, cable and pipeline burial, and secondary effects of construction works all effect water clarity.
- Resuspension of sediment can impact benthic communities through smothering, burial, and increased turbidity. Higher water turbidity can inhibit respiratory and feeding functions for various organisms, especially visual hunters.
- Declines in dab populations in the Wadden Sea were attributed to higher water turbidity, whilst herring and sprat have been recorded avoiding more turbid areas.
- Many of these fish species such as herrings, sprat, and sand-eel are an important food source. Increased water turbidity was linked to a decline in Sandwich turns breeding success in the Wadden Sea as the turns travelled longer distances to clearer waters, increasing their energy consumption.
- Seagrass also show a clear relationship between water transparency and depth, with higher water turbidity decreasing light penetration and therefore, photosynthesis. In contrast to estuarine infaunal species, epifaunal non-mobile species such as seagrass are also prone to suffering high mortalities following burial and smothering from dredging activity.
- Multiple studies suggest that the sediment plumes caused by dredging gear is relatively short-lived and that water turbidity will decline to base levels within a day of dredging.
- Natural levels of turbidity, generated by wind and tide action, have been shown to produce particle loads equal to or exceeding those caused by dredging disturbance. Therefore, organisms living in more dynamic environments may be more tolerant to the effects of resuspension.

6.2.8 Physical change (to another sediment type)

Generic pressure description

The permanent change of one marine habitat type to another marine habitat type, through the change in substratum, including to artificial (e.g. concrete). This therefore involves the permanent loss of one marine habitat type but has equal creation of a different marine habitat type. Associated activities include the installation of infrastructure (e.g. surface of platforms or wind farm foundations, marinas, coastal defences, pipelines and cables), the placement of scour protection where soft sediment habitats are replaced by hard/coast substratum habitats, removal of coarse substrata (marine mineral extraction) in those

instances where surficial finer sediments are lost, capital dredging where the residual sedimentary habitat differs structurally from the pre-dredge state, creation of artificial reefs, mariculture i.e. mussel beds. Protection of pipes and cables using rock dumping and mattressing techniques. Placement of cuttings piles from oil and gas activities could fit this pressure type, however there may be additional pressures e.g. pollution and other changes. This pressure excludes navigation dredging where the depth of sediment is changed locally but the sediment typology is not changed.

Overview of potential impacts

The physical change of one marine habitat type to another encompasses a wide range of habitats including saltmarsh, seagrass and intertidal sediments. Previous advice from Natural England has indicated that erosion of saltmarsh may take place where shellfish dredging occurs in close proximity to the habitat. A study by Dyrynda (1995) referenced in Liley *et al.* (2012) also indicates the ability for bottom towed fishing gear, in this case bait dragging, to cause changes to certain habitats and communities involving rooted species such as saltmarsh, seagrass and beds of the peacock worm *Sabella pavonina*. However, the study notes that these areas are not usually suitable for this particular gear type and are actively avoided by fishers resulting in no impact. It is recognised that bottom towed fishing gear is unlikely to occur over saltmarsh habitats and this is further supported by a lack of literature on this subject. With regard to intertidal sediments, impacts and changes to sediment type i.e. change in the dominant grain size fraction, organic matter content etc. the resultant change arises as a result of direct impacts to the sediment from pressures such as abrasion, penetration and siltation. The potential for these pressures is explored in sections 6.2.6 and 6.2.7.

6.2.8 Summary

- The physical change of one marine habitat type to another through changes in the substratum encompasses a wide range of habitats.
- Shellfish dredging in proximity to saltmarshes can lead to erosion and loss of habitat.
- The loss of ecosystem building species can result in the transformation of a habitat. Bait dragging has been shown to transform seagrass and peacock worm beds by removing key rooted species.
- Habitat change is often associated with changes in sediment type such as grain size, type, and organic matter content. These pressures are explored in sections 6.2.6 & 6.2.7.

6.3 Site Condition

Natural England provides information on the condition of designated sites and describes the status of interest features.

Under the Habitats Directive, relevant for Special Areas of Conservation (SACs) and Sites of Community Importance (SCIs), the United Kingdom is obliged to report on the Favourable Conservation Status of Annex I and Annex II features every 6 years. There are similar reporting requirements under the Birds Directive, relevant for Special Protection Areas (SPAs). Feature condition influences the Conservation Objectives in that it is used to determine whether a 'maintain' or 'recover' objective is needed to achieve the target level for each attribute.

During 2015-16 Natural England reviewed, refined and tested condition assessment methodology to provide more robust results. Natural England aimed to employ this methodology to start a rolling programme of marine feature condition assessments in 2017-18, conducted by their Area Teams. The condition assessment currently available for Poole Harbour SPA is comprised of an assessment of the bird features of the Harbour, completed in March 2025, supplemented by the condition assessment (CA) of Poole Harbour SSSI which was compiled in 2010, with a few of the units having been re assessment in 2018.

6.3.1 Poole Harbour SPA Feature Condition Summary

Feature	Condition	Confidence	Rational for Adverse Conditions	Condition Threats	Comments	Aquaculture Identified as a Potential Threat
Black-Tailed Godwit	Unfavourable – No Change	High	• Nutrient enrichment • Visual disturbance – *attributed to recreational activities* • Agriculture – fertiliser use • Freshwater pollution – water pollution – discharge • Recreation	• Removal of non-target species • Fishing (*relating to shore gathering activities under CA)*	Decline and fragmentation in saltmarsh habitat with loss of transitional habitats, saltmarsh and mudflats in certain areas smothered by opportunistic macroalgal mat from eutrophication from hyper-nutrified water quality. Recreational activities increasing.	No
Spoonbill	Unfavourable – No Change	High	• Nutrient enrichment • Visual disturbance – *attributed to recreational activities* • Agriculture – fertiliser use • Freshwater pollution – water pollution – discharge • Recreation	None listed	Rationale listed as decline and fragmentation in saltmarsh habitat with loss of transitional habitats, saltmarsh and mudflats in certain areas smothered by opportunistic macroalgal mat from eutrophication from hyper-nutrified water quality. Recreational activities increasing.	No

Common Tern	Unfavourable – No Change	High	• Nutrient enrichment • Agriculture – fertiliser use • Freshwater pollution – water pollution – discharge	None listed	Noted that abundance is favourable, unfavourable condition related to productivity and water quality attributes. Productivity fluctuating, not consistently below sustainable levels, varied over last 20 years from 0.01-1.57 chicks per pair, only above 1 in 2017 & 2018, reasons for productivity fluctuations unknown. Saltmarsh and mudflats in certain areas smothered by opportunistic macroalgal mat from eutrophication from hyper-nutrified water quality.	No
Mediterranean Gull	Unfavourable – No Change	High	• Nutrient enrichment • Agriculture – fertiliser use • Freshwater pollution – water pollution – discharge • Physical change (to another sediment type) – *related to specific nesting areas* • Climate Change	• Removal of target species	Abundance of feature favourable, productivity unknown, islands used for nesting are threatened by decline, erosion and fragmentation of *Spartina* saltmarsh and sea level rise, flooding of the islands has caused the loss of all nests. Saltmarsh and mudflats in certain areas smothered by opportunistic macroalgal mat from eutrophication from hyper-nutrified water quality.	No
Shelduck	Unfavourable – declining	High	• Nutrient enrichment • Visual disturbance – *attributed to recreational activities* • Agriculture – fertiliser use • Freshwater pollution – water pollution – discharge • Recreation	• Removal of non-target species • Fishing (*relating to shore gathering activities under CA)*	Continuing decline in numbers, national decline is observed but degree of decline in Poole Harbour considered to be related to site-specific factors, main one being macroalgal mats cause by eutrophication from water quality. Macroalgal mats smother intertidal sediment used for foraging and main prey species *Hydrobia* sp. Is reduced as a result. Pump-scoop dredging noted to reduce number of *Hydrobia* sp. in the sediment. Anthropogenic disturbance from recreational activities is contributing to decline.	No

Avocet	Unfavourable – No Change	High	• Nutrient enrichment • Visual disturbance – *attributed to recreational activities* • Agriculture – fertiliser use • Freshwater pollution – water pollution – discharge • Recreation	• Removal of non-target species • Fishing (*relating to shore gathering activities under CA)*	Abundance favourable, unfavourable condition resulted from extent of supporting habitat, water quality and human disturbance. Saltmarsh and mudflats in certain areas smothered by opportunistic macroalgal mat from eutrophication from hyper-nutrified water quality. Recreational activities increasing.	No
Sandwich Tern	Unfavourable – No Change	High	• Nutrient enrichment • Agriculture – fertiliser use • Freshwater pollution – water pollution – discharge	None Listed	Abundance favourable, unfavourable condition from productivity, food availability and water quality. Productivity fluctuating, not consistently below sustainable levels, varied over last 20 years from 0.21-1.36 chicks per pair, only above 1 in 2018, reasons for productivity fluctuations are speculative. Food availability considered sufficient to raise one chick, but on Brownsea Island 2-3 eggs laid. Saltmarsh and mudflats in certain areas smothered by opportunistic macroalgal mat from eutrophication from hyper-nutrified water quality.	No
Little Egret	Unfavourable – No Change	High	• Nutrient enrichment • Visual disturbance – *attributed to recreational activities* • Agriculture – fertiliser use • Freshwater pollution – water pollution – discharge • Recreation	• Removal of non-target species • Fishing (*relating to shore gathering activities under CA)*	Abundance favourable and species likely not as affected as others by declines in certain habitats. Saltmarsh and mudflats in certain areas smothered by opportunistic macroalgal mat from eutrophication from hyper-nutrified water quality. Recreational activities increasing. Access to intertidal sediments for foraging are impeded by macroalgal mats but does not appear to affect this species, likely due to variety in prey type and how they forage. Diversity of food could	No

					be reduced by this, along with bait-digging and pump-scoop dredging.	
Waterbird Assemblage	Unfavourable – declining	High	• Nutrient enrichment • Visual disturbance – *attributed to recreational activities* • Agriculture – fertiliser use • Freshwater pollution – water pollution – discharge • Recreation	• Removal of non-target species • Fishing (*relating to shore gathering activities under CA)*	Overall abundance stable, diversity of assemblage is declining, over a third of species of the assemblage declining by over 50% and 7 species by over 75%. Decline and fragmentation in saltmarsh habitat with loss of transitional habitats, saltmarsh and mudflats in certain areas smothered by opportunistic macroalgal mat from eutrophication from hyper-nutrified water quality. Recreational activities increasing.	No

6.3.1 Poole Harbour SSSI Condition Assessment

An indication of the condition of site interest features can also be inferred, if available, from assessments of SSSIs[16] that underpin the SPA. The Poole Harbour SSSI was extended in 2018 to include four new areas, the largest of which being open water and channels below mean low water. The relevant feature condition assessments for units under the Poole Harbour SSSI are summarised in table 8.

Table 8: Relevant feature condition assessments for units under the Poole Harbour SSSI

Unit Number	Unit Name	Habitat	Condition
001	Sandbanks	Littoral Rock	Favourable
002	Whitley Lake	Littoral Sediment	Favourable
015	Ham Common	Littoral Sediment	Favourable
037	Patchin Point and Arne Bay	Fen, Marsh and Swamp – Lowland	Unfavourable – declining
046	Long and Round Island saltmarsh and mudflat	Fen, Marsh and Swamp - Lowland	Favourable
047	Ower Bay and Fitzworth	Fen, Marsh and Swamp – Lowland	Unfavourable – declining
050	Green Island Shoreline	Fen, Marsh and Swamp – Lowland	Favourable
052	Newton Bay	Fen, Marsh and Swamp – Lowland	Unfavourable – declining
053	Inner Brands Bay and Drove Island	Fen, Marsh and Swamp – Lowland	Unfavourable – declining
054	Bramble Bush Bay, east South Deep and Stone Island	Fen, Marsh and Swamp – Lowland	Favourable

[16] SSSI Condition assessments: http://designatedsites.naturalengland.org.uk/.

060	Brownsea South Shoreline	Littoral Sediment	Unfavourable – Recovering
061	Furzey Shoreline	Littoral Rock	Favourable
062	Goathorn mudflat	Littoral Rock	Unfavourable – declining
063	Brands Bay North	Littoral Rock	Unfavourable – declining
064	Brands Bay East	Littoral Sediment	Unfavourable – declining
065	Poole Harbour Channels and Open Water	Littoral Sediment	Unfavourable – declining

Overall, the SSSI condition assessments appear to suggest that the units considered are generally in favourable condition, except for five units, notably bays or inlets located within the southern region of Poole Harbour, where the condition is unfavourable – declining. For each unit, comments are provided on the rationale for the condition, there are common rationales across multiple units therefore these have been given here in summary.

Unfavourable condition is caused by significant algal mat coverage, largely driven by eutrophication, saltmarsh decline and low numbers of Shelduck where studies suggest decline may be linked to reduced food availability as a result of opportunistic algal mat cover possibly leading to a physical inhibition of feeding activity in the presence of dense algal mats. For Unit 65, reference is made to unfavourable winter dissolved inorganic nitrogen (DAIN), particularly away from the Harbour entrance. Phytoplankton species assemblage has also been noted to change with diatom species characteristic of high nutrient conditions replacing those typical of lower nutrient conditions. The overall nitrogen loading into the Harbour is noted to exceed that where typically seagrasses are eliminated and estuaries become dominated by macroalgae. The largest subtidal seagrass beds have been noted to remain stable in area between 2008-2015 but there is evidence that seagrass was historically more widespread. For wildfowl species, it is noted that Goldeneye and Red-breasted merganser numbers have declined but numbers of tern species, Brent goose, Teal, Pintail and Cormorant have all remained stable or increased. The unit of Brownsea South Shoreline is unfavourable – recovering with the removal of sea defences by the National Trust deemed to be the remedy to the unfavourable status. A number of units considered to be in favourable condition do note reductions in the overall biomass of small invertebrates (particularly worms) with respect to intertidal sediment communities, presence of algal mats and lower numbers of bird species however, these provisions do not constitute a reason to classify such units as unfavourable.

6.3.2 Population Trends

Population trend data, where available, can be used to identify site-specific pressures. Information on population trends comes from Natural England's Conservation advice packages available here: https://designatedsites.naturalengland.org.uk/. The setting of population abundance targets for the species is derived based on Wetland Bird Survey (WeBS) and JNCC's Seabird Monitoring Programme (SMP) population data.

Table 9: Population abundance targets for the bird species found in the Poole Harbour SPA. Please note all information presented in this table has been taken from Natural England's Conservation Advice Package available at: https://designatedsites.naturalengland.org.uk/. These do not represent condition assessments.

Species	Target	Explanation
Avocet	Maintain	Since classification, the avocet population has increased in number in Poole Harbour, with a current five-year peak mean (2015/16-2019/20) of 1,526 individuals. This represents 19% of the latest GB wintering population estimate of 7,969 individuals. Poole Harbour ranks as the fourth most important wintering site in the UK.
Black-tailed godwit (Icelandic Race)	Maintain	Since classification, the black-tailed godwit population has steadily increased in number in Poole Harbour, with a baseline (2012/13 to 2016/17) of 2,030 individuals. The most recent five-year peak reached 3,110 individual birds (2015/16 – 2019/20) This represents 7.6% of the British population and Poole Harbour is ranked as the 7th most important wintering site in the UK for this species.
Common tern	Maintain	When classified in 2000 the site supported 155 pairs, representing over 1% of the British population. The number of nesting pairs of common terns during a recent five-year period (2011-2015) were: 2011 - 222 pairs, 2012 - 171 pairs, 2013 - 163 pairs, 2014 - 145 pairs. This provided an updated baseline for the Poole Harbour SPA of 178 pairs (or 356 breeding adults), representing 1.78% of the GB breeding population. The most recent five-year mean of 174 pairs (2017-2021) represents 1.6% of the GB breeding.
Little egret	Maintain	The current five-year peak mean (2015/16 - 2019/20) is 155 individuals (with 114 at time of designation), representing 2.6% of the British population. The most recent WeBS report indicates that Poole Harbour currently ranks as the 8th most important overwintering site in the UK for this species.
Mediterranean gull	Maintain	Since classification in 1999, the number of breeding pairs of Mediterranean gulls in Poole Harbour has increased from 5 pairs to a baseline of 64 pairs in 2015. This count represented a 10-fold increase in numbers since the site was originally classified. The most recent count of 155 pairs in 2018 represents 13% of the latest (2013 to 2017) GB breeding population estimate of 1200 pairs.
Sandwich tern	Maintain	The most recent five-year mean (2017-2021) is 154 pairs, represents 1% of the GB breeding population (2013 - 180 pairs, 2014 - 210 pairs, 2015 - 174 pairs, 2016 - 189 pairs, 2017 - 140 pairs).
Shelduck	Restore	Since classification in 1999, the shelduck population in Poole Harbour has declined by 66%, with a current five-year peak mean of 1,223 individuals (2015/16 - 2019/20). Poole Harbour is currently only the 17th most important site for the species in the UK, holding less than 0.4% of the north-west European population. We do not have site-specific information about the cause of the decline, although a study in 2010 suggested that food availability for shelduck in Poole Harbour was borderline, and extensive algal mats may be inhibiting effective foraging (Herbert et al., 2010).
Spoonbill	Maintain	The current five-year peak mean (2015/16 - 2019/20) is 54 individuals (20 at time of designation), representing 27% of the British population. The most recent WeBS report indicates that Poole Harbour currently ranks as the most important overwintering site in the UK.
Waterbird Assemblage	Maintain	The latest five-year peak mean is 25,091 individuals (2015/16-2019/20) forming a new assemblage baseline, with the highest peak count being 26,184 individuals in 2016/17.

It is important to note that the time periods of data used to inform conservation advice packages vary and therefore this data may not have captured the effects of fishing activities that have since commenced or altered since publication. The effects of fishing activities may not necessarily be captured in the next population abundance targets due to the time lag between cause and effect. With respect to aquaculture activity, there has been very little change in fishing practice over recent years and therefore there are not likely to be any impacts of this activity on these species when compared to the numbers quoted in the Conservation Advice packages.

Additional analysis of bird count data (WeBS data) was undertaken by Natural England in 2012. This analysis highlighted declines in the numbers of overwintering birds in some sectors of the Poole Harbour. The data analysis highlighted in particular there was concern regarding declines in some species in Lytchett Bay (shelduck, redshank and dunlin), Brands Bay (shelduck, redshank, dark bellied brent geese, dunlin) and Wych (shelduck, black tailed godwit, dunlin). One of these areas (Brands Bay) concurs with the Poole Harbour SSSI which classified Brands Bay as being in an 'unfavourable – declining' condition.

6.3.3 Site-Specific Seasonality Table

Table 10 below indicates (highlighted in grey) when significant numbers of each mobile designated feature are most likely to be present at the site during a typical calendar year. Periods highlighted in grey are periods to be aware of with regard to planned aquaculture activity within the Poole Harbour Fishery Order 2015. The absence of overlap between the location of T3 lease beds and the areas highlighted as key for bird features of the SPA ensures that impacts from aquaculture on feeding, roosting and breeding are minimised year-round including the significant periods outlined in table 10. It is noted that the months not highlighted in grey do not necessarily indicate when features are absent, rather that features may be present in less significant numbers, however this is still mitigated by the location of T3 lease beds in relation to bird sensitive areas.

Table 10. Presence by month of mobile designated features at the Poole Harbour SPA (updated by Natural England, March 2020). Grey indicates periods of presence in significant numbers whereas blank (white) indicates either periods of absence or of presence but only in numbers of less significance.

Common Name	Latin Name	Designated Season	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Reference
Avocet	*Recurvirostra avosetta*	Nonbreeding; Wintering													Cramp and Simmons, 1983; British Trust for Ornithology (BTO), 2014
Black-tailed godwit	*Limosa limosa*	Nonbreeding; Wintering													Wernham *et al*., 2002

Common tern	*Sterna hirundo*	Breeding													Forrester and Andrews, 2007; Pennington *et al*., 2004; Wernham *et al*., 2002; Cramp and Simmons, 1983
Mediterranean gull	*Larus melanocephalus*	Breeding													Cox, 2014; Hunnybun and Hart, 2011; Wernham *et al*., 2002; Cramp and Simmons, 1983
Shelduck	*Tadorna tadorna*	Nonbreeding; Wintering													Cramp and Simmons, 1977; Liley and Fearnley, 2012; British Trust for Ornithology (BTO), 2014
Little egret	*Egretta garzetta*	Nonbreeding; Wintering													WeBS data
Sandwich tern	*Sterna sandvicensis*	Breeding													Seabird Monitoring Programme
Spoonbill	*Platalea leucorodia*	Non-breeding													BTO data (analysed 13th August 2015)

6.4 Existing Management

Whilst management for The Order is specific and operates within the defined area of lease beds, there are additional fishing activities which take place within Poole Harbour which are managed by Southern IFCA. The following management measures are currently those which have specific reference to Poole Harbour (*note that this may also include District wide provisions where there is specific management for Poole Harbour*):

- **Bottom Towed Fishing Gear Byelaw 2016** – prohibits bottom towed fishing gear over sensitive features including seagrass features within the Poole Harbour SPA.

- ***Bottom Towed Fishing Gear Byelaw 2023*** – a proposed update to the BTFG Byelaw 2016 is being considered by the MMO and Defra, the BTFG Byelaw 2023 includes extensions to prohibited areas for BTFG in seagrass beds in Poole Harbour
- **Fishing for Cockles** byelaw – describes methods by which are cockles are permitted to be fished, including hand picking, using a rake (max. 305 mm wide head and spaces of 22.5 mm between the teeth) and dredge (basket must not exceed 460 mm in width by 460 mm in depth by 300 mm high and spaces of no less than 22.5 mm).
- **Memorandum of Agreement for Bait Digging within Poole Harbour – b**ait diggers are asked to avoid conducting activity within the bird sensitive areas in Poole Harbour between 1st November and 30th March, backfill any holes which are dug and a number of general provisions, including avoiding trampling saltmarsh and reedbeds and carrying torch lights at night which may disturb roosting birds.
- **Net Fishing** byelaw – regulates net fishing within the district through Net Prohibition, Net Restriction and Net Permit Areas. Poole Harbour contains both Net Prohibition and Net Restriction areas, the latter limiting the type of net fishing which can occur on a seasonal basis. Additional provisions including the operation of a ring net and marking of nets.
- **Poole Harbour – Prawns Close Season –** byelaw states that no person shall in Poole Harbour west of and within the line of the ferry across the mouth of the Harbour fish for any prawns or remove any prawns from the fishery between 1st January and 31st July in any year (both days inclusive)
- **Poole Harbour Dredge Permit** byelaw – prevents a person or vessel using, retaining on board, storing or transporting a dredge within Poole Harbour except in accordance with a permit issued by the Authority, technical provisions under Permit Conditions manage dredge fishing gear, species harvested and introduce spatial and temporal restrictions.
- **Poole Harbour Shellfish Hand Gathering** byelaw - prohibits persons from fishing for or taking shellfish by hand picking or using a hand rake or similar instrument from 1st November to 31st March in defined areas.
- **Prohibition of Gathering (Sea Fisheries Resources) in Seagrass Beds** byelaw. This prohibits any person from digging for, fishing for or taking any sea fisheries resource in or from the prohibited areas and does not apply to fishing/taking fisheries resources by means of net, rod and line and hook and line. It also does not apply to fishing for/taking sea fisheries resources using a vessel, provided that no part of the vessels hull in contact with the seabed. No person shall carry a rake, spade, fork or any similar tool in prohibited areas.

  Additional regulations apply to the Southern IFCA District requiring commercial fishers to hold a permit with Southern IFCA, limiting the size of vessel which can operate in the District and creating Minimum Conservation Reference Sizes, there are also byelaws which apply District wide – details of all Southern IFCA regulations can be found on the website - https://www.southern-ifca.gov.uk/all-regulations.

6.5 Summary of Impacts

The potential pressures identified through the TLSE for features and supporting habitats, provided in Tables 2 and 3 along with relevant attributes, have been considered in terms of the nature and likelihood of impacts and mitigation measures provided by aquaculture activity in Poole Harbour and associated management under The Order.

Table 11: Potential pressures, relevant features/supporting habitats, attributes and activity, the nature and likelihood of impacts and mitigation measures provide by The Order and issuing of leases for 2025-30.

Pressure	Relevant Features/Supporting Habitats	Relevant Attributes	Relevant Activity	Nature and Likelihood of Impacts	Mitigation
Introduction of microbial pathogens	• Avocet • Black-tailed godwit • Little egret • Shelduck • Spoonbill • Common Tern • Sandwich tern • Mediterranean gull • Waterbird Assemblage • Coastal Lagoons • Intertidal Seagrass Beds • Intertidal Mud • Water Column	• Non-breeding population: abundance • Supporting Habitat; water quality – contaminants • Breeding population: abundance • Supporting habitat: food availability • Supporting habitat: extent and distribution of supporting habitat	Shellfish aquaculture: bottom culture	There is potential for the introduction of microbial pathogens and INIS by aquaculture activity through shellfish movements from regional, national or international locations into Poole Harbour. The risk of genetic modification & translocation of indigenous species resulting in adverse genetic change to a wild population is not applicable to aquaculture activity under The Order. Species farmed in Poole Harbour are not subject to any genetic modification, nor are the species being subject to shellfish movements those which are at risk (for example climate-endangered species where translocation may increase the risk of extinction.	Leaseholders are required to operate in accordance with the Biosecurity Plan for the Order which ensures that correct biosecurity is maintained in relation to all aquaculture operations (see S4.2.4 for details). A Biosecurity Risk Assessment is produced for all activity under The Order (see Annex 5), leaseholders then adapt this to any specific requirements of their own operations under the Business Plan for 2025-2030. Pacific oysters as a non-native species are subject to specific monitoring and management (see S4.2.4.1). The most recent review of P. oyster monitoring suggests there is no indication that the presence of aquaculture activity in Poole Harbour is causing large increases in the presence of wild P. oyster, and there is no indication that the presence of wild P. oyster is resulting in large scale habitat change or the formation of reefs. The Biosecurity Plan is reviewed by Cefas FHI, providing independent verification of the suitability of biosecurity processes for aquaculture in Poole Harbour.
Introduction or spread of invasive non-indigenous species (INIS)	• Coastal Lagoons • Intertidal Seagrass Beds • Intertidal Mud • Water Column	• Supporting habitat: extent and distribution of supporting habitat • Supporting habitat: food availability • Connectivity with supporting habitats			
Genetic modification & translocation of indigenous species	• Intertidal Seagrass Beds • Water Column	• Supporting habitat: extent and distribution of supporting habitat • Supporting habitat: food availability • Connectivity with supporting habitats			
Visual disturbance	• Avocet • Black-tailed godwit	• Non-breeding population abundance	Shellfish aquaculture:	Aquaculture activity and associated dredging has	The extent of the Poole Harbour Fishery Order 2015 was designed to exclude the defined bird sensitive areas in the

	• Little egret • Shelduck • Spoonbill • Common Tern • Sandwich tern • Mediterranean gull • Waterbird Assemblage • Water Column	• Disturbance caused by human activity • Connectivity with supporting habitats • Breeding population: abundance • Predation - all habitats	bottom culture Dredges Hydraulic Dredges	the potential to disturb bird species and water column species, resulting from the presence of vessels in areas adjacent to feeding and roosting sites. There is the potential for disturbance to tern species and Mediterranean gulls at breeding sites during the breeding season, if species are scared away from nesting sites this can result in nearly total reproductive failure. Species from the waterbird assemblage, Goldeneye and Red-breasted merganser are known to create roosting rafts at night, disturbance from vessel activity on lease beds could occur during nighttime hours over sensitive periods. Wading and surfacing feeding bird species can be directly impacted by above water noise causing a disturbance. Depending on the sound intensity birds may react by being alerted or taking flight. Impulsive sound in particular may result in a disturbance. Feeding waders are not as strongly affected as roosting birds, and there are species-specific tolerance levels. Vessels operating on lease grounds may also result in	Harbour. The minimum distance between a lease bed and one of these areas is over 1km. In addition, the extent of the Order does not encompass any areas where Mediterranean gulls are known to breed or the area of Brownsea Lagoon. Activity therefore cannot take place in locations where the risk to bird features from disturbance is high which greatly reduces the risk of disturbance by vessels or dredging activity at any time of year or time of day. Leaseholders are required to submit a business plan outlining the species and activities which will be carried out over lease beds. This business plan covers the 5-year period for the lease and there is a requirement for permit holders to operate as per their Business Plan. Any updates to Business Plans during the lease period are considered in line with this HRA and all other required considerations before any changes are made. Only persons and vessels named in the business plans may operate on lease ground preventing other vessels from operating in this area and preventing any activity which may be contrary to that in the business plans. Vessel used on lease grounds is limited, there is a maximum of three vessels for a single lease and these vessels do not all operate at the same time. It is anticipated that approx. 5 of these vessels at the most would be operating at any one time. Based on existing overall vessel traffic in Poole Harbour, vessels operating on lease grounds do not introduce a significant additional presence to result in collision or increased noise. Activity on lease beds is limited in duration, occurrence and spatial scale compared to other operations, both fishing and non-fishing, within Poole Harbour. Therefore, the risk of additional noise to a level significant enough to cause disturbance is unlikely. Aquaculture activity proposed for 2025-30 is the same as that carried out under T2. This involves very limited activity at night and activity is unlikely to take place during periods of inclement weather which would also affect the visual capabilities of bird species. Within Poole Harbour there are many landing spots and therefore the vessels on the aquaculture beds are not an attraction for bird species.
Above water noise	• Avocet • Black-tailed godwit • Little egret • Shelduck • Spoonbill • Common Tern • Sandwich tern • Mediterranean gull • Waterbird Assemblage	• Disturbance caused by human activity • Connectivity with supporting habitats	Shellfish aquaculture: bottom culture Dredges Hydraulic Dredges		
Collision ABOVE water with static or moving objects not naturally found in the marine environment (e.g. boats, machinery, and structures)	• Avocet • Black-tailed godwit • Little egret • Shelduck • Spoonbill • Common Tern • Sandwich tern • Mediterranean gull • Waterbird Assemblage	• Supporting habitat: landscape	Shellfish aquaculture: bottom culture Dredges Hydraulic Dredges		

				potential for collision with above water objects. There are no other structures permitted on lease ground, so the presence of vessels in the only potential collision risk. Examples of collision studies are mostly related to wind farms or large fixed structures at sea. No studies were found where vessels posed a collision risk for bird species. Indication that activity at night, in periods of inclement weather, where there are no other landing spots available and the structure is the only source of light are the factors that contribute to increasing the risk of collision.	Lights on vessels would not be significant when compared to other light sources around the Harbour and are also therefore unlikely to attract bird features. In addition, Leaseholders are not permitted to place any structures on the seabed. The risk of collision between bird features and aquaculture vessels in Poole Harbour is extremely low. For all lease beds, activity will be prohibited between 18:00-06:00 for the months of November to March inclusive to mitigate any risk to nighttime rafting species during the key period. This is aligned with management of the wild dredge fishery for bivalve species in the Harbour.
Changes in suspended solids (water clarity)	• Common Tern • Sandwich Tern • Intertidal seagrass beds • Intertidal mud • Water column	• Supporting habitat: water quality – turbidity • Connectivity with supporting habitats • Supporting habitat: food availability	Shellfish aquaculture: bottom culture Dredges Hydraulic Dredges	Harvesting aquaculture beds through the use of dredges has the potential to result in changes to suspended solids and/or smothering and siltation rate changes through the suspension of sediment. Species which are visual feeders relying on light to find, recognize and capture prey may be affected. In addition, smothering and siltation on intertidal mud and seagrass beds can affect the ability of bird features to find food as organisms are buried by settling sediments. There is no requirement for preparatory cleaning works	Leaseholders are required to submit a business plan outlining the species and activities which will be carried out over lease beds. This business plan covers the 5-year period for the lease and there is a requirement for permit holders to operate as per their Business Plan. Any updates to Business Plans during the lease period are considered in line with this HRA and all other required considerations before any changes are made. Studies on siltation and sedimentation from dredging indicate that increases in suspended sediment and settling occur within a fairly small area around dredge works. Particle tracking models have shown that dredging through sediment using 8 dredges per side resulted in only 8.2% of suspended sediment remaining in the water column after 1 hour, figures which were comparable to naturally occurring suspension (Dale *et al.,* 2011). The same study found that it would take more than 200 dredge tows for suspended sediment levels to equal those seen during storm conditions (Dale *et al.,* 2011). This has been shown in other studies with sediment plumes and increased turbidity caused by dredging seen to disappear
Smothering and siltation rate changes (Light)	• Common Tern • Sandwich Tern • Intertidal seagrass beds • Intertidal mud • Water column	• Supporting habitat: water quality – turbidity • Connectivity with supporting habitats	Shellfish aquaculture: bottom culture Dredges Hydraulic Dredges		

				to take place across any bed for T3, all beds have been established for at least 5-years, activity will be focused on seeding and harvesting with cleaning occurring as part of the latter rather than a stand-alone activity.	within 30 minutes to 24 hours of dredging taking place (Lambert and Goudreau, 1996; Maier *et al.,* 1998). Specific studies on clam dredging found that the resuspension of sediment was relatively minor compared to long-term wild-induced suspension (Auster and Langton, 1999) and the limitation of this activity to discrete areas was seen to result in these impacts occurring over a much smaller spatial scale than when suspended sediments result from natural disturbance (Wilber and Clarke, 2001). This is of particular relevance to the aquaculture activity which, when compared to other types of dredging activity is small-scale and occurs over short time scales. Based on the above information, aquaculture activity will not pose a risk to visual feeders. The extent of The Order does not include any intertidal seagrass beds, the proximity of the nearest lease bed to intertidal seagrass within the Harbour (approx. 1km) based on the above information indicates that a risk of changes in suspended solids, smothering or siltation as a result of aquaculture activity is extremely low. The only area of intertidal mud overlapping with a lease bed is an area of approx. 0.1ha in a single lease bed. Based on the above information plus the limited level of activity on lease ground compared to other dredging operations, it is determined that there will not be a significant risk of suspended solids, smother or siltation on this area of intertidal mud. This area was specifically assessed under the HRA for T2 and it was determined that no additional specific management measures were required for this lease bed for the area of intertidal mud. Activity on this lease bed is proposed to remain the same as for T2, with the additional benefit of no preparatory cleaning activity being required as the relevant bed, whilst new under T2, has now been established for 5-years and any cleaning activity will take place as part of harvesting, therefore additional specific management will not be required under T3.
Abrasion/disturbance of the substrate on the surface of the seabed	• Intertidal mud	• Supporting habitat: extent and distribution of supporting habitat	Dredges Hydraulic Dredges	Dredging activity as part of aquaculture operations has the potential to overlap with a 0.1 ha area of intertidal	Leaseholders are required to submit a business plan outlining the species and activities which will be carried out over lease beds. This business plan covers the 5-year period for the lease and there is a requirement for permit

		• Supporting habitat: food availability		mud within one lease bed. Abrasion, penetration and physical change can alter supporting habitat and the function this plays in supporting bird features, primarily through food availability. Removal of non-target species can impact bird species both through direct removal of prey species and through changes to benthic communities and changes in species diversity and population composition. A reduction in prey species can affect the ability of bird species to obtain sufficient energy, particularly in the winter and can have knock-on effects such as impacts to successful breeding. Penetration, abrasion and physical change were identified under T2 as most likely to arise from intensive preparatory cleaning works required for new lease ground developed under the Lease Bed Reallocation Programme for T2. There is no requirement for intensive preparatory cleaning works to take place across any bed under T3, all beds have been established for at least 5-years, activity will be focused on seeding and harvesting with cleaning occurring as part of the	holders to operate as per their Business Plan. Any updates to Business Plans during the lease period are considered in line with this HRA and all other required considerations before any changes are made. Leaseholders are not permitted to place any structures on the seabed. Vessel used on lease grounds is limited, there is a maximum of three vessels for a single lease and these vessels do not all operate at the same time. It is anticipated that approx. 5 of these vessels at the most would be operating at any one time. Activity on lease beds is limited in duration, occurrence and spatial scale compared to other operations, both fishing and non-fishing, within Poole Harbour. Farming methods do not remove or have the potential to remove fish from the marine environment and therefore will not impact bird species with fish as their primary prey source i.e., Red-breasted merganser. The farming of the common mussel (*Mytilus edulis*) will provide a food source for a bird species identified as being in unfavourable condition (Goldeneye). The farming of this species will also benefit other bird species within the Harbour including curlew and redshank (components of the waterfowl assemblage), oystercatcher and herring gull. The low frequency of dredging activity is identified as having a low risk in effecting the benthic community and thus the availability of other prey items, with more intensive dredging practices showing no change in biotope of ecological quality in intertidal sediments within Poole Harbour (S6.2.1). The increase in certain species i.e., small polychaete worms, documented to follow more intensive dredging activity may also benefit ten of the species protected under the SPA, including two species determined to be in unfavourable condition; Shelduck and Goldeneye. A reduction in small invertebrates, including polychaete worms is referenced in the SSSI condition assessment for Poole Harbour, therefore an increase in these species as a result of activity may have a beneficial contribution to site condition in some areas.
Penetration and/or disturbance of the substratum below the surface of the seabed, including abrasion	• Intertidal mud	• Supporting habitat: extent and distribution of supporting habitat • Supporting habitat: food availability	Dredges Hydraulic Dredges		
Physical change (to another sediment type)	• Intertidal mud	• Supporting habitat: extent and distribution of supporting habitat	Dredges Hydraulic Dredges		
Removal of non-target species	• Intertidal mud	• Supporting habitat: food availability	Dredges Hydraulic Dredges		

				latter rather than a stand-alone activity.	A condition of the lease is that certain species of clam, common cockle and native oyster cannot be removed from lease ground under the minimum conservation reference size (MCRS). Many of the clam species and common cockle are utilised as a food source by bird features within Poole Harbour. Farming of these species and ensuring no removal before they have reached MCRS allows individuals to breed and contribute to the wider wild populations of these species and thus maintain or even improve food resources for bird species. For two of the lease beds, under T2, where these beds were newly introduced, it was identified that, although there was no overlap with intertidal mudflats, NE had recommended that there needed to be consideration of the extremely shallow nature of the Harbour in these two areas and that although the habitat may be used less frequently, there is the potential for this area to provide a food source during lower tides. Work carried out by Southern IFCA prior to T2 identified that on one of the lowest tides of the 2020-2021 winter period (height 0.36m), no area of either lease bed became exposed but there was the potential for water coverage to be down to a few inches. It is noted that, at the point at which these areas could be used for feeding, there would be no vessel activity on the grounds due to the inability to operate in such shallow waters. There is no potential for aquaculture to remove fish species which is the food preference for one species feeding in this area, the Red-breasted merganser. Applicable to other feeding species is the information presented above on no change in biotope of ecological quality in intertidal sediments within Poole Harbour. The only area of intertidal mud overlapping with a lease bed is an area of approx. 0.1ha in a single lease bed. Based on the limited level of activity on lease ground compared to other dredging operations, it is determined that there will not be a significant risk from abrasion, penetration or physical change to another sediment type. This area was specifically assessed under the HRA for T2, and it was determined that no additional specific management measures were required for this lease bed for the specific area of intertidal mud. Activity on this lease bed is proposed to remain the same as for T2, with the additional benefit of no preparatory cleaning activity being

					required as the relevant bed, whilst new under T2, has now been established for 5-years and any cleaning activity will take place as part of harvesting, therefore additional specific management will not be required under T3. Additional restrictions are also provided for this bed during the period April to September with no activity to take place during daytime (08:00-20:00), which limits the effort taking place on this lease bed for 6 months of the year. With general regard to abrasion, penetration and physical change. There is no intensive preparatory cleaning activity proposed to be carried out over any lease bed during 2025-2030 due to all lease beds having been operational for at least 5 years. Cleaning will be carried out as part of routine harvesting activities, where removals are focused on shell and detritus, as needed. Aquaculture is a very selective activity, any organisms brought up by harvesting (which do not return as a result of sorting mechanisms built into equipment such as bar spacing and flushing) are returned immediately to the same area of seabed.

Additional Mitigation

In addition to the mitigation provided in the table above in respect to specific pressures identified through the TLSE, there are additional benefits which will be provided under The Order and associated management/activity which contribute to supporting the SPA, SSSI and Ramsar Site, particularly in relation to the identification through the recent SPA Condition Assessment of eutrophication and nutrient levels causing algal mats being the main factor in defining features as being in an unfavourable condition. The information on beneficial services provided by aquaculture from which this summary is taken is in the Literature Review of Bivalve Ecosystem Services[17].

- Filter-feeding bivalves, such as mussels, oysters, cockles and clams remove nitrogen and phosphorus from the water by incorporating them into tissue and shells which can be removed through harvest removal, and through biodeposition that promotes burial and denitrification.
- In Poole Harbour, mussel and oyster farms have been estimated to filter up to 62% of the Harbour on a neap tide. Harvest-based removal estimates have shown that mussels remove ~0.88% of live weight in nitrogen; oysters remove 0.37%.
- Carbon sequestration varies by species. Manila clams store more carbon in shells whilst mussels store more in soft tissue. In the UK, mussels account for the majority of bivalve carbon sequestration (~83.51% of total carbon), followed by Pacific oysters (~16.32%), primarily due to the greater tissue and shell carbon content and current UK production levels.

[17] Poole-Order-Literature-Review

- Culture method can notably influence carbon sequestration, tissue growth, and biodeposition. Bottom bivalve cultures have been shown to sequester more carbon than suspended cultures primarily due to lower remineralisation rates.
- Eutrophication has been identified as a significant cause of the decline of seagrass beds and saltmarsh coverage in Poole Harbour. Bivalves help regulate nitrogen and phosphorus buildup, aiding in eutrophication mitigation.
- Shellfish filtration reduces water turbidity, allowing more light penetration, enabling photosynthesis at greater depths which benefits seagrass and macroalgae growth.
- Bivalve nitrogen sequestration can reduce harmful algal beds (*Ulva lactuca*), which threaten seagrass and invertebrate biodiversity. Additionally, bivalve farms have the capacity to reduce epiphyte coverage on seagrass near aquaculture sites, promoting healthier seagrass ecosystems.
- Bivalve aquaculture can enhance carbon sequestration and nitrogen cycling in seagrass beds if appropriate distances are maintained between farms and seagrass beds, thereby enhancing blue carbon stocks.
- Bivalves recycle nutrients, supporting phytoplankton growth whilst enhancing denitrification processes. Species-specific filtration preferences can shift plankton assemblages towards more rapidly growing plankton, influencing carbon sequestration.
- Bivalve presence can enhance biodiversity by increasing seston species richness and supporting macrofaunal abundance.
- Bivalve farms have been observed to reduce disease prevalence among marine life including wild bivalve populations by improving water quality.
- Bivalve aquaculture has been shown to improve the resilience of vegetative habitats that act as fish nurseries for plaice, pollock, herring and bass stocks, especially in areas with high nutrient runoff such as Poole Harbour.
- Bivalves aquaculture provide a range of tangible cultural benefits and services. By enhancing water quality, bivalves can improve the resilience of seagrass beds and saltmarshes which in turn, provide their own cultural values. Healthier ecosystems and higher water quality support recreational water activities and associated industries that have human health benefits and social value.

7 Conclusion[18]

In order to conclude whether the issuing of leases for 2025-30 under the Poole Harbour Fishery Order 2015, which will allow aquaculture to take place within a defined area of Poole Harbour, has an effect on the integrity of the Poole Harbour SPA, it is necessary to assess whether the impacts of the issuing of the leases will hinder the site's conservation objectives, namely;

Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring;

- The extent and distribution of the habitats of the qualifying features
- The structure and function of the habitats of the qualifying features
- The supporting processes on which the habitats of the qualifying features rely
- The population of each of the qualifying features, and,
- The distribution of the qualifying features within the site.

The TLSE and a review of research into the impacts of aquaculture and associated dredging activity (detailed in section 6) identifies that there a number of pressures relevant to these activities where there is the potential for a resulting adverse effect upon SPA attributes:

- Introduction of microbial pathogens
- Visual disturbance
- Above water noise
- Collision above water with static or moving objects not naturally found in the marine environment (e.g. boats, machinery, and structures)
- Changes in suspended solids (water clarity)
- Introduction of spread of invasive non-indigenous species (INIS)
- Genetic modification & translocation of indigenous species
- Smothering and siltation rate changes (light)
- Abrasion/disturbance of the substrate on the surface of the seabed
- Penetration and/or disturbance of the substratum below the surface of the seabed, including abrasion
- Physical change (to another sediment type

[18] If there is a conclusion of an adverse effect alone, an in-combination assessment is not required

These potential pressures are mitigated through a number of management measures implemented under The Order as follows:

General

- Leaseholders are required to submit a Business Plan outlining the species, activities, vessels and personnel which will be used on the ground that they will be leasing. This Business Plan has to cover the full period of the five-year lease and leaseholders are required to comply with what is set out in their business plan. Any updates to the Business Plan during the 5-year period are considered in line with a set process and incorporates consideration of proposed changes against the outputs of this HRA and all other required considerations before any updates are made. In changing any activity or species the leaseholder is required, bar exceptional circumstances, to give the Authority at least 8-weeks' notice of the proposed change so full consideration can be given. In the event that an additional assessment, either TLSE alone or with an Appropriate Assessment is required for any updates then this will be completed and submitted to Natural England for Formal Advice ahead of any changes being made.
- The Southern IFCA has a robust compliance and enforcement framework which will also be applied to lease ground under The Order. Southern IFCA will be monitoring to ensure that leaseholders are operating according to their business plan and the requirements under their lease. The requirement for Business Plans to stipulate the vessels and persons that can operate over lease ground ensures that only legitimate users can undertake activity in these areas. This removes the ability for other vessels or persons to engage in activity in these areas which may be contrary to the requirements of the lease or operate in a way which is not compatible with this assessment. The detection of any non-compliance or any intelligence of non-compliance can be fed into the Compliance and Enforcement Framework[19] through which appropriate enforcement action can be taken if required.

Disturbance (*visual disturbance, above water noise, collision above water***)**

- The extent of the Poole Harbour Fishery Order 2015 was designed to exclude the defined bird sensitive areas in the Harbour. The minimum distance between a lease bed and one of these areas is over 1km. In addition, the extent of the Order does not encompass any areas where Mediterranean gulls are known to breed or the area of Brownsea Lagoon. Activity therefore cannot take place in locations where the risk to bird features from disturbance is high which greatly reduces the risk of disturbance by vessels or dredging activity at any time of year or time of day.
- By setting out the species, activities and vessels that will be used there can be an assessment of likely effort over the lease beds for the duration of the lease period. There will be a maximum of nine vessels associated with aquaculture activities and it is thought, based on current knowledge of aquaculture practices and the workings of the lease ground from 2015-25 that a maximum of five of those vessels would be in use at any one time but that this number will often be lower. There is no risk of increased effort over the period of the five-year lease. This low level of vessel effort also mitigates against collision risk above water for bird features. Research indicates that the collision risk between bird species and vessels is very low compared to fixed structures. The lease does not permit the erection of any fixed structures on the lease beds therefore there is no risk of introducing extra collision risk for the duration of the five-year lease. With regard to collision in general, risk is seen to be higher at night, during periods of inclement weather where there are no other landing areas or sources of light other than the fixed structure. In Poole Harbour, very limited aquaculture activity will be taking place at night and, given experience of practices between 2015-2025 any inclement weather which would cause an issue for bird species would result in vessels not being able to go out on to

[19] https://secure.toolkitfiles.co.uk/clients/25364/sitedata/Redesign/Compliance-Enforcement/Compliance-and-Enforcement-Framework-2023.pdf

lease beds. Poole Harbour has many landing points for bird species and many sources of light, bird species are therefore extremely unlikely to be attracted toward vessels operating on aquaculture beds over and above other areas of the Harbour. The collision risk between bird features and vessels on lease beds is therefore thought to be extremely low. Only persons and vessels named in the business plans may operate on lease ground preventing other vessels from operating in this area and preventing any activity which may be contrary to that in the business plans.

- Activity on lease beds is limited in duration, occurrence and spatial scale compared to other operations, both fishing and non-fishing, within Poole Harbour. Therefore, the risk of additional noise to a level significant enough to cause disturbance is unlikely.
- For all lease beds, activity will be prohibited between 18:00-06:00 for the months of November to March inclusive to mitigate any risk to nighttime rafting species during the key period. This is aligned with management of the wild dredge fishery for bivalve species in the Harbour.

Biosecurity (*microbial pathogens, INIS, genetic modification & translocation*)

- Leaseholders are required to operate in accordance with the Biosecurity Plan for the Order which ensures that correct biosecurity is maintained in relation to all aquaculture operations (see S4.2.4 for details).
- A Biosecurity Risk Assessment is produced for all activity under The Order (see Annex 5), leaseholders then adapt this to any specific requirements of their own operations under the Business Plan for 2025-2030.
- Pacific oysters as a non-native species are subject to specific monitoring and management (see S4.2.4.1).
- The most recent review of P. oyster monitoring suggests there is no indication that the presence of aquaculture activity in Poole Harbour is causing large increases in the presence of wild P. oyster, and there is no indication that the presence of wild P. oyster is resulting in large scale habitat change or the formation of reefs.
- The Biosecurity Plan is reviewed by Cefas FHI, providing independent verification of the suitability of biosecurity processes for aquaculture in Poole Harbour.

Suspended sediment (*changes in suspended solids, smothering and siltation rate changes*)

- Studies on siltation and sedimentation from dredging indicate that increases in suspended sediment and settling occur within a fairly small area around dredge works. Particle tracking models have shown that dredging through sediment using 8 dredges per side resulted in only 8.2% of suspended sediment remaining in the water column after 1 hour, figures which were comparable to naturally occurring suspension (Dale *et al.,* 2011). The same study found that it would take more than 200 dredge tows for suspended sediment levels to equal those seen during storm conditions (Dale *et al.,* 2011). This has been shown in other studies with sediment plumes and increased turbidity caused by dredging seen to disappear within 30 minutes to 24 hours of dredging taking place (Lambert and Goudreau, 1996; Maier *et al.,* 1998). Specific studies on clam dredging found that the resuspension of sediment was relatively minor compared to long-term wild-induced suspension (Auster and Langton, 1999) and the limitation of this activity to discrete areas was seen to result in these impacts occurring over a much smaller spatial scale than when suspended sediments result from natural disturbance (Wilber and Clarke, 2001). This is of particular relevance to the aquaculture activity which, when compared to other types of dredging activity is small-scale and occurs over short time scales. Based on this information, aquaculture activity will not pose a risk to visual feeders.

- The extent of The Order does not include any intertidal seagrass beds, the proximity of the nearest lease bed to intertidal seagrass within the Harbour (approx. 1km) based on the above information indicates that a risk of changes in suspended solids, smothering or siltation as a result of aquaculture activity is extremely low.
- The only area of intertidal mud overlapping with a lease bed is an area of approx. 0.1ha in a single lease bed. Based on the above information plus the limited level of activity on lease ground compared to other dredging operations, it is determined that there will not be a significant risk of suspended solids, smother or siltation on this area of intertidal mud. This area was specifically assessed under the HRA for T2 and it was determined that no additional specific management measures were required for this lease bed for the area of intertidal mud. Activity on this lease bed is proposed to remain the same as for T2, with the additional benefit of no preparatory cleaning activity being required as the relevant bed, whilst new under T2, has now been established for 5-years and any cleaning activity will take place as part of harvesting, therefore additional specific management will not be required under T3.

Benthic Impacts (*Abrasion/disturbance to seabed surface, penetration and/or disturbance below the seabed surface, physical change to another sediment type, removal of non-target species*)

- Leaseholders are not permitted to place any structures on the seabed.
- Vessel used on lease grounds is limited, there is a maximum of three vessels for a single lease and these vessels do not all operate at the same time. It is anticipated that approx. 5 of these vessels at the most would be operating at any one time. Activity on lease beds is limited in duration, occurrence and spatial scale compared to other operations, both fishing and non-fishing, within Poole Harbour.
- Farming methods do not remove or have the potential to remove fish from the marine environment and therefore will not impact bird species with fish as their primary prey source i.e., Red-breasted merganser.
- The farming of the common mussel (*Mytilus edulis*) will provide a food source for a bird species identified as being in unfavourable condition (Goldeneye). The farming of this species will also benefit other bird species within the Harbour including curlew and redshank (components of the waterfowl assemblage), oystercatcher and herring gull.
- The low frequency of dredging activity is identified as having a low risk in effecting the benthic community and thus the availability of other prey items, with more intensive dredging practices showing no change in biotope of ecological quality in intertidal sediments within Poole Harbour (S6.2.1). The increase in certain species i.e., small polychaete worms, documented to follow more intensive dredging activity may also benefit ten of the species protected under the SPA, including two species determined to be in unfavourable condition; Shelduck and Goldeneye. A reduction in small invertebrates, including polychaete worms is referenced in the SSSI condition assessment for Poole Harbour, therefore an increase in these species as a result of activity may have a beneficial contribution to site condition in some areas.
- A condition of the lease is that certain species of clam, common cockle and native oyster cannot be removed from lease ground under the minimum conservation reference size (MCRS). Many of the clam species and common cockle are utilised as a food source by bird features within Poole Harbour. Farming of these species and ensuring no removal before they have reached MCRS allows individuals to breed and contribute to the wider wild populations of these species and thus maintain or even improve food resources for bird species.

- For two of the lease beds, under T2, where these beds were newly introduced, it was identified that, although there was no overlap with intertidal mudflats, NE had recommended that there needed to be consideration of the extremely shallow nature of the Harbour in these two areas and that although the habitat may be used less frequently, there is the potential for this area to provide a food source during lower tides. Work carried out by Southern IFCA prior to T2 identified that on one of the lowest tides of the 2020-2021 winter period (height 0.36m), no area of either lease bed became exposed but there was the potential for water coverage to be down to a few inches. It is noted that, at the point at which these areas could be used for feeding, there would be no vessel activity on the grounds due to the inability to operate in such shallow waters. There is no potential for aquaculture to remove fish species which is the food preference for one species feeding in this area, the Red-breasted merganser. Applicable to other feeding species is the information presented above on no change in biotope of ecological quality in intertidal sediments within Poole Harbour.
- The only area of intertidal mud overlapping with a lease bed is an area of approx. 0.1ha in a single lease bed. Based on the limited level of activity on lease ground compared to other dredging operations, it is determined that there will not be a significant risk from abrasion, penetration or physical change to another sediment type. This area was specifically assessed under the HRA for T2, and it was determined that no additional specific management measures were required for this lease bed for the specific area of intertidal mud. Activity on this lease bed is proposed to remain the same as for T2, with the additional benefit of no preparatory cleaning activity being required as the relevant bed, whilst new under T2, has now been established for 5-years and any cleaning activity will take place as part of harvesting, therefore additional specific management will not be required under T3.
- Additional restrictions are also provided for this bed during the period April to September with no activity to take place during daytime (08:00-20:00), which limits the effort taking place on this lease bed for 6 months of the year.
- With general regard to abrasion, penetration and physical change. There is no intensive preparatory cleaning activity proposed to be carried out over any lease bed during 2025-2030 due to all lease beds having been operational for at least 5 years. Cleaning will be carried out as part of routine harvesting activities, where removals are focused on shell and detritus, as needed. Aquaculture is a very selective activity, any organisms brought up by harvesting (which do not return as a result of sorting mechanisms built into equipment such as bar spacing and flushing) are returned immediately to the same area of seabed.

Taking into account all the evidence presented in this Appropriate Assessment, including scientific literature, habitat feature data and knowledge of the activities proposed to be carried out under The Order, it is concluded that the issuing of leases for 2025-30 under the Poole Harbour Fishery Order 2015 will not hinder the site from achieving its conservation objectives and as such will not have an adverse effect upon the integrity of the Poole Harbour SPA, SSSI or Ramsar site.

8 In-Combination Assessment

Based on the mitigation measures outlined in Section 7, it is concluded that the issuing of leases for 2025-30 under the Poole Harbour Fishery Order 2015 alone will not hinder the site from achieving its conservation objectives and as such will not have an adverse effect upon the integrity of the Poole Harbour SPA, SSSI or Ramsar site.

Under Article 6(3) of the Habitats Directive and outlined in the Conservation Regulations, the assessment of any plan or project likely to have a significant effect on a site within the National Site Network, must be assessed in combination with other plans or projects. Any commercial plan or project requires a Habitats Regulations Assessment in their own right and must also account for any in-combination effects with the issuing of leases for 2025-2030 under The Poole Harbour Fishery Order 2015.

Commercial plans and projects that occur within or that may affect the Poole Harbour SPA are considered below. The impacts of these plans or projects require a Habitats Regulations Assessment in their own right and must also account for any in-combination effects with The Poole Harbour Fishery Order 2015.

Project	Status	In-combination Assessment
Poole Local Plan	Ongoing	Poole Local Plan describes the requirement that Poole District must add at least 14,200 homes between 2013 and 2033. An increase in homes will directly increase the number of people living in the area. As it is well known that those who live close to the sea often take recreational visits to these areas it is likely that this will lead to an increased level of disturbance to protected overwintering birds around Poole Harbour. Therefore, one common impact pathway between this project and the Poole Harbour Fishery Order 2015 of visual disturbance/above water noise is possible. However, through this assessment of the Poole Harbour Fishery Order 2015 it is clear that these pressures have been screened out from having an adverse effect on the integrity of the site. Furthermore, each individual housing development will have to undergo a Habitats Regulations Assessment of its own as well as an in-combination assessment with fishing activity to ensure it does not cause adverse effect to the integrity of Poole Harbours MPAs. As these developments are not yet in the planning stages, and are likely to come in the form of many smaller developments over a long period of time, and with the consideration of the permits mitigating factors considered within this HRA it is unlikely that there will be a combination effect between those developments and the Poole Harbour Fishery Order 2015.

8.1 Fishing Activity In-Combination Assessment

The Poole Harbour Dredge Permit Byelaw	The Poole Harbour Dredge Permit Byelaw regulates fishing for shellfish using dredges within Poole Harbour. The byelaw permits the use, storage, transportation and retention on board of the fishing gear and 45 permits are issued annually. The permit fishery is subject to an annual Habitats Regulations Assessment. The conclusion of the HRA completed ahead of the 2025/26 season was that the dredge permit fishery would have no adverse effect on the integrity of the Poole Harbour SPA. The Poole Harbour Fishery Order 2015 is a several order and therefore the areas of lease ground are severed from the public fishery. There is therefore no potential for spatial overlap of the two activities within Poole Harbour. Based on this and the conclusion of both the HRA for the issuing of leases for 2025-30 under the Poole Harbour Fishery Order 2015 and the HRA for the issuing of permits under the Poole Harbour Dredge Fishery of no adverse effect. It is concluded that there will be no in-combination effect on the integrity of the Poole Harbour SPA from these two fishing activities.
Net Fishing	At a TSLE level no common pressures between net fishing and the Poole Harbour Fishery Order 2015 were screened in. Therefore, there is unlikely to be any in-combination effect between the two gear types. Net Fishing is regulated under the Southern IFCA Net Fishing Byelaw with an accompanying Conservation Assessment Package which concluded no adverse effect on relevant MPAs based on mitigation provided by the Byelaw.
Light otter trawl	Light otter trawls do not interact with the features. At a TSLE level no common pressures between light otter trawl and the Poole Harbour Fishery Order 2015 were screened in. Therefore, there is unlikely to be any in-combination effect between the two gear types.
Pots/creels	At a TSLE level no common pressures between static gear and the Poole Harbour Fishery Order 2015 were screened in. Therefore, there is unlikely to be any in-combination effect between the two gear types.
Handlines (rod/gurdy) & Jigging/trolling	At a TSLE level no common pressures between handline/jigging and the Poole Harbour Fishery Order 2015 were screened in. Therefore, there is unlikely to be any in-combination effect between the two gear types.

9 Summary of Consultation with Natural England

Date	Contact	Sent	Comments Received
13/05/25	Elanor James - Marine and Coastal Higher Officer	24/04/25	HRA was sent to NE on 24th April 2025 and that Formal Advice was received on 13th May 2025, no changes were required.

10 Integrity Test

Based on the mitigation measures, in the form of management under T3, the associated lease and the Biosecurity Plan, and how these relate to the species, vessels and activities outlined in the individual Business Plans, it is concluded that the issuing of leases for 2025-30 under the Poole Harbour Fishery Order 2015 will not have an adverse effect, alone or in-combination, on the bird features and their supporting habitats within the Poole Harbour SPA.

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Annex 2 – Maps for Tranche 2 issuing of leases (2020-2025)

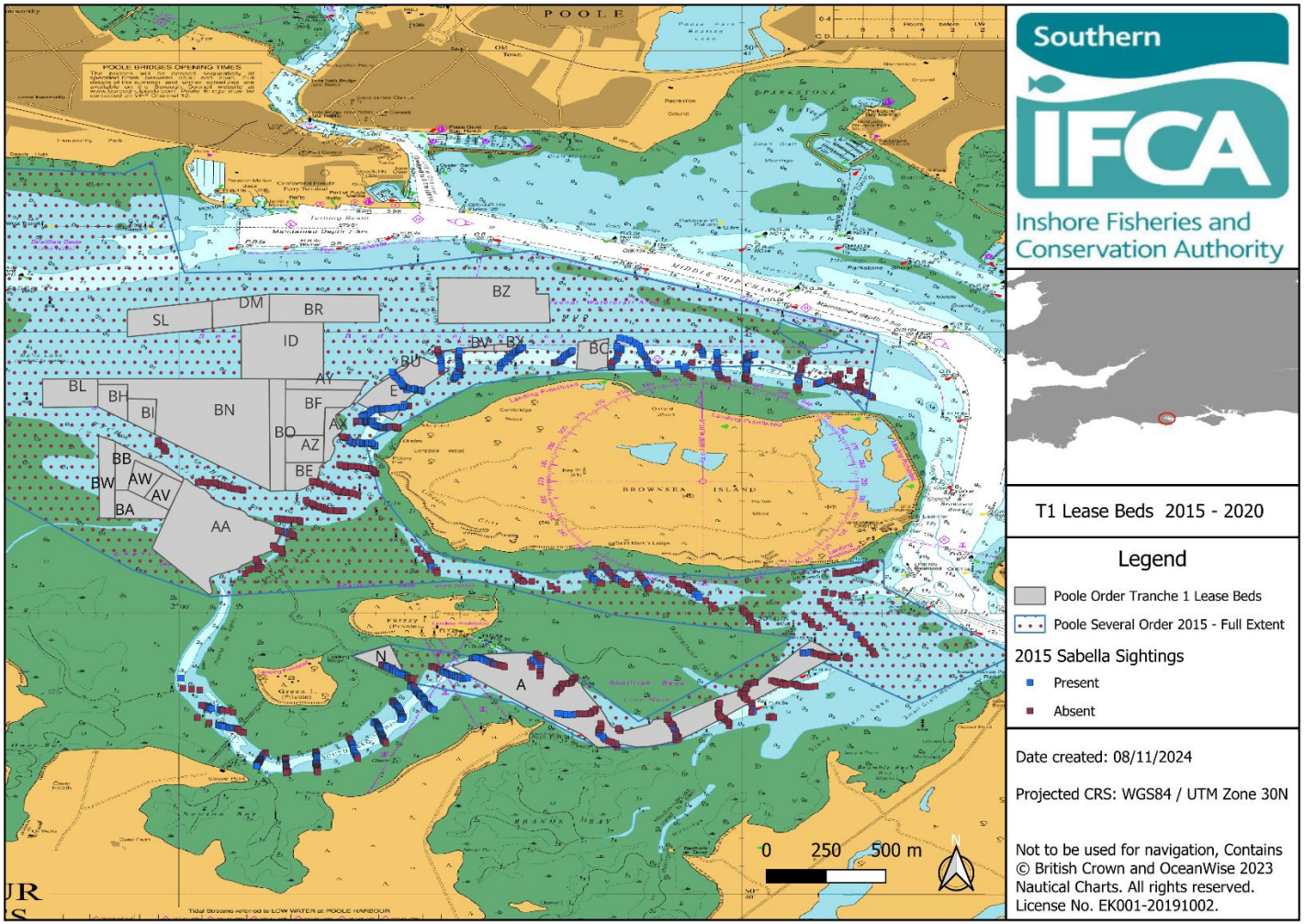

Figure A2.1: Presence and absence of *Sabella pavonina* in Poole Harbour (specific to the vicinity of T1 lease beds)

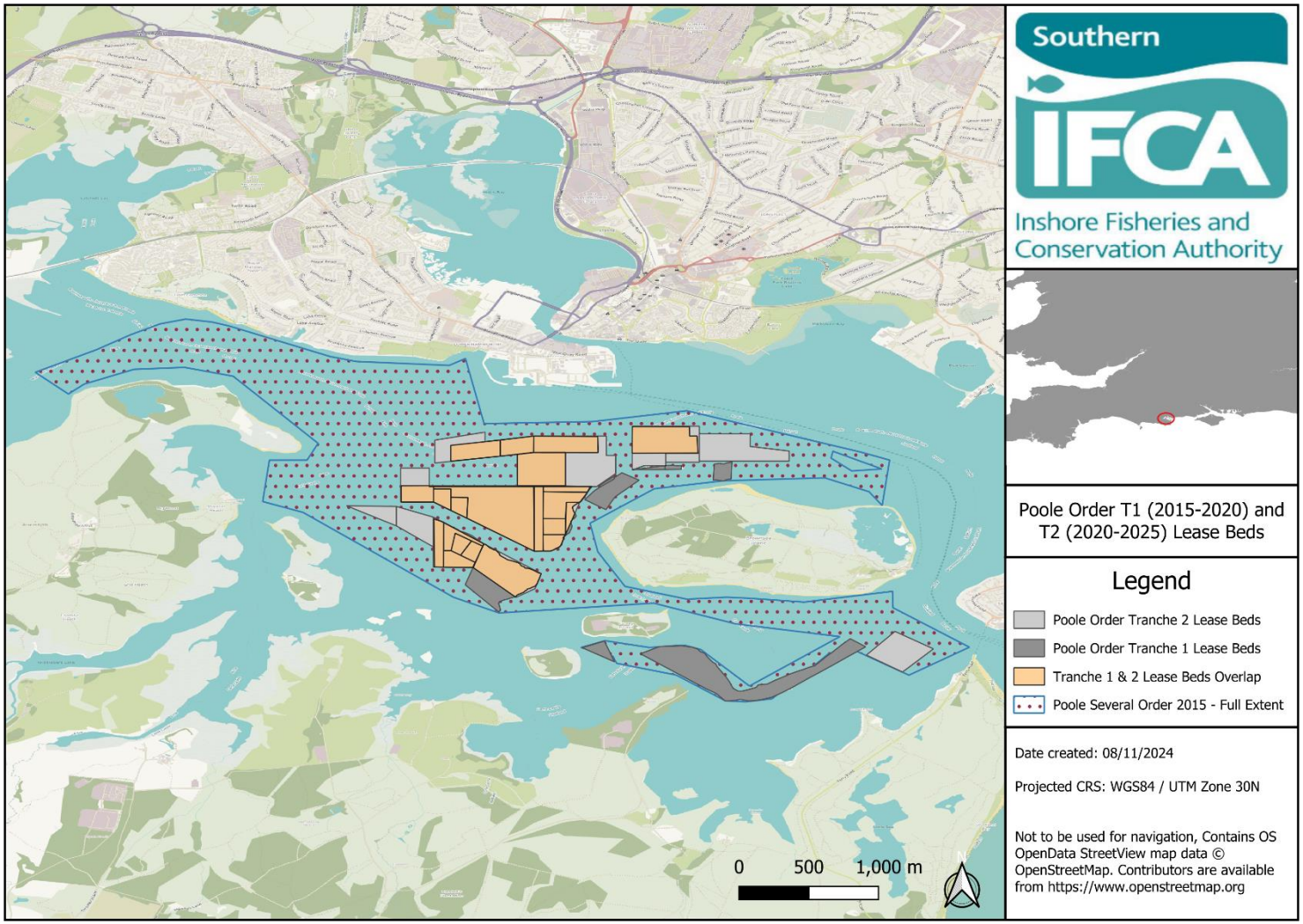

Figure A2.2: The footprint of Tranche 1 (2015-2020) and Tranche 2 (2020-2025) lease beds showing where changes were made under the Lease Bed Reallocation Programme for Tranche 2.

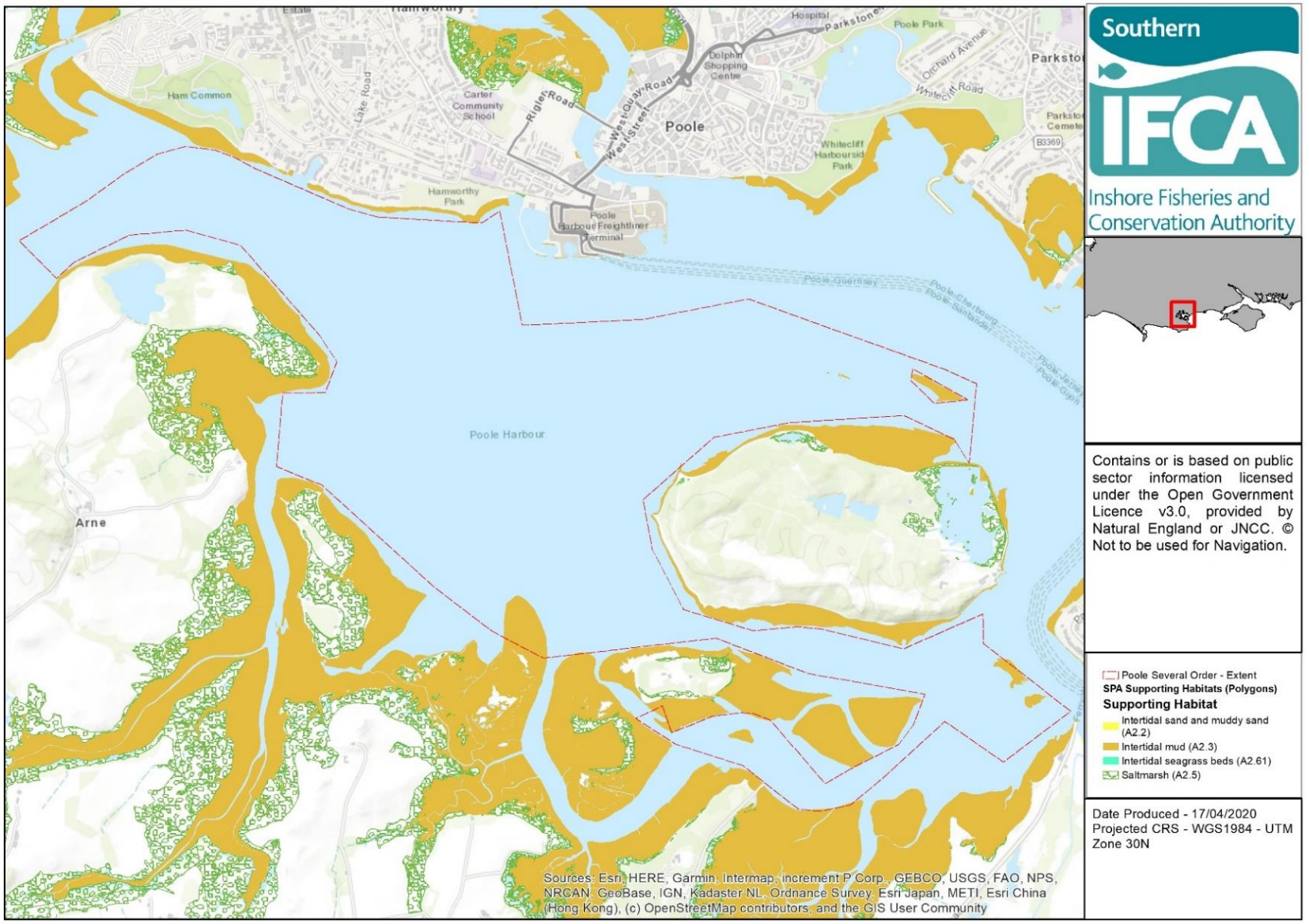

Figure A2.3: Supporting Habitat Feature/Sub-Feature location and the extent of the Poole Harbour Several Oder 2015.

Annex 3 – NE Advice

Date: 3rd June 2014

Rob Clarke
Chief Executive
SIFCA
64 Ashley Road
Parkstone
Poole
Dorset
BH14 9BN

Natural England
Sunrise Business Park
Higher Shaftesbury Road
Blandford
DT11 8ST

Dear Rob

Poole Harbour Several Order –

The following is Natural England's formal advice as to the potential impacts of aquaculture on the nature conservation features of Poole Harbour to inform the proposed SIFCA Several Order as to the likely environmental constraints with respect to where aquaculture can take place in the Harbour. **However a full assessment of likely impacts cannot be made until the details of each aquaculture proposal is put forward when applicants apply for a lease bed.**

1. **Legal Requirements**

Aquaculture takes place within Poole Harbour Site of Special Scientific Interest (SSSI). This SSSI is part of Poole Harbour Special Protection Area (SPA), and Poole Harbour Wetland of International Importance under the Ramsar Convention (Ramsar Site). Poole Harbour SPA and Ramsar site is afforded protection under the Habitats and Species Regulations 2010 (as amended) while Poole Harbour SSSI is afforded protection under the Wildlife and Countryside Act (1981) (as amended under the Countryside and Rights of Way Act 2000).

Natural England and S-IFCA have duties under Regulation 9 (3) of the Conservation of the Habitats & Species Regulations 2010 as competent authorities with functions relevant to marine conservation to exercise those functions so as to secure compliance with the Habitats Directive. Article 6.2 of the Habitats Directive requires appropriate steps to be taken to avoid, in Natura 2000 sites, the deterioration of natural habitats and habitats of species as well as significant disturbance of the species for which the area has been classified[1] The IFCA also need to ensure that aquaculture proposals are compatible with the conservation and enhancement of the special interest of the Poole Harbour SSSI in line with the status as a Section 28 G authority under the Wildlife and Countryside Act 1981 (as amended).

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SIFCA must therefore ensure that aquaculture is managed so as to avoid damage or deterioration to the conservation features of the European Marine Site and ensure the activity is not likely to disturb or damage any of the interest features of the SSSI.

2. **Protected Sites**

Poole Harbour was classified as a SPA for birds because it supports an assemblage of over 20,000 waterfowl, internationally important populations of overwintering shelduck and black tailed godwit and over 1% of three species listed on Annex 1 of the birds directive (overwintering avocet, breeding common tern and breeding Mediterranean gull).

It is also a wetland of international importance under the Ramsar convention because it regularly supports over 20,000 waterfowl and over 1% of populations of avocet, black tailed godwit, common tern, Mediterranean gull and shelduck while also being a good example of an estuary, supporting an appreciable assemblage of rare, vulnerable or endangered species and being of special value for maintaining the genetic and ecological diversity of a region because of the quality and peculiarities of its flora and fauna including supporting the nationally scarce plants narrow leaved eelgrass *Zostera augustifolia* and dwarf eelgrass *Zostera noltii*.

Poole Harbour is also recognised as nationally important for its extensive mudflats and marshes which together with the permanent channels support large populations of overwintering waders and wildfowl. The fringing habitats support further rare and scarce fauna and flora including nesting birds. Several rare marine invertebrates also occur within the Harbour. With respect to nesting birds Poole Harbour condition assessment in 2010 noted the harbour was nationally important for its breeding populations of common and Sandwich terns, Mediterranean and black-headed gulls, Cetti's warbler, bearded tit and water rail. In a local context, the breeding population of the amber-listed redshank and reed bunting are also important. Other relevant species recorded breeding and part of the breeding bird assemblage include shelduck, little egret, grey heron, teal, mute swan, snipe, ringed plover, oystercatcher, reed warbler (Underhill-Day et al., 2010.)

The Poole Harbour SPA, Ramsar and SSSI citation are provided in Appendix 1.

3. **Poole Harbour Special Protection Area**

a) Conservation objectives

The conservation objectives for Poole Harbour SPA are provided in Appendix 2.

In summary, the qualifying features are Common shelduck (Non-breeding), Pied avocet (Non-breeding), Black-tailed godwit (Non-breeding), Mediterranean gull (Breeding), Common tern (Breeding) and the Waterbird assemblage. In addition, little egret and aquatic warbler were identified as qualifying features by the UK SPA Review in 2001. However more recent data suggests aquatic warbler nolonger qualify in terms of numbers. Breeding sandwich terns are however now occurring in internationally important numbers and therefore qualify. http://jncc.defra.gov.uk/page-1419 Natural England recommends that as a matter of best practice these additional qualifying features should be a material consideration when assessing the impact of activities on a site.

With regard to the individual species and/or assemblage of species for which the site has been classified ('the Qualifying Features') the conservation objectives are to '*Avoid the deterioration of the habitats of the qualifying features, and the significant disturbance of the*

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qualifying features, ensuring the integrity of the site is maintained and the site makes a full contribution to achieving Favourable the aims of the Birds Directive.'

Subject to natural change, to maintain or restore:

- 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 the qualifying features;
- The distribution of the qualifying features within the site.

b) *Sub Features (Supporting Habitats for the Qualifying Features)*

The key sub features (or habitats for the SPA qualifying features) are listed in the Regulation 33 advice Package for Poole Harbour:-

Internationally important populations of the regularly occurring Annex 1 species

Shallow Inshore Waters inc. Lagoons - Shallow tidal waters provide key feeding habitat for the Annex 1 species common tern. avocet, and Mediterranean gull. Brownsea Island lagoon is an essential feeding area for wintering avocet. It also provides key nesting islands for common tern, however these are above highest astronomical tide and therefore not within the European marine site boundary. Shallow inshore waters are of importance for feeding common terns and to a lesser extent, for the qualifying population of breeding Mediterranean gulls which will also occasionally feed in these areas.

Intertidal Sediment Communities - Mudflats and sandflats support rich populations of intertidal invertebrate species, which in turn provide a food source for wintering avocets and breeding Mediterranean gull. Although avocets occasionally swim, they generally feed whilst wading on the intertidal sediments in areas of very shallow water. These habitats also provide important roosting areas for both species

Saltmarsh Communities - This habitat is of importance for providing roosting, feeding and nesting habitat. Upper saltmarsh is of importance as nesting habitat for both common tern and Mediterranean gull, whilst saltmarsh habitats, and in particular the associated creeks are also used as a feeding area by Mediterranean gull. Saltmarsh provides ideal highwater roosts for all of the annex 1 species.

Internationally important assemblage of waterfowl including internationally important populations of regularly occurring migratory bird species

'Shallow Inshore Waters inc. Lagoons - Shallow tidal waters provide key feeding and roosting habitat for the internationally important populations of wintering shelduck. Shallow tidal waters also provide key feeding habitat for nationally important populations of goldeneye, red-breasted merganser and cormorant, which feed on fish and small molluscs.

Intertidal Sediment Communities Mudflats and sandflats support rich populations of intertidal invertebrate species, which in turn provide a food source for the internationally important populations of black-tailed godwit and shelduck. Nationally important populations including dunlin, teal, curlew, spotted redshank, greenshank, redshank and black-headed gull also feed on these rich populations of intertidal invertebrate species. Nationally important populations of dark-bellied brent geese feed on *Zostera* and *Enteromorpha* that grow on the intertidal sediment communities. These habitats provide important roosting areas for all of these species.

Saltmarsh Communities - Upper and lower saltmarsh provide important feeding areas for the internationally important assemblage of waterfowl and its qualifying species. Upper saltmarsh in particular also makes ideal highwater roost sites. Dark-bellied brent geese and teal feed on saltmarsh plants and their seeds.

Reedbeds - These provide feeding and roosting areas for a proportion of the internationally important assemblage of waterfowl. They are of particular importance for teal and pochard. Reed beds also play a key role in providing shelter for adjacent sub features.'

c) Summary of potential impacts of aquaculture on the attribute targets that could prevent the achievement of the conservation objectives for the SPA

The attributes listed in the tables in Appendix 3 are considered to be those most likely to contribute to this European Site's ecological integrity and towards the achievement of the European Site Conservation Objectives.

Natural England consider that shellfish dredging activity could prevent the site from achieving its conservation objectives through impacts on the following attributes:-

i) Disturbance caused by human activity (minimising disturbance)

The frequency, duration and/or intensity of disturbance affecting the foraging and roosting overwintering waterbird assemblage, avocet, black tailed godwit, shelduck and little egret should not reach levels which significantly affects the feature.

Potential Impact
Over the winter 2011/2012 a study of disturbance with respect to bird behaviour (waders and wildfowl) in relation to activities in the Harbour took place (Liley & Fearnley, 2012). The report found disturbance levels appeared to affect the distribution of birds within the harbour with bird densities lower where more people or boats were observed. The report found water based activities were generally more disturbing than intertidal activities with shore based activities the

1 Article 6.2 of the Habitats Directive requires appropriate steps to be taken to avoid, in Natura 2000 sites, the deterioration of natural habitats and habitats of species as well as significant disturbance of the species for which the area has been classified. (Article 7 clarifies that this Article should also apply to obligations arising from the Birds Directive)

least disturbing. It cannot be dismissed therefore that boat movements used for aquaculture together with other disturbance factors would not cause a significant disturbance to the features of the SPA when taking place in proximity to key feeding and roosting habitat (eg saltmarsh and shallow inshore waters).

The European Commission guidance states that any event contributing to the reduction or to the risk of reduction of the range of the species within the site or a reduction of the size of the habitat of the species within the site can be regarded as a significant disturbance[1].

Aquaculture activity could cause noise and visual disturbance (either alone or in combination with other plans and projects) to the features listed above when taking place at key times of the year for the overwintering birds and in proximity to important feeding and roosting sites. The significance of this disturbance is likely to depend on the availability of alternative undisturbed areas for birds; and the frequency and intensity at which boat movements are taking place (Liley & Fearnley, 2012).

ii) Extent and Distribution of supporting non-breeding habitat

The extent and distribution of suitable habitat (either within or outside the site boundary) which supports overwintering waterbird assemblage, avocet, black tailed godwit, shelduck and little egret for all stages of the non-breeding period (moulting, roosting, loafing, and feeding) is maintained.

Potential Impact
In addition the main eelgrass beds within the intertidal sediment communities in Poole Harbour are known to support fish eating species such as red breasted mergansers as well as providing a food source for dark bellied brent geese. Physical damage could occur from the laying of shellfish and structures supporting on aquaculture on the intertidal sediment communities including eelgrass beds if it takes place within this habitat.

Shallow inshore waters also provide important feeding and roosting habitats for species such as goldeneye, red breasted merganser and cormorant. Some aquaculture practices could potentially have an impact on the extent of this habitat eg where floating structures are causing a loss in the extent of the habitat. Distribution maps of species feeding and roosting over shallow water are attached (Appendix 5). In most instances the distribution of these species is not localised to one particular area although pochard appear to be preferentially feeding in the western part of the Harbour.

ii) Extent and Distribution of supporting breeding habitat

The extent, distribution and availability of suitable breeding habitat which supports common tern, sandwich tern and Mediterranean gull for all stages of their breeding cycle (courtship, nesting, feeding) is maintained.

Potential impact
Shallow inshore waters provide key feeding habitat for breeding common and sandwich terns and Mediterranean gull. Some aquaculture practices could potentially have an impact on the extent of this habitat eg where floating structures are causing a loss in the extent of the habitat. Common and sandwich tern distribution however is quite widespread throughout the Harbour.

ii) Breeding Population (productivity and survival)

Overall breeding productivity and adult survival is at a level which is consistent with maintaining the

[1] European Commission. 2000. **Managing Natura 2000 sites : The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC**. Luxembourg: Office for Official Publications of the European Communities.

structure and abundance of the population of Mediterranean gulls at or above its current or target level, whichever is the higher or all stages of its breeding cycle (courtship, nesting, feeding) is maintained.

Potential Impact
Disturbance of Mediterranean gull nesting sites from boat movements for aquaculture taking place in proximity to Seagull Island could cause a decline in the annual productivity or breeding success of the population (i.e. the number of chicks successfully raised per breeding pair per year) and this may adversely affect the overall size and age-structure of the breeding population and its long-term viability. Common and sandwich tern nest at Brownsea Lagoon where there is no fishing access and would therefore not be exposed to disturbance.

iv) Food availability (Function and supporting processes)

Maintain the overall prey availability of key prey species of preferred prey sizes which supports overwintering waterbird assemblage, avocet, black tailed godwit, shelduck and little egret and breeding common tern, sandwich tern and Mediterranean gull

Potential Impact
Sediment disturbance as a result of aquaculture (and in combination with other activities eg baitdigging and baitdragging) can potentially impact on bird prey availability, prey size and the birds ability to forage over intertidal sediment communities and shallow inshore waters. This can be through removal (mortality) of target and non target species and impacts on non target prey availability through changes in habitat structure of the intertidal sediment communities. In addition aquaculture practices could also potentially affect the water quality which in turn could impact on the prey availability.

4. Poole Harbour Ramsar

In addition to the above overwintering waders and wildfowl, the Ramsar site is also designated for its eelgrass beds. Physical damage could occur to this habitat if shellfish or structures supporting aquaculture were laid over the eelgrass beds.

5. Poole Harbour SSSI

In addition to the bird features for which the SPA is classified the SSSI is designated for nesting birds using the fringing reedbed and saltmarsh habitats of Poole Harbour and marine invertebrates. Aquaculture has the potential to damage the breeding bird assemblage feature through disturbance to breeding birds effecting breeding productivity when taking place in proximity to their nesting and feeding sites. Unusually dense forests of the peacock worm *Sabella pavonina* were recorded in the channels of the Harbour in the 80's associated with the subtidal fine sands of the central harbour and proposals for aquaculture could potentially damage this feature when taking place in these locations.

6. Poole Harbour Aquatic Management Plan

Poole Harbour's Aquatic Management Plan serves as Poole Harbour's European Marine Site management scheme under which relevant authorities functions (including any power to make byelaws) are to be exercised so as to secure in relation to that site compliance with the requirements of the Habitats Directive *www.pooleharbouraqmp.co.uk*

Bird Sensitive Areas – All recreational users are asked in Poole Harbour's Aquatic Management Plan to avoid these areas at key times of the year.

These are areas where at present there is relatively little disturbance, or areas where the geographically enclosed nature of the bays means that activities such as shellfish dredging would

 SIFCA Reference: SIFCA/HRA_PP/PooleOrder202530

have the potential to disturb birds over a large area. They are also areas where birds appear to be preferentially feeding and roosting and where the key bird interests for which the Harbour is recognised as important reside (Drake, 2006).

Appendix 4 shows the Bird Sensitive Areas which have been identified as being of particular importance to overwintering and breeding birds. During the winter, principally between 1st November and 31st March, it is essential that disturbance in the 'Overwintering Bird Sensitive Areas' are kept to a minimum to ensure these migratory birds have every opportunity to feed and rest.

During the spring, between mid April and the end of June Mediterranean gulls and common terns breed at 'Gull Island' and 'Brownsea Lagoon' respectively and disturbance should be avoided to ensure the successful hatching of eggs and rearing of chicks of these rare bird species. Appendix 4

7. Poole Harbour Condition Assessment

SIFCA should also consider the current condition of the site when determining the significance of effect of aquaculture on Poole Harbour SPA, Ramsar and SSSI.

The latest analysis of data spanning over several decades by the British Trust for Ornithology (BTO) recorded declines in a numbers of some bird species in Poole Harbour. Comparison by BTO of national, regional and local trends suggest that for shelduck, curlew, redshank and lapwing these declines are likely to be due to site-specific pressures while the declining trends of the other species appear to reflect a broad-scale shift in population. . For further information see the species accounts under http://www.bto.org/volunteer-surveys/webs/publications/webs-alerts

Bird count data (WeBs data) analysed by Natural England in 2012 also highlighted declines in the numbers of overwintering birds in some sectors of the Harbour. (Appendix 6). The data analysis highlighted in particular there was concern regarding declines in some species in Lytchett Bay (shelduck, redshank and dunlin) Brands Bay (shelduck, redshank, dark bellied brent geese, dunlin) and Wych (shelduck, black tailed godwit, dunlin).

A condition assessment of Poole Harbour SSSI was compiled in 2010.The features of interest of the Ramsar and SPA were also covered in this assessment. The main concern from the assessment is the high inputs of nitrogen into the Harbour and the consequent algal mat growth which is at levels that could impact on bird prey availability and bird foraging behaviour. A further concern is the possible reduction in the abundance and variety of benthic invertebrates with a decline in biomass of some 26% between surveys in 2002 and 2009. This may be due to year to year fluctuations in variability and slight differences in the sampling methodology although the difference is of sufficient magnitude to cause concern. There is still uncertainty as to the long term effects of pump scoop dredging and other disturbances on invertebrate distribution and abundance. (Underhill-Day et al., 2010).

Generally the breeding bird community in the Harbour is retaining its interest, and scores as in favourable condition both for sand dunes and salt marshes, and for lowland open water and margins. However breeding redshank were last recorded as being in decline. (Underhill-Day et al., 2010; Chown & Cook, 2004).

8. Potential Mitigation Measures

Natural England's advice is that to protect the SPA, Ramsar interest and SSSI, the Several Order should exclude:-

- intertidal sediment (other than that already leased for aquaculture) due to the likely loss of important supporting feeding habitat for waders and wildfowl from the laying of shellfish and structures to support aquaculture
- the main eelgrass beds that provide supporting non breeding feeding habitat to the SPA features and are also a Ramsar feature due to the likely loss of supporting feeding habitat from the laying of shellfish and structures to support aquaculture
- shallow inshore waters where species appear to be preferentially feeding eg pochard in the western part of the Harbour
- 'bird sensitive areas' to avoid disturbance to birds at key times of the year (these areas are also within the intertidal sediment)

When proposals for shellfish lease beds are put forward, SIFCA will need to assess each proposal, and consult with Natural England, to consider whether they are able to conclude no likely significant effect on the SPA and Ramsar site either alone or in combination with other plans and projects. In particular it should be considered whether the proposals will impact on the features of the site through disturbance, loss of extent of habitat or impacts on food availability. SIFCA will need to consider what mitigation measures are needed to exclude any significant effect from aquaculture or commence work on an appropriate assessment in order to ascertain that the activity will not adversely affect the integrity of Poole Harbour SPA and Ramsar. Furthermore, SIFCA should also ensure that the measures proposed are compatible with the conservation and enhancement of the special interest of the Poole Harbour SSSI in line with the status as a Section 28 G authority under the Wildlife and Countryside Act 1981 (as amended).

Please do not hesitate to contact me if you would like to discuss any of the above further.

Yours sincerely

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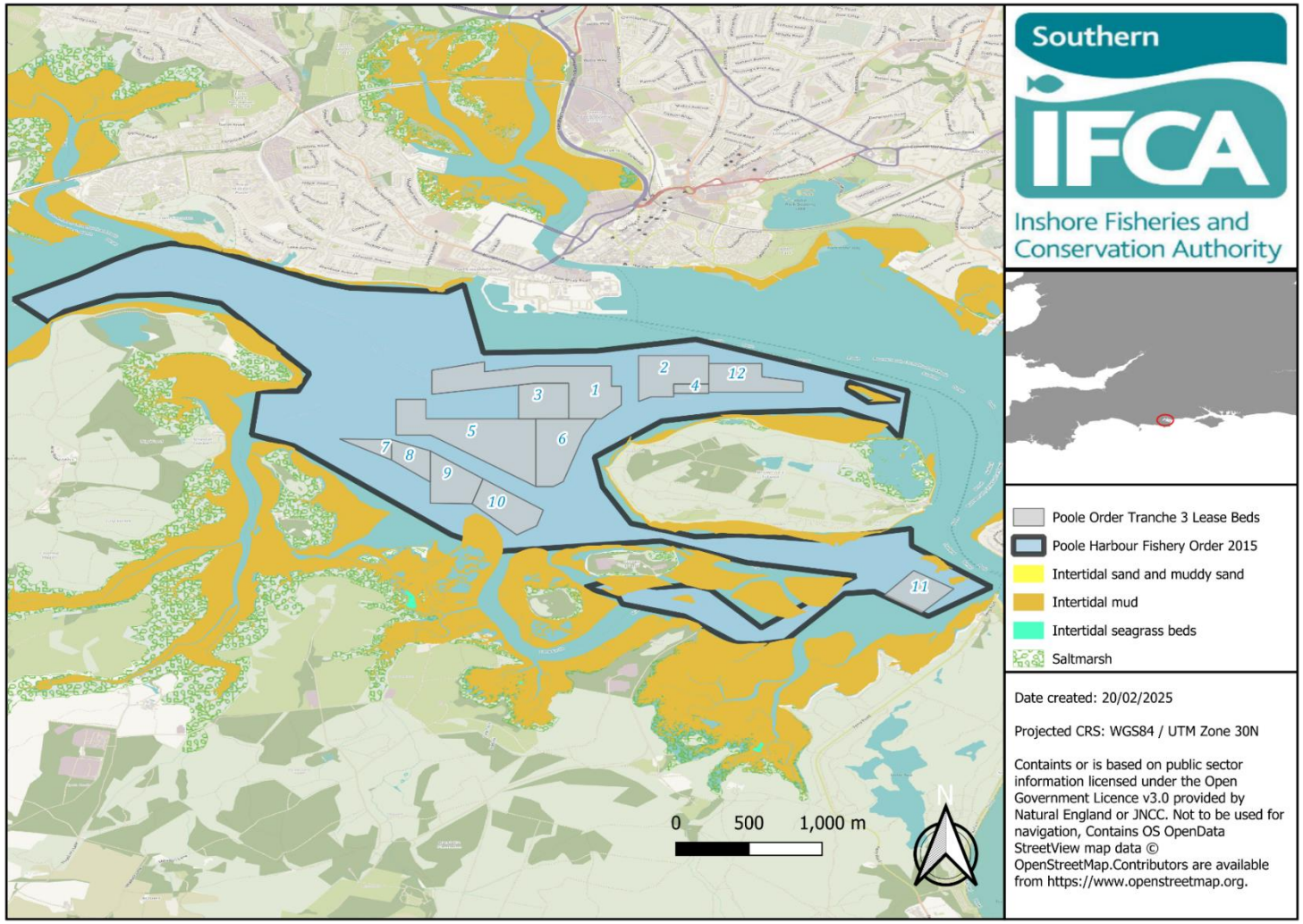
Annex 4 – Extent of the Poole Harbour Fishery Order 2015 showing location of Tranche 3 lease beds and supporting habitats of the Poole Harbour SPA



Annex 5 – Biosecurity Risk Assessment for the Issuing of Leases for 2025-30

KEY

PROBABILITY		SEVERITY		RISK FACTOR	
Probable	3	Critical	3	4 – 9	High Risk
Possible	2	Serious	2	4	Medium Risk
Unlikely	1	Minor	1	1 – 3	Low Risk

**Note INIS refers to Invasive Non-Indigenous Species*

Activity		Biosecurity Risk	Risk without control measures			Mitigation	Risk with mitigation		
			P	S	RF		P	S	RF
Import, Export and Movement of Shellfish, Stock and/or Seed									
1	**Purchase of seed from areas outside the UK**	• **Seed contains a disease that is not found in Poole Harbour** • **Seed may have associated INIS either within the seed stock or the packing materials**	**2**	**3**	**6**	**a)** Seed can only be brought into Poole Harbour for the purposes of aquaculture, every import from outside of Cefas designated shellfish Area 12b must be registered on the FHI Online Live fish movements website by Southern IFCA prior to the import taking place; **b)** The provenance of all incoming seed is checked by Cefas before it is excepted; **c)** Seed must come from Cefas approved hatcheries and must be accompanied by the appropriate paperwork to indicate this; **d)** Seed must come from an area with equal or higher disease status than Poole Harbour. For human hygiene purposes, leaseholders are required to keep abreast of any changes in classification with relevant local Environmental Health departments; **e)** Any seed that shows signs of disease or the presence of INIS will not be accepted on to the site; **f)** All seed imports are to be thoroughly washed and checked for INIS before any processing activity is carried out or any seed is introduced on to any lease bed; **g)** All imports must be recorded in accordance with stipulated shellfish movement requirements and copies of all documentation should be kept; **h)** All imported seed must be separated from other stocks for two weeks.	**1**	**3**	**3**

2	**Seed moved or purchased from another shellfish farming area within the UK**	• Seed contains a disease that is not found in Poole Harbour • Seed may have associated INIS either within the seed stock or the packing materials	**2**	**3**	**6**	**a)** There must be authorisation from Cefas for the transfer of seed between sites and seed must be accompanied by the appropriate movement documents ; **b)** Seed must come from Cefas approved farms and must be accompanied by the appropriate paperwork to indicate this; **c)** An application must be made to Cefas to move seed between farms, leaseholders must inform the Southern IFCA of any imports from outside Cefas designated shellfish Area 12b prior to the import; **d)** The provenance of all incoming seed is checked by Cefas before it is excepted; **e)** Seed must come from an area with equal or higher disease status than Poole Harbour. For human hygiene purposes, leaseholders are required to keep abreast of any changes in classification with relevant local Environmental Health departments; **f)** Any seed that shows signs of disease or the presence of INIS will not be accepted on to the site; **g)** All seed imports are to be thoroughly washed and checked for INIS before any processing activity is carried out or any seed is introduced on to any lease bed; **h)** All imports must be recorded in accordance with stipulated shellfish movement requirements and copies of all documentation should be kept.	**1**	**3**	**3**
3	**Relaying seed from wild stock**	• Seed contains a disease that is not found in Poole Harbour • Seed may have associated INIS within the seed stock • Seed may introduce pathogens from an area of lower water quality than Poole Harbour	**2**	**3**	**6**	**a)** The provenance of all wild seed is subject to approval by Cefas; **b)** Seed must come from an area with equal or higher water classification status than Poole Harbour. Leaseholders are required to keep abreast of any changes in classification with relevant local Environmental Health departments; **c)** For seed coming from a lower water classification i.e. Class C, can only be relayed on to an approved relaying area as determined by BCP Council Environmental Health Department; **d)** Dependent on the source of the wild stock, seed must be separated from other stocks for two weeks; **e)** Any seed that shows signs of disease or the presence of INIS will not be accepted on to the site; **f)** All seed is to be thoroughly washed and checked for INIS before any processing activity is carried out or any seed is introduced on to any lease bed; **g)** All imports must be recorded in accordance with stipulated shellfish movement requirements and copies of all documentation should be kept.	**1**	**3**	**3**
4	**Movements off**	• There is the potential for exported stock to	**2**	**3**	**6**	**a)** Shellfish and the bags/containers used for export must be cleaned before export;	**1**	**3**	**3**

		transfer a disease or INIS that is found in Poole Harbour to other areas of the UK or abroad				**b)** Exported product can only be sent to Cefas approved and bio-secure depuration and/or processing plants; **c)** Any destination for exported product must hold the appropriate licences for shellfish; **d)** Any product that shows signs of disease or the presence of INIS should not be exported; **e)** All exports must be recorded in accordance with stipulated shellfish movement requirements and copies of all documentation should be kept; **f)** Shellfish movement documents must accompany all products.			
5	**Mixing of seed from multiple sources**	• Any disease present in a single seed batch is passed between different seed batches • Any INIS present in a single seed batch is passed between different seed batches • Seed coming from different water classifications may be mixed, introducing pathogens in to seed stocks from a higher classification	**3**	**3**	**9**	**a)** Seed batches must come from areas subject to the same water classification. Leaseholders are required to keep abreast of any changes in classification with relevant local Environmental Health departments; **b)** Seed batches should be thoroughly checked for signs of disease and the presence of INIS before mixing; **c)** Any seed batch showing any sign of disease of presence of INIS should not be mixed with any other batch; **d)** Records should be kept of the origin of individual seed batches and the sources which have been mixed. Copies should be kept of all relevant documentation.	**1**	**3**	**3**
Species Farmed										
6	**Farming of Pacific Oyster (*Crassostrea gigas*)**	• Spread of a wild Invasive Non-Indigenous Species (INIS) to areas of the Harbour outside of lease ground. • Establishment of wild populations.	**3**	**3**	**9**	**a)** The farming of Pacific oysters will only take place on the authorisation of Southern IFCA and in accordance with any agreed methodology through the leaseholder's Business Plan; **b)** Pacific oysters must be triploid or subject to another form of sterilization; **c)** Any applications to farm Pacific oysters using a type of stock different to that stipulated above will be considered on a case by case basis by the Authority in consultation with Natural England, with the proposed methodology provided by the lease holder subject to an appropriate assessment.	**1**	**3**	**3**

7	**Farming of shellfish species**	• Species suffer a mortality event • Species show reduced growth rate • Species show signs of poor health • The presence of an INIS is identified on lease ground • Damage to shellfish from harvesting processes	**2**	**2**	**4**	**a)** Leaseholders should have an inspection procedure in place for shellfish stocks, suggested on a weekly basis; **b)** Any mortality events must be reported to the Southern IFCA and Cefas, Southern IFCA will liaise with Cefas to identify any required actions, leaseholder are required to help facilitate any actions such as obtaining samples; **c)** Where any reductions in growth rate or signs of poor health are thought to be as a result of disease, this should be reported to the Southern IFCA and Cefas as above; **d)** Any INIS identified on lease ground must be reported to the Southern IFCA. Photographs, date of discovery and precise geographic location must be provided to enquiries@southern-ifca.gov.uk. In addition, lease holders are encouraged to use INNS (Invasive Non-Native Species) Mapper https://ywt-data.org/INNS-mapper/ to record any INNS into a wider database; **e)** Harvesting processes should be optimised to be efficient and gentle on shellfish; **f)** Harvesting should be avoided during periods of spawning when shellfish are weaker and more vulnerable; **g)** Post-harvesting processes i.e. grading should only occur when necessary and post-harvesting processes should be avoided in overly hot weather.	**1**	**2**	**2**
Use of vessels and equipment, operation of farm personnel										
8	**Use of vessels and equipment between different lease beds**	• Vessels/equipment spread a disease between different lease grounds from any remaining organisms present • Vessels/equipment spread INIS between different lease grounds through attachment or remaining organisms on the vessel	**3**	**3**	**9**	**a)** Where possible, vessels and equipment should only be used on the lease beds for which the leaseholder has the lease; **b)** Where vessels and equipment are required to be used across multiple leases then the vessels and equipment must be cleaned prior to moving between areas. Cleaning processes must not allow cleaning water or materials to enter the water column; **c)** Vessels and equipment must be subject to the Check, Clean, Dry procedure.	**1**	**3**	**3**
9	**Use of vessels and equipment**	• Vessels/equipment introduce a disease into	**3**	**3**	**9**	**a)** Vessels and equipment must come from areas that are disease free;	**1**	**3**	**3**

	from outside of Poole Harbour	Poole Harbour from any remaining organisms present • Vessels/equipment introduce INIS in to Poole Harbour through attachment or remaining organisms on the vessel				**b)** Prior to arrival on site vessels and equipment must be thoroughly cleaned in a manner that does not allow cleaning water or materials to enter the water column; **c)** Vessels and equipment must be subject to the Check, Clean, Dry procedure.			
10	**Use of processing equipment on site**	• Any INIS spat or individuals are retained on processing equipment and are transferred to different batches of shellfish	**2**	**3**	**6**	**a)** Processing equipment must be washed after every use; **b)** Equipment must be subject to the Check, Clean, Dry procedure; **c)** Shellfish bags should be pressure washed before use.	**1**	**3**	**3**
11	**Disposal of effluent water from depuration, storage or processing**	• Pathogens expelled during processing and depuration may be put into the water column • If disposal occurs in an area other than the lease ground of the particular business there may be transfer of INIS or disease between lease beds	**2**	**3**	**6**	**a)** For the purposes of harvesting stock where water is required i.e. for washing shellfish etc. this should only be done over the area leased under a particular lease to avoid transfer of any organisms between lease grounds leased by different leaseholders; **b)** Any water from depuration or processing to remove pathogens etc. should be collected and disposed of via an appropriate mechanism on land, water from these sources must not be put in to the water column; **c)** Where there is concern that the washing or processing of shellfish on the deck of a vessel may introduce contamination to lease ground or the water column, the deck of the vessel should be sealed and waste water disposed of via an appropriate mechanism on land.	**1**	**3**	**3**
12	**Disposal of rubbish materials**	• Inappropriate disposal of rubbish could introduce litter in	**2**	**3**	**6**	**a)** There should be waste separation streams for oil, fuel, metal and general waste; **b)** Refuse and litter should be stored safely prior to collection in suitable containers to avoid the possibility of any litter entering the water; **c)** Only registered contractors should be used for waste disposal;	**1**	**3**	**3**

		to the marine environment • Inappropriate disposal of fuel and/or oil could result in pollution of the marine environment • Dead shellfish or shell disposed of in to the water column may introduce associated pathogens or INIS into the marine environment				**d)** Dead shellfish should be disposed of in suitable containers via a contractor equipped to handle this type of waste; **e)** Waste oil should be disposed of through an approved onshore process; **f)** Waste chemicals such as oil and fuel must be stored in secure containers designed for this purpose to prevent spillage prior to disposal; **g)** Waste materials should be disposed of at appropriate intervals and not allowed to build up on site.			
13	**Storage of chemical, fuel and/or oil on site**	• Spillage of chemicals, fuel and/or oil in to the marine environment • Spillage of chemicals, fuel and/or oil in the vicinity of seed may contaminate the seed and introduce pollutants in to the marine environment • Spillage of chemicals, fuel, and/or oil in the vicinity of harvested shellfish may contaminate export products	**2**	**3**	**6**	**a)** Storage areas on site must be kept tidy; **b)** Where possible, use of chemicals to treat shellfish should be avoided; **c)** Fuel oil must be stored in bunded tanks; **d)** Oils and other lubricants must be stored in leakproof containers; **e)** There must be a spillage action plan in place for the business, this should contain processes to prevent spillage of chemicals, including fuel and oil and other contaminants and procedures that are implemented in the event of a spillage taking place; **f)** Spill kits appropriate to the chemicals used in the business must be available on site; **g)** All staff must be trained in the spillage action plan and use of spill kits; **h)** Any spillages of chemicals or other contaminants must be reported to the Southern IFCA with details of the time and date of the spillage, the chemicals involved and any processes that have been implemented in response to the spillage.	**1**	**3**	**3**

14	**Transfer of staff between aquaculture sites**	• Contaminants including disease and/or INIS can be transferred between areas on clothing and footwear • Biosecurity protocols are not followed by staff not familiar with multiple sites	**3**	**3**	**9**	**a)** Staff should have their own PPE which they are responsible for; **b)** When moving between sites all PPE should be thoroughly cleaned and disinfected, waste water and chemicals from this cleaning must not be allowed to enter the water column; **c)** At the end of each day PPE should be subject to the Check, Clean, Dry Procedure; **d)** Staff must be made aware and trained in biosecurity protocols, the site manager should make regular checks to ensure that all staff are fully trained in this area.	**1**	**3**	**3**
15	**Visitors/ Members of the public attending the site**	• Contaminants including disease and/or INIS can be transferred between areas on clothing and footwear • Biosecurity protocols are not followed as visitors/members of the public are not familiar with protocols	**2**	**2**	**4**	**a)** Visits should only happen by appointment; **b)** Visitors must be issued with appropriate PPE which has been cleaned and disinfected before use; **c)** Any PPE which belongs to the visitor should be subject to the Check, Clean, Dry procedure before the visitor is allowed on site; **d)** Visitors must be made aware of biosecurity protocols on arrival, this must be checked by the site manager; **e)** All visits to the site must be logged.	**1**	**2**	**2**

Details on the potential impacts of the biosecurity risks highlighted in this risk assessment can be found in the 'Poole Harbour Special Protection Area (SPA) Appropriate Assessment - Issue of Leases under the Poole Harbour Fishery Order 2015 for 2025-30'.

The Check, Clean, Dry Procedure referred to in the Risk Assessment is outlined below:

Clean, Check, Dry

The check, clean dry protocol is provided by www.nonnativespecies.org/checkcleandry as follows:

Check equipment and clothing for live organisms – particularly in areas that are damp or hard to inspect

Clean and wash all equipment, footwear and clothes thoroughly, use hot water where possible. If you do come across any organisms, leave them at the water body where you found them.

Dry all equipment and clothing – some species can live for many days in moist conditions. Make sure you don't transfer water elsewhere.