



Hornsea Three Sandbank Implementation Plan

North Norfolk Sandbanks and Saturn Reef SAC

 Orsted

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Acronyms

Acronym	Definition
AoS	Area of Search
CSIP	Cable Specification and Installation Plan
Cefas	Centre for Fisheries, Environment and Aquaculture Science
DCO	Development Consent Order
Defra	Department for Environment Food & Rural Affairs
DDV	Drop Down Video
DML	Deemed Marine Licence
EIFCA	Eastern Inshore Fisheries and Conservation Authority
ECOW	Ecological Clerk of Works
EMP	Environmental Monitoring Plan
FfL	Fishing for Litter
FLO	Fisheries Liaison Officer
HSE	Health, Safety and Environmental
JNCC	Joint Nature Conservation Committee
MMO	Marine Management Organisation
MBES	Multibeam Echosounder
NNSSR	North Norfolk Sandbanks and Saturn Reef
OPRED	Offshore Petroleum Regulator for Environment and Decommissioning
PLN	Port Letters and Numbers
SAC	Special Area of Conservation
SBIP	Sandbanks Implementation Plan ¹
SCI	Site of Community Importance
SG	Steering Group
SNCB	Statutory Nature Conservation Body
SIP	Site Integrity Plan
UXO	Unexploded Ordnance
WMP	Waste Management Plan
WNNC	Wash and North Norfolk Coast
WROV	Work-class Remotely Operated Vessel

¹ Acronym chosen in consultation with the SG so as not to be confused with Site Integrity Plan (SIP)

1 Introduction

1.1 Project background

1. A Development Consent Order (DCO) was awarded to Orsted Hornsea Project Three (UK) Limited (Hornsea Three) on 31st December 2020 ("the DCO"). Hornsea Three is working towards reaching a final investment decision and taking Hornsea Project Three through the execution and construction phases. As part of the DCO, Hornsea Three is required to implement a package of benthic compensation measures to compensate for impacts, resulting from the deployment of cable protection, to the Annex 1 benthic features 'sandbanks which are slightly covered by sea water all of the time' in The Wash and North Norfolk Coast (WNNC) Special Area of Conservation (SAC) and North Norfolk Sandbanks and Saturn Reef (NNSSR) SAC.

1.2 Purpose of this document

2. This document has been produced to fulfil the requirements of Schedule 14: Part 2 Benthic Compensation Measures of the DCO to submit a Sandbanks Implementation Plan (SBIP²) for the benthic compensation measures to the Secretary of State for approval in respect of the NNSSR. A separate document has been prepared for the WNNC SAC (07103743_A). Due to the similarity of requirements, the SBIPs for NNSSR and WNNC contain sections of similar text. To ease stakeholder review, a comparative table has been included in the Consultation Summary document to provide a note to the reader as to where there are fundamental differences between the two SBIPs.

3. This SBIP accords with the principles set out in the Sandbanks Compensation Strategy³ relating to the protected feature "sandbanks which are slightly covered by sea water all of the time" and must include specific requirements (as set out in **Section 1.3**).

4. No cable installation works in the relevant Work Numbers detailed in the DCO⁴ may be commenced until a SBIP for the NNSSR and the WNNC has been approved by the Secretary of State in writing (following consultation with the MMO and Natural England and, in relation to the SBIP for the NNSSR, the JNCC).

1.3 Overview of SBIP requirements

5. **Table 1** sets out a summary of the Hornsea Three DCO conditions as required to be drafted into the SBIP and which section this detail is provided in.

Table 1: Summary of DCO requirements as addressed within the SBIP.

DCO Requirement (condition 13)	Section and/or Appendix where requirement is addressed
(a) Details of how all impacts to Annex 1 reef habitats within designated sites will be avoided	Section 4 presents how Hornsea Three have met this requirement.
(b) details of the locations for the disposal of dredged material, and evidence that the disposal mechanism will allow sediment to be retained within the sandbank system and avoid impacts to other features, particularly reef habitats;	Section 5 presents how Hornsea Three have met this requirement.
(c) details of the areas which will be subject to marine debris removal, which should equate to no less than 41.80 ha at NNSSR (and 2.77 ha at WNNC)	Section 6 presents how Hornsea Three have met this requirement. Further supporting information is

² Acronym chosen so as not to be confused with Site Integrity Plan (SIP)

³ [EN010080-003190-HOW03_CON02_Appendix2A_SandbanksCompensationStrategy.pdf \(planninginspectorate.gov.uk\)](#)

⁴ Work No. 2(c) (a network of cables) and (d) (up to six cable circuits between Work No. 2 and Work No. 3, and between Work No. 3 and Work No.5 consisting of offshore export cables along routes within the Order limits seaward of MHWS including one or more cable crossings), Work No. 3(c) (in the event that the mode of transmission is HVAC, a network of cables between HVAC booster stations or offshore subsea HVAC booster stations) and (d) (in the event that the mode of transmission is HVAC, up to six cable circuits between Work No. 2 and Work No. 3, and between Work No. 3 and Work No.5 consisting of offshore export cables along routes within the Order limits seaward of MHWS including one or more cable crossings) and Work No. 5 (landfall connection works comprising up to six cable circuits and ducts and onshore construction works within the Order limits seaward of MHWS and landward of MLWS)

DCO Requirement (condition 13)	Section and/or Appendix where requirement is addressed
	presented in the 'Hornsea Three Marine Debris Desktop Study' as Appendix 1.
<i>(d) details of the marine debris awareness events, and measures to facilitate the rapid recovery of lost fishing gear, as detailed in the sandbanks compensation strategy. Such measures should be applied to NNSSR (and WNCC)</i>	Section 7 presents how Hornsea Three have met this requirement.
<i>(e) an environmental monitoring plan to include appropriate surveys to assess the effects of cable protection on sediment movement and epifauna assemblages during the operation of the Project, to improve the evidence base for assessing the impacts of offshore windfarm cable installation and rock protection for future projects; and appropriate surveys to monitor the recovery of the areas of the NNSSR (and the WNCC) impacted by cable protection, post-decommissioning</i>	Section 7.4 summarises how Hornsea Three have met this requirement and the Environmental Monitoring Plan (EMP) is provided as Appendix 2.
<i>(f) Details of the timetable for implementation of each measure</i>	Section 9 presents the timetables for implementation.

2 Description of site and conservation objectives

6. The NNSSR SAC was designated as a SAC in 2017, having been confirmed as a Site of Community Importance (SCI) in 2011. The SAC covers 360,341 ha in UK offshore waters⁵ and comprises the most extensive area of offshore linear ridge sandbanks in the UK and has sandy sediments that support sparse infauna communities of polychaete worms, isopods, crabs, and starfish. The site is designated under Article 4(4) of the Directive (92/43/EEC) as it hosts the following habitats listed in Annex I:
 - Sandbanks which are slightly covered by sea water all of the time; and
 - Reefs⁶.
7. The conservation objectives for the NNSSR SAC are for the features to be in favourable condition, thus ensuring site integrity in the long term and contributing to Favourable Conservation Status of Annex I Sandbanks which are slightly covered by sea water all of the time and Annex I Reefs. This contribution would be achieved by maintaining or restoring, subject to natural change:
 - The extent and distribution of the qualifying habitats in the site;
 - The structure and function of the qualifying habitats in the site; and
 - The supporting processes on which the qualifying habitats rely.
8. The supplementary advice for the site advises that the features of interest need to be restored to favourable condition. There are various activities that are identified as exerting pressures on the site including demersal fishing, aggregate extraction, cabling and oil and gas operations.

3 Consultation

9. As per Schedule 14 Part 2 of the DCO a benthic compensation Steering Group (SG) has been formed to consult on the preparation of this SBIP prior to submission to the Secretary of State.

⁵ Between 12 and 200 nautical miles of the UK coastline

⁶ The reefs consist of *Sabellaria spinulosa* biogenic reef consisting of thousands of sand tubes consolidated to create a solid structure rising above the seabed

The SG has contributed to the scope and delivery of the SBIPs prior to their submission to the Secretary of State for approval.

10. The SG has been involved in the development of this SBIP document through discussion, review, and comment on the key scopes of work that will be appended on submission to the Secretary of State and are summarised in the Consultation Summary and presented as Annex 2 to the Consultation Summary. SG meetings have been held at six-weekly intervals as set out in **Table 2**. The functioning of the SG has been governed by the Plan of Work (O6827200_A) which was approved by the Secretary of State 07 September 2021.
11. The SG comprises core members who are the named consultees in Schedule 14 Part 2 of the DCO (Joint Nature Conservation Committee (JNCC)⁷, Natural England and the Marine Management Organisation (MMO). Advisory bodies (the Eastern Inshore Fisheries and Conservation Authority (EIFCA), the Department for Environment Food & Rural Affairs (Defra), the Centre for Environment, Fisheries and Aquaculture Science (Cefas), The National Federation of Fishermen's Organisations (NFFO) and the Wash and North Norfolk Marine Partnership (WNNMP) additionally attend to ensure breadth of expertise, with an independent Chair to facilitate efficient discussion.
12. All formal written feedback to date from SG members has been recorded and responded to by Hornsea Three and is presented in full within Annex 1 of the Consultation Summary (07124534_A) provided as a supporting document to this SBIP.

Table 2: Timeline of SG meetings and documents circulated.⁸

Meeting	Date	Supporting Documents
SG 1	02/03/2021	Hornsea Three Benthic Compensation Plan of Work Hornsea Three DCO
SG 2	30/03/2021	Hornsea Three Benthic Compensation Plan of Work Hornsea Three DCO Hornsea Three Marine Debris Removal Scope of Works
SG 3	27/04/2021	Hornsea Three Benthic Compensation Plan of Work Hornsea Three DCO Hornsea Three Environmental Monitoring Plan Technical Note Hornsea Three Marine Debris Awareness Campaign Scope of Work
SG 4	08/06/2021	Hornsea Three Supporting Document SG4 (adaptive management proposals)
SG 5	21/07/21	No supporting documents. Overview of first draft SBIPs provided to the SG.
SG 6	31/08/21	No supporting documents. Comments had been received from SG Members on the SBIPs prior to the meeting and key comments were reviewed and discussed.
SG 7	09/11/21	No supporting documents. Comments had been received from SG Members on the second draft SBIPs prior to the meeting and key comments/updates were reviewed and discussed.

⁷ It should be noted that JNCC attend as a core member in relation to NNSR SAC.

⁸ Note that supporting documents from SG Meetings 2, 3 and 4 are provided as Annex 2 to the Consultation Summary when the SBIPs are submitted to Secretary of State.

13. Consultation has also been undertaken with various other stakeholders (such as fisheries and oil and gas operators) in relation to defining appropriate target locations for the debris removal campaign. These are captured in more detail as part of Appendix 1 as relevant.

3.1 Ongoing role of the SG

14. Engagement with the SG regarding the compensation measures will continue following approval of the SBIP and will include consultation on the results of the marine debris removal campaign and the progress of the marine debris awareness & reduction campaign (including evidence and progress of implementation).

Table 3: Future engagement of the SG.

Time period	Purpose of engagement	Frequency of engagement ⁹
2022 / 2023	Update SG on the debris removal campaign and share results	A minimum of two SG meetings annually
During construction of Hornsea Three	Update SG on the implementation of the marine debris awareness & reduction campaign	A minimum of one SG meeting annually
During operation of Hornsea Three	Update SG on the functioning of the marine debris awareness & reduction campaign	A minimum of one SG meeting every two years

4 Requirement 13(a): Avoidance of impacts to Annex I reef habitats

15. Avoidance of Annex 1 reef features is a recognised requirement that Hornsea Three maintains in relation to the offshore installation activities and the implementation of the package of benthic compensation measures (i.e., avoidance of impacts during any activities associated with debris removal).

4.1 Offshore installation activities

4.1.1 Likelihood of Annex 1 reef

16. Hornsea Three note that there is a relatively low likelihood of encountering Annex 1 reef during the offshore installation works. Although no areas of core reef¹⁰ were identified within the offshore Order Limits (this assessment was supported by geophysical data collected in 2016 and 2018), Hornsea Three adopted a precautionary approach whereby potential future Annex 1 reef, not yet qualifying as core reef, within the offshore cable corridor was included in the worst-case assessment (as shown in Figure 2.6 of the benthic ecology chapter of the Hornsea Three EIA¹¹).
17. Further geophysical surveys were conducted in April 2021 (to confirm Unexploded Ordnance (UXO) clearance of geotechnical sample collection locations), some of which were within the NNSR SAC as shown in **Figure 1**. This survey in 2021, which collected data from within a 50 m buffer of each geotechnical survey sample collection location, did not identify any areas of *Sabellaria* reef despite some sample locations overlapping with JNCC Annex 1 reef management areas and being in close proximity to historic reef.

⁹ Meeting frequency may change (subject to review and consultation with SG members)

¹⁰ The core reef approach provides a means of predicting areas where reef is most likely to occur (i.e., where conditions are favourable to consistent presence of *S. spinulosa* reef, either continuously or frequently recurring)

¹¹ [ENO10080-000532-HOW03_6.2.2_Volume 2 - Ch 2 - Benthic Ecology.pdf \(planninginspectorate.gov.uk\)](#)

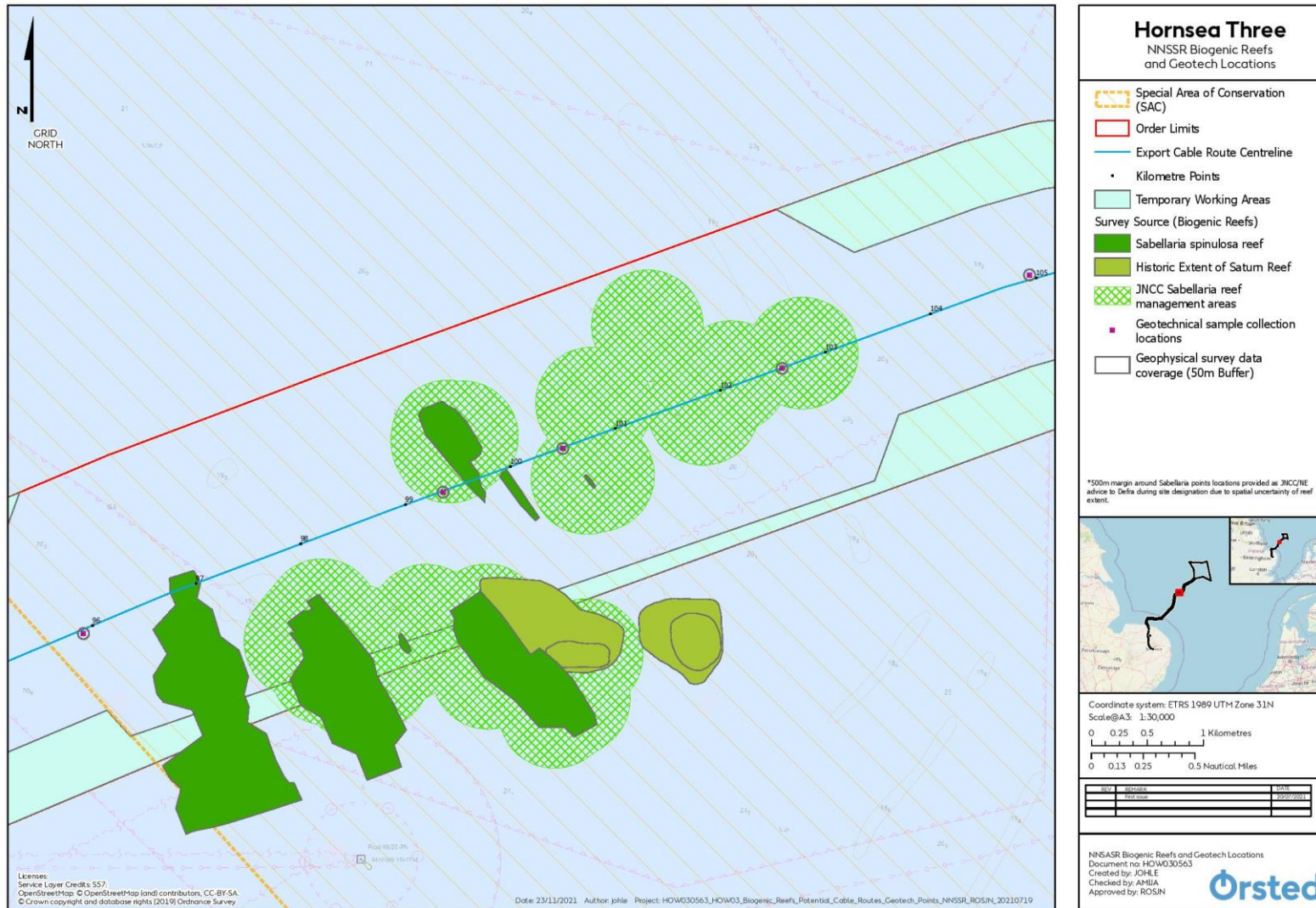


Figure 1: Geophysical data collection (2021).

4.1.2 Existing commitments

- 18. The Hornsea Three ES includes several commitments to ensure no impacts occur to Annex 1 reef. These include commitments to micro-siting to avoid any sensitive areas within the SAC, and that disposal of sediment will not occur within 500 m of identified reef unless otherwise agreed with the MMO and Natural England¹². These commitments are secured in the Outline Cable Specification and Installation Plan (CSIP) and substantial further detail will be drafted into the CSIP in consultation with MMO and Natural England.
- 19. The Hornsea Three In-Principle Monitoring Plan outlines further work which will be undertaken to ensure micro-siting commitments can be maintained. A pre-construction geophysical survey will be undertaken to identify the extent of *Sabellaria* reef within the offshore Order Limits, and subsequent ground truthing using Drop Down Video (DDV) surveys are anticipated to be required to confirm if reef is present and reef quality¹³. These surveys will then be used to inform and discharge the micro-siting requirements as set out within the Hornsea Three Outline CSIP.

4.1.3 Further Commitments

- 20. Hornsea Three acknowledge concern raised by Natural England regarding cable protection deployment within *Sabellaria* reef management areas. **Figure 2** demonstrates the overlap between the Hornsea Three Order Limits and NNSR *Sabellaria* reef management areas.
- 21. Hornsea Three note that greater understanding regarding the export cable route and areas where cable protection may be deployed will be available following pre-construction geophysical surveys and appointment of an installation contractor who will conduct a trenching assessment for the installation. Further consultation will be conducted with Natural England in relation to these aspects as part of the CSIP. At this stage, Hornsea Three can demonstrate available micro-siting options to avoid the *Sabellaria* reef management areas as shown on **Figure 2**. These micro-siting options may be employed should the pre-construction trenching assessment and cable route engineering indicate a likelihood for cable protection to be required in those areas.
- 22. Hornsea Three will further commit to undertaking an additional pre-construction geophysical survey to ensure the extent of *Sabellaria* reef within the relevant section of the offshore cable route is fully understood within sufficient time prior to construction to feed into the trenching assessment. Hornsea Three will undertake this additional survey in 2022 utilising the geophysical survey vessel which will be undertaking works associated with the marine debris removal campaign (detailed further in **Section 6**). This further commitment will provide Hornsea Three two years of pre-construction geophysical survey data to assess the extent of *Sabellaria* reef within the section of the Order Limits shown in **Figure 2**.

¹² Note that this buffer is 50 m in WNNC SAC as no evidence of *Sabellaria* reef has been found in benthic characterisation surveys

¹³ These surveys are anticipated to take place between 2023 – 2025 depending on project programme

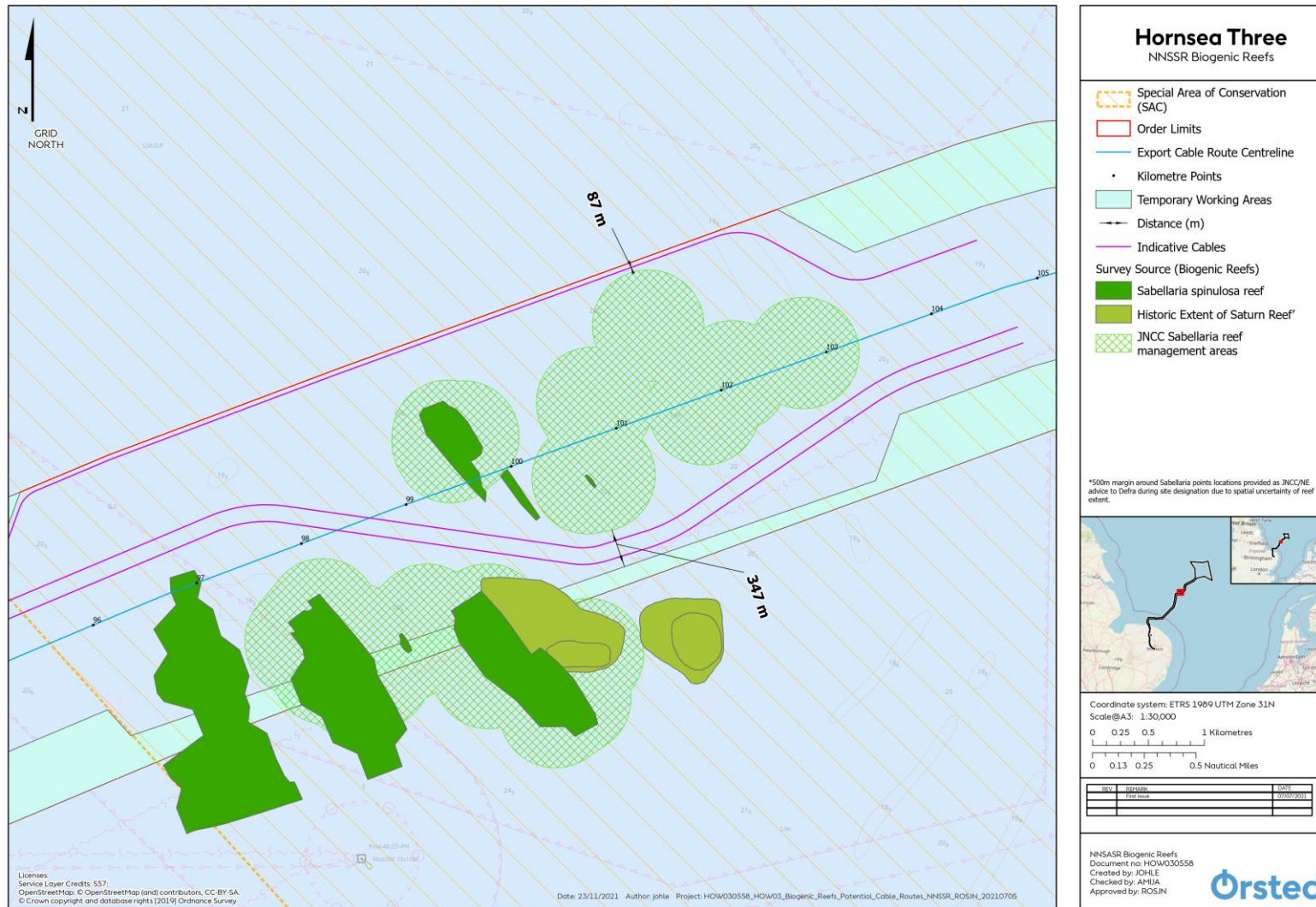


Figure 2: Indicative micro-siting opportunities around Sabellaria reef management areas.

4.2 Implementation of the compensation measures

23. In terms of the marine debris removal campaign, it is important that the activities do not cause damage to any reef features. In order to achieve this, all areas of biogenic reef and 'areas of potential reef' as identified in historic data (including both the JNCC Annex I reef data and data from previous Hornsea Three surveys) have been excluded during the desktop assessment which identifies a target location for the debris removal campaign, presented further in Appendix 1. JNCC reef management areas in NNSSR have also been excluded. A buffer zone of 50m from the edge of the exclusion area was applied to all such exclusion areas, as stated in the Hornsea Three Marine Debris Removal Scope of Works (Hornsea Three, 2021), and as discussed during the second SG meeting on the 30th March 2021. Consultation responses in relation to this document are provided in the Consultation Summary.
24. Further to this, a benthic ecologist (with experience of identifying reef features from geophysical data) will review all geophysical data collected during Stage 1 of the campaign to determine any additional areas of biogenic reef, or potential biogenic reef, that would need to be avoided (see [Section 6.3.3](#)).
25. The target investigation is being undertaken with the use of a Work-Class Remotely Operated Vessel (WROV) which allows for controlled, targeted, and sensitive activities to be undertaken when assessing whether a target is appropriate for removal. The WROV will also be used during the debris removal process to either remove the item itself or target the alternative removal tools such as the grab (this approach has been chosen over less targeted methodologies such as grappling). This further reduces any likelihood of damage to reef features of interest. This is detailed further in [Section 6.3.2](#). A benthic ecologist will be on the WROV vessel to further confirm that there is no biogenic reef within close proximity to the debris target. The decision-making process with regard to the debris removal is detailed further in [Section 6.3.3](#). Hornsea Three note that the on-vessel benthic ecologist will be expected to have a minimum of a Masters (MSc) qualification in benthic ecology, or related subject, and at least two years of experience working offshore in the UK in seabed habitat mapping, or similar.
26. The long term debris prevention measures detailed in [Section 7](#) will not introduce any adverse impact pathways to Annex 1 reef features.

5 Requirement 13(b): Disposal of Dredged Material

27. As secured in the Hornsea Three deemed Marine Licence (dMLs), a CSIP will be produced that includes a bespoke Sandwave Clearance Plan and Cable Protection Plan for each of the SACs to be managed by a dedicated Ecological Clerk of Works (ECoW). The CSIP will include detail on the disposal process and locations (including measures taken to avoid impacts to Annex I reefs).
28. As detailed within the Outline CSIP (OCSIP) (Hornsea Three, 2020), the Sandwave Clearance Plan will contain information on:
 - The maximum design scenario presented within the Environmental Statement, RIAA and the DCO;
 - The location, timing, and methodology of any proposed sandwave clearance works (and associated disposal activity);
 - The context of the proposed clearance works in relation to the relevant designation features (for the NNSSR), including:
 - Annex I sandbanks; and
 - Annex I reefs.
 - Roles and responsibilities and key contacts (noting the prominent role of the ECoW); and
 - Communication procedures and timescales.
29. The OCSIP secures a detailed list of draft disposal principles which will be maintained to ensure appropriate locations for the disposal of dredged material are identified.

5.1 Further information

- 30. Hornsea Three note further information has been requested by Natural England in relation to disposal locations. This further information to discharge requirement 13 (b) is presented in Appendix 3 of this SBIP.

6 Requirement 13(c): Marine debris removal campaign

6.1 Introduction

- 31. The compensation condition that is required to be implemented prior to the commencement of offshore works is the removal of marine debris from an area of no less than 41.8 ha within the NNSSR SAC.
- 32. For the purpose of the Hornsea Three benthic compensation measures, 'marine debris' consists of any lost or abandoned, non-natural or introduced material on the seabed which does not offer a practical purpose, has low biodiversity value and may detract from the extent and functionality of the designated features of the NNSSR SAC¹⁴.
- 33. Given that the purpose of the compensation is to assist in the restoration of sandbank functionality, it is marine debris associated with such habitat that will form the focus of the measures (as discussed in [Section 6.2.1.2](#)). 'Marine debris' in this instance will only include items that are on the seabed or protrude above the seabed to an estimated size of > 0.5 m in any single dimension. It is considered that any debris under 0.5 m in size will have a smaller detrimental impact to the sandbanks and therefore effort is better spent removing larger items from the seabed for a greater positive impact.
- 34. Removal of items smaller than 0.5 m will be attempted where they are encountered during Stage 3, for example entangled in larger items such as fishing nets. The debris removal methodology outlined in this section can be used to remove items > 0.5 m (primarily executed through use of the WROV manipulators). It should be noted that in circumstances where the debris item is highly mobile (for example a plastic bag or plastic bottle which is moving along the seafloor) it would be challenging to secure a moving target and therefore removal of such highly mobile items is not anticipated to be attempted. Upper size limits of debris would be limited by the capability of the WROV support vessel and equipment used for the removal which are detailed within [Section 6.3](#). Further consideration of items which may be beyond vessel capability is provided in [Section 6.3.5.1](#).
- 35. Target marine debris items would include (for example) lost and abandoned fishing gear such as trawl, gill and seine nets, pots / fish traps and tickler chains, and debris lost from vessels, for example, in anchoring areas and adjacent to current or historic shipping lanes.

6.2 Locations of target

- 36. As per the DCO requirement detailed in [Section 1.3](#), this SBIP presents an Area of Search (AoS) which the offshore debris removal campaign will target. Hornsea Three will remove marine debris identified within the area required by the DCO (41.8 ha of NNSSR) however have selected two 100 ha AoS in NNSSR SAC, through the process described in this section, within which to conduct Stage 1 of the campaign (geophysical data collection). This approach will allow Hornsea Three to target the 41.8 ha in NNSSR SAC with the highest density of seafloor targets for investigation and removal.
- 37. A scope of works report was consulted on with the SG (see [Section 3](#)) outlining the methodology for defining the AoS for debris removal and consultation responses are detailed in the Consultation Summary. The AoS has been defined based on an extensive data search and consultation phase to attempt to identify areas that either should be excluded or represent an area with a higher likelihood of finding debris. Appendix 1 details the full methodology and assessment conducted to identify the most appropriate AoS including the data sources and

¹⁴ The SG has been consulted on this definition

scoring system used to map the likelihood of debris present. The data was further used to delineate areas for exclusion buffers.

38. The scoring system which was applied to the data incorporated a score for confidence in the data source and a value of the data in terms of the expectation of finding debris. A value was then assigned based on the potential for debris within specified blocks (100 ha blocks in NNSSR SAC were scored). Each block is valued for each data source and then a cumulative value is given to each block using all data sources (this is detailed further in Appendix 1). The process is shown in **Table 4** below.

Table 4: Calculation of overall score per block.

Data source	Score	Confidence multiplier	Value multiplier	Total score for data source
Hornsea Three Geophysical survey	1.0, 2.0 or 3.0, based on scoring set out in Appendix 1	1.5	2.0	Based on score x multipliers
Race Bank / Lincs Geophysical and WROV imaging survey		2.0	2.0	
Sea Search surveys		1.5	1.0	
MMO fishing intensity data (Fishermat value)		1.0	1.5	
Fisheries UK VMS data 2018 to 2019		2.0	1.5	
UK VMS data (all vessels)		2.0	1.5	
UKHO / Admiralty wreck data		2.0	1.0	
Fisheries consultation		1.0	1.0	
OVERALL SCORE FOR BLOCK				Cumulative score of the above

39. As shown in **Figure 3**, block scores at NNSSR SAC range between 12.5 and 26 points. Highest scoring blocks are generally located in the southern and western sections of the SAC. There are also high scoring blocks that run adjacent to each other in a northwest-southeast orientation across the centre of the SAC.
40. The block scores were then further overlaid with habitat type and priority areas based upon conceptual analysis of physical processes (i.e., areas where an understanding of local physical processes suggests that debris may accumulate) and a target AoS and adaptive management AoS were identified. This is further detailed in Appendix 1.
41. The target AoS and adaptive management AoS are shown in **Figure 4**.

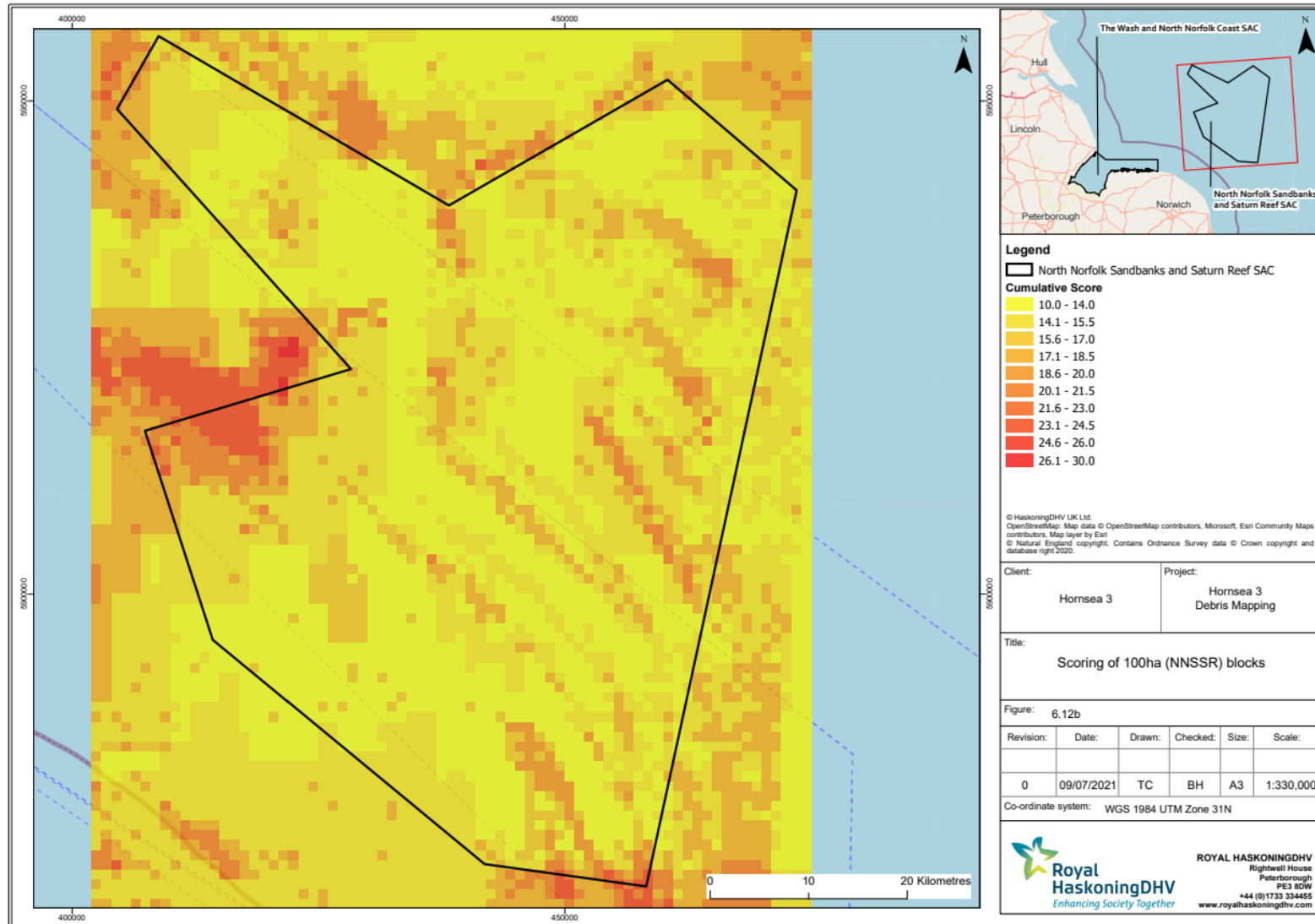


Figure 3: NNSR Block Scoring (100 ha). Higher scores reflect higher likelihood of debris.

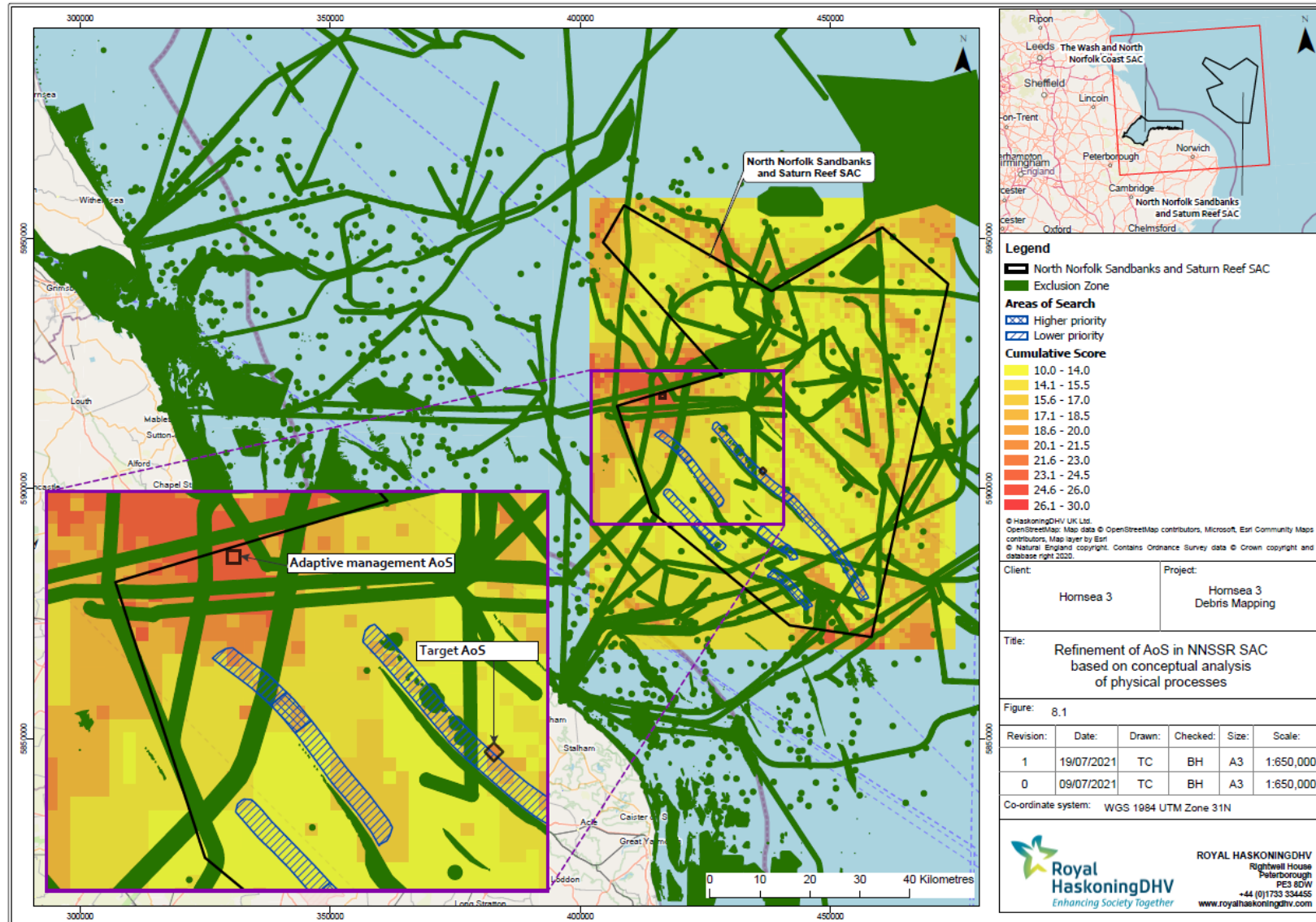


Figure 4: NNSR target AoS and adaptive management AoS.

6.2.1 Target location sensitives

6.2.1.1 Geogenic reef

42. The pre-application benthic surveys undertaken to inform the benthic characterisation¹⁵ of the Hornsea Three Order Limits identified five stations (ECR 24, 35, 36, 38 and 39 as shown in the footnoted report) as including stony substrate (i.e., cobble and pebble beds). Stony reef assessments were undertaken and three of the sites (ECR 24, 35 and 38) were classified as 'not reef' and two (ECR 36 and 39) as 'low reef'. Of these two areas only ECR 36 is within the NNSSR SAC boundary and this area coincides with an area excluded from the debris removal AoS as Annex 1 *Sabellaria* reef habitat.
43. These sample stations were in close proximity to the edge of the SAC boundary; however, it is recognised that there may be areas of geogenic reef (mainly expected to be stony/cobble reef) within the NNSSR SAC that have not been identified through historic survey effort, and may not be associated with *Sabellaria* reef, and therefore may be present within the NNSSR AoS.
44. Data from the Natural England condition assessment for stony-reef sub-features in other areas, such as the WNNC SAC¹⁶ recognises that the sub-feature of subtidal stony reef can recover from one-off activities. Additionally, as geogenic reef is a harder substrate it is less likely that debris will be buried, and therefore any tools required to excavate partially buried debris (Section 6.3.2.2) are less likely to be required.
45. Hornsea Three propose that if geogenic reef, including stony or cobble reef, is identified within an AoS and an item of debris is present on the reef, that debris will be targeted for removal as the long term ecological benefit to the geogenic reef substrate is greater than the single localised disturbance impact experienced as part of the removal activities. As detailed in Section 4.2, this approach is not similar to the exclusionary approach adopted for biogenic reef due to the difference in sensitivities of the features to disturbance events. Geogenic reef will, however, be considered as a sensitive feature and decision making using a decision tree, as discussed further in Section 6.3.2.3, will be implemented by a benthic ecologist. As outlined in Section 6.3.2.3, a more detailed decision tree referencing geogenic reef specifically will be submitted as part of the Marine License application.
46. Hornsea Three notes that specific post removal monitoring commitments are provided in relation to geogenic reef in Section 6.10.2.

6.2.1.2 Sediment type

47. During selection of the AoS, consideration was given to selection of habitat type (detailed further in Appendix 1). Coarse and mixed substrate (where present) was targeted as a priority over sand sediment. This preference was due to the understanding that debris removal from coarser sediment is considered to be more beneficial for this compensation measure for the following reasons:
- Such areas would support a higher biodiversity and therefore greater benefits could be achieved for removal of debris per unit area (if considering biodiversity as a value for positive impact). More mobile and finer sediment types are likely to have a much sparser faunal component and therefore the benefit for ecological gain would be lower per unit of debris removed.
 - Debris removal is expected to have less impact in a harder substrate as there would be less impact from the WROV as it would be resting on the top of the sediment rather than settling into it.

¹⁵ [ENO10080-000572-HOW03_6.5.2.1_Volume 5 - 2.1 - Benthic Ecology Technical Report.pdf \(planninginspectorate.gov.uk\)](#)

¹⁶ <https://designatedsites.naturalengland.org.uk/MarineCondition/PublicSubFeature.aspx?featureGuid=495dbf45-a650-e411-a6ba-000d3a2004ef&SiteCode=UK0017075>

- The debris is also less likely to be buried into the sediment and therefore easier to remove with the WROV with less requirement for sediment movement to uncover the item of debris.
48. Finally, Hornsea Three note that while final locations of cable protection are not yet understood, it is more likely that the deployment of cable protection will be deployed in areas of more stable substrate, therefore there is a greater likelihood of restoring similar habitat type to that which may be lost due to the deployment of cable protection.

6.2.2 Anticipated debris densities

49. Numerous debris items have been previously identified in the vicinity of, or overlapping with, the NNSSR SAC or in the wider southern North Sea area, from three Orsted offshore wind farm projects (Race Bank, Lincs, and Hornsea Two)¹⁷ and from pre-consent surveys for Hornsea Three¹⁸. Further details of the density of debris identified during these surveys is presented in Appendix 1 and an average density (targets per square km) is provided in **Table 5**.
50. **Table 5** further considers the debris density in relation to the minimum required AoS required to comply with the DCO, detailed in **Section 1.3**, and in relation to the size of the block identified as the target AoS.
51. In reality the debris is not likely to be evenly distributed and the data outlined in **Table 5** suggests that debris appears to accumulate in higher densities closer to shore, potentially due to the coastal processes and estuarine inputs of land-based debris. Therefore, Hornsea Three anticipate identifying a minimum debris density in NNSSR of between 4.4 and 7.1 items (item of debris of minimum size 1m²) per square km based upon those data sources which overlap with NNSSR (Hornsea Three) or are similarly offshore areas (Hornsea Two).
52. As the AoS is targeted to locations considered to have high likelihood of debris it is expected that a higher debris density will be identified.
53. Hornsea Three have used these anticipated minimum debris densities to develop a trigger level for adaptive management, presented in **Section 6.9.1**.

Table 5: Anticipated debris densities within the southern North Sea.

	Targets per square km	Predicted targets in 41.8 ha (0.418km ²)	Predicted targets in 100 ha AoS
Race Bank (within WNNC SAC)	91	38	91
Lincs (within WNNC SAC)	22	9	22
Hornsea Two (no overlap with SACs)	4.4	2	4.4
Hornsea Three (within WNNC SAC)	13	5.5	13
Hornsea Three (within NNSSR SAC)	7.1	3	7.1

6.2.3 Anticipated debris condition

54. Any debris that has remained static on the seabed for a period of time will have an area of scour around it induced by changes in physical processes due to the obstruction which will affect the benthic habitats and species in the localised area. The removal of the debris therefore restores this indirect footprint as well as the direct footprint. This is demonstrated by **Figure 5**.

¹⁷ Debris targets were identified using geophysical survey and confirmed using WROV
¹⁸ Targets identified using geophysical surveys only



Figure 5: Debris showing scour formation (source Chapter 5 Project Description).¹⁹

- 55. The size of the scour footprint and its shape will depend on the size and shape of the debris, and the mobility and particle size of the sediment upon which it sits. Debris will have a variety of shapes and sizes and there is not a single relationship that can represent the scour footprint for all types of debris.
- 56. As a general rule, a scour hole twice the area of the debris footprint is assumed. This is based on empirical formula for an idealised cylindrical obstruction (wind turbine foundation) on the seabed for Hornsea Two offshore wind farm (Smart Wind Limited, 2015). For a 10m diameter cylinder (area = 80m²) with a shallow scour depth of 1.8m, the predicted scour footprint in a loose fine to medium sand would be about 140m².

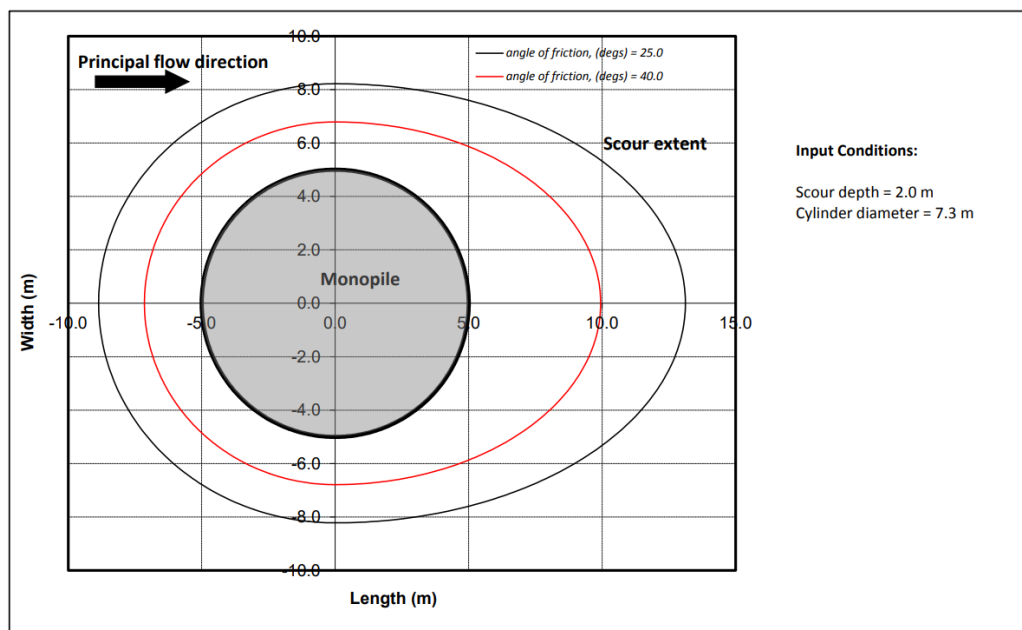


Figure 6: Estimated scour extent for 1.8 m scour hole assuming an angle of friction (repose) of both 25o and 40o and a pile diameter of 10 m (Smart Wind Limited 2015).

¹⁹ Hornsea Three note that any anchors identified during the debris removal campaign will be subject to archaeological assessment prior to their removal.



Figure 7: Form of the equilibrium scour hole developed around a conical GBS foundation in a scaled model test for Thornton Bank (Bolle et al., 2010).

- 57. Hornsea Three anticipate that the vast majority of debris identified and removed will be causing a direct and indirect scouring impact to the seabed.
- 58. **Table 6** depicts the potential direct and indirect footprint removed associated with an item of debris and therefore any item removed restores greater than the sediment directly beneath the debris. Debris with footprints of 20m², 10m² and 5m², and associated scour are described however it should be noted that these are of course provided as an example and debris identified could be smaller or larger than these indicative sizes.

Table 6: Potential debris footprints and associated scour footprint.

Debris footprint without scour (m ²)	Debris footprint with scour (m ²)
20	60
10	30
5	15

6.3 Marine debris removal campaign methodology

- 59. Following approval of the SBIPs by the Secretary of State, Hornsea Three will conduct a physical removal campaign of relevant debris (i.e., any lost or abandoned, non-natural or introduced material on the seabed in accordance with the approved SBIPs and within the AoS identified in **Section 6.2**).

6.3.1 Exclusions: sensitive features

- 60. There may be instances where certain areas within the NNSSR SAC, or specific types of marine debris, are excluded from consideration for removal. These are outlined below and detailed further in Appendix 1.

Table 7: Exclusions of sensitive features.

Exclusion	Detail of sensitivity
Sabellaria reef	<p>All known areas of <i>Sabellaria</i> reef have been excluded (including JNCC <i>Sabellaria</i> reef management areas), as detailed in Appendix 1.</p> <p>Areas of <i>Sabellaria</i> reef identified during Stage 1 of the removal campaign (Section 6.3.2) would be avoided and removal activities would not take place within an appropriate buffer of 50 m to</p>

Exclusion	Detail of sensitivity
	<p>ensure no damage is caused to any reef features. The excluded areas will encompass areas of <i>Sabellaria</i> identified as 'low', 'medium', and 'high' reef (Gubbay, 2007).</p> <p>It should be noted that, given the focus on restoration of sandbank habitat and communities, debris with biological colonies / settlements that do not naturally occur on or near sandbank habitats would not be excluded from removal. This approach has been consulted on with Natural England and JNCC as detailed in the Consultation Summary.</p>
Heritage assets	<p>Known heritage assets have been excluded, as detailed in Appendix 1.</p> <p>Marine debris items that represent sites of archaeological interest (for example, debris associated with historic wrecks or historic material relating to activities at sea) would be excluded and removal activities would not take place within an appropriate buffer to prevent accidental damage during debris removal. Marine debris entangled within sites of archaeological interest would not be targeted for removal due to the sensitivity of those sites.</p> <p>The identification of material of archaeological interest will be made through a combination of experience and reference to appropriate guidance including <i>Ships and Boats: Prehistory to 1840</i> (English Heritage, now Historic England, 2012), <i>Ships and Boats: 1840-1950</i> (English Heritage, now Historic England, 2012), and <i>Military Aircraft Crash Sites, Archaeological guidance on their significance and future management</i> (English Heritage, 2002).</p> <p>The debris removal campaign will be conducted in compliance with a further detailed Method Statement approved by Historic England²⁰.</p>
Third party assets	<p>Exclusion zones of 500m will be implemented around electrical infrastructure and oil and gas infrastructure in NNSSR. A safety zone of 500 m is a standard buffer to protect subsea structures.</p> <p>Any pots / other fishing gear which are marked at the surface will be treated as active or wet-stored and will be avoided, although by necessity this would be determined at the time of the removal campaign. Notices to Mariners issued prior to the campaign would allow fishers to remove / mark unmarked gear. The Offshore Fisheries Liaison Officer (OFLO) on the vessel will coordinate the approach to managing any gear potentially active within the AoS during the debris removal campaign.</p>
Health, Safety and Environmental (HSE) considerations (including UXO)	<p>Debris posing technical, feasibility issues or health and safety risks (such as the presence of potential UXO) will not be proposed for removal.</p> <p>The CIRIA guidance (2015) on UXO has been used to develop a method statement with the contractor for risk analysis of such debris targets. A UXO/Explosive Ordnance Disposal (EOD) specialist will review geophysical survey data and be on 24-hour call during Stage 3 of the campaign (Section 6.3.2) to be consulted on potential for debris to be a UXO risk based on WROV footage prior to attempted recovery.</p> <p>Should the WROV or support vessel contractor deem recovery of an item poses too high a UXO HSE risk, the contractor has right to decline to recover through providing a clear rationale. Should an item be identified as UXO the contractor is not obliged to remove from the seabed.</p>

²⁰ Hornsea Three note that the archaeological Method Statement has been approved by Historic England 24/11/21.

6.3.2 Exclusions: Campaign scope

6.3.2.1 Buried debris

- 61. Only debris protruding from the seabed, or with a clear seabed impression, will be considered for removal. The WROV will be mobilised with either a water jet or a pump tool to allow for limited movement of sediment around debris, approximately up to 1m depth of seabed material. Estimated degree of burial and whether to attempt recovery will be assessed on the vessel by offshore supervisors, and WROV Supervisor. WROV contractor experience suggests seabed debris larger than 1m is unlikely to be buried more than 0.5m and therefore Hornsea Three do not consider sediment movement to a maximum depth of 1m to be required at a large proportion of debris items.

- 62. Examples of a WROV which may be utilised are provided in **Figure 8**. The figure to the left shows the green hose attached to the side of the WROV which is the water jet tool which would be used to disperse sediment where it was required. The water jet tool can be set up to ensure the end of the jet tool is relatively narrow to ensure any jetting can be carefully targeted. The figure below shows a jet tool with an end width of 4 inches. The figure to the right shows the alternative sediment pump which may be used to remove sediment surrounding a debris target and deposit that sediment to the side of the WROV. Similarly, this tool can be relatively narrow and will be targeted using the WROV manipulators.

- 63. Sediment movement will be required to excavate debris but also to minimise the suction effect which is often experienced when lifting debris from sediment.

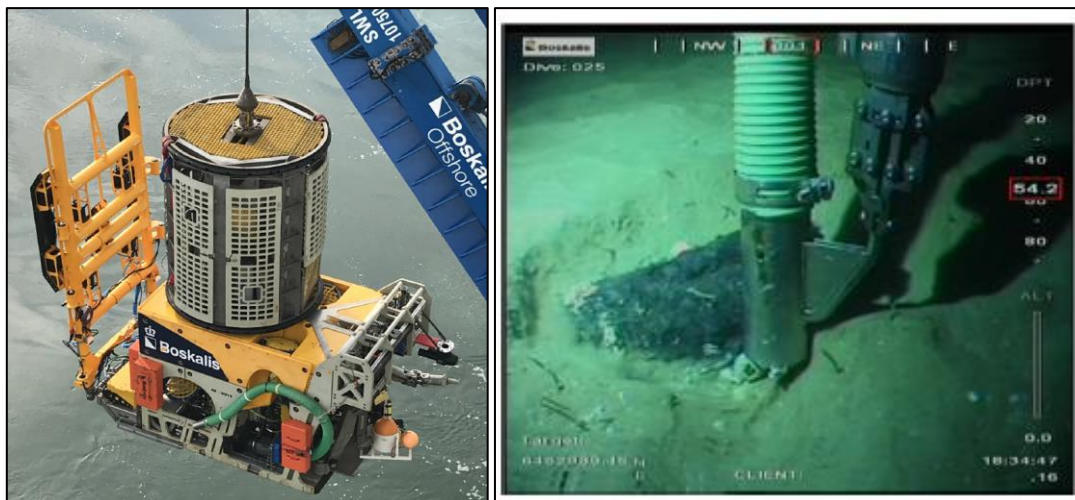


Figure 8: Example WROV and attachment tools.

- 64. Following consultation with contractors, Hornsea Three does not consider it appropriate to cut debris such as fishing nets at the seabed surface due to the risk of WROV entanglement. Contractor experience suggests that cutting nets often results in sections of plastic net splintering and being lost which is not considered to be a desirable outcome.

6.3.2.2 Depth

- 65. The methodology outlined in this SBIP is restricted to water depths deeper than 8m Lowest Astronomical Tide (LAT), due to vessel access requirements. The target AoS (and adaptive management AoS) are in water depths deeper than 10m depth, therefore the proposed removal methodology is suitable to those AoS blocks identified.

6.3.3 Survey sequence of events

- 66. The removal campaign will be carried out in three stages (**Figure 9**), using a geophysical survey vessel and WROV support vessel:

Stage 1 – Geophysical Data Acquisition:

- a. Geophysical data acquisition using Multibeam Echosounder (MBES) & side scan sonar.
- b. Offshore assessment of geophysical data.
- c. Preliminary onshore data processing & target identification.

Stage 2 – Data Review & Target Assessment:

- a. Onshore assessment of targets, consultation with relevant technical specialists.
- b. Target listing for Stage 3 Investigation & Removal confirmed.

Stage 3 – Investigation & Removal:

- a. Target Investigation using WROV.
- b. Offshore assessment of target using relevant experts on board the vessel (benthic ecologist, UXO specialist²¹ and Retained Archaeologist).
- c. Recovery of debris using WROV, vessel crane or winch depending on size and shape of object.

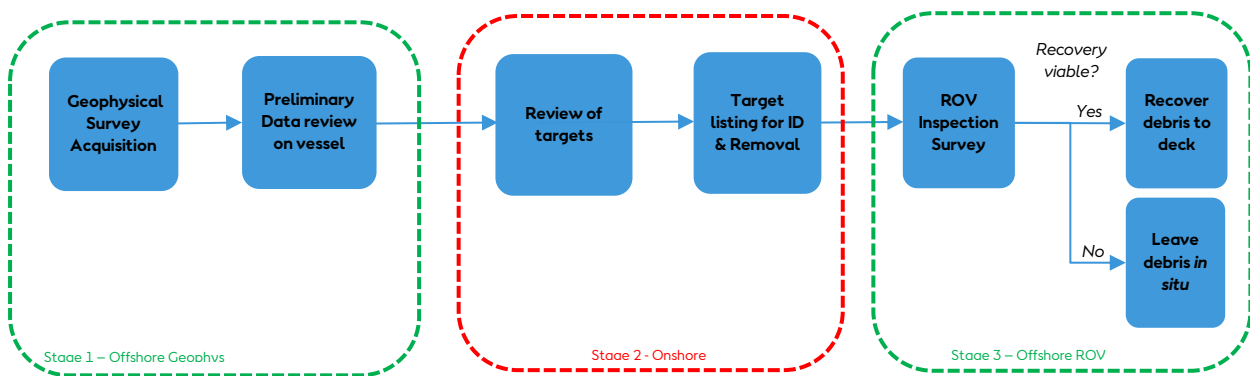


Figure 9: Survey sequence of events - Flow diagram.

67. It should be noted that recovery is deemed viable through the screening of each target to ensure it is not within the list of exclusions outlined in **Section 6.3.1** and the contractor has confidence it can be removed without posing undue HSE risk to the vessel and crew.

6.3.3.1 Stage 1: Offshore geophysical survey

68. High resolution geophysical seabed data (hull mounted MBES, towed side scan sonar) will be acquired to identify potential debris targets (or debris clusters) approximately greater than 1m in size. The survey plan has been designed to optimise resolution in both datasets. General equipment requirements are:

- MBES - Full coverage MBES bathymetry, minimum 20 soundings per 1m x 1m bin.
- Side scan sonar – High frequency, min 800 KHz, providing full seabed coverage, to include under-towfish gaps on adjacent lines. See **Figure 10** for data example.

²¹ Note UXO specialist will not be present on vessel but available on 24 hour call for onshore consultation.

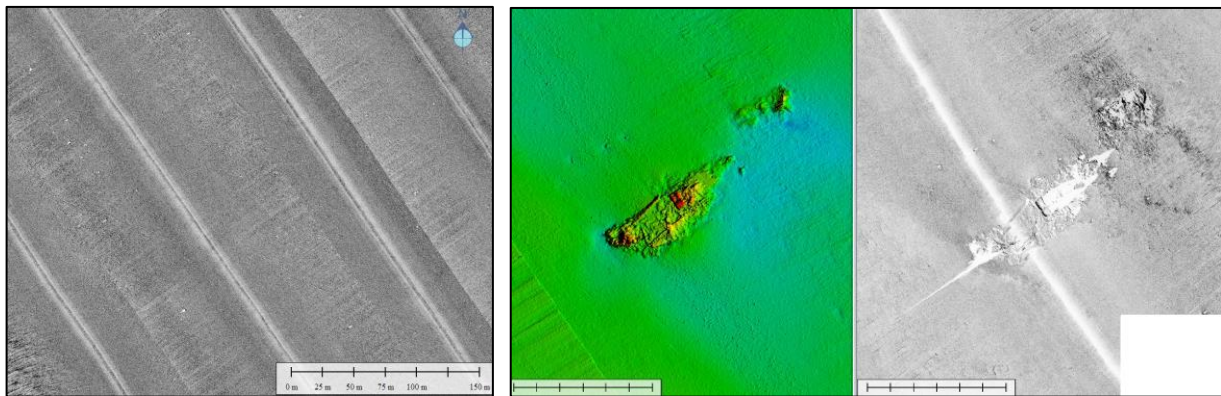


Figure 10: Typical Multibeam and side scan sonar imagery, showing a wreck with debris (left) and boulders (right).

69. MBES and side scan sonar data will undergo preliminary processing offshore to identify targets greater than 1m in size. These targets will be provided to the Hornsea Three Supervisor aboard the vessel who will provide daily updates to the Hornsea Three team onshore. It should be noted that it will not be explicitly clear whether targets identified are debris or other seabed features (for example boulders) until data processing and WROV investigation is complete.
70. Following completion of geophysical survey of the required AoS as approved in the SBIPs, the vessel will demobilise, and the data will be processed onshore.

6.3.3.2 Stage 2: Onshore data processing

71. The processed data will be provided from the geophysical contractor to Hornsea Three, alongside a technical note and associated spreadsheet summarising each target, with information such as its location, description of anticipated size and any inferences as to its likelihood of being debris, with supporting side scan sonar and MBES imagery to a 50 m buffer. If required, the full unprocessed data set could be provided to technical specialists identified below to support review of the target list and provide context to the target list.
72. The technical note, associated information and, where relevant, the raw data will be reviewed by Hornsea Three and the required specialists: benthic ecologist, UXO / EOD Specialist and Hornsea Three Retained Archaeologist.
73. Following the review, Hornsea Three will have a list of targets (and coordinates) which will be progressed to Stage 3 of the campaign. Hornsea Three will additionally have a list of targets which were discounted from further investigation and rationale for the exclusion, such as established *Sabellaria* reef being noted within 50 m buffer to the target. At this point the SG will be presented the seafloor target list and any exclusion zones for information during a SG meeting.

6.3.3.3 Stage 3 a/b: Target investigation survey

74. Stage 3 comprises the below steps:
 - a. Target Investigation using WROV.
 - b. Offshore assessment of target using relevant experts (benthic ecologist, UXO specialist and Retained Archaeologist).
 - c. Recovery of debris using WROV, vessel crane or winch depending on size and shape of object.
75. Based on the seafloor target list resulting from Stage 2, the potential marine debris targets will be approached in a systematic order by the WROV installed on the WROV support vessel. Hornsea Three may request that the contractor prioritise WROV investigation of specific targets

should they be considered high potential for clusters of marine debris from the MBES and side scan sonar data.

76. Hornsea Three note that where a target is revisited for investigation and it has moved following the geophysical survey, Hornsea Three cannot re-survey using geophysical methodologies to identify the new position of that target as full mobilisation of a geophysical survey vessel is not proportionate in response to the movement of an individual target. Debris investigation and removal will be undertaken in quick succession of the geophysical survey to mitigate this occurrence.
77. At each target, WROV will acquire video data of the target. The Hornsea Three Supervisor, benthic ecologist, UXO / EOD Specialist (where required), Retained Archaeologist and WROV Supervisor²² will review data from WROV cameras and decide if and how target recovery is to be attempted. This decision will be based upon several factors and will result from either those exclusions agreed in the SBIPs (for example items of archaeological interest) or contractor expertise (risk assessment and consideration of the most appropriate removal tool to utilise). A decision tree has been developed for the purpose of the SBIP and is shown in **Figure 11** with supporting information provided in **Figure 13**.
78. A further detailed decision tree, related to biogenic and geogenic reef specifically, has been developed with input from all specialists and the WROV contractor and submitted to the MMO as part of the marine licence process for the debris removal campaign. The decision tree is presented as **Figure 12** and will be subject to agreement with the SNCBs through the marine licence process. Hornsea Three note that should amendments to the decision tree provided in **Figure 12** be agreed through the marine licensing process, the updated decision tree will supersede the version provided in this document.

²² Considered to be part of the contractor vessel crew

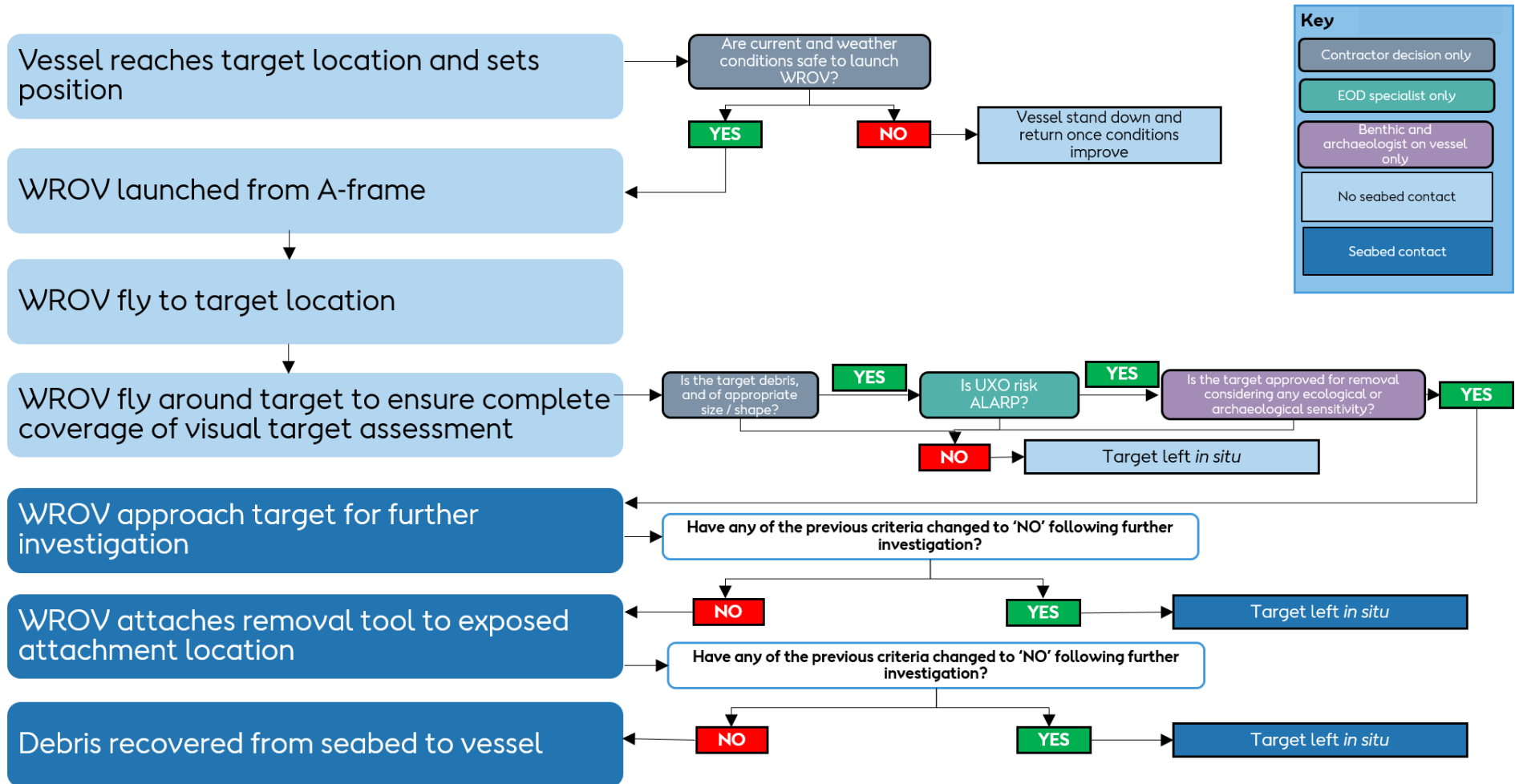


Figure 11: Decision tree outlining the processes to be followed during Stage 3 of the campaign.

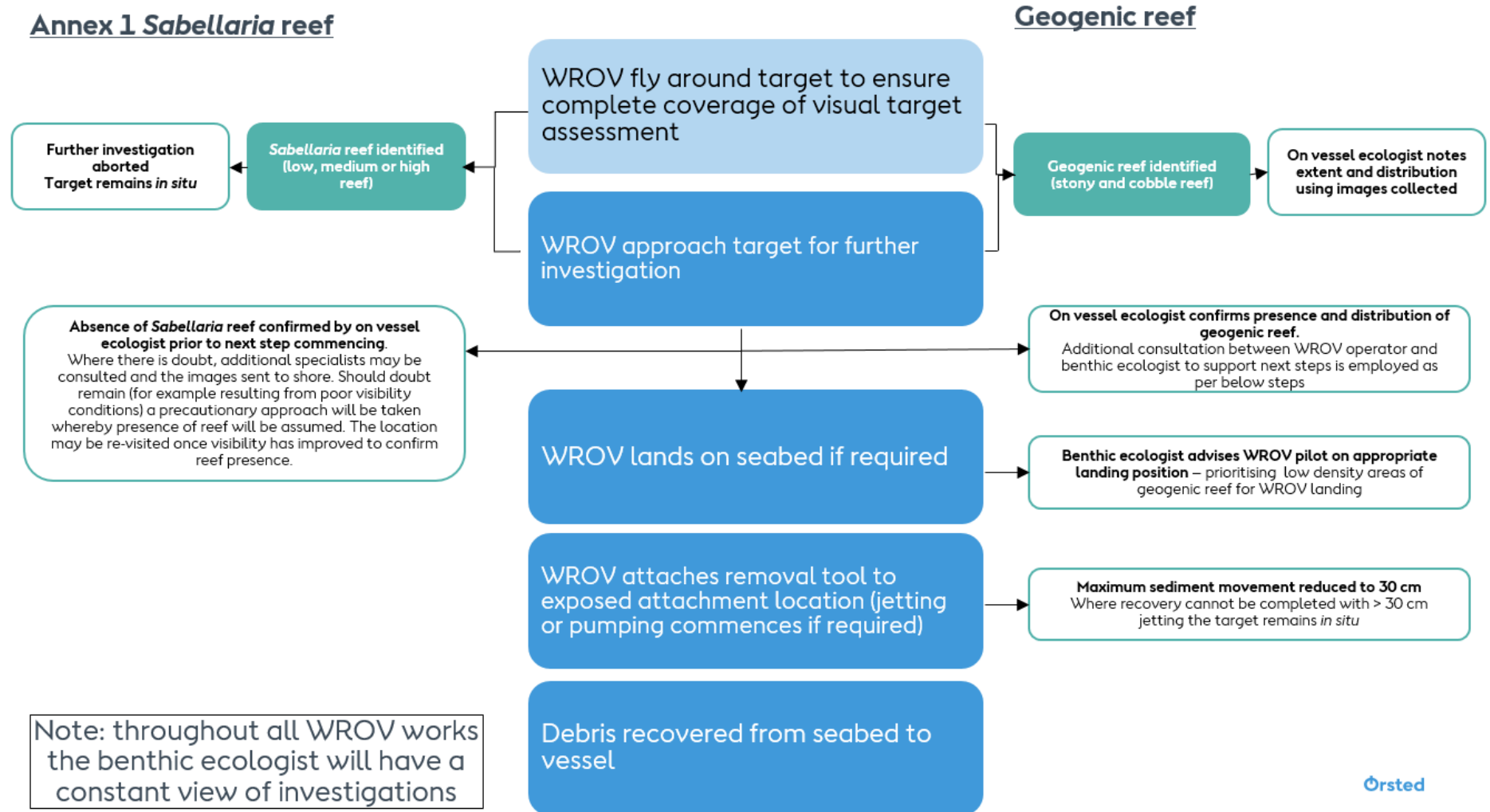


Figure 12: Decision tree outlining the processes to be followed during Stage 3 of the campaign in relation to biogenic and geogenic reef.²³

²³ This decision tree has been submitted as part of the Marine License Application and is currently under consultation.

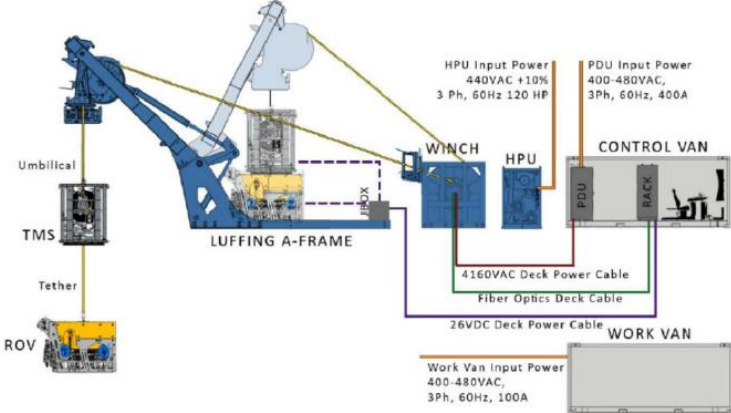
<p>Vessel reaches target location and sets position</p>	<p>Vessel DP system maintains position of vessel throughout. Vessel GPS coordinate logged. Weather and visibility considered when launching WROV.</p>
<p>WROV launched from A-frame</p>	<p>All relevant personnel will be within the WROV control van.</p>  <p>The diagram illustrates the power and data connections for the WROV launch system. It shows a Luffing A-Frame with a Winch and HPU (Hydraulic Power Unit) connected to a PDU (Power Distribution Unit) and a Control Van. The Control Van is connected to a Work Van. The diagram also shows the Umbilical, TMS (Tether Management System), and Tether connecting the ROV to the A-Frame. The Work Van is connected to the Control Van via a 26VDC Deck Power Cable. The Control Van is connected to the PDU via a 4160VAC Deck Power Cable and a Fiber Optics Deck Cable. The PDU is connected to the HPU via a 440VAC +10% 3 Ph, 60Hz 120 HP cable. The Work Van is connected to the PDU via a 400-480VAC, 3 Ph, 60Hz, 100A cable.</p>
<p>WROV fly to target location</p>	<p>During survey operations, the WROV-Pilot has a constant view on the investigation area with cameras mounted on the WROV, the WROV is also equipped with a forward-looking sonar system. Target GPS coordinate logged.</p>
<p>WROV fly around target to ensure complete coverage of visual target assessment</p>	<p>WROV will maintain an approximate 1.5 m set back distance from the target and altitude of approximately 0.5 m.</p>
<p>WROV approach target for further investigation</p>	<p>Water jet or pump fitted on the WROV will be conducted with as little physical contact or disturbance to the target as possible. Sediment will not be moved to greater than 1m depth. During this activity the WROV may be positioned on the seafloor.</p>
<p>WROV attaches removal tool to exposed attachment location</p>	<p>WROV may use manipulators and remove debris. WROV may alternatively attach larger lifting equipment, such as the winch mechanism, to the attachment location exposed. During this activity the WROV may be positioned on the seafloor.</p>
<p>Debris recovered from seabed to vessel</p>	<p>WROV pilot will have view of the debris being lifted.</p>

Figure 13: Supporting information for each step outlined in the Stage 3 decision tree (Figure 11) and biogenic reef and geogenic reef specific decision tree (Figure 12).

- 79. If a target is confirmed for recovery, those recovery operations will commence immediately to minimise the likelihood of the target moving or becoming further buried in sediment.
- 80. **Figure 14** shows the anticipated imagery expected to be achieved for each target in Stage 3b. The WROV will be equipped with several cameras and lighting which can be used in low visibility environments to improve the picture quality.



Figure 14: Example of debris identified using WROV, anchor, anchor chain and fishing net (top to bottom).

6.3.3.4 Stage 3c: Removal of debris

- 81. Following Stage 3b, if a target is confirmed as viable for recovery, the contractor will attempt retrieval using a method appropriate to the type, size, and weight of the debris item. Hornsea Three has undertaken extensive consultation with contractors and identified the below three options for removal of a target which can be utilised, however should a contractor propose a

different method of lifting which operates similarly to the below potential approaches this may be considered²⁴:

- **WROV:** manipulators can lift an item up to 250 kg in weight and of a size which the WROV manipulators can manage.
- **Vessel crane with grab attachment:** weight capabilities up to 25 tonnes at 8 m water depth, 12.5 tonnes at 20 m water depth. Capabilities of up to 2.8 m³ and used by several contractors to remove other marine infrastructure including debris identified. The grab attachment has limitations in terms of debris length. Operated via deck controls. Where required the WROV can monitor the crane lift for more controlled movements. Shown in **Figure 15**.
- **Vessel winch:** can be utilised for debris of any length such as wires and chains to a weight of up to 150 tonnes. Debris is reeled in directly onto the vessel deck and this option will only be utilised for considerably large debris targets.



Figure 15: Example grab attached at the end of the crane.

82. The preferred method of recovery will be determined on board by the Hornsea Three Supervisor and WROV Supervisor, however it is understood that recovery using the WROV will be the preferred option unless the size of the debris means that the WROV cannot be used.
83. Where the crane or winch is used, the connecting cables will be mobilised and attached to the debris target using the WROV hook or other method for WROV to connect recovery cable with debris using WROV manipulators. This guidance of the removal tool to the debris item by the WROV will ensure a controlled and highly targeted removal process.
84. As detailed in **Section 6.3.2** a jet or pump tool on the WROV may be utilised to remove surface material on or around the debris to expose a connection point. Similarly, the approach to connection will be determined on board by Hornsea Three Supervisor and WROV Supervisor and will be individual to each debris target as the only way to assess the most appropriate connection technique is through visual inspection.
85. **Table 8** details some examples of potential connection method and lifting equipment which would be needed in relation to different types of debris and are provided as a guide to the likely approach that will be taken on board.

²⁴ All tools will be included as part of the marine license application made to support the removal activity

Table 8: Guide to potential removal methodologies.

Object example	Lifting equipment ²⁵	Recovery method
Anchor ²⁶	Endless chain	Crane
Anchor and chain	Endless chain or chain with hook	Crane or winch dependent on length of chain
Concrete block	Soft sling or endless chain	Crane or winch
Concrete block and chain	Endless chain or chain with hook	Crane or winch dependent on length of chain
Framework	Soft sling or endless chain	Crane
Fishnet	Grappling hook	Crane or winch dependent on volume

86. **Figure 16** shows a concrete block recovered using the soft sling lifting equipment (the orange ties providing connection to the debris) and a fish net being removed using the grappling hook which is placed by WROV directly on top of the fishing net.

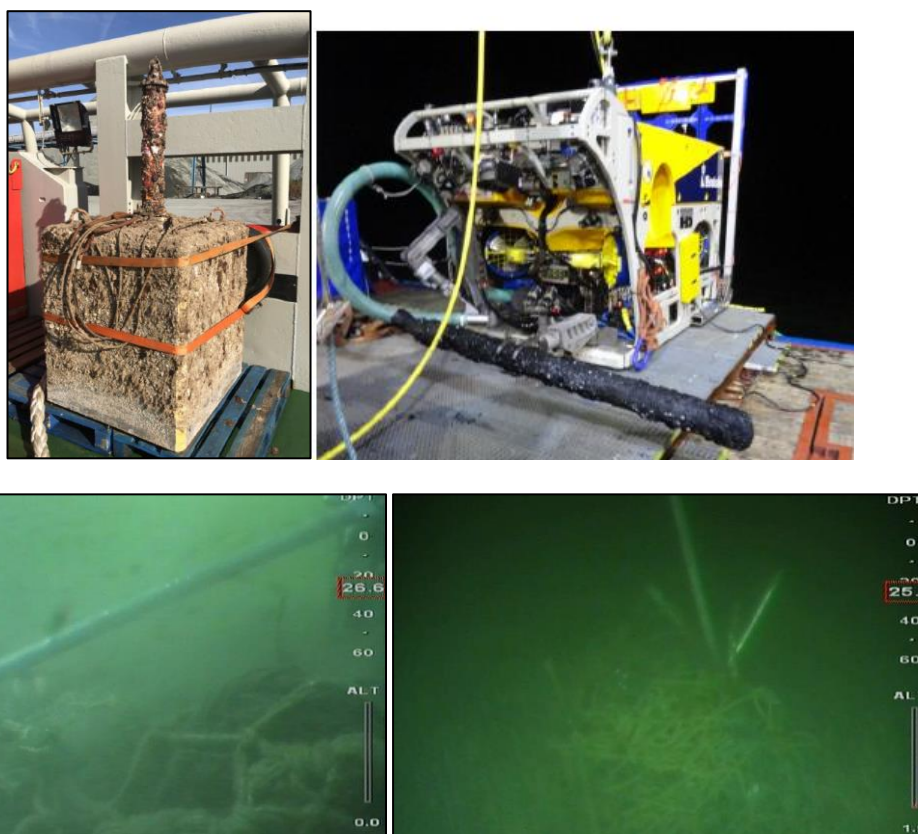


Figure 16: Concrete block debris recovered (above left), WROV manipulators recovering metal debris (above right) and fishing net being recovered (below).

²⁵ Lifting equipment is placed on the debris using the WROV to ensure no grappling occurs on the seabed to 'snag' the debris target
²⁶ Only modern anchors would be targeted for removal and historic anchor would remain *in situ* according to the Method Statement to support this campaign

87. WROV operations will be deemed complete once all targets listed for inspection have been inspected and either recovered, left *in situ*, or left on the seabed following an aborted recovery.
88. The contractor will provide Hornsea Three with a field report summarising the operations and all associated data and rationale for approach to each individual target.

6.3.4 Debris disposal

89. Debris will be lifted onto the vessel deck and stored appropriately according to HSE requirements as defined by the contractor. Hornsea Three understands that several vessel options are available which provide the required open deck space²⁷, and additional deck space for container(s) to be utilised, to store the removed marine debris with minimal requirement for numerous port returns to offload the debris collected.
90. The debris will be brought to shore for disposal or recycling (as appropriate) on return to a UK port. The contractor will organise recycling options where they are available however as the debris is likely to be heavily fouled, onshore disposal is considered to be the realistic option for the majority of debris collected.
91. A Waste Management Plan (WMP) for all debris removed will be developed with the offshore contractor and port authority (at this stage not yet known) and submitted alongside the Marine License application for the debris removal campaign.
92. Should any lost/unmarked fishing gear be retrieved that still has identification tags attached, then this information will be provided to the EIFCA to allow retrieval of gear by fishermen as opposed to disposal. The OFLO on vessel will assist in the identification of ownership of lost/unmarked fishing gear retrieved.

6.3.5 Target abandonment

93. Hornsea Three notes that while the intention is to remove as many marine debris targets as are identified, it is imperative that the contractor maintains the right to abort operations should concerns arise either during Stage 3b or Stage 3c. Whether to proceed with attempted removal of any target or to abort during recovery is at the discretion of offshore management.
94. For example, recovery may be aborted if there are concerns regards the following:
 - Level of HSE risk including potential for UXO.
 - Extent of target likely to be submerged below seabed.
 - Inability to securely connect lifting mechanism to target, e.g., due to size, weight, shape, orientation, material.
 - Excessive likely weight or size of target posing risk to lifting off seabed, onboarding to deck or storage on vessel.
 - Target identified as of potential archaeological interest.
95. Lifting capabilities of WROV, crane and winch equipment are anticipated to facilitate recovery of targets of considerable weight. However, recovery from seabed and onboarding onto deck of very large items (for example >10 m) may not be feasible.

6.3.5.1 Large items exceeding anticipated vessel capability

96. Hornsea Three notes that there is the potential to encounter targets which are beyond the capabilities of the vessels currently mobilised. For example:
 - Seafloor target identified during Stage 1 of the campaign is clearly too large or too heavy for the vessel(s) which will be mobilised during Stage 3 to remove, either due to equipment capabilities or vessel deck space.

²⁷ Considered to be 5 m by 5 m to store those debris items which cannot be stored in the container(s) on deck

- Seafloor target investigated during Stage 3 of the campaign cannot be removed within the parameters secured within the marine license, particularly in relation to a maximum sediment movement depth of 1 m.

97. Should Hornsea Three identify an item which is beyond the capabilities of the vessels currently mobilised, within the 41.8 ha in NNSR SAC or 2.77 ha in WNNC SAC, these will be investigated using the WROV during Stage 3 of the campaign and where possible the images collected will be used to develop a bespoke removal plan which would demonstrate how that item may be able to be removed. This may involve working with a specialist salvage contractor. The field report ([Section 6.7](#)) will inform the SG and Secretary of State if any such items have been identified and will note whether a bespoke removal plan is considered to be required for an item.
98. As these removals may require bespoke methodologies, Hornsea Three would deliver this in a separate campaign (anticipated to be the following summer season) and under a separate Marine License as a different methodology would require consent. Hornsea Three note that agreement with the SG would be sought throughout the development of this removal plan, and should alignment not be reached as to the benefit versus impact of removal the item will remain *in situ*. These removals would be completed prior to the commencement of offshore construction.
99. Hornsea Three note that removal of such items is subject to HSE risk considerations which will also be considered during consultation with the SG. The principles outlined within this SBIP will also apply to the removal of any such items, such as exclusion of impact to sensitive features listed in [Section 6.3.1](#).

6.4 Schedule

100. Duration of programme will be dependent on various factors, for example amount and nature of debris, complexity of seabed, weather conditions and ease of recovery. As a guide only, programme duration is estimated as follows and is based upon information from relevant contractors and experience on other projects:
- Stage 1a/b: Geophysical Acquisition – up to 2 weeks.
 - Stage 1c: Data processing – 4 weeks.
 - Stage 2: Technical specialist review – 4 weeks (from data delivery).
 - Stage 3: ROV Investigation & removal – up to 6 weeks.
101. Contractor and Orsted experience suggest that visual identification of a target (Stage 3a) can take between 30 minutes to one hour and recovery (Stage 3c) can take between 1.5 – 2 hours for what would be considered a straightforward recovery however additional time may be required to displace sediment around the debris target or in poor visibility conditions. The duration of Stage 3b is dependent upon the complexity of item recovery.

6.5 Contractor management

6.5.1 Offshore representation

102. The following Hornsea Three supplied personnel will be present on vessel to ensure that the contractor adheres to the approved methodology and exclusions and is fully aware of the environmentally sensitive nature of the target location:
- Stage 1: Hornsea Three Supervisor, OFLO.
 - Stage 3: Hornsea Three Supervisor, benthic ecologist, UXO / EOD Specialist (either onboard or onshore as required), Retained Archaeologist, OFLO.
103. Hornsea Three personnel will not be supplied for Stage 2 however the process will be closely managed by the Hornsea Three team.

104. All Hornsea Three personnel will have the required certifications and level of experience to manage this campaign.

6.5.2 Hornsea Three engagement with contractor

105. A Project Execution Plan (PEP) will be provided by the contractor for all stages of the debris removal campaign which will detail the Hornsea Three approved way of working and methodologies approved in the SBIPs and any supporting license documents.
106. Hornsea Three will regularly engage with the contractor and provide toolbox talks for each stage of the campaign. Where required the benthic ecologist and Retained Archaeologist will similarly provide toolbox talks to ensure appropriate ways of working.

6.5.3 Contractor expertise

107. Stage 1 and Stage 2 of the proposed campaign are considered a standard form of operation and Hornsea Three have robust ways of working to ensure data collection and provision is to a high quality.
108. While Stage 3a and 3b are standard operations for Orsted, Stage 3c is considered routine for a WROV support vessel. Hornsea Three will ensure that the appointed contractor, particularly in relation to Stage 3, is experienced in the inspection and recovery of debris from the seabed onto vessel.

6.6 Impact pathways associated with debris removal

109. As debris removal is a discrete and targeted activity, sediment movement arising from its removal from the seabed will be a temporary, short term and highly localised impact to the seabed and immediate surrounding area. The impressions left during removal are expected to be small in comparison to the size of the sandbanks and given the mobility of the sediment within the area, will refill over a short time period. The volume of sediment within the sandbank system would not change as it is expected that items will not have retained sediment within them, and the removal of debris is being undertaken with the aim of increasing the surface area of sediment. The removal methodology is designed to be sensitive to the features the debris removal will restore to a more natural state.

6.6.1 Sediment movement

110. As detailed in [Section 6.3.2](#), a water jet or sediment pump tool may be required to remove some items of debris that are partially buried in the seabed or to achieve connection of the removal tool. This would disturb the sediment around the item to enable its release and could therefore affect the surrounding habitat and species. However, it is recognised that such areas will already be affected to some degree through scour and detrimental impacts due to the presence of the item of debris.
111. Scour around an upstanding item of debris on the seabed is typically elliptical in form, with the longest part of the ellipse on the down-current side. Scour-hole dimensions depend on numerous factors including current velocity, size and shape of the debris, and the composition of the seabed around the debris. The scour would begin to form almost immediately after the item of debris lands on the seabed, reach an equilibrium and then be maintained if the debris remains stationary. Once the debris is removed, the scour hole would gradually fill in through natural sediment transport processes.
112. The process of sediment movement to aid extraction of debris would disturb the seabed sediments and shallow near-bed sediments around the debris. The process would cause localised and short-term increases in suspended sediment concentrations at the point of seabed interaction. Mobilised sediment from this activity may then be transported by wave and tidal action in suspension in the water column. Given that the material that would be released during each individual event is sand and coarser sediment with the potential for very small volumes of fine sediment, the disturbance effects at each debris location are only likely to be highly localised in terms of the deposition zone and any plume from finer sediment would last for no more than a

few hours before dispersing widely to background levels. This is based on the debris removal being undertaken within sandbank habitat which is highly mobile and thus not expected to contain a high proportion, if any, of fine material (<63 microns). It is generally accepted that coarser sediment will settle out of suspension much quicker as it is denser and therefore the plumes and deposition footprint are considerably more localised.

113. Therefore, it is not expected that sediment movement using either the water jet or sediment pump tool to assist removal of an item of debris would have a significant effect on conservation features as the impact of the presence of the debris would have already resulted in a disturbed habitat, and therefore affected the faunal community, in the surrounding area. The removal of the debris would enable the return of the more natural habitat and enable recolonisation of the area.

6.7 Compliance and Success

114. The compliance requirement within the DCO (outlined in [Section 1.3](#)) is to carry out debris removal within an AoS equating to a minimum of 41.80 ha of the NNSR SAC, and the desktop assessment presented in Appendix 1 has been utilised to identify the most appropriate target area within the NNSR with the aim of maximising the potential for finding debris. The target AoS 100 ha block shown in [Section 6.2](#).
115. It should be noted that success is therefore measured, in terms of compliance with the above DCO requirement, with the removal of marine debris from the given AoS. Success is also linked to the implementation and management of the longer-term debris reduction measures as set out in [Section 7.2](#).
116. Hornsea Three will remove debris from within the AoS using the methods stated within this SBIP. A field report will be submitted to the Secretary of State and the SG for information following completion of the campaign which will demonstrate that the required AoS (and the adaptive management AoS if triggered) has been searched and, where possible, debris has been removed. The field report will also contain information regarding the location, size, and nature of the debris, whether the debris was recovered (and what decisions were taken to enable recovery), if a recovery was attempted and aborted, or if the debris was left *in situ* (and, if so, why it was left).
117. Hornsea Three will draft a further report which will be more detailed than the field report and provide information such as habitat type restored and a categorisation of the potential debris sources. The report will also include an estimate of the direct footprint of the recovered debris (based on size of each item of debris) and the potential area of seabed that could have been indirectly affected by the debris (as described in [Section 6.2.2](#)). The seabed type will also be described as far as possible from the evidence gathered during the campaign. This will be submitted to the SG and the Secretary of State on a for information basis ([Section 9](#) provides an indicative timeframe).
118. All data collected during the offshore campaign will be provided to Natural England and JNCC to help inform further management of the site.
- ## **6.8 Consents for implementation**
119. All removal operations will be carried out under the requisite marine licence and subject to conditions as specified by the MMO at the time of consent. Hornsea Three anticipate submitting a marine licence application detailing the same methodology as that outlined in [Section 6.3](#) in parallel with the submission of the SBIPs to Secretary of State. This is detailed further in [Section 9](#).
120. A Method Statement for the campaign will be developed in consultation with Historic England and submitted as part of the Marine License application²⁸.

²⁸ Hornsea Three note that the archaeological Method Statement has been approved by Historic England 24/11/21.

6.9 Adaptive management

121. As detailed above, the marine debris removal campaign is required to conduct a search of a minimum of 41.80 ha of the NNSSR SAC and remove any suitable marine debris identified within those areas to discharge the requirement in the DCO. Hornsea Three have proposed adaptive management measures which will be employed in the instance that the expected densities of debris are not realised and to ensure maximum ecological benefit resulting from the marine debris removal campaign (achieved through removal of marine debris and the increase in availability of seabed habitat that can then be colonised by macrofauna, as would have been the case prior to the debris item smothering the seabed).
122. A screening exercise was conducted to identify potential options for the adaptive management strategy, which are detailed further below, and consulted on with the SG (details provided in the Consultation Summary). The screening is outlined below in **Table 9**. The adaptive management options have been developed to deliver the same outcome as the measure secured in the DCO (the removal of marine debris).

Table 9: Adaptive management screening.

Option	Further detail	Taken forward?
Adapt methodology of campaign	<ul style="list-style-type: none"> Hornsea Three have developed the campaign to utilise the most proven techniques to identify debris within AoS. Hornsea Three may be able to remove more debris with a less sensitive removal methodology (e.g., micro-sited grapnel runs). 	N Less sensitive removal methodology not considered to be supported by SNCBs (inferred from written responses, detailed in Consultation Summary)
Re-visit AoS at a different time	<ul style="list-style-type: none"> Hornsea Three could not conduct the campaign outside of the summer season but considered returning in a subsequent year, however it is considered that the timing is irrelevant in relation to the density of debris likely to be identified, therefore returning at a later date is unlikely to result in significantly different levels of debris. 	N Repeating a campaign which had unsatisfactory results is unlikely to yield significantly different results at a later time
Adapt the campaign spatially	<ul style="list-style-type: none"> Several options to expand the survey area of the campaign 	Y

123. As set out above, the adaptive management strategy taken forward is to spatially increase the AoS to exceed the trigger level identified (**Section 6.9.1**). Hornsea Three proposed several spatial adaptive management strategies to the SG, detailed further in Supporting Document 4. Consultation responses (detailed within the Consultation Summary) indicated a preference to maintain removal efforts within the SAC and remain focussed on sandbank habitat and therefore adaptive management strategies proposed to target removals on other habitats, such as rocky outcrops or chalk reefs, or sandbanks outside of the SAC have not been progressed.

124. Therefore, an adaptive management AoS has been identified within the NNSSR SAC, which has been identified to have similarly high likelihood of marine debris (further detailed in **Appendix 1**) and is presented in **Figure 4**.

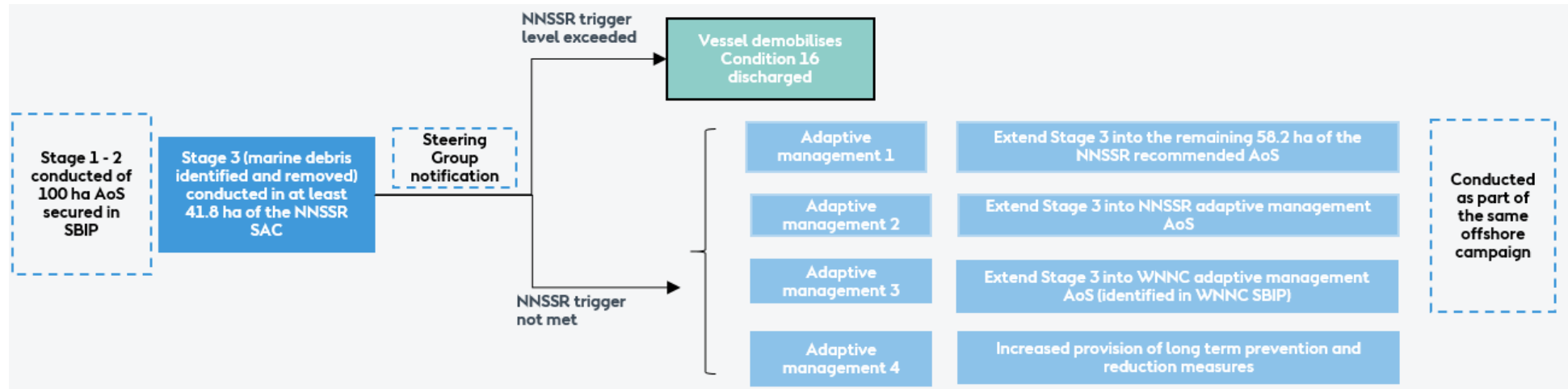
6.9.1 Trigger Level

125. As detailed within **Section 6.2.1**, debris densities identified in the vicinity of, or overlapping with, the NNSSR SAC from two Orsted offshore wind farm projects (Hornsea Two²⁹ and from pre-consent surveys for Hornsea Three³⁰) have been presented as an expected minimum density of debris likely to be identified in the offshore NNSSR SAC.

²⁹ Debris targets were identified using geophysical survey and confirmed using WROV
³⁰ Targets identified using geophysical surveys only

126. Hornsea Three acknowledge that each debris item is likely to be of varying size and footprint and will not be known until the debris removal campaign is underway. Hornsea Three therefore consider debris density calculated from other offshore campaigns to be an appropriate trigger level for adaptive management.
127. Based on the findings presented within [Figure 5](#), the debris density anticipated could be estimated to be 6 items per 100 ha based on an average of 4.4 – 7.1 items per 100 ha. Hornsea Three propose that the trigger level for adaptive management is based on the peak identified in similar surveys (rather than the average), therefore if the debris density identified is less than 7.1 items per 100 ha (rounded to 8) the need for adaptive management will be triggered.
128. Stage 1 of the campaign will be undertaken within the 100 ha target AoS and 100 ha adaptive management AoS prior to the debris removal and the area within the target AoS with the greatest density of finds within this area will be subject to removal of debris within an area of 41.8 ha. Should the debris removed be below the minimum assumed 8 items per 100 ha then adaptive management will be triggered.
129. Hornsea Three note that the trigger level is required only for adaptive management and does not dictate the number of debris items to be removed. Hornsea Three further note that:
- There is no upper limit to the debris removal campaign.
 - Within the required 41.8 ha (refined through searching a wider AoS) all debris identified will be removed subject to the exclusions outlined in [Section 6.3.1](#).
 - The debris removal campaign duration provided in [Section 9](#), and the associated vessel procurement works ongoing, allow for the removal of significantly greater than the trigger level to be used for adaptive management purposes. Contractor experience suggests that each debris item will take approximately three hours³¹ for identification and removal, therefore a six week duration to the campaign allows for approximately 168 targets to be identified and removed within NNSSR (should a greater number be identified in the 41.8 ha the campaign will be extended in duration).
130. The SG will be notified if the requirement for adaptive management has been triggered.
131. This process is illustrated as a flow chart in [Figure 17](#).

³¹ Subject to type, size, and condition of debris item



1.	Hornsea Three will remove marine debris identified within the required area (41.8 ha of NNSSR) however if the trigger level is not met the debris removal will be extended into the full 100 ha target AOS with the aim of removing a sufficient density of debris as identified in Section 6.2.1
2.	Should the trigger levels not be met in the target AOS, the removal campaign will extend into the NNSSR adaptive management AoS identified in Section 6.2.1 until enough items had been removed to meet the trigger level for the 41.8ha
3.	Should the trigger levels not be met in either the target or adaptive management AoS identified for NNSSR SAC, the removal campaign will extend into the WNNC adaptive management AoS until enough items had been removed to meet the trigger level for the 41.8ha This adaptive management option is dependent upon the trigger level being exceeded in WNNC
4.	Hornsea Three do not consider it appropriate to expand the marine debris removal campaign further than the proposed measures 1 – 3 as the compensation measure will have been comprehensively implemented in accordance with the requirements of the DCO. However, Hornsea Three would consider a corresponding increase in the scope of the awareness campaign should the marine debris removal not achieve its aims. This would likely include the addition of further debris removal works (such as beach cleans) targeting intertidal habitat where debris is likely to accumulate due to tidal processes

Figure 17: Approach to adaptive management of marine debris removal.

6.10 Monitoring

6.10.1 Monitoring during debris removal

132. Hornsea Three propose that monitoring of the marine debris removal would be conducted throughout the campaign. Hornsea Three note that monitoring is required to meet two aims: (1) to log and record the outcomes of the marine debris removal campaign and (2) to ensure that the removal campaign is undertaken in a manner which avoids impacts to sensitive features such as *Sabellaria* reef and features of archaeological interest.
133. Stage 1 ([Section 6.4](#)) of the removal campaign will locate any potential marine debris targets within the relevant areas of the SACs which will be further investigated as to their suitability for removal. The geophysical survey will additionally provide information with regard to sensitive features which the following steps of the removal campaign should avoid and consider as exclusion zones. In particular, the geophysical survey will provide a greater understanding of areas of Annex I reef which Hornsea Three will avoid and apply a suitable buffer and those areas will be excluded from further investigation.
134. Stage 3b would confirm whether the target is marine debris which could be removed or whether the target was in fact a sensitive feature which should remain *in situ*. The removal itself will be logged and evidenced via WROV footage. Stage 3c would maintain a log of debris removed and evidence of the removal would be provided in the field report submitted to the Secretary of State and the SG.
135. A further detailed report (discussed in [Section 6.7](#)) would include photographs of the debris following removal, a categorisation of the type of debris, a figure showing the locations of each item of marine debris, identification of any areas of scour or habitat damage that are visible around the item of debris and where possible information on habitat type inferred from WROV data would be provided to evidence the reinstatement of the natural habitat that was underneath and surrounding the debris. These parameters are included to investigate predictions made in this document regarding scour, see [Section 6.2.3](#). The report will also include, where possible, an assessment of debris post-collection, recording data such as tonnages of debris that were cleaned, dismantled, recycled, landfilled and why.
136. Once the debris has been removed, the impact has been removed, and the area can recolonise naturally when subjected to natural processes. It is not considered that ongoing monitoring following completion of the debris removal campaign would be needed to provide any further evidence of habitat restoration following removal of the debris, as outlined in the Sandbanks Compensation Strategy submitted as part of the Hornsea Three derogation³² and post-removal monitoring is not a requirement of the DCO.
137. However, Hornsea Three recognise that such monitoring could assist in providing evidence regarding recoverability and will conduct the monitoring detailed below.

6.10.2 Monitoring following debris removal

138. There is considerable evidence, collated by the aggregates industry and others, to show that these type of habitats (sedimentary habitats, particularly in areas with mobile substrate) recover quickly (within 2-4 years based upon evidence from dredging and spoil disposal activities) following any disturbance events as long as similar habitat remains (i.e., the event hasn't resulted in a habitat change). The habitat in the areas where debris is removed from are expected to be similar to the surrounding habitat once the item of debris has been removed and therefore recovery is likely to occur rapidly with mobile opportunistic species recolonising the area almost immediately after debris removal.
139. In all instances where debris is removed, the contractor will ensure a sufficient post-removal survey is completed. This will include WROV sonar (to identify the size of impressions in the

³² [EN010080-003190-HOW03_CON02_Appendix2A_SandbanksCompensationStrategy.pdf \(planninginspectorate.gov.uk\)](#)

seabed) and WROV image collection (to demonstrate resulting habitat). The contractor may complete this using the WROV at time of removal or undertake a second dive with the WROV to ensure sufficiently clear images are captured post-removal where visibility allows. This post-removal seabed survey which is conducted immediately at each location where marine debris is removed will constitute the baseline for subsequent monitoring campaigns.

140. Hornsea Three will undertake subsequent monitoring, against the baseline collected immediately post-removal, on a minimum of five areas (if seabed impression can be accurately located using surface-logged GPS coordinates) where larger items (greater than 10m in diameter) are recovered. If items of that size are not removed, then the next largest items will be selected as the five monitoring locations. Priority will be given to locations where larger objects have been removed to increase the likelihood of identifying remaining seabed impressions one year following marine debris removal. Hornsea Three further note that should geogenic reef (**Section 6.2.1.1**) be identified during the marine debris removal campaign, and an item of debris be removed from this habitat type, this location will be included as a monitoring location in addition to the minimum of five targeting monitoring locations which will be selected in relation to the largest items of debris removed. The selected monitoring locations will be presented in the detailed report discussed in **Section 6.7**. As noted above, the data collected at time of removal will form the baseline to this monitoring.
141. Monitoring of the five locations would be undertaken using DDV one year post removal (which is considered proportionate to the scale of the removal activity and anticipated recovery duration) to assess any remaining impressions on the sediment and colonisation of epifaunal species. In parallel, a geophysical survey would be undertaken to collect data across the extent of the AoS (which had been subject to debris removal) to provide further consideration of wider changes to the sandbank feature. Observations of the homogeneity of the habitat in the area, and the surrounding area, would also inform the likelihood of infaunal recovery. As discussed above, it is acknowledged from extensive studies by the aggregate industry that if similar habitat (to the surrounding area) occurs following a disturbance then infauna will rapidly colonise. It is therefore considered that monitoring of the habitat characteristics will provide an appropriate proxy for infaunal analysis.
142. Should recovery of the feature not be demonstrated at the five monitoring locations; a Year 2 survey (two years post removal) will be conducted at those specific locations to further monitor recovery of the feature. If a seabed impression cannot be identified at a location, recovery will be assumed.
143. Reporting would consider recovery by comparing the baseline data collected in relation to the subsequent monitoring data collected and would be provided to the SG members. Where requested by SG members, supporting metadata can be provided. Following completion of the post-removal monitoring, and subsequent reporting, the final monitoring report will be provided to the Secretary of State to evidence the recovery of the feature in those monitoring locations.

7 Requirement 13(d): Marine debris reduction and awareness campaign measures

144. To compensate for impacts to sandbank features, Hornsea Three are required to detail the proposed implementation of *'marine debris awareness events, and measures to facilitate the rapid recovery of lost fishing gear'* within this SBIP.
145. Hornsea Three have developed long term prevention measures which align with this requirement to reduce the instances of debris entering the marine environment. These measures will be implemented throughout the operational lifetime of Hornsea Three with a view to promoting the long term reduction in the volume of marine debris reaching the NNSSR SAC and the wider marine environment, and thereby provide long term compensation to the Annex 1 sandbank features. This campaign will be formed of several different measures, as detailed in this section.

- 146. The awareness campaign will focus on stakeholder engagement to promote a ‘stopping at source’ approach to reducing marine debris and aims to target several marine debris sources including lost and abandoned fishing gear, debris from other industries, recreational activities and from onshore sources. This campaign would be implemented in an inclusive manner and aim to achieve ‘buy-in’ from those relevant stakeholders and, ultimately, promote long term change in activities and processes from those groups the awareness campaign will target.
- 147. It should be noted that while each of these potential marine debris sources is understood to be linked to activities relating to the NNSSR SAC, the results would not be solely relevant to the NNSSR SAC and, therefore, this component of the measure would have a much wider application and extend to subtidal sandbanks (i.e., the qualifying feature) outside of the SAC. Hornsea Three acknowledges that the types and potential sources of marine debris identified during the marine debris removal campaign (**Section 6**) may have different sources than those outlined in this section. Should a much higher quantity of a particular debris type be identified in NNSSR SAC, this will be communicated to the SG and the awareness campaign may be adapted to ensure that source is being addressed.
- 148. The awareness campaign will aim to conduct a variety of awareness events and work with various stakeholder groups/industries to launch initiatives, or support ongoing initiatives, to help reduce debris entering the marine environment in the long term. It should be noted that Hornsea Three could undertake elements of the awareness campaign in partnership with relevant organisations such as local councils or community partnerships.

7.1 Measures to be included in campaign

- 149. Hornsea Three are taking forward a range of measures as part of the marine debris awareness and reduction campaign, as set out in **Table 10** and further detailed in the following sections.
- 150. Hornsea Three note that as these measures are to be provided over the lifetime of the project, a robust decision-making framework is required to ensure the measures are appropriately maintained. The SG will have a continued role in this process and will ensure decisions made are in line with this SBIP.

Table 10: Summary of awareness campaign measures including compliance and monitoring.

Potential measure	Purpose of measure	Compliance measure	Monitoring
Rapid retrieval mechanisms (for lost fishing gear)	Long term debris prevention / reduction	NetTag technology (or other similar rapid retrieval technology) detailed in Section 7.1.7 would be made available and Hornsea Three would support its use	Monitoring would report the uptake of the rapid retrieval mechanism and reporting of lost gear retrieved through use of the measure
Partnership with local initiatives actively removing marine debris	Long term removal of marine debris from marine environment	The FfL scheme would be made available within the relevant ports and harbours in relation to the SAC shown in Section 7.1.2	Monitoring would report the uptake of the FfL scheme and would make reference to the volume of marine litter removed from the environment
Industry and community events providing education on the impacts of marine debris	Awareness raising	Provision of educational events and industry forums detailed in Section 7.1.3	Attendance at the provided events and industry forums would be monitored

7.1.1 Rapid retrieval mechanisms

- 151. As part of the Sandbanks Compensation Strategy, Hornsea Three proposed implementing suitable measures to facilitate the rapid recovery of lost fishing gear. It is the intention of Hornsea Three to promote a technological solution using transponders on fishing gear (detailed further below) however Hornsea Three note that there are outstanding considerations as to the feasibility of this mechanism including the availability of the transponder technology for purchase.
- 152. Should NetTag not be viable to implement over the long term, Hornsea Three propose initially investigating alternative transponder systems (such as PingMe). Should a technological solution not be available, Hornsea Three would implement a programme of providing gear markers to relevant fishing vessels and authorities to enable retrieval by other vessels should gear be either lost or abandoned. This approach aligns with the Sandbanks Compensation Strategy *'It is also proposed that the identification of suitable measures to facilitate the rapid recovery of lost gear would be developed with the EIFCA. These may comprise options such as voluntary reporting and provision of technical solutions (such as transponders) that can be fixed to static gear, the detail of which will be confirmed in the Sandbanks Compensation Plan.'*
- 153. Hornsea Three note that any fishing vessel engaging in the rapid retrieval measure will be provided industry-standard guidance, anticipated to be from the NFFO and SeaFish, in relation to appropriate methodologies for the retrieval of gear.

7.1.1.1 NetTag Transponders

- 154. NetTag transponders provide a trackable Global Positioning System (GPS) location which would enable the fishers to easily locate and retrieve gear from the seabed within a short timeframe of the gear being lost. Newcastle University, as part of the European Union project on marine litter (EASME/EMFF/2017/1.2.1.12/S2/O2/S12.789121) have designed the NetTag project - "Tagging fishing gears and enhancing on board best-practices to promote waste free fisheries" – which Hornsea Three consider to be a potential solution.
- 155. A NetTag is a self-contained acoustic transponder in a low-cost housing which can be attached to fishing gear, both nets and static gear (Figure 18). The NetTag transponder device passively listens for an interrogation signal and only transmits signals in response to this interrogation signal, which may be uniquely addressed to each unit in the water by means of an application on a mobile phone. The approach used by the acoustic transponder, as opposed to a pinger which emits signals continuously, presents the following advantages:
 - Accurate ranging and 3D position estimate of lost gear;
 - Negligible contribution ocean noise pollution (silent until interrogated and then rapidly located); and
 - Higher energy efficiency/battery life (NetTag can be deployed for approximately six weeks prior to recharging).



Figure 18: NetTag and charging receiver.

- 156. When a net is lost, the fishers can search for the net by repeatedly sending the interrogation signal until they are within range of the tag and receive a response as illustrated by Figure 19.

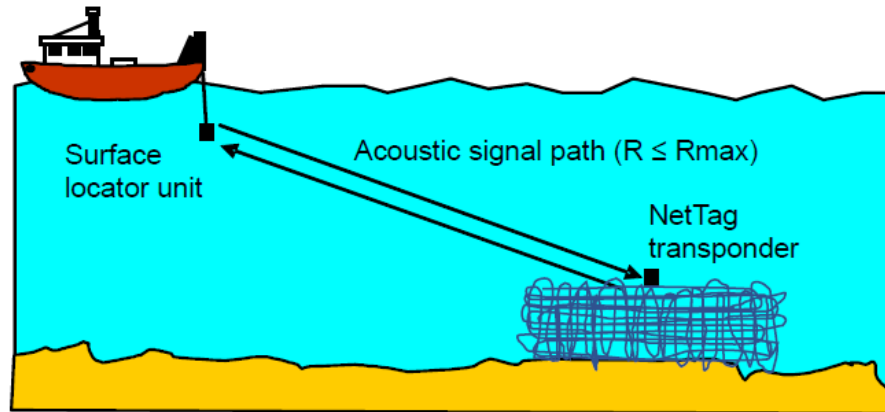


Figure 19: NetTag system concept.

- 157. Hornsea Three has consulted with some fishers with initial positive response to the proposals of using transponders and anticipate trialling the technology with fishers during the implementation of this measure to test its efficacy in relation to the operators which target the NNSR SAC (timetable detailed in [Section 9](#)).
- 158. Rapid recovery of fishing gear, whilst not changing the methods used for recovery, would facilitate fishermen in the retrieval of their gear in a more efficient manner (thereby potentially reducing any effects on the seabed from repeated efforts of retrieval). This in turn would potentially reduce the affected seabed area impacted by drifting lost or derelict gear, all of which could reduce the scale of any effect.
- 159. The uptake of this measure will be achieved through consultation with relevant vessel operators and promotion of the technology via trials. The uptake of this measure will be monitored through discussion and consultation with the fishermen, provision of rapid retrieval techniques to a proportion of fishers which operate within the SAC and recording of the number of transponders in use to determine its ease of use and effectiveness.

7.1.1.2 Gear marker fund

- 160. In all UK and EU waters fishermen must mark any static gear with a permanent label showing the Port Letters and Numbers (PLN) of the vessel. Each label must be at least 75mm x 65mm in size, made of durable material securely fixed to the gear and not removable. However, this is often not the case and there is little to no enforcement. Fishing gear markers are often very small and difficult to see ([Figure 20](#)) and as a result, gear markers are often lost, becoming detached from associated gear due to tidal and weathering conditions or as a result of interaction with marine traffic. Fishing gear can also be completely unmarked ('blind' fishing), whereby fishers grapple for gear in locations, noted on plotter systems, as the location the gear was last deployed. Sufficiently marked fishing buoys would include detail of the PLN of the vessel deploying passive gear and/or beam trawls (HM Government, 2016)³³.
- 161. By using a larger, more visible gear marker labelled with vessel name or PLN number, gear will be more visible to passing marine traffic and as a result would reduce the number of buoys that get removed from gear by accidental interaction with other sea users. In addition, gear that has moved location as a result of adverse weather will be more easily identified and reported to the owner to be retrieved, leading to a reduction of lost fishing gear on the seabed.

³³ <https://www.gov.uk/guidance/markings-of-fishing-gear-retrieval-and-notification-of-lost-gear>



Figure 20: Example fishing gear marker observed.

- 162. In the instance that a technological solution is not considered to be viable, in consultation with the SG, Hornsea Three would propose to set up a fund for the provision of static gear markers to fishing vessels that are known to target WNNC and NNSSR SACs. Facilitating sufficient marking of fishing gear will allow for easy identification of gear by fishers and other vessels within the vicinity, allowing navigating vessels to spot gear markers earlier, enabling them to navigate around the markers sufficiently, thereby reducing the number of lost gear markers.
- 163. Furthermore, gear markers will reduce the need for grappling for unmarked gear and, therefore, damage to the benthos caused by grappling. The marking of fishing gear will enable owners to be notified should their gear become lost or accidentally dragged away from the fishing grounds by other vessels in the area, which is a particular problem for static gear types. The measure would be delivered through provision of a fund which would allow vessels which operate within the NNSSR SAC to apply for gear markers.

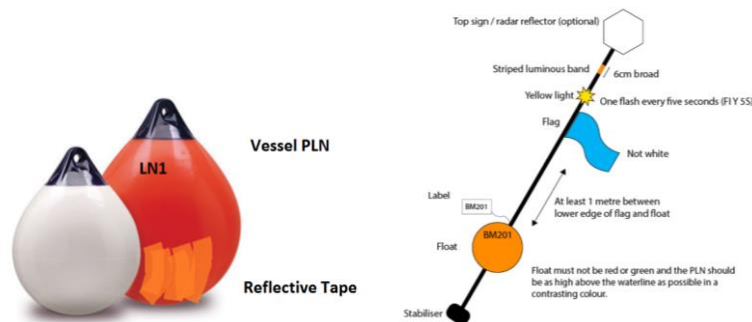


Figure 21: Example gear markers.

7.1.2 Partnership with local initiatives actively removing debris

- 164. Hornsea Three will support KIMO UK's 'Fishing for Litter' (FfL) initiative which provides fishers with hardwearing, reusable sacks to store onboard their vessel for collection of waste encountered at sea. Once back ashore, fishers can dispose the sack's contents into a designated waste receptacle within the harbour area for ongoing disposal (Figure 22).
- 165. It is proposed that four locations are targeted. Hornsea Three are consulting with six locations with the aim of successfully implementing the partnership scheme at a minimum of four of the locations, namely Wells-next-the-Sea, West Runton, Cromer, Boston, Kings Lynn and Grimsby, shown in Figure 23.
- 166. Table 11 details how these selected ports relate to the NNSSR SAC. At this stage it is Hornsea Three's understanding that the ports named would support provision of FfL facilities, however further consultation with harbour masters will be undertaken and it may be that the measure is implemented at other nearby harbours through consultation with the SG.



Figure 22: Example FfL waste disposal facility.

Table 11: Further information on Fishing for Litter proposed ports.

Port Name	Further Information
Wells-next-the-sea	Wells-next-the-Sea has a harbour and quay, supporting not only fishing vessels, but commercial anglers, tour boats and leisure craft. Vessels leaving and returning to Wells are restricted by the tides. Due to their larger size, these vessels will tend to fish a further range than those at Cromer and are likely to fish in the WNNC SAC and the Inner Dowsing, Race Bank and North Ridge SAC.
West Runton	As with Cromer the fishing is predominantly potting for crabs, lobster, and whelks and these vessels will rarely venture outside the 12nm limit, or even the 6nm limit. Again, they will tend to follow along the coast from West Runton heading both east and west. Therefore, they will be targeting WNNC SAC.
Cromer	All vessels operating out of Cromer are beach launched, and most are open topped and single handed. All vessels are typically under 10m in length. Fishermen vary from full time to part time, with some taking on other work during the off season. Due to the size of the vessels, most vessels will not fish further than the 6nm limit, with a few reaching further out to 12nm. They tend to follow along the coast from Cromer heading both east and west, fishing primarily on top of the chalk bed. Therefore, they will be targeting WNNC SAC.
Grimsby	Grimsby is a larger fishing port, dedicated primarily to fishing and offshore wind support. The vessels fishing out of this port are larger than those from the other ports mentioned. Vessels will often spend several days at sea before returning to land their catch. Fishing range for these vessels can extend across the North Sea. These vessels are unlikely to be found fishing in the same areas as the smaller vessels from the North Norfolk coast. Although the fishing grounds of vessels operating out of Grimsby are largely unknown for each individual vessel and fishing type, these vessels have the capability to fish within the NNSSR SAC. Five potting vessels are known to fish within the NNSSR SAC; however, fishing grounds will depend on where the target species can be found.
Boston	Located in the Wash, Boston port is frequented by fishers targeting whelks, cockles, mussels, and shrimps as in Kings Lynn. Approximately 26 vessels are registered here, with the majority over 10 m in length. Fishing vessels have wider drafts in order to navigate during a wider range of tides than other vessels.
Kings Lynn	Kings Lynn is predominantly a cargo-port for agri-business although hosts fisheries targeting brown shrimp, cockles, mussels, and inshore prawns. Currently 38 vessels are registered to King Lynn. As the port is located in the Wash, there is restricted access for leisure craft.

- 167. As well as the direct causes of loss of fishing gear (such as snagging and entanglement) there are also indirect causes that result in lost or abandoned gear, including lack of disposal facilities and inaccessible or expensive disposal facilities. In order to encourage the appropriate disposal of end-of-life fishing gear, the provision of collection bins in strategic locations would make it easy for fishers to dispose of waste and reduce the marine debris that may otherwise be discarded at sea.
- 168. The provision of FfL infrastructure would be bolstered by the trial of facilities which encourage reuse, repurposing, or recycling of end-of-life fishing gear. Following further consultation with FfL, Hornsea Three understand that this is an initiative which would likely have to be implemented in an adaptive approach as the supply chain for end-of-life fishing gear and ability to responsibly dispose of the material is not established and therefore this would be trialled but not comprise a necessary requirement of Hornsea Three long term compensation measures.
- 169. There may also be potential to install information boards around debris collection points (with attached beach clean equipment such as pickers) to inform the public of the issues of marine debris and the need for the various initiatives being implemented.
- 170. The provision of FfL facilities at the four ports identified will be monitored and annual reporting from FfL as to the use of the disposal facilities and volume of debris removed will be collated.
- 171. Over a three-year project in the south-west run by FfL, waste landed from Celtic Sea, South Western Approaches, and the English Channel totals more than 1000 items counted per year (small and numerous items are conglomerated in the count). Approximately 98 tonnes were collected across the three-year project. This waste was collected incidentally whilst fishing as normal and the fishing methods used included most methods used in the region including the following: Shellfish by Pots, Trawling (Stern, Beam, Pair, Twin, Scallop), netting (wreck, gillnets, inshore and offshore) plus floating litter picked up by small inshore vessels when occasioned upon. Hornsea Three would anticipate similar levels of waste to be collected through provision of these facilities in the north east. The project run by FfL additionally noted positive feedback from those involved which in turn has reinforced the good practice encouraged by FfL.

7.1.3 Industry events providing education on the impacts of marine debris

- 172. Hornsea Three proposes to undertake a series of awareness events and workshops for fisheries stakeholders and those stakeholders directly involved in other marine industries (e.g., aggregate extraction, dredge disposal, oil and gas, communications).
- 173. Industry awareness events for the fishing industry would be closely linked to the rapid retrieval campaign, in terms of illustrating success through use of technology or other strategies but would also focus on disseminating the economic cost and potential loss to catch resulting from marine debris presence. Workshops would additionally aim to encourage the fishing industry to play an active role in collecting marine debris identified at sea, where practicable, and the workshop format would ensure there was buy-in from local fishing operators. As part of the awareness campaign events, existing best practice guidance on retrieving lost fishing gear will be promoted. Initial consultation conducted on behalf of Hornsea Three has resulted in positive feedback in relation to the removal and 'stopping at source' of marine debris and Hornsea Three are confident with a sensitive approach local buy-in would be achieved.
- 174. Events targeting recreational activities will draw on experiences of the fishing industry and ensure recreational vessel users are aware of the markings used on static fishing gear and instances of recreational vessels causing damage and loss of fishing gear would aim to be reduced.
- 175. Industry awareness events would also target other industries operating offshore. These would likely take the form of industry workshops where attendance from industries could be monitored. Workshops would present the results of the marine debris removal campaign and demonstrate the positive benefits of minimising marine debris entering the marine environment. The awareness campaign could also encourage a policy of removing marine debris identified during asset integrity surveys or decommissioning as far as practicable.

176. Options for supporting wider initiatives to reduce marine debris and encourage more sustainable solutions for the debris generated would be investigated and lessons learned disseminated within the workshops through showcasing examples, i.e., where materials are recycled³⁴ to provide an additional resource for either fishermen or others who can use such materials for crafting purposes.
177. The partnership initiatives could also take the form of organised beach cleans, commissioning and installation of plastic waste receptacle sculptures, organised talks in schools and local recreational groups and provision of dedicated workshops to bring people together to discuss the issue of marine debris, its impacts on the seabed and marine life and discuss and facilitate alternative methods/options for reducing the instances of marine debris and/or litter.
178. Hornsea Three would anticipate conducting at least one event, either for the public or industry, annually throughout the operational life of the project.

³⁴ It should be noted that marine debris will not be able to be recycled in cases where significant fouling has occurred

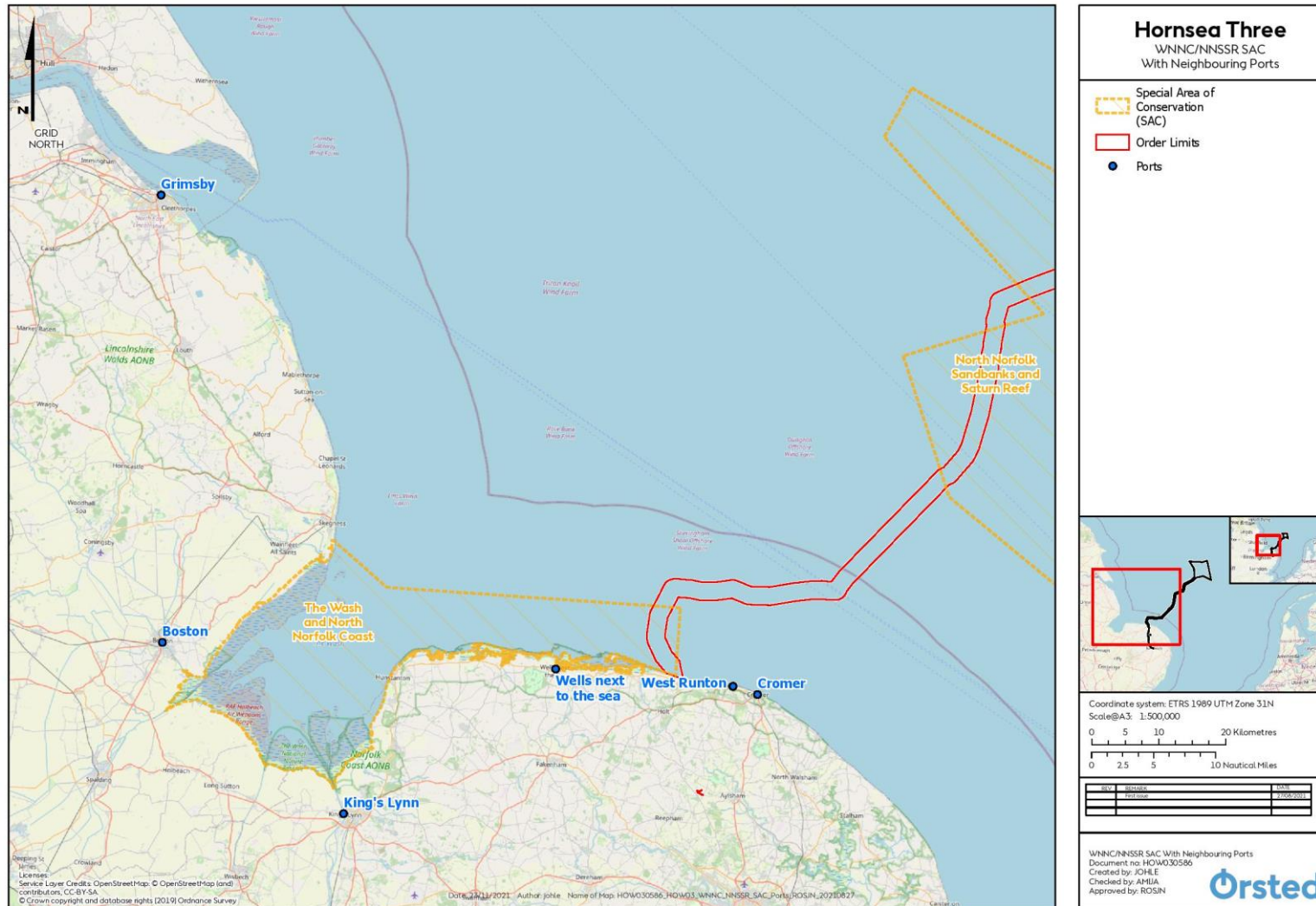


Figure 23: Potential FFL collection port locations.

7.2 Compliance

- 179. To compensate for impacts to sandbank features, Hornsea Three are required to detail the proposed implementation of '*marine debris awareness events, and measures to facilitate the rapid recovery of lost fishing gear*' within this SBIP.
- 180. This SBIP provides detail with regard to the debris reduction and awareness campaign measures which will be implemented throughout the operation of Hornsea Three.
- 181. Compliance will be considered through Hornsea Three making the measures as outlined in **Table 10** available to the relevant target groups, for example through holding awareness events or making rapid retrieval technology available and supporting its use through funding and promotion.
- 182. Hornsea Three intend to commence implementation of these measures following approval of the SBIPs and anticipate that the measures detailed in **Section 7.1** will be made available no less than four months prior to the deployment of cable protection. This is anticipated to include a minimum of one awareness event, FfL initiative implemented at four ports and provision of the rapid retrieval measure to relevant fishers targeting SACs.
- 183. Measures will be monitored throughout the operation of Hornsea Three to ensure they are functioning (in terms of remaining available to the appropriate groups) and reporting of their uptake will be provided to the SG as outlined in **Section 7.4**. Hornsea Three notes that the aim of the long term debris reduction measures is to have full engagement from the relevant target groups, however the level of engagement is challenging to predict through the full operational life of Hornsea Three, particularly in consideration of the fluctuating nature of the target groups, predominantly the local fishing industry, which may alter considerably across a long time period. Hornsea Three proposes to conduct a feedback survey every two years to gather detailed feedback from those persons engaged within the measures, and with those persons whom have chosen not to engage. Where there is a lack of engagement, the feedback will be used by Hornsea Three and the SG to understand whether adjustments can be made to facilitate greater engagement. The report associated with this feedback can be provided to the Secretary of State for information.
- 184. No consents are anticipated to be required for the implementation of these measures.

7.3 Adaptive management

- 185. Hornsea Three will build flexibility into the awareness campaign to ensure that lessons learned during the initial years of the awareness campaign are fed back, both from the SG and the relevant target groups, and the awareness campaign and debris prevention measures can be modified as necessary to ensure the aims are being met.
- 186. As noted in **Table 10**, compliance will be considered through Hornsea Three making the measures as outlined in **Table 10** available to the relevant target groups, for example through holding awareness events or making rapid retrieval technology available through funding and supporting its use. Making the measures listed in **Section 7.1** available is considered success in terms of compliance with the DCO, however adaptive management will ensure that measures continue to maintain viability and effectiveness throughout the operation of Hornsea Three.
- 187. The trigger level which facilitates the adaptive management process outlined in **Figure 24** is when a measure is no longer viable and is unable to be implemented. Should provision of any measure no longer be viable, for example transponder technology is superseded by an alternative and more favourable solution to rapid retrieval, then the steps outlined in **Figure 24** will be undertaken so that Hornsea Three can continue to provide appropriate and viable long term awareness measures. The SG would be consulted on the need for adaptive management to ensure that stakeholders are aligned that a specific measure was no longer viable and ensure that the SG are aligned with the specific adaptive management approach proposed by Hornsea Three.

188. Potential adaptive management solutions may include moving the locations of FfL facilities if uptake is not being realised or amending the target audience and/or format of awareness events if the events are not being attended.

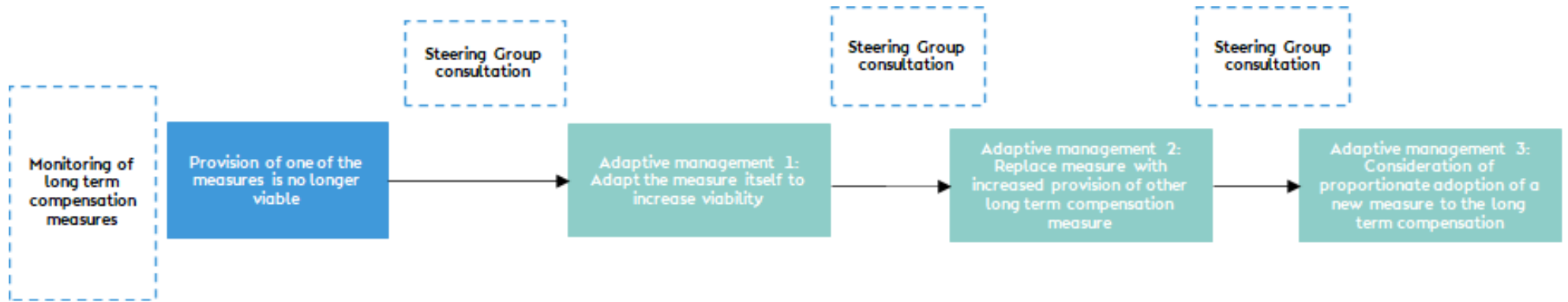


Figure 24: Approach to adaptive management of measures.

7.4 Monitoring

189. As noted in the Sandbanks Compensation Strategy³⁵, Hornsea Three proposes that the implementation of the awareness campaign will be defined primarily by the uptake of the proposed measures and will be monitored as such. Monitoring of each specific measure is provided in **Table 10**.
190. It may be that the success of the awareness events can additionally be measured through an increase in understanding in relation to the impacts of marine debris and a marked behaviour change in those industries and stakeholders identified as target groups, however it should be noted that this is challenging to monitor in a quantitative manner other than attendance at forums and events which is the monitoring mechanism proposed in **Table 10**.
191. The monitoring of the uptake of the long term compensation measures would be reported to the SG in line with the meeting frequency outlined in **Section 3.1**. Monitoring would detail suggestions should adaptive management be required.

8 Requirement 13(e): Environmental monitoring of operational and post-decommissioned cable protection

192. To fulfil DCO requirement Schedule 14, Part 2, condition 13(e), Hornsea Three will be conducting an environmental monitoring campaign to assess the effects of cable protection on sediment movement and epifauna assemblages during the operation and post-decommissioning phases of Hornsea Three. The conservation objectives for the Annex 1 Sandbank includes the following statement: *"JNCC understands that the site has been subjected to activities that have resulted in a change to the extent and distribution of the feature within the site. Installation and/or removal of infrastructure may have a continuing effect on extent and distribution. As such, JNCC advise a restore objective which is based on expert judgment; specifically, our understanding of the feature's sensitivity to pressures which can be exerted by ongoing activities i.e., oil and gas sector activities and cabling. Our confidence in this objective would be improved with longer-term monitoring and access to better information on the activities taking place within the site. Activities must look to minimise, as far as is practicable, changes in substratum and the biological assemblages within the site to minimise further impact on feature extent and distribution"*. The monitoring objective will also therefore look to improve the evidence base for assessing the impacts of cable protection for future projects and will also monitor the recovery of the relevant areas of the NNSSR SAC post-decommissioning.
193. The Environmental Monitoring Plan (EMP) is provided as Appendix 2 to this SBIP.
194. As detailed in the DCO, the EMP will be approved by the Secretary of State as part of this SBIP. Further consultation (requirements detailed within Appendix 2) and submission of monitoring reports in relation to the EMP will be provided to the MMO. Further submissions in relation to the EMP will not be made to the Secretary of State following the approval of the SBIP³⁶.
195. This environmental monitoring secured within the EMP should not be confused with the wider monitoring requirements of the Hornsea Three project (pre-construction, operational or decommissioning), or any monitoring that will be required under the various marine licences associate with discrete elements of the project (e.g., marine debris removal) as the objectives for the EMP, as outlined in the DCO, are specific to improving industry evidence base.

9 Requirement 13(f): Timetable for implementation

196. Timetables for implementation have been provided for the DCO requirement Schedule 14 condition 13(c) and 13(d) as **Figure 25** and **Figure 26**.

³⁵ [EN010080-003190-HOW03_CON02_Appendix2A_SandbanksCompensationStrategy.pdf \(planninginspectorate.gov.uk\)](#)

³⁶ This approach has been agreed with BEIS and MMO via email 12/07/21.

197. The implementation timetable for condition 13(c) is predominantly driven by the need to conduct the offshore works associated with the marine debris removal campaign in an appropriate weather window (approximately May – September). Hornsea Three additionally note condition 16 of the DCO and therefore conducting the debris removal campaign within 2022 is critical to maintaining project programme.
198. The implementation timetable presented for condition 13(d) is driven by the need to have the long term compensation measures implemented prior to the impact occurring to the NNSSR SAC.
199. Further information in relation to 13(a) and 13(b) is not considered to be required further than that provided in this SBIP. Hornsea Three note that substantial further information will be provided in relation to Annex 1 reef and disposal locations as part of the CSIP, the requirement for which is secured within the DMLs.
200. Information with regard to 13(e) including proposed monitoring timescales are secured in the EMP, provided as Appendix 2 of this SBIP.

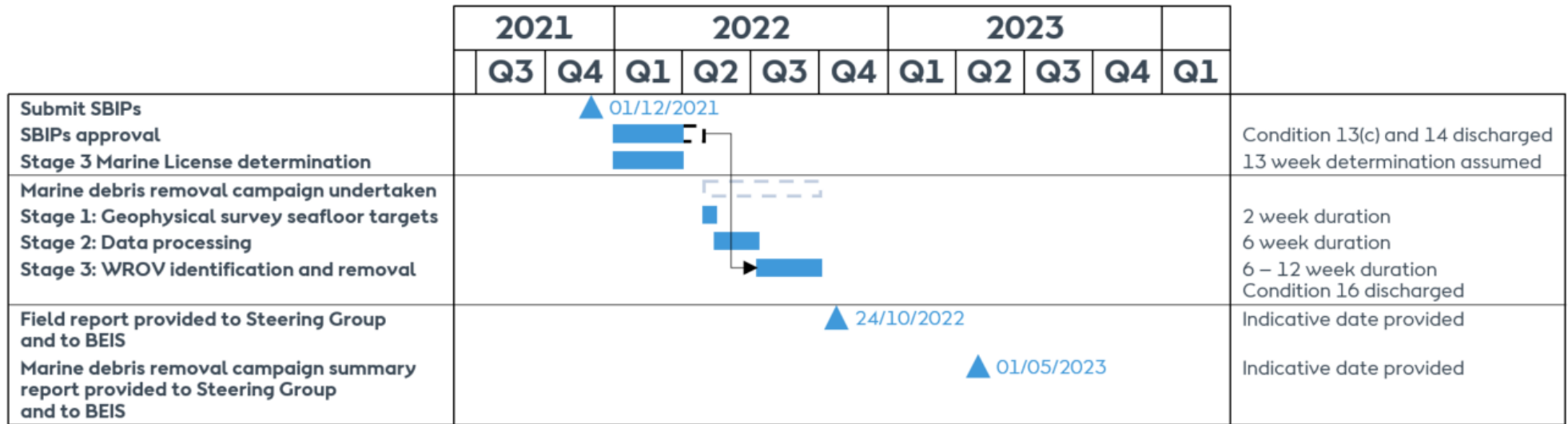


Figure 25: Condition 13 (c) timeline of implementation.

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