Rampion 2 WIND FARM

Rampion 2 Wind Farm

Category 5: Reports

Draft Marine Conservation Zone assessment

Date: August 2023

Revision A

Document Reference: 5.11
Pursuant to: APFP Regulation 5 (2) (q)
Ecodoc number: 004879236-01

Document revisions

Revision	Date	Status/reason for issue	Author	Checked by	Approved by
A	04/08/2023	Final for DCO Application	GoBe	RED	RED

Executive summary

Purpose of this report

This Marine Conservation Zone (MCZ) assessment has been produced for the purpose of providing evidence on whether the potential impacts of the proposed Rampion 2 development could give rise to a significant risk of hindering the conservation objectives of MCZs located in proximity to the development.

A total of five impacts have been highlighted and screened in for the Stage 1 assessment, these cover the whole life cycle of the development, from construction to decommissioning, across the seven identified MCZs (for the purposes of this MCZ assessment, decommissioning impacts were assessed together with construction impacts). These impacts include:

- Mortality, injury, behavioural changes and auditory masking arising from noise and vibration (fish and shellfish features during construction and decommissioning);
- Temporary localised increases in suspended sediment concentrations (SSC) and sediment deposition (during construction and decommissioning);
- Increased risk of introduction or spread of Marine Invasive Non-Native Species (INNS) due to presence of infrastructure and vessel movements (during operation).

The designated features of each MCZ's and their conservation targets vary spatially, however there are recuring features such as black seabream (*Spondyliosoma cantharus*), lagoon sand shrimp (*Gammarus insensibilis*), short snouted seahorse (*Hippocampus hippocampus*) and subtidal sediments (chalk and mixed) present across multiple MCZs. In assessing the MCZ's from project alone effects, the magnitude of the effect is typically deemed to be negligible based on the evidence provided within this MCZ assessment.

The development has the potential for inter-related effects including, 'proposed development lifetime effects', where multiple phases of the proposed development interact to create a potentially more significant effect on a receptor than in one phase alone. Additionally, 'receptor-led effects', where effects from different environmental aspects combine spatially and temporally on a receptor. These have been considered for potential interactions between fish and shellfish ecology and benthic ecology aspects.

Through the implementation of appropriate embedded environmental measures, the MCZ assessment concluded that based on the Stage 1 assessment of relevant features, there is no significant risk of the proposed development hindering the conservation targets of the identified attributes or the achievement of the conservation objectives stated for the following MCZs: Kingmere MCZ; Offshore Overfalls MCZ; Beachy Head West MCZ; Beachy Head East MCZ; Selsey Bill and the Hounds MCZ; Bembridge MCZ; and Pagham Harbour MCZ.

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1. Introduction

1.1 Introduction to the Proposed Development

1.1.1 Rampion Extension Development (RED) ('the Applicant') is proposing to develop the Rampion 2 Offshore Windfarm ("Rampion 2"). Rampion 2 will be located adjacent to the existing Rampion Offshore Wind Farm located in the English Channel in the south of England. For the purposes of clarification, in this document, the existing Rampion Offshore Wind Farm is referred to as 'Rampion 1' hereon in to enable clear differentiation with Rampion 2. Rampion 2 will include both offshore and onshore (landward of Mean High Water Spring (MHWS)) infrastructure including an offshore wind farm, export cables to landfall, and connection to the electricity transmission network.

1.2 Marine Conservation Zone Assessment

1.2.1 The Marine and Coastal Access Act (MCAA) came into force in 2009 and applies to the territorial waters around England and Wales. One of the provisions of MCAA was to designate new marine protected areas, known as Marine Conservation Zones (MCZs), to increase biodiversity protection in United Kingdom (UK) waters by creating a network of sites that are well managed and support healthy ecosystem functioning. MCZs were designated to protect areas that are important for biodiversity on a national scale, with features consisting of rare, threatened and representative marine habitats, species, geology and geomorphology.

1.2.2 Consideration of MCZs is required for any Marine Licence or Development Consent Order (DCO) applications in English waters. Under Section 126 of MCAA, a relevant authority, such as the Marine Management Organisation (MMO) in case of Marine Licences, or the Secretary of State (SoS) for DCO applications, has specific duties in relation to MCZs and decision making.

1.2.3 Section 126[1] applies where:

- (a) a public authority has the function of determining an application (whenever made) for authorisation of the doing of an act, and
- (b) the act is capable of affecting (other than insignificantly)—
  - (i) the protected features of an MCZ; and
  - (ii) any ecological or geomorphological process on which the conservation of any protected feature of an MCZ is (wholly or in part) dependent.

1.3 Purpose of the MCZ Assessment

1.3.1 This MCZ Assessment has been produced to provide evidence on whether the potential impacts of Rampion 2 could give rise to a significant risk of hindering the conservation objectives of the following MCZs identified within the secondary Zone

[1] Section 126 - Marine and Coastal Access Act 2009 (Date accessed: 1 August 2023)

of Influence (ZOI) for sediments and the underwater noise and allow the relevant authority to exercise its functions to further the conservation objectives stated for these MCZs (**Graphic 1-1**), further discussed in **Section 5: MCZ Screening**:

- Kingmere MCZ;
- Offshore Overfalls MCZ;
- Selsey Bill and the Hounds MCZ;
- Pagham Harbour MCZ;
- Beachy Head West MCZ;
- Beachy Head East MCZ; and
- Bembridge MCZ.

1.3.2 In drafting this document, RED has referred to the MMO guidance: "*Marine conservation zones and marine licensing*" published in 2013, as well as the advice from the Statutory Nature Conservation Bodies (SNCBs) received throughout the pre-application consultations (**Section 10: References**).

1.3.3 The MCZ assessment has been undertaken based on the information detailed within **Chapter 4: The Proposed Development, Volume 2** of the ES (Document Reference: 6.2.4). This document is drafted with the intention of informing the Planning Inspectorate (PINS) on behalf of the SoS in its statutory duty to conduct the formal MCZ assessment under Section 126 of MCAA. However, the Applicant acknowledges that the relevant authority may follow a process that differs from the methodology set out in this document.

1.4 Project description

1.4.1 The following paragraphs provide a brief overview of the key components of Rampion 2. A full description of the offshore and onshore components of the Proposed Development is provided in **ES Chapter 4: The Proposed Development, Volume 2** of the ES (Document Reference: 6.2.4).

1.4.2 The Rampion 2 boundaries (referred to as the 'proposed DCO Order Limits'), including both onshore and offshore components, were selected following both engineering and environmental considerations. Further details regarding the site selection of the Proposed Development are provided in **Chapter 3: Alternatives, Volume 2** of the ES (Document Reference: 6.2.3).

1.4.3 The offshore components of Rampion 2 comprise the following infrastructure:

- Up to 90 offshore wind turbine generators (WTGs) and associated foundations and scour protection;
- inter-array cables connecting the WTGs to each other and up to three offshore substations and associated scour protection;
- up to four offshore export cables that will be buried under the seabed, where possible, within the export cable corridor and associated cable protection; and

- a single landfall site connecting offshore and onshore cables using Horizontal Directional Drilling (HDD) installation techniques.

1.5 Document structure

1.5.1 This MCZ assessment is structured as follows:

- **Section 1: Introduction;**
- **Section 2: Consultation and engagement;**
- **Section 3: Embedded environmental measures;**
- **Section 4: MCZ assessment methodology;**
- **Section 5: MCZ screening;**
- **Section 6: Background information;**
- **Section 7: Stage 1 Assessment**;
- **Section 8: Conclusion**;
- **Section 9: Glossary of terms and abbreviations**; and
- **Section 10: References**.

1.5.2 This MCZ assessment should be read in conjunction with the following chapters of the **ES** (Application Reference Number 6.2), which contain relevant detail which have been drawn upon and referred to throughout this document:

- **Chapter 6: Coastal processes, Volume 2** of the ES (Document Reference: 6.2.6) and **Appendix 6.1: Coastal processes technical report: Baseline description, Volume 4** of the ES (Document Reference: 6.4.6.1);
- **Chapter 8: Fish and shellfish ecology, Volume 2** of the ES (Document Reference: 6.2.8);
- **Chapter 9: Benthic subtidal and intertidal ecology, Volume 2** of the ES (Document Reference: 6.2.9); and
- **Appendix 11.3: Underwater noise assessment technical report, Volume 4** of the ES (Document Reference: 6.4.11.3).

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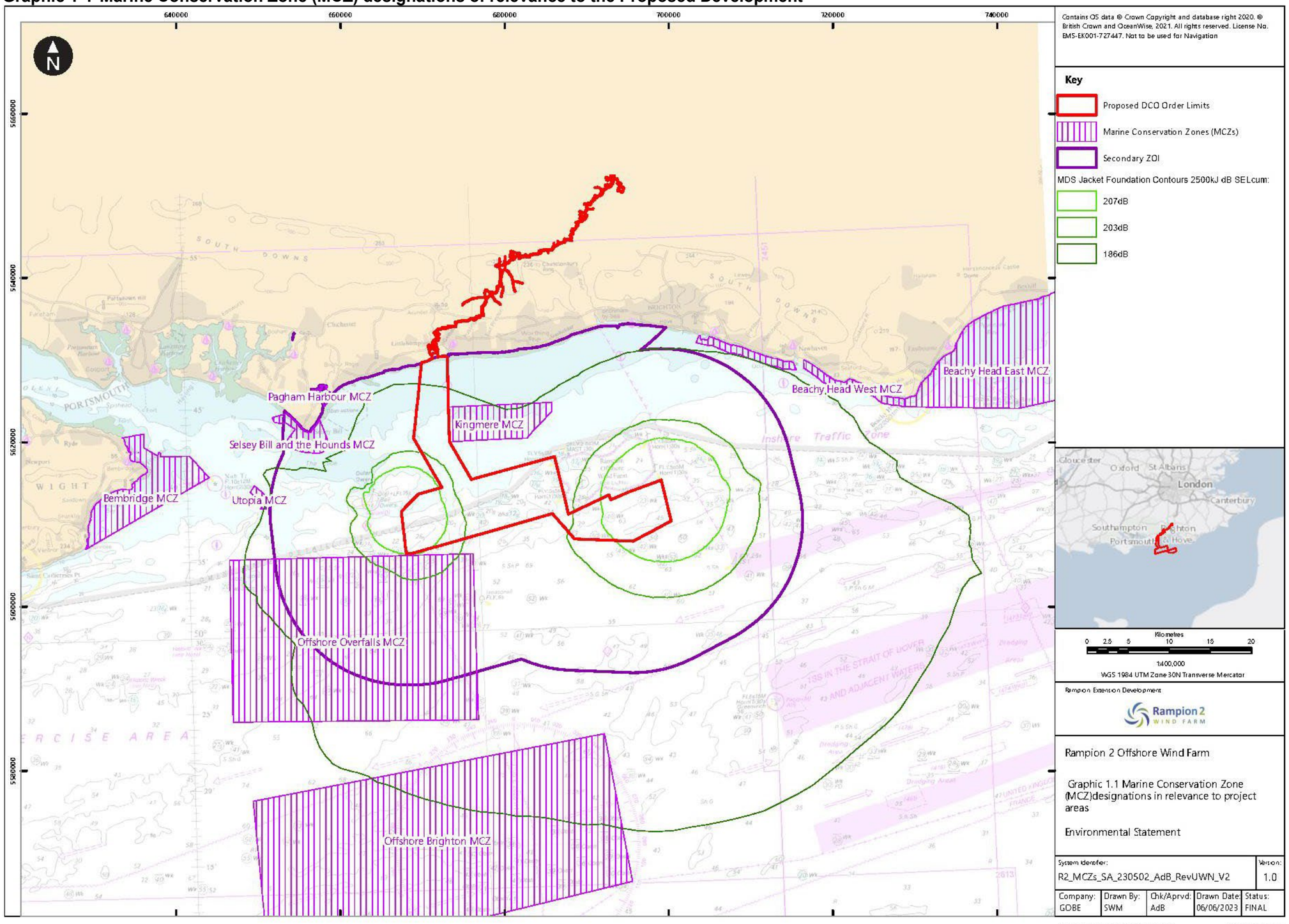
Graphic 1-1 Marine Conservation Zone (MCZ) designations of relevance to the Proposed Development



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2. Consultation and engagement

2.1 Overview

2.1.1 This section describes the stakeholder engagement undertaken for Rampion 2. This consists of early engagement, the outcome of, and response to, the Scoping Opinion in relation to the MCZ assessment, the Evidence Plan Process (EPP), informal consultation and Rampion 2's statutory consultation (hereafter referred to as the 'formal consultation'). An overview of engagement undertaken for Rampion 2 as a whole can be found in **Section 1.5** of **Chapter 1: Introduction, Volume 2** of the ES (Document Reference: 6.2.1).

2.1.2 Given the social distancing restrictions which have been in place due to the COVID-19 pandemic, all technical consultation relating to benthic subtidal and intertidal ecology has taken place online, primarily in the form of conference calls using Microsoft Teams.

2.2 Early engagement

2.2.1 Early engagement was undertaken with a number of prescribed and non-prescribed consultation bodies including Natural England, the Marine Management Organisation (MMO), and its advisors Centre for Environment, Fisheries and Aquaculture Science (Cefas) and The Wildlife Trusts (TWT) in relation to the MCZ assessment. This engagement was undertaken to introduce the Proposed Development and the proposed approach to scoping the EIA.

2.3 Scoping Opinion

2.3.1 RED submitted a Scoping Report (RED, 2020) and request for a Scoping Opinion to the Secretary of State (administered by The Planning Inspectorate) on 2 July 2020. A Scoping Opinion was received on 11 August 2020. The Scoping Report sets out the proposed nature conservation assessment methodologies and the scope of the assessment. **Table 2-1** sets out the comments received in Section 4 of the PINS Scoping Opinion 'Aspect based scoping tables – Offshore' and how these have been addressed in the **ES**. A full list of the Planning Inspectorate Scoping Opinion comments and responses is provided in **Appendix 5.2: Responses to the Scoping Opinion, Volume 4** of the ES (Document Reference: 6.4.5.2).

Table 2-1 The Planning Inspectorate Scoping Opinion responses – MCZ assessment

Planning Inspectorate ID number	Scoping Opinion comment	Section where comment is addressed
4.1.5	The ES should present a full list of designated sites that have the potential to be impacted in terms of coastal processes, including any effects on Beachy Head East MCZ and the Bembridge MCZ. JNCC should be consulted on whether Offshore Brighton MCZ should be scoped in.	Impacts to Beachy Head East MCZ and Bembridge MCZ have been assessed. Offshore Brighton is not included within this assessment because it falls outside the ZOI for benthic indirect impacts (**Graphic 1-1**), for which the MCZ is designated. The full list of MCZs considered in this assessment is presented in **Section 7**.
4.4.7	The ES should include an assessment of the potential for the spread of non-indigenous species via the colonisation of hard substrates and for the Proposed Development to be used to reach the designated hard habitats in the adjacent Kingmere MCZ.	Increased risk of introduction or spread of Marine Invasive Non-Native Species (INNS) has been considered where relevant as listed in **Section 7**.
4.10.3	Although the requirements for standalone MCZ assessment(s) under the MCAA are separate to the EIA process, the Inspectorate expects a coordinated approach to the assessment of effects on MCZs in the ES and any separate assessment under the MCAA.	This document has been prepared with due regard to the Environmental Impact Assessment (EIA) included in relevant ES chapters and these are referenced in **Section 1.4**.
Annex 2 offshore Section 5.11 Table 5.11.5	Direct impact to designated sites, including the Offshore Overfalls MCZ and the Kingmere MCZ, has been scoped out. Natural England suggests this decision is kept under review, until a	Direct impacts to Offshore Overfalls MCZ and the Kingmere MCZ have been scoped out based on the proposed DCO Order Limits having no overlap with MCZs, which is discussed in detail within **Section 5**. Indirect impacts to these sites

Planning Inspectorate ID number	Scoping Opinion comment	Section where comment is addressed
	more detailed cable route is available. The applicant will still need to consider indirect impacts, such as noise, vibration and increased suspended sediment on these sites.	are scoped into the assessment as presented within **Section 7**.
Annex 2 offshore Section 5.4 Black Seabream	Black seabream from Kingmere MCZ has been assigned a recover target for population size and a restore target for nest abundance and distribution. Any negative impact from development on the MCZ would be in direct contravention to this advice. Natural England therefore supports scoping in impacts of mortality, injury, behavioural changes and auditory masking arising from noise and vibration.	Impacts from underwater noise on black seabream of the Kingmere MCZ from have been scoped into the assessment (see **Section 5**) and are assessed in **Section 7**. Furthermore, embedded environmental measures are being implemented for black seabream, including a commitment to utilising at least one offshore pilling noise mitigation technology will be utilised to deliver underwater noise attenuation in order to reduce predicted impacts to sensitive receptors at relevant Marine Conservation Zone (MCZ) sites and reduce the risk of significant residual effects on the designated features of these sites (C-265), as well as commitments to provide spatial and temporal controls on piling activities during the breeding season (March to July) (C-274, C-280, C-281). In addition, a seasonal restriction for export cable installation will be implemented to ensure offshore cable corridor installation activities are undertaken outside the black seabream breeding period (March-July) (C-273), together with cable routeing design and use of specialist installation equipment where required to mitigate direct and indirect impacts to black seabream and its habitats (C-269, C-270, C-271, C-272).
Annex 2 offshore Section 5.4 Seahorses	Short-snouted seahorse is a feature of: Beachy Head West MCZ, Selsey Bill and the Hounds MCZ, Bembridge MCZ and Beachy	Assessment of indirect impacts on seahorses is detailed in **Section 7**. Furthermore, embedded environmental measures are being implemented including a commitment to utilising at

Planning Inspectorate ID number	Scoping Opinion comment	Section where comment is addressed
	Head East MCZ. The potential for indirect effects on short-snouted seahorses within these MCZ's should be considered. These effects include: • Mortality, injury, behavioural changes and auditory masking arising from noise and vibration; and • Changes in suspended sediment	least one offshore pilling noise mitigation technology to deliver underwater noise attenuation in order to reduce predicted impacts to sensitive receptors at relevant Marine Conservation Zone (MCZ) sites and reduce the risk of significant residual effects on the designated features of these sites (C-265) throughout piling operations.

2.4 Evidence Plan Process (EPP)

2.4.1 Consultation post-Scoping has been important to the evolution of Rampion 2 and the parameters for assessment. As part of the EIA process, ongoing consultation has been undertaken with various statutory and non-statutory stakeholders, under the auspices of the EPP.

2.4.2 Discussions with the Expert Topic Group (ETG) focused on baseline characterisation, establishing agreement on data sources and methodology approach for the purposes of the Preliminary Environmental Information Report (PEIR) and the MCZ assessment. **Chapter 9: Benthic, subtidal and intertidal ecology, Volume 2** of the ES (Document Reference: 6.2.9) provides characterisation of the benthic environment within the proposed DCO Order Limits and the 16km secondary ZOI (as shown in **Graphic 1-1**), which lies adjacent to the Kingmere and Offshore Overfalls MCZs. **Chapter 8: Fish and shellfish ecology, Volume 2** of the ES (Document Reference: 6.2.8) provides characterisation of the fish and shellfish environment within the proposed DCO Order Limits and across the wider region. Details on how the study areas were determined is presented in **paragraph 4.2.4** *et seq*. The information was compiled based on existing datasets and Rampion 2 site specific surveys (see **Table 9-9, Chapter 9: Benthic, subtidal and intertidal ecology, Volume 2** of the ES (Document Reference: 6.2.9)), as agreed with the consultees.

2.4.3 Full details of the baseline characterisations of the relevant MCZ considered are presented in **Section 6** and these were discussed and agreed with the ETG throughout the pre-application phase of the Proposed Development. Details of the sites were based on the JNCC and Natural England data and reporting outputs for each MCZ, in addition to regional broadscale habitat mapping (UKSeaMap, 2018; MAGIC, 2022) and any additional site-specific survey work. Further information is provided in the **Evidence Plan** (Document Reference: 7.21).

2.5 Non-statutory consultation

Overview

2.5.1 Non-statutory consultation captures all consultation and engagement outside of statutory consultation and has been ongoing with a number of prescribed and non-prescribed consultation bodies and local authorities in relation to the MCZ assessment. A summary of the informal consultation undertaken since completion of the Scoping Report is outlined in this section.

Informal Consultation Exercise – January/February 2021

2.5.2 RED carried out a non-statutory consultation exercise for a period of four weeks from 14 January 2021 to 11 February 2021. This non-statutory consultation exercise aimed to engage with a range of stakeholders including the prescribed and non-prescribed consultation bodies, local authorities, Parish Councils and general public with a view to introducing the Proposed Development and seeking early feedback on the emerging designs.

2.5.3 The key themes emerging from the non-statutory consultation exercise in January 2021 relating to the MCZ assessment were:

- concerns about the impact of the Proposed Development on the environment and wildlife, with comments about the beach (Climping Beach) being a designated SSSI; and
- concern about the proximity to the MCZ's (Kingmere and Offshore Overfalls), in addition to statements about the negative impacts to the seabed and sea life within these sites.

2.5.4 Further detail about the results of the non-statutory consultation exercise can be found in the **Consultation Report** (Document Reference: 5.1).

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Table 2-2 Summary of key comments and issues relevant to MCZs raised during non-statutory consultation

Date	Document	Consultee	Comment or issue raised	Details of change or response to comment
11/02/2021	Nature Conservation Method Statement	Natural England	Direct habitat disturbance to all MCZs is currently scoped out. This should remain under review for Kingmere MCZ and Offshore Overfalls MCZ in relation to the construction methodology and the final location of the cable route.	All MCZ's will be avoided by the direct footprint of the proposed DCO Order Limits and will not be crossed by any direct impacts associated with construction activities. There is therefore no direct impact to MCZs, as detailed within **Section 5**.
11/02/2021	Method Statement Feedback	Natural England	It is suggested that Bembridge MCZ is only designated for benthic ecology features of interest and falls outside of the benthic ecology ZOI, therefore no impact is expected from the proposed development of Rampion 2. This is not the case as this site also contains fish and shellfish features.	The short-snouted seahorse, oyster and native oyster (*Ostrea edulis*) have the potential to be impacted by noise. These features of Bembridge MCZ have been scoped into the assessment because they fall within the noise ZOI. The assessment is presented in **Section 7.5: Selsey Bill and the Hounds MCZ.**
11/02/2021	Method Statement Feedback	Natural England	Pagham Harbour MCZ is scoped into the nature conservation assessment but is missing from the list of MCZ's considered in the MCZ assessment.	Pagham Harbour MCZ is considered within this MCZ assessment. The assessment of this MCZ is presented within **Section 7.6**: **Pagham Harbour MCZ.**

Date	Document	Consultee	Comment or issue raised	Details of change or response to comment
11/02/2021	Method Statement Feedback	Natural England	The noise modelling has not yet been carried out. As some sites that at this stage fall outside of the study areas for ornithology, benthic, fish and shellfish ecology, but fall within the noise sensitivity study area, these should not be discounted as they may need to be scoped in for noise sensitive features at a later stage.	The MCZ Assessment has been updated following design changes and additional information that has become available, including noise modelling outputs. MCZs in proximity to Rampion 2, that are designated for short-snouted seahorse (a noise sensitive feature) (Selsey Bill and the Hounds MCZ, Beachy Head West MCZ, Bembridge MCZ and Beachy Head East MCZ) have been considered in this MCZ Assessment (**Section 7**).
11/02/2021	Method Statement Feedback	Natural England	As Beachy Head West MCZ falls within the study area for fish and shellfish ecology, impacts on other shellfish features of this site (Blue mussel beds and Native oyster) should also be considered in this chapter.	Native oyster and blue mussel beds features of Beachy Head West MCZ have been scoped in and are assessed throughout **Section 7.7: Beachy Head West MCZ**.
11/02/2021	Method Statement Feedback	Natural England	It is suggested that features of Bembridge MCZ (short-snouted seahorse, and native oyster) will be included in this assessment. Clarification needs to be provided on whether it is expected that this site and its features will be impacted.	Features of Bembridge MCZ have been considered in this MCZ Assessment in **Section 7.7**.

Date	Document	Consultee	Comment or issue raised	Details of change or response to comment
11/02/2021	Method Statement Feedback	Natural England	The document states that the primary spawning season identified within the Kingmere MCZ Supplementary Advice is April to June. Seasonality in Natural England's conservation advice published in March 2021 has been updated to March to July.	Updated seasonality for black seabream has been acknowledged and taken into consideration in **Chapter 8: Fish and shellfish ecology, Volume 2** of the ES (Document Reference: 6.2.8) and within this assessment.
11/02/2021	Method Statement Feedback	Natural England	Evidence suggests that black seabream leave the site in July and that nests require constant maintenance to remain free of sediment. Geophysical surveys were undertaken between July and August 2020. Surveys undertaken at the very end of the breeding season and outside of it are not considered to provide a reliable indicator of presence or absence of black seabream nesting sites in a particular area during the entire season.	The updated seasonality information for Kingmere MCZ assumes black seabream being present up to and including July. Baseline characterisation and assessment included in **Chapter 8: Fish and shellfish ecology, Volume 2** of the ES (Document Reference: 6.2.8) has followed a precautionary approach, with this MCZ assessment drawing upon the findings of that chapter. The baseline characterisation approach and data sources were agreed as appropriate by the MMO, Cefas and Natural England in ETG meeting and subsequent follow up meetings and targeted meetings (Targeted meeting, 30 November 2020, Catchup

Date	Document	Consultee	Comment or issue raised	Details of change or response to comment
				meeting, 21 October 2020 and ETG meeting, 24 March 2021).
11/02/2021	Method Statement Feedback	Natural England	In relation to the site-specific data collected (geophysical and Drop Down Video (DDV)) it is proposed that where nests are identified the data will be interpreted, and nests classified into the density classes assigned to the aggregates data. These density classes will be presented in figures, alongside the pre-existing aggregate monitoring data to enable a robust assessment of black seabream nesting areas across the Kingmere MCZ and the Rampion 2 offshore export cable corridor. Natural England strongly disagrees that this would enable a robust assessment of black seabream nesting areas.	The Applicant confirms that the data will be used for context only, with a general assumption of nest presence being made in areas of likely thin sediment veneer for the purposes of assessment, as informed by site specific data.
11/02/2021	Method Statement Feedback	Natural England	In relation to Kingmere MCZ we understand that there will be no direct loss of habitat within the MCZ. It is not considered that an understanding of the density and frequency of nests would be informative in relation to noise and sedimentation impacts. In relation to loss of essential fish habitat outside of the MCZ, the potential for nest presence or absence is key.	The Applicant recognises Natural England's position with regards the ability to interpolate or extrapolate the existing data beyond the bounds of the spatially limited aggregate dataset. It is considered relevant when assessing the relative importance of an area for fish spawning to draw on all available data. Furthermore, embedded environmental measures are

Date	Document	Consultee	Comment or issue raised	Details of change or response to comment
				being implemented for black seabream, including a commitment to utilising at least one offshore pilling noise mitigation technology will be utilised to deliver underwater noise attenuation in order to reduce predicted impacts to sensitive receptors at relevant Marine Conservation Zone (MCZ) sites and reduce the risk of significant residual effects on the designated features of these sites (C-265), as well as commitments to provide spatial and temporal controls on piling activities during the breeding season (March to July) (C-274, C-280, C-281). In addition, a seasonal restriction for export cable installation will be implemented to ensure offshore cable corridor installation activities are undertaken outside the black seabream breeding period (March-July) (C-273), together with cable routeing design and use of specialist installation equipment where required to mitigate direct and indirect impacts

Date	Document	Consultee	Comment or issue raised	Details of change or response to comment
				to black seabream and its habitats (C-269, C-270, C-271, C-272), thus avoiding any potential for sedimentation impacts to arise.
11/02/2021	Method Statement Feedback	Natural England	At this point the Applicant has not collected appropriate data on black seabream during the peak nesting season, and so cannot interpret this using density classes. To robustly investigate nesting density would require, as a minimum, a multi-year dataset with comprehensive spatial coverage and replicate samples taken at peak black seabream spawning season. Natural England does not think such a dataset exists and furthermore questions why the Applicant is focussed on nest density when they have not yet ascertained the presence and extent of nesting black seabream habitat within their development area. Natural England has suggested an alternative approach in targeted habitat mapping to identify potential spawning habitats which can then be avoided.	Rampion 2 site-specific geophysical and benthic surveys were undertaken in 2020 and 2021, across the cable corridor to identify potential black seabream nesting habitats. Furthermore, a geotechnical survey undertaken by Gardline (2020) contains areas of suspected black seabream nesting locations. Data used for historic black seabream nesting is taken from the aggregates industry from 2002 to present, which highlights black seabream nest locations predominately within the Kingmere MCZ but also within the cable corridor. Notwithstanding this, the Applicant confirms that further benthic surveys will be conducted as part of the pre-construction surveys to determine where key black seabream nesting locations are within the offshore export cable

Date	Document	Consultee	Comment or issue raised	Details of change or response to comment
				corridor. These data will be used to inform the mitigation Plan that will be delivered pre-construction, in line with a range of commitments to reduce the potential for impacts to arise (C-269, C-270, C-271, C-272 and C-273). The combination of long term and site-specific data allows a conclusion to be drawn that nests are likely to be present within the export cable corridor, in areas of infralittoral sediment.
11/02/2021	Method Statement Feedback	Natural England	Natural England has concerns over the developer's ability to determine the presence and extent of nesting black seabream, which could affect the outcome of the impact assessment based on sediment plume modelling and noise modelling. The model should only draw conclusions on nest presence and extent in areas which have been adequately surveyed and should not assume absence of nests where data are not available.	**Chapter 8: Fish and shellfish ecology, Volume 2** of the ES (Document Reference: 6.2.8) presents the area in which there is nesting habitat potential at a site and regional scale. The assessment relies on a combination of high-resolution site-specific data and regional scale British Geological Society (BGS) data. Furthermore, embedded environmental measures are being implemented including a commitment to utilising at least

Date	Document	Consultee	Comment or issue raised	Details of change or response to comment
				one offshore piling noise mitigation technologies during piling to deliver noise attenuation with the aim to reduce predicted impacts to breeding black seabream. In addition, a seasonal restriction for export cable installation will be implemented to ensure offshore cable corridor installation activities are undertaken outside the black seabream breeding period (March-July). Impacts from export cable installation will also be substantially reduced by the implementation of commitments to seasonal restrictions on cable works and cable routeing based on pre-construction data (C-269-C273).
11/02/2021	Method Statement Feedback	Natural England	It should be noted that temporary localised increases in SSC and smothering (Construction and Decommissioning) also need to be considered in relation to seahorses.	SSC and sediment deposition impacts have been assessed for seahorses, detailed within **Section 7.**

2.6 Statutory consultation

2.6.1 Rampion 2's first statutory consultation exercise ran from 14 July to 16 September 2021, a period of nine weeks. The PEIR (RED, 2021) was published as part of Rampion 2's first statutory consultation exercise which provided preliminary information on shipping and navigation within Chapter 13: Shipping and navigation, Volume 2 of the PEIR (RED, 2021).

2.6.2 Following feedback to the Statutory Consultation exercise in 2021 it was identified that some coastal residents did not receive consultation leaflets as intended. Therefore, the first Statutory Consultation exercise was reopened between 7 February 2022 to 11 April 2022 for a further nine weeks. The original PEIR published as part of the first Statutory Consultation exercise in 2021 was unchanged and re-provided alongside the reopened Statutory Consultation exercise in early 2022.

2.6.3 The following statutory consultation exercises focussed on changes made to the onshore cable route, onshore substation, and National Grid interface point and did not consider offshore aspects of the Proposed Development.

2.6.4 The second Statutory Consultation exercise was undertaken from 18 October 2022 to 29 November 2022. This was a targeted consultation which focused on updates to the onshore cable route proposals which were being considered following feedback from consultation and further engineering and environmental works. As part of this second Statutory Consultation exercise, RED sought feedback on the potential changes to the onshore cable route proposals to inform the onshore design taken forward to DCO application.

2.6.5 The third Statutory Consultation exercise was undertaken from 24 February 2023 to 27 March 2023. This was a targeted consultation which focused on a further single onshore cable route alternative being considered following feedback from consultation and further engineering and environmental works. As part of this third Statutory Consultation exercise, RED sought feedback on the potential changes to the onshore cable route proposals to inform the onshore design taken forward to DCO Application.

2.6.6 The fourth Statutory Consultation exercise was undertaken from 28 April 2023 to 30 May 2023. This was a targeted consultation which focused on the proposed extension works to the existing National Grid Bolney substation to facilitate the connection of the Rampion 2 onshore cable route into the national grid electricity infrastructure. As part of this fourth Statutory Consultation exercise, RED sought feedback on the proposed substation extension works to inform the onshore design taken forward to the DCO Application.

2.6.7 **Table 2-3** provides a summary of the key themes of the feedback received in relation to MCZ Assessment receptors and outlines how the feedback has been considered in this ES chapter. A full list of all comments received during the statutory consultation period and the response to those comments is provided in the **Consultation Report** (Document Reference: 5.1).

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Table 2-3 Statutory Consultation feedback

Stakeholder	Comment ID	Theme	How this is addressed in this ES
Natural England	Section 42 Consultation (ID: 253/282/701)	Concerns that the assessment relies upon spatially discrete data and large data gaps exist. Concerns regarding the timing of site-specific surveys, which were undertaken outside of the optimum black seabream nesting period and reliance on old data Coull *et al*. (1998) and Ellis *et al*. (2010, 2012). Natural England request further data on black seabream nesting habitats is collected to adequately characterise the study area for black seabream. Natural England request that potential and existing black seabream nesting habitats are clearly mapped.	The Applicant has used the best available data to provide a representative characterisation of the baseline environment presented in **Chapter 8: Fish and shellfish ecology, Volume 2** of the ES (Document Reference: 6.2.8). Site specific survey results are summarised in the chapters, as well as the data limitations and uncertainties. The surveys are presented in full in **Appendix 9.1: Predictive seabed mapping methods report** to **Appendix 9.4: Geophysical survey, Volume 4** of the ES (Document Reference: 6.4.9.1 – 6.4.9.4). Any concerns that seabream nesting may be under-represented has been addressed through 20 years of regional data and by undertaking a precautionary assessment which assumes black seabream nests to be present. **Figures 8.14a and b, Volume 3** of the ES (Document Reference 6.3.8) present the historic and potential nesting areas. The baseline characterisation approach and data sources were agreed as appropriate by the MMO, Cefas and Natural England in ETG meeting and subsequent follow up meetings and targeted meetings (Targeted meeting, 30 November 2020, Catchup meeting, 21 October 2020 and ETG meeting, 24 March 2021). Pre-construction survey data will also be collected in order to inform locations of sensitive features, including nesting

Stakeholder	Comment ID	Theme	How this is addressed in this ES
			areas, which in turn will inform the cable routeing mitigation plan.
Natural England	Section 42 Consultation (ID: 700)	Natural England request confirmation of how the MCZs have been characterised and if this is based on site specific data.	The Applicant can confirm that information on all MCZs has been informed by the detailed information that is presented alongside the designation order. Where sites are close by to the proposed DCO Order Limits they have also been characterised using a predictive habitat model which was developed by Ocean Ecology Limited (OEL) to provide the most up to date full coverage knowledge on the distribution of sediments, biological zones and biotopes.
Natural England	Section 42 Consultation (ID: 713)	Natural England requested the predictive habitat model to be updated with the full site-specific data.	Predictive habitat mapping utilised the best available data for the array area and export cable corridor to produce a detailed predictive habitat map at PEIR. The primary purpose of creating the predictive habitat map was to address data gaps identified at PEIR, due to planned further survey work not being available at that time. Since PEIR, further site-specific survey data has been added to the habitat mapping. It should be stressed that where site specific data have been collected, this has been prioritised within the predictive habitat map and that an appropriate baseline has been characterised. This Appendix has been updated accordingly.

Stakeholder	Comment ID	Theme	How this is addressed in this ES
Natural England	Section 42 Consultation (ID:704/706/708-711)	Natural England requested information and justification for all impacts that are not taken forward into the stage 1 assessment.	Those impacts that were found to be insignificant throughout the ES assessment and not taken forward into the stage 1 assessment have been justified in **Section 5.**
Natural England	Section 42 Consultation (ID: 705)	Natural England request an updated figure demonstrating Kingmere MCZ is outside of the Proposed DCO Order Limits.	**Graphic 1-1** presents all MCZs and their location outside the proposed DCO Order Limits.
Natural England	Section 42 Consultation (ID: 714/715	Natural England requested the MCZ feature description and conservation objectives to be updated. Conservation Advice is likely to be available for Beachy Head East MCZ in the near future.	The general management approaches have been added to the MCZ feature description and conservation objectives tables throughout **Section 6** and Beachy Head East and Selsey Bill and the Hounds conservation advice has been included.
Natural England	Section 42 Consultation (ID: 717-719	Natural England disagree and require clarification on the impact pathway conclusions presented in Attribute-impact pathway summary matrix for Stage 1 assessment for relevant features of the MCZs.	Receptors have been updated to have potential for significant effect unless the sediment plume modelling assessment indicates there is no significant effect (**Section 5**).
Natural England	Section 42 Consultation (ID: 722/727- 729	Concerns regarding the impacts to nesting habitats within the Kingmere MCZ. In relation to black seabream some of the key issues relate to the assessment of underwater noise and suspended sediment. Natural England disagree with the conclusion that the magnitude of disturbance would be moderate. Natural England's view is there is	Potential impacts to black seabream as a feature of the Kingmere MCZ are assessed within **Section 7**. The magnitudes of underwater noise and suspended sediment impacts have been informed by site specific underwater noise modelling and plume modelling and presented accordingly. To reduce the magnitude of impact on nesting black seabream, mitigation measures are

Stakeholder	Comment ID	Theme	How this is addressed in this ES
		a potential for the activity to hinder the conservation objectives of the site.	being implemented. These include a commitment to utilising at least one offshore pilling noise mitigation technology will be utilised to deliver underwater noise attenuation in order to reduce predicted impacts to sensitive receptors at relevant Marine Conservation Zone (MCZ) sites and reduce the risk of significant residual effects on the designated features of these sites (C-265), as well as commitments to provide spatial and temporal controls on piling activities during the breeding season (March to July) (C-274, C-280, C-281). In addition, a seasonal restriction for export cable installation will be implemented to ensure offshore cable corridor installation activities are undertaken outside the black seabream breeding period (March-July) (C-273), together with cable routeing design and use of specialist installation equipment where required to mitigate direct and indirect impacts to black seabream and its habitats (C-269, C-270, C-271, C-272).).
Natural England	Section 42 Consultation (ID: 735)	Concerns regarding noise impacts on seahorses.	The potential impacts from underwater noise on short snouted seahorse as a feature of the Beachy Head West MCZ, Selsey Bill and the Hounds MCZ, Beachy Head East MCZ and Bembridge MCZ have been assessed within **Section 7**. Furthermore, embedded environmental measures are being implemented, including a commitment to utilising at least one offshore piling noise mitigation technologies to deliver noise attenuation with the

Stakeholder	Comment ID	Theme	How this is addressed in this ES
			aim to reduce predicted impacts to seahorse throughout the year, with additional measures for spatial and temporal controls on piling activities during the March to July period (C-274, C-280, C-281), to be set out in a mitigation plan.
Natural England	Section 42 Consultation (ID: 732/ 736/ 739-741)	Natural England request illustrative sediment plume modelling and a noise contour figure showing the location of MCZs with noise-sensitive features.	**Figure 6.3.4** within **Appendix 6.3: Coastal processes technical report: Impact assessment, Volume 4** of the ES (Document Reference 6.4.6.3) provides a useful schematic summarising the spatial extent of the impact zones and contours associated with SSC, deposition and noise in relation to Rampion 2.
Natural England	Section 42 Consultation (ID: 743)	It is not appropriate to suggest that a significant effect will not be realised based on mitigation that has not been defined at this stage. In relation to impacts on Kingmere MCZ, we would suggest the Applicant consider the most westerly cable route possible within the cable corridor.	Targeted meetings with appropriate stakeholders discussing the technical notes 'Underwater noise mitigation for sensitive features' and 'Cable Corridor area mitigation for sensitive features' occurred in February 2022. Embedded environmental measures are discussed presented in **Section 3** and embedded environmental measures are discussed within the assessment for Kingmere MCZ (**Section 7.2**).
Natural England	Section 42 Consultation (ID: 745)	Natural England recommend cumulative and inter-related effects on MCZ features are included in the assessment.	Cumulative effects have been considered in **Section 7.8**and all proposed development lifetime effects and MCZ receptor-led effects are assessed in **Chapter 30: Inter-related effects, Volume 2** of the ES (Document Reference: 6.2.28)

Stakeholder	Comment ID	Theme	How this is addressed in this ES
SWT	Section 42 Consultation (ID: 24)	Concerned to note that not all features of relevant MCZs have been listed such as: - Fragile sponge and anthozoan communities (Utopia) - High Energy Infralittoral Rock (Utopia, Selsey Bill & The Hounds) - Low Energy Infralittoral Rock (Selsey Bill & The Hounds) - Moderate Energy Circalittoral Rock (Selsey Bill & The Hounds) - Peat & Clay Exposures (Selsey Bill & The Hounds) - Bracklesham Bay Geological Feature (Selsey Bill & The Hounds)	Following the revision of the Rampion 2 Red Line Boundary and secondary ZOI, Selsey Bill & The Hounds have been included in the ES assessment, with receptor impacts discussed within **Section 7.** However, Utopia MCZ is located outside the benthic ecology ZOI (**Graphic 1-1**) and therefore there are no potential impacts to protected features at this distance from Rampion 2. Utopia MCZ has not been included within this MCZ assessment.

3. Embedded environmental measures

3.1.1 This section describes the embedded environmental measures that have been adopted to reduce the potential impacts on MCZs. These embedded environmental measures have evolved over the development process as the EIA has progressed and in response to consultation.

3.1.2 The embedded environmental measures adopted by Rampion 2 that are relevant to the MCZ assessment are summarised in **Table 3-1**.

3.1.3 These measures also include those that have been identified as good or standard practice and include actions that would be undertaken to meet existing legislation requirements. As there is a commitment to implementing these embedded environmental measures, and also to various standard sectoral practices and procedures, they are considered inherently part of the design of Rampion 2 and are set out in this ES.

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Table 3-1 Embedded environmental measures relevant to the MCZ assessment

ID	Environmental measure proposed	Project phase measure introduced	How the environmental measures will be secured	Relevance to MCZ assessment
C-52	A piling Marine Mammal Mitigation Protocol (MMMP) will be implemented during construction and will be developed in accordance with Joint Nature Conservation Committee (JNCC, 2010) guidance and with the latest relevant guidance and information and in consultation with stakeholders. The piling MMMP will include details of soft starts to be used during piling operations with lower hammer energies used at the beginning of the piling sequence before increasing energies to higher levels. A **Draft Piling Marine Mammal Protocol** (Document Reference 7.14) has been submitted with this application.	Scoping	DCO requirements or dML conditions.	The use of soft start procedures for piling deter marine life, therefore reducing the noise exposure to fish and shellfish receptors, where these are not assessed as static receptors.
C-95	The assessment has taken into consideration the mitigation and control of invasive species measures, this has been incorporated into the **Outline**	Scoping	DCO requirements or dML conditions.	This measure will reduce where possible the risk of introducing invasive species into the region.

ID	Environmental measure proposed	Project phase measure introduced	How the environmental measures will be secured	Relevance to MCZ assessment
	Project Environmental Management Plan (PEMP) (Document Reference 7.11).			
C-111	A Decommissioning Plan will be prepared for the Proposed Development in line with the latest relevant available guidance.	PEIR	DCO requirements or dML conditions.	This measure will be developed to cover the decommissioning phase and will minimise impact on benthic, subtidal and intertidal ecology and fish and shellfish receptors, where appropriate.
C-265	At least one offshore pilling noise mitigation technology will be utilised to deliver underwater noise attenuation in order to reduce predicted impacts to sensitive receptors at relevant Marine Conservation Zone (MCZ) sites and reduce the risk of significant residual effects on the designated features of these sites.	ES	DCO requirements or dML conditions	The implementation of this commitment will reduce predicted impacts from underwater noise on sensitive receptors, features of MCZs principally nesting black seabream and breeding seahorse.
C-269	Cable routeing design will be developed to ensure micrositing where possible to identify the shortest feasible path avoiding subtidal chalk and reef features	ES	DCO requirements or dML conditions	Whilst this is not of direct benefit to the MCZ assessment, as direct interaction with MCZs has been avoided in the Rampion 2 project design, the

ID	Environmental measure proposed	Project phase measure introduced	How the environmental measures will be secured	Relevance to MCZ assessment
	and areas considered to potentially support black seabream nesting.			measure will benefit geo- and bio-genic reef habitats and potential black seabream nesting areas in adjacent areas.
C-270	As part of the routeing design, a working separation distance (buffer) will be maintained wherever possible from sensitive features, notably black seabream nesting areas, as informed by the outputs of the physical processes assessment, to limit the potential for impacts to arise (direct or indirect).	ES	DCO requirements or dML conditions	Whilst this is not of direct benefit to the MCZ assessment, as direct interaction with MCZs has been avoided in the Rampion 2 project design, the implementation of this measure will mitigate impacts to all seabed habitats, but particularly chalk and reef areas as well as potential (unknown) black seabream nesting locations, where avoidance is not possible
C-271	The offshore export cable routeing design will target areas of the seabed that enable maximising the potential for cables to be buried, thus providing for seabed habitat recovery in sediment areas and reducing the need for secondary protection and consequently minimising any potential for longer-term residual effects.	ES	DCO requirements or dML conditions	The implementation of this measure will mitigate impacts to all seabed habitats, aiding recovery.

ID	Environmental measure proposed	Project phase measure introduced	How the environmental measures will be secured	Relevance to MCZ assessment
C-272	Adoption of specialist offshore export cable laying and installation techniques will minimise the direct and indirect (secondary) seabed disturbance footprint to reduce impacts, which will provide mitigation of impacts to all seabed habitats, but particularly chalk and reef areas as well as potential (unknown) black seabream nesting locations, where avoidance is not possible. The Applicant will seek to utilise the most appropriate technology available at the time of construction to reduce the direct footprint impact from cutting machinery.	ES	DCO requirements or dML conditions	The implementation of this measure will mitigate impacts to all seabed habitats, but particularly chalk and reef areas as well as potential (unknown) black seabream nesting locations, where avoidance is not possible.
C-273	A seasonal restriction will be put in place to ensure offshore export cable corridor installation activities are undertaken outside the black seabream breeding period (March-July) to avoid any effects from installation works on black seabream nesting within or outside of the Kingmere MCZ.	ES	DCO requirements or dML conditions	The implementation of this measure is to avoid any effects from installation works on black seabream nesting.

ID	Environmental measure proposed	Project phase measure introduced	How the environmental measures will be secured	Relevance to MCZ assessment
C-274	Commitment to commence piling at locations furthest from the Kingmere MCZ during the black seabream breeding period (March-July), to reduce effects from installation works on breeding black seabream within or outside of the Kingmere MCZ.	ES	DCO requirements or dML conditions	The implementation of this commitment will reduce predicted impacts from underwater noise on sensitive receptors, features of MCZs principally nesting black seabream and breeding seahorse.
C-280	Commitment that no piling will occur in the piling exclusion zones during the seabream breeding period (March-July) which will be defined by the modelling in the Final Sensitive Features Mitigation Plan.	ES	DCO requirements or dML conditions	The implementation of this commitment will reduce predicted impacts from underwater noise on sensitive receptors, features of MCZs principally nesting black seabream and breeding seahorse.
C-281	Commitment to no piling within the western part of the Rampion 2 offshore array closest to the Kingmere MCZ during the majority of the black seabream breeding period (March-June); and sequenced piling in the western part of the Offshore Array Area during July in accordance with the zoning plan to be set out in the	ES	DCO requirements or dML conditions	The implementation of this commitment will reduce predicted impacts from underwater noise on sensitive receptors, features of MCZs principally nesting black seabream and breeding seahorse.

ID	Environmental measure proposed	Project phase measure introduced	How the environmental measures will be secured	Relevance to MCZ assessment
	Final Sensitive Features Mitigation Plan, to reduce the risk of significant effects from installation works on breeding black seabream within or outside of the Kingmere MCZ.			

4. MCZ Assessment methodology

4.1 Guidance and relevant information

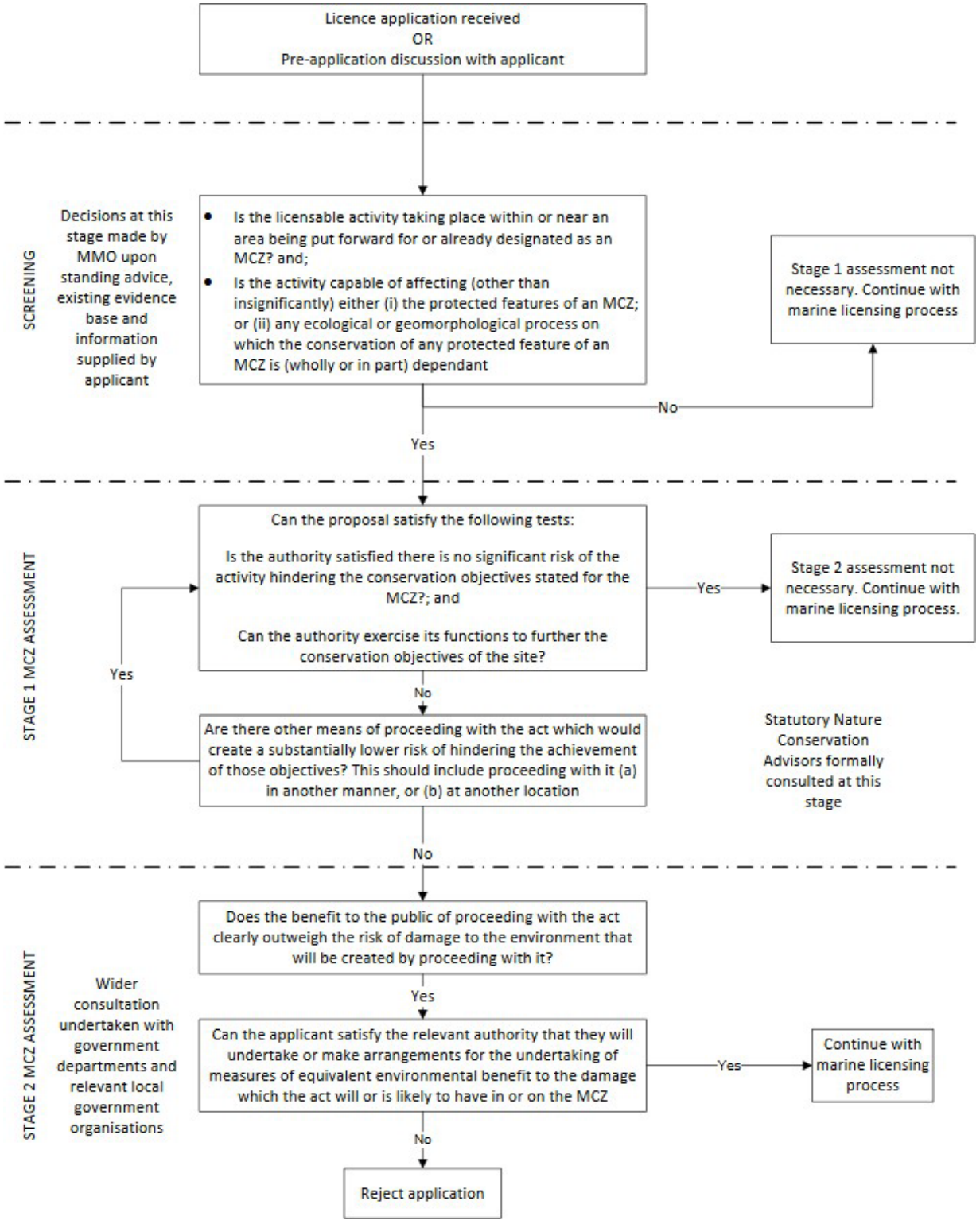
4.1.1 The MCZ assessment methodology has been largely informed by the guidance published by the MMO (2013). The document outlines the proposed procedure of undertaking MCZ assessments in the context of marine licensing decisions. The document recommends a staged approach to the assessment, with three sequential stages:

- Screening;
- Stage 1 assessment; and
- Stage 2 assessment.

4.1.2 Where specific activities, impacts or MCZs and their features are screened into the MCZ assessment process, these are then considered within the Stage 1 assessment. Should a significant risk of the activity hindering the conservation objectives be identified within Stage 1, then specific impact receptor pathways need to be considered in Stage 2 assessment (**Graphic 4-1**). Full details of each of these stages of the approach have been provided in the following sections.

4.1.3 The approach presented in this MCZ assessment was informed by guidance published by the MMO (MMO, 2013) and refined based on the feedback from the ETG and scoping consultation responses. This included agreement on the baseline characterisation, development of the MCZ assessment methodology and key concerns from stakeholders about the potential effects of Rampion 2 on MCZ features, and in particular, Kingmere MCZ and black seabream.

Graphic 4-1 Summary of the MCZ assessment process used by the MMO (MMO, 2013)



4.2 Screening methodology

4.2.1 The MMO (2013) guidelines specify, that all marine licence applications need to be screened to determine if Section 126 should apply. It will apply if, through the course of screening, it is determined that:

- the licensable activity is taking place within or near an area being put forward or already designated as an MCZ; and
- the activity is capable of affecting (other than insignificantly) either (i) the protected features of an MCZ; or (ii) any ecological or geomorphological process on which the conservation of any protected feature of an MCZ is (wholly or in part) dependant.

4.2.2 To determine the "nearness" of an activity to individual MCZ and its features, the MMO propose a risk-based approach. This includes applying an appropriate buffer zone to the MCZ features under consideration as well as a consideration of risks which lie in activities further removed from features.

4.2.3 In considering "insignificance", the following aspects have been taken into account:

- the likelihood of an activity causing an effect;
- the magnitude of the effect should it occur; and
- the potential risk any such effect may cause on either the protected features of an MCZ or any ecological or geomorphological process on which the conservation of any protected MCZ feature is, wholly or in part, dependant.

4.2.4 For the purposes of the Rampion 2 MCZ Screening, MCZs considered within the assessment were identified through the Scoping Report (RED, 2020), and further expanded based on the Scoping Opinion (PINS, 2020) and additional consultation feedback on the Nature Conservation Method Statement. The screening identified relevant MCZs based on proximity to Rampion 2, as follows:

- sites with spatial overlap with Rampion 2;
- sites within the study area defined as the proposed DCO Order Limits together with the ZOIs for individual technical disciplines:
  - secondary ZOI comprising of 16-kilometre (km) buffer from the array and the offshore export cable route, informed by the tidal excursion extent and coastal processes modelling undertaken (ABPmer, 2012) as described in **Chapter 6: Coastal processes, Volume 2** of the ES (Document Reference: 6.2.6); and
  - underwater noise ZOI (with a maximum extent of 43km) as informed by underwater noise propagation modelling detailed in **Chapter 8: Fish and shellfish ecology, Volume 2** of the ES (Document Reference: 6.2.8) and **Appendix 11.3: Underwater noise assessment technical report, Volume 4** of the ES (Document Reference: 6.4.11.3) It should be noted, that a wider ZOI is also used to inform the assessment, to account for behavioural effects from underwater noise on fish and shellfish receptors.

4.2.5 The above approach has been established following the consultation feedback, which identified sensitivity of certain MCZ features to noise impacts (namely, short snouted seahorse). Consequently, the underwater noise ZOI was included as relevant to the MCZ assessment.

4.2.6 Baseline information from relevant chapters of the ES, Natural England MCZ conservation advice, and the details of Proposed Development design available at this stage have been reviewed to further refine the list of sites where there is a risk that Rampion 2 is capable of significantly affecting the protected/proposed features of those sites. This included review of **Chapter 6: Coastal processes, Volume 2** of the ES (Document Reference: 6.2.6) to identify potential far field effects (such as increases in SSC).

4.3 Stage 1 assessment methodology

4.3.1 The Stage 1 assessment, which is presented in **Section 7**, assesses the extent of the potential impact of Rampion 2 on the MCZs screened into the assessment. The MMO guidance (2013) sets out that Stage 1 assessment needs to consider whether the conditions in Section 126(6) of MCAA can be met. Using information supplied by the Applicant, advice from the SNCBs and any other relevant information, the relevant authority would determine whether:

- there is no significant risk of the activity hindering the achievement of the conservation objectives stated for the MCZ; and
- the relevant authority can exercise its functions to further the conservation objectives stated for the MCZ (in accordance with s.125(2)(a)).

4.3.2 If the condition in Section 126(6) cannot be met, the Stage 1 assessment also considers whether the condition in Section 127(7)(a) can be met, which requires the relevant authority to determine whether:

- there is no other means of proceeding with the act which would create a substantially lower risk of hindering the achievement of the conservation objectives stated for the MCZ. This should include proceeding with it (a) in another manner, or (b) at another location.

4.3.3 In undertaking a Stage 1 assessment the relevant authority consults with SNCBs for a period of 28 days, unless the SNCB notifies the relevant authority that it need not wait, or the relevant authority determines that there is an urgent need to grant authorisation (in accordance with section 126(4) of the MCAA).

4.3.4 In Stage 1 the conservation objectives for the MCZ features need to be considered. The conservation objectives for MCZ features are high level criteria describing the desired condition of the MCZ features. While conservation objectives for individual MCZs or certain features are often site-specific, the two overarching conservation objectives defined for MCZs are:

- to maintain a feature in favourable condition if it is already in favourable condition; or
- to bring a feature into favourable condition if it is not already in favourable condition.

4.3.5 When considering whether an activity can "further" (for instance, increase the likelihood that the current status of a feature would be maintained or improve) or "hinder" the conservation objectives of a site, the relevant authority considers the direct impact of an activity upon a feature as well as any applicable indirect impacts. An indirect impact may include, for example, changing the effectiveness of a site-specific management measure put in place to further its conservation objectives.

4.3.6 With respect to "other means", the Applicant should be able to demonstrate that the proposed approach to development reduces the risk such that the activity no longer has a significant risk of hindering the conservation objectives of the site. Where sufficient mitigation to reduce the predicted impacts to an acceptable level cannot be implemented and there are no other means that substantially lower the risk of hindering the achievement of conservation objectives, then a Stage 2 assessment would be required.

4.3.7 **Chapter 8: Fish and shellfish ecology, Volume 2** of the ES (Document Reference: 6.2.8) and **Chapter 9: Benthic, subtidal and intertidal ecology, Volume 2** of the ES (Document Reference: 6.2.9) present assessments of the impacts of Rampion 2 on the ecological marine environment with regards to benthic, fish and shellfish receptors. The definitions of the magnitude of impacts, sensitivity of receptors and the significance of effects on those receptors are defined within these chapters, respectively. These definitions have also been adopted for the purposes of this MCZ assessment, with the term 'effect' used to express the consequence of an impact. This is expressed as the 'significance of effect' and is determined by considering the magnitude of the impact alongside the sensitivity of the receptor or resource, in accordance with defined significance criteria as defined in the respective chapters and bringing forward the conclusions of the assessments from the relevant ES chapters.

4.4 Stage 2 assessment methodology

4.4.1 The Stage 2 of the MCZ assessment considers whether the conditions in Sections 126(7)(b) and (c) of the MCAA can be met. From the approach suggested by the MMO (2013), the relevant authority will use information supplied by the Applicant with the licence application, advice from the SNCBs and any other relevant information to determine whether:

- the benefit to the public of proceeding with the proposed activity clearly outweigh the risk of damage to the environment that will be created by said activity; and, if so, then whether; and
- the Applicant can satisfy the relevant authority that they will make arrangements for the undertaking of measures of equivalent environmental benefit (MEEB) to the damage which the activity is likely to have on the MCZ. The above determinations will be addressed in sequence, that is, if the public benefit test is not "passed" then a consideration of MEEB would not be made as the application would be rejected.

4.4.2 In determining "public benefit" benefits at a national, regional or local level will be considered by the relevant authority. Applications for activities that are of solely private benefit do not qualify as delivering a benefit to the public.

4.4.3 Guidance from the MMO on what constitutes MEEB suggests that “types of compensatory measures that might be considered under the Habitats Directive will also be appropriate[2], although consideration will not be confined to those measures alone”.

[2] Although the EU Habitats Directive does no longer apply, compensatory measures that might be considered for European sites under The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019, could be referred to in developing MEEB.

5. MCZ Screening

5.1 MCZs relevant to Rampion 2

5.1.1 In addressing the following point of the MCZ screening process "*the licensable activity is taking place within or near an area being put forward or already designated as an MCZ*", MCZs in the vicinity of the Proposed Development were identified.

5.1.2 The Scoping Report (RED, 2020) listed a number of MCZs as having the potential to be affected by the Proposed Development. This list was reviewed in light of SNCB comments. Natural England identified several MCZs with features that could potentially be affected by the Proposed Development even where these fall outside the benthic and fish and shellfish ecology study areas identified in the Scoping Report. **Graphic 1-1** shows those sites that have been considered as relevant to the Proposed Development.

5.2 Impacts Considered

5.2.1 To assess, whether "the activity is capable of affecting (other than insignificantly) either (i) the protected features of an MCZ; or (ii) any ecological or geomorphological process on which the conservation of any protected feature of an MCZ is (wholly or in part) dependant", the conclusions of relevant ES sections were reviewed. Impacts that have the potential to affect designated MCZ features were identified as part of the EIA Screening (**Chapter 6: Coastal processes, Chapter 8: Fish and shell fish ecology** and **Chapter 9: Benthic, subtidal and intertidal ecology, Volume 2** of the ES (Document References: 6.2.6, 6.2.8 and 6.2.9)

5.2.2 **Graphic 1-1** shows there is no direct overlap between the proposed DCO Order Limits and any of the MCZs. All direct impacts will occur within the array area and offshore export cable corridor. On this basis, impacts that relate to direct effects from construction or operation activities have been screened out from MCZ assessment. These impacts are:

- Construction:
  - habitat disturbance within the proposed DCO Order Limits;
  - direct disturbance resulting from construction within the array and the export cable route (fish and shellfish features).
- Operation and maintenance:
  - long-term habitat loss/ alteration from the presence of foundations, scour protection and cable protection;
  - underwater noise as a result of operational wind turbine generators (WTGs);

- indirect disturbance arising from electromagnetic field (EMF) generated by the current flowing through the cables buried to less than 1.5m below the surface;
- habitat disturbance from jack-up vessels and cable maintenance activities; and
- colonisation of the WTGs and scour / cable protection.

- Decommissioning:
  - habitat disturbance from decommissioning of foundations, cables and rock protection; and
  - direct disturbance resulting from decommissioning within the array and the export cable route (fish and shellfish features).

5.2.3 Indirect effects from Rampion 2 are considered further given the proximity of the array area and/or the offshore export cable corridor to the boundary of each MCZ site and the potential for indirect effects.

5.2.4 The MMO guidance states the MCZ assessment process requires impacts to be assessed, unless the impact is deemed insignificant (MMO, 2013). Impacts which can be concluded as having a negligible impact magnitude (in EIA terms) on features of an MCZ are considered to present a sufficiently low risk, to its protected features or the ecological or geomorphological process on which the conservation of any protected feature of an MCZ is (wholly or in part) dependent, to allow these impacts to be screened out at this stage.

5.2.5 Indirect impacts that were assigned a 'negligible' magnitude in the ES EIA assessment (**Section 9 to 11** of **Chapter 8: Fish and shellfish ecology** and **Chapter 9: Benthic, subtidal and intertidal ecology, Volume 2** of the ES (Document References: 6.2.8 and 6.2.9) have been screened out based on "insignificance" and are therefore not taken through to the Stage 1 assessment. These include:

- Construction:
  - direct and indirect seabed disturbances leading to the release of sediment contaminants;
  - indirect disturbance arising from the accidental release of pollutants;
  - increased risk of introduction or spread of Marine INNS may affect benthic ecology and biodiversity;
  - indirect disturbance from increased noise and vibration from construction activities (benthic ecology receptors); and
  - impacts of underwater noise from seabed preparation, rock dumping and cable installation (fish and shellfish receptors).
- Operation and maintenance:
  - changes to seabed habitats arising from effects on physical processes; and
  - indirect disturbance arising from the accidental release of pollutants.

- Decommissioning:
  - direct and indirect seabed disturbances leading to the release of sediment contaminants; and
  - indirect disturbance arising from the accidental release of pollutants.

5.2.6 Impacts that are considered further in the MCZ screening and assessment process include:

- Construction:
  - mortality, injury, behavioural changes and auditory masking arising from noise and vibration (fish and shellfish features); and
  - temporary localised increases in SSC and sediment deposition;
- Operation and maintenance:
  - increased risk of introduction or spread of Marine INNS (due to presence of infrastructure and vessel movements).
- Decommissioning:
  - mortality, injury, behavioural changes and auditory masking arising from noise and vibration (fish and shellfish features); and
  - temporary increase in SSC and sediment deposition (from removal of foundations, cables and rock protection).

5.2.7 For the purposes of this MCZ assessment, decommissioning impacts are assessed together with construction impacts, as it is assumed that effects arising during decommissioning will be much less than those resulting from construction. This approach is considered to be precautionary.

5.3 MCZ Screening

5.3.1 **Table 5-1** lists those MCZs where connectivity between the impacts arising from the Rampion 2 and MCZ features exists.

5.3.2 **Chapter 8: Fish and shellfish ecology, Volume 2 of the ES** (Document Reference: 6.2.8) and **Chapter 9: Benthic, subtidal and intertidal ecology, Volume 2** of the ES (Document Reference: 6.2.9) include detailed assessments of impacts screened in above. For some of the MCZs it is only select features that have a potential to be affected, other than insignificantly, by the Proposed Development. **Table 5-1** identifies certain features, which are proposed to be screened out at this stage due to a lack of receptor sensitivity to the impact, or due to control measures to be implemented by Rampion 2 that would greatly reduce the risk of the effect occurrence.

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Table 5-1 MCZ screening assessment

Site Name	Location relative to Rampion 2 proposed DCO Order Limits	Features screened out of further assessment	Justification for screening out	Features screened into Stage 1	Justification for screening in
Kingmere MCZ	Lies adjacent to the eastern side of the offshore export cable corridor; falls within the secondary ZOI and the underwater noise ZOI.	-	-	Black seabream (*S. cantharus*)	Potential for mortality, injury, behavioural changes and auditory masking arising from noise and vibration
				Black seabream (*S. cantharus*) Infralittoral rock and thin mixed sediment Subtidal chalk	Potential for indirect impacts to benthic features from temporary localised increases in SSC and sediment deposition Potential for indirect impact to features from introduction or spread of Marine INNS
Offshore Overfalls MCZ	Lies 0.25km from the array area and falls within the secondary ZOI.	Indirect impacts do not have the potential to affect: English Channel outburst flood features	The coastal processes ES assessment determines that the impacts on hydrodynamic and wave regimes will be not significant	Subtidal coarse sediment Subtidal mixed sediments Subtidal sand	Potential for indirect impacts to benthic features from temporary localised increases in SSC and sediment deposition Potential for indirect impact to features from

Site Name	Location relative to Rampion 2 proposed DCO Order Limits	Features screened out of further assessment	Justification for screening out	Features screened into Stage 1	Justification for screening in
			and magnitude of changes to seabed habitats arising from effects on physical processes, including scour effects and changes in the sediment transport and wave regimes is negligible.		introduction or spread of Marine INNS
Selsey Bill and the Hounds MCZ	10km west of the offshore export cable corridor and falls within the secondary ZOI. The MCZ lies outside of the underwater ZOI (**Graphic 1-1**), although there is the potential for a wider behavioural impact from underwater noise. Therefore, taking a precautionary approach, impacts from underwater noise on the short snouted	Indirect impacts do not have the potential to affect: Bracklesham Bay geological feature	The coastal processes ES assessment determines that the impacts on hydrodynamic and wave regimes will be not significant and magnitude of changes to seabed habitats arising from effects on physical processes, including scour effects and changes in the sediment transport	Short-snouted seahorse (*H. hippocampus*)	Potential for mortality, injury, behavioural changes and auditory masking arising from noise and vibration
				High energy infralittoral rock; Low energy infralittoral rock; Moderate energy circalittoral rock; Moderate energy infralittoral rock;	Potential for indirect impacts to benthic features from temporary localised increases in suspended sediment concentrations (SSC) and sediment deposition

Site Name	Location relative to Rampion 2 proposed DCO Order Limits	Features screened out of further assessment	Justification for screening out	Features screened into Stage 1	Justification for screening in
	seahorse feature have been assessed.		and wave regimes is negligible.	Peat and clay exposures; Subtidal mixed sediments; Subtidal sand; and Short-snouted seahorse	Potential for indirect impact to features from introduction or spread of Marine INNS
Pagham Harbour MCZ	Lies 10.41km west of the export cable corridor and falls within the secondary ZOI. The MCZ lies outside of the underwater noise ZOI (**Graphic 1-1**), although there is the potential for a wider behavioural impact from underwater noise. Therefore, taking a precautionary approach, impacts from underwater noise on the lagoon sand	-	-	Lagoon sand shrimp (*G. insensibilis*)	Potential for mortality, injury, behavioural changes and auditory masking arising from noise and vibration
				Defolin's lagoon snail (*Caecum armoricum*) Lagoon sand shrimp (*G. insensibilis*) Seagrass beds	Potential for indirect impacts to benthic features from temporary localised increases in SSC and sediment deposition Potential for indirect impact to features from introduction or spread of Marine INNS

Site Name	Location relative to Rampion 2 proposed DCO Order Limits	Features screened out of further assessment	Justification for screening out	Features screened into Stage 1	Justification for screening in
	shrimp feature have been assessed.				
Beachy Head West MCZ	17km north-east of the offshore export cable corridor and falls outside the secondary ZOI. The MCZ falls within the underwater noise ZOI.	Benthic features that lie outside the secondary ZOI: High energy circalittoral rock; Infralittoral muddy sand; Infralittoral rock and thin sandy sediment; Infralittoral sandy mud; Intertidal coarse sediment; Littoral chalk communities; Moderate energy circalittoral rock; Subtidal chalk; Subtidal mixed sediments;	The MCZ falls outside the secondary ZOI, and therefore benthic features are screened out of the assessment.	Short snouted seahorse (*H. hippocampus*) Native oyster (*O. edulis*) Blue mussel (*Mytilus edulis*) beds	Potential for mortality, injury, behavioural changes and auditory masking arising from noise and vibration

Site Name	Location relative to Rampion 2 proposed DCO Order Limits	Features screened out of further assessment	Justification for screening out	Features screened into Stage 1	Justification for screening in
		Subtidal mud; and Subtidal sand. The effect 'Potential for indirect impact to features from introduction or spread of Marine INNS' has been screened out			
Beachy Head East MCZ	28.2km north-east of the offshore export cable corridor. The site falls outside the secondary ZOI. The MCZ falls outside of the underwater noise ZOI, although there is the potential for a wider behavioural impact from underwater noise. Therefore, taking a precautionary approach, impacts from underwater noise	Benthic features that lie outside the secondary ZOI: High energy circalittoral rock; Littoral chalk communities; Moderate energy circalittoral rock; Peat and clay exposures;	The MCZ falls outside the secondary ZOI, and therefore benthic features are screened out of the assessment.	Short snouted seahorse (*H. hippocampus*)	Potential for mortality, injury, behavioural changes and auditory masking arising from noise and vibration

Site Name	Location relative to Rampion 2 proposed DCO Order Limits	Features screened out of further assessment	Justification for screening out	Features screened into Stage 1	Justification for screening in
	on short snouted seahorse features have been assessed.	Ross worm (*Sabellaria spinulosa*) reefs; Subtidal chalk; Subtidal coarse sediment; and Subtidal sand. The effect 'Potential for indirect impact to features from introduction or spread of Marine INNS' has been screened out			
Bembridge MCZ	23.8km west of the proposed DCO Order Limits. The site falls outside the secondary ZOI. The MCZ falls outside of the underwater noise ZOI, although there is the potential for a wider behavioural impact	Benthic features that lie outside the secondary ZOI: Maerl beds; Peacock's tail (*Padina pavonica*); Seagrass beds;	The MCZ falls outside the secondary ZOI, and therefore benthic features are screened out of the assessment.	Short snouted seahorse (*H. hippocampus*) Native oyster (*O. edulis*)	Potential for mortality, injury, behavioural changes and auditory masking arising from noise and vibration.

Site Name	Location relative to Rampion 2 proposed DCO Order Limits	Features screened out of further assessment	Justification for screening out	Features screened into Stage 1	Justification for screening in
	from underwater noise. Therefore, taking a precautionary approach, impacts from underwater noise on fish and shellfish features have been assessed.	Sea-pen and burrowing megafauna communities; Sheltered muddy gravels;Stalked jellyfish (*Calvadosia campanulata*); Stalked jellyfish (*Haliclystus* spp); Subtidal coarse sediment; Subtidal mixed sediments; Subtidal mud; and Subtidal sand. The effect 'Potential for indirect impact to features from introduction or spread of Marine INNS' has been screened out				

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6. Background information

6.1.1 This section provides a summary of the baseline information for each of the MCZs, and the specific features considered within the Stage 1 assessment for Kingmere MCZ.

6.2 Kingmere MCZ

Site description

6.2.1 Kingmere MCZ lies between 5 and 10km offshore from the West Sussex coast, between Worthing and Littlehampton. The size of the MCZ is approximately 47.8 square kilometres (km^2). The site contains excellent examples of rocky habitat and subtidal chalk outcropping reef systems that support a wide range of marine life, such as algae, sea squirts and sponges. Kingmere MCZ is one of the most important black seabream spawning sites within UK waters, as the rocky habitats and chalk outcrops provide ideal nesting grounds.

6.2.2 The site contains two Local Wildlife Sites (LWS): Kingmere Rocks and Worthing Lumps. These are non-statutory sites identified for local conservation and geological value by the local authorities and Sussex Seasearch.

6.2.3 **Chapter 9: Benthic, subtidal and intertidal ecology, Volume 2** of the ES (Document Reference: 6.2.9) provides characterisation of the benthic environment of the offshore export cable corridor plus buffer, which lies adjacent to Kingmere MCZ. The information was compiled based of existing datasets and Rampion 2 site specific surveys (see **Table 9-9, Chapter 9: Benthic, subtidal and intertidal ecology, Volume 2** of the ES (Document Reference: 6.2.9)), as agreed with the consultees. Kingmere MCZ is named after Kingmere Rocks, which is a rocky and boulder reef running through the middle of the site, with areas of subtidal chalk, rock and mixed sediments. The benthic environment has been characterised using a predictive habitat model which was developed by Ocean Ecology Limited (OEL) to provide the most up to date full coverage knowledge on the distribution of sediments, biological zones and biotopes across the proposed DCO Order Limits, using the newly acquired site specific acoustic data and wealth of existing ground-truthing data available. The full methodologies and results of the model are presented within **Appendix 9.1: Predictive seabed mapping methods report, Volume 4** of the ES (Document Reference: 6.2.9.1). The key biotopes recorded from the predictive habitat mapping exercise note that the site includes *S. spinulosa* with kelp and red seaweeds on sand-influenced infralittoral rock; piddocks with a sparse associated fauna in sublittoral very soft chalk or clay.

6.2.4 The location of Kingmere MCZ in relation to Rampion 2 is shown in **Graphic 1-1.** The seabed habitats of the Kingmere MCZ according to Broadscale regional habitat mapping to EUNIS Level 4, detailing biological zone and substrate (UKSeaMap, 2018), indicates Kingmere MCZ is predominantly characterised by circalittoral coarse sediments with a small portion of infralittoral mixed sediments. This aligns with findings from the dominant habitats across the proposed DCO

Order Limits and wider secondary ZOI (**Figure 9.3, Volume 3** of the ES (Document Reference: 6.3.9)). Additionally, site specific sediment data confirmed the presence of coarse and mixed sediments within the eastern section of the proposed DCO Order Limits, adjacent to Kingmere MCZ (**Figure 9.4, Volume 4** of the ES (Document Reference: 6.3.9.4)).

6.2.5 Reference to the mapped features (MAGIC, 2022)[3] obtained from Natural England's 'Conservation Advice for Marine Protected Areas' for the Kingmere MCZ reveals a habitat type of predominantly infralittoral rock and thin mixed sediment. Subtidal chalk is identified in a small patch in the eastern side of the MCZ, as well as Black seabream nesting areas which are present in the eastern areas. Each of these habitats is considered in the following section through reference to the recognised pressures and sensitivities detailed within the Natural England Advice on Operations (AOO) for Kingmere MCZ.

Features screened into Stage 1 assessment

6.2.6 **Table 6-1** below presents the screening conclusions following a detailed review of impacts and features presented in **Section 5.2: Impacts considered**, above.

Table 6-1 Kingmere MCZ screening conclusions

Site Name	Location relative to Rampion 2 proposed DCO Order Limits	Features screened into Stage 1	Justification for screening in
Kingmere MCZ	Lies adjacent to the eastern side of the offshore export cable corridor; falls within the benthic, fish ecology and noise ZOI as defined in relevant chapters.	Black seabream (*S. cantharus*)	Potential for mortality, injury, behavioural changes and auditory masking arising from noise and vibration
		Black seabream (*S. cantharus*) Infralittoral rock and thin mixed sediment Subtidal chalk	Potential for indirect impacts to benthic features from temporary localised increases in suspended sediment concentrations (SSC) and sediment deposition Potential for indirect impact to features from introduction or spread of Marine INNS

[3] Defra (2022). Magic maps [online] Available at: https://magic.defra.gov.uk/MagicMap.aspx?srs=WGS84&chosenLayers=mczIndex,mczfociPIndex,mczhociPIndex,mczbshPIndex,mczhociIndex,mczbshIndex,backdropDIndex,backdropIndex,europeIndex,vmlBWIndex,25kBWIndex,50kBWIndex,250kBWIndex,miniscaleBWIndex&box=-0.582217999999955:50.6844243990001:-0.333179606999955:50.7688274850001&useDefaultbackgroundMapping=false [Accessed: October 2022].

6.2.7 **Table 6-2** provides a description of the relevant features from Kingmere MCZ, which is assessed in Stage 1, and includes the conservation objectives for these features. It should be noted that Supplementary Advice on conservation objectives (SACOs) is also available for Kingmere MCZ and presents attributes which are ecological characteristics or requirements of the designated features within a site. These attributes are considered to best describe the site's ecological integrity and, if safeguarded, will enable achievement of the conservation objectives. Due regard to SACOs will be given as part of Stage 1 assessment.

Feature sensitivity

6.2.8 As part of the conservation advice package, Natural England provides AOO, which identifies pressures associated with the most commonly occurring marine activities and provides a detailed assessment of the feature sensitivity to these pressures. The AOO can inform an initial assessment of whether a proposed activity may have an impact on a feature in the site. The AOO from pressures associated with impacts scoped into this MCZ are presented in **Table 6-3**.

6.2.9 A detailed appraisal of feature sensitivity is presented in **Section 7**, which forms the basis of the Stage 1 assessment.

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Table 6-2 Kingmere MCZ feature description and conservation objectives[4]

Feature	Feature description	Conservation objective(s)	Condition of features
Infralittoral rock and thin mixed sediment	Infralittoral rock and thin mixed sediments covers over half the site but is absent from a patch in the south east corner and a corridor from the north-west to the south of the site. The uneven seabed is formed of outcrops of sandstone and mudstone exposures. The ground between the outcrops is covered with mixed sediments. Kingmere MCZ is a core record for this habitat type. At depths shallower than 8 meters (m) red algae dominates the upward facing surfaces of the rocks. As depth increases, algae are covered in a dense animal layer of primarily bryozoans. Encrusting coralline algae; sponges, sea squirts are present on the vertical rock faces. Tidal transport of sediments scours the area, and the bases of most rocky outcrops are kept free of any encrusting organisms. Crustaceans, including commercially important brown crab (*Cancer pagurus*) and European lobster (*Homarus gammarus*) are frequently found amongst the rocks. The mixed sediments (cobble, pebble, gravel, shells and sand) support fan worms, in particular *Bispara volutacornis*. Due to the mobile nature of the sediments most of the associated species are mobile but occasional sessile species, such as keel worm (*Pomatoceros triqueter*) and dahlia anemone (*Urticina felina*) are	To ensure that the protected habitats are: 1) maintained in favourable condition if they are already in favourable condition, or 2) brought into favourable condition if they are not already in favourable condition. For each protected habitat feature, favourable condition means that, within a zone both: (a) its extent is stable or increasing; and (b) its structure and function, its quality, and the composition of its characteristic biological communities (including diversity and abundance of species forming part or inhabiting the habitat) are sufficient to ensure that it remains in a	No current Marine Condition Assessment.

[4] Natural England (2022). Natural England Conservation Advice for Marine Protected Areas. Kingmere MCZ [online] Available at: https://designatedsites.naturalengland.org.uk/Marine/MarineSiteDetail.aspx?SiteCode=UKMCZ0009&SiteName=kingmere&SiteNameDisplay=Kingmere+MCZ&countyCode=&responsiblePerson=&SeaArea=&IFCAArea=&NumMarineSeasonality=1&HasCA=1#hlco [Accessed October 2022]

Feature	Feature description	Conservation objective(s)	Condition of features
	present. The sediment provides a habitat for cuckoo rays (*Leucoraja naevus*) and nursery grounds for several commercially important fish species.	condition which is healthy and does not deteriorate.	
Subtidal chalk	Kingmere MCZ contains two prominent examples of subtidal chalk cliff (Worthing Lumps). These are present in the north-east corner of the site and represent the best exposure of subtidal chalk cliffs in Sussex. Bored by bivalve molluscs, the chalk is particularly species rich and used by a range of invertebrates, shellfish, worm species, bryozoans, coralline algae, sea squirts, sponges and sea stars. The chalk cliffs are sheer faces 1 to 4m proud of the seabed divided into three distinct habitats. The flat cliff tops, dominated by mixed sediment of sand and gravel have been stabilised by significant populations of foliaceous red algae, some foliaceous green algae and calcareous red algae. In some places the sheer cliff faces form narrow gullies, bored by piddocks (*Pholas dactylus*) and exposed to high tidal flows, the cliffs are relatively unstable, and colonisation of sessile species is limited. The unstable nature of the cliff faces results in an abundance of crevices, and these are widely used by mobile species such as European lobster, brown crab, conger eels (*Conger conger*), leopard-spotted goby (*Thorogobius ephippiatus*), and tompot blenny (*Parablennius gattorugine*). The base of the cliffs is characterised by exposed chalk and in places, a sparse cover of pebble and cobble. Due to the strong tidal flows channelled by the chalk cliffs, sessile species are typically absent.	*As above for infralittoral rock and thin mixed sediment.*	No current Marine Condition Assessment.

Feature	Feature description	Conservation objective(s)	Condition of features
Black seabream (*S. cantharus*)	Kingmere MCZ protects the spawning stage of black seabream and is one of the longest studied black seabream breeding sites in the UK. Black seabream is commonly 35 centimetres (cm) in length but can grow up to 60cm. This is a long-lived species, with juveniles maturing at around 20cm in length as females, and later changing to become male. Adult black seabream exhibit a schooling behaviour and feed primarily on seaweed and invertebrates, in particular young cuttlefish, which can also be found in Kingmere MCZ. Black seabream migrate within the English Channel. They overwinter in the deeper (50 to 100m) waters of the western channel and as the water warms up they move to shallower inshore waters. They arrive and spawn in the Kingmere MCZ in the spring/summer months, typically between March and July. The spawning season has high variability between years, for example in 2014 spawning black seabream were present in February. It is thought that the breeding and spawning behaviour are likely to be driven by changes in water temperature. Black seabream exhibit highly selective 'nesting behaviour', which requires very specific nesting habitat: near horizontal bedrock with a thin layer of sediment. Kingmere MCZ contains a substantial area of this habitat, particularly in the eastern half of the site, so it is ideal for nesting black seabream. The male fish clears an area of sediment to create a nest roughly one metre in diameter for the female to lay her eggs directly onto clean bedrock. The males remain at the nest site guarding it from predators and keeping the eggs clear of sediment. The males remain in the vicinity to guard their nests until the eggs	1) In relation to black seabream spawning habitat to (a) maintain the habitat in favourable condition if already in favourable condition, or (b) bring into favourable condition if not already in favourable condition. 2) To ensure the black seabream population occurring in the MCZ be free of the disturbance of a kind likely to significantly affect the survival of its members or their ability to aggregate, nest, or lay, fertilise or guard eggs during breeding. For the spawning habitat of black seabream within the MCZ, favourable condition means that the habitat is of sufficient quality and quantity to enable individuals of this species using the habitat to survive, aggregate, nest, lay, fertilise or guard eggs during breeding.	No current Marine Condition Assessment.

Feature	Feature description	Conservation objective(s)	Condition of features
	hatch. After hatching the larvae enter the plankton and the male abandons the nest. After spawning the adults disperse and can be found in a variety of habitats including seagrass beds and sandy habitats down to 300m.		

Table 6-3 AOO from impacts screened into Stage 1 for Kingmere MCZ and the feature sensitivity to pressures that may arise[4]

Pressures	Infralittoral rock and thin mixed sediment	Subtidal chalk	Black seabream (*S. cantharus*)
Physical change (to another sediment type)	not relevant	Sensitive	Insufficient evidence
Changes in suspended solids (water clarity)	Sensitive	Sensitive	not relevant
Deoxygenation	Sensitive	Insufficient evidence	Sensitive
Introduction or spread of invasive non-indigenous species	Sensitive	Sensitive	Insufficient evidence
Smothering and siltation rate changes (Light)	Sensitive	Sensitive	Sensitive
Smothering and siltation rate changes (Heavy)	Sensitive	Sensitive	Sensitive
Underwater noise changes, vibration	not relevant	not relevant	Sensitive

6.3 Offshore Overfalls MCZ

Site description

6.3.1 Offshore Overfalls MCZ is located in the eastern English Channel, approximately 18km south-east of the Isle of Wight. The seabed is predominantly coarse sediment with areas of sand, mixed sediments and exposed bedrock. The site protects 593km^2 of seabed, with a depth range between from 20 and 70m, the deeper areas coinciding with a valley system running through the site from the south to the north-east. The valley is part of the English Channel outburst flood features (Quaternary fluvio-glacial erosion features), which are protected within the site for their importance to the study of geomorphology (feature screened out of further assessment, see **Section 5**).

6.3.2 The variety of habitats found support a diverse range of species, including sponges, hydroids, bryozoans on the cobbles and boulders and crabs, sea stars and sea urchins. Burrowing worms live within the sediment alongside burrowing anemones and bivalves such as scallops.

6.3.3 **Chapter 9 Benthic, subtidal and intertidal ecology, Volume 2** of the ES (Document Reference: 6.2.9) provides characterisation of the benthic environment within the proposed DCO Order Limits and the 16km buffer. The information was compiled based of existing datasets and Rampion 2 site specific surveys, as agreed with the consultees. Offshore Overfalls MCZ lies adjacent to the Rampion 2 array area. Offshore Overfalls MCZ is designated for several broad-scale habitats including subtidal coarse sediment, subtidal mixed sediments, subtidal sand and English Channel outburst flood features. As noted in **Section 6.2** the benthic environment has been characterised using a predictive habitat model with the full methodologies and results of the model presented within **Appendix 9.1: Predictive seabed mapping methods report, Volume 4** of the ES (Document Reference: 6.4.9.1). The predictive habitat mapping exercise identified the key biotopes present at the site comprise infralittoral mobile clean sand with sparse fauna; *Mediomastus fragilis*, *Lumbrineris* species and venerid bivalves in circalittoral coarse sand or gravel; *Spirobranchus triqueter* with barnacles and bryozoan crusts on unstable circalittoral cobbles and pebbles; *Crepidula fornicata* with ascidians and anemones on infralittoral coarse mixed sediment; and *Flustra foliacea* and *Hydrallmania falcata* on tide-swept circalittoral mixed sediment.

6.3.4 The location of Offshore Overfalls MCZ in relation to Rampion 2 is shown in **Graphic 1-1.** The seabed habitats of the Offshore Overfalls MCZ according to Broadscale regional habitat mapping to EUNIS Level 4, detailing biological zone and substrate (UKSeaMap, 2018), indicates the seabed includes deep circalittoral coarse sediment and circalittoral coarse sediment. **Figure 9.3, Volume 3** of the ES (Document Reference: 6.3.9) provides a broad picture of the seabed substrate over the proposed DCO Order Limits and wider areas. The site-specific survey of the array's southwestern section, closest to the Offshore Overfalls MCZ, identified subtidal mixed sediments and subtidal coarse sediments. (**Figure 9.2, Volume 3** of the ES (Document Reference: 6.3.9)).

Features screened into Stage 1 assessment

6.3.5 **Table 6-4** below presents the screening conclusions following a detailed review of impacts and features presented in **Section 5.2**, above.

Table 6-4 Offshore Overfall screening conclusions

Site Name	Location relative to Rampion 2 proposed DCO Order Limits	Features screened into Stage 1	Justification for screening in
Offshore Overfalls MCZ	Lies 0.25km from the array area and falls within the benthic ecology ZOI.	Subtidal coarse sediment Subtidal mixed sediments Subtidal sand	Potential for indirect impacts to benthic features from temporary localised increases in suspended sediment concentrations (SSC) and sediment deposition Potential for indirect impact to features from introduction or spread of Marine INNS

6.3.6 **Table 6-5** provides a description of the relevant features from Offshore Overfalls MCZ, which is assessed in Stage 1, and includes the conservation objectives for these features. No SACO is available for Offshore Overfalls (at the time of writing this assessment).

Feature sensitivity

6.3.7 There is currently no equivalent to Natural England's site-specific AOO produced by JNCC for Offshore Overfalls MCZ.

6.3.8 A detailed appraisal of feature sensitivity is presented in **Section 7**, which forms the basis of the Stage 1 assessment.

Table 6-5 Offshore Overfalls MCZ feature description and conservation objectives[5]

Feature	Feature description	Conservation objective(s)	Condition of features
Subtidal sand **Subtidal mixed sediments** **Subtidal coarse sediments**	Subtidal sand can be found in two isolated patches that fringe the northern margin of the Northern Palaeovalley and is associated with marine bedforms that form a collection of sediment ripples and waves. These marine bedforms are predominantly comprised of sandy sediment although some coarse or mixed sediments may be present in the troughs of the sediment waves. Subtidal mixed sediments are confined to the northeast of the MCZ. Evidence from 2012 survey shows bedrock structures visible at the seabed in this region, covered with a thin veneer of mixed sediments. Bedrock structures are sporadic along the south east of the site and in an area to the north-west known as the 'Overfalls'. Subtidal coarse sediment is predominant within the MCZ, covering almost three-quarters of the site. Most of the feature is located on the flanks and terraces of the Northern Palaeovalley and within the valley floor. Offshore Overfalls MCZ is incredibly diverse with 278 infauna species and 45 epifauna species identified from the 2012 survey. Some of the biotopes are characterised by comparatively high numbers of the bristle worm (*Notomastus latericeus*), along with the pea urchin (*Echinocyamus pusillus*). The infauna biological communities appear to be dominated by a diverse range of burrowing worms (polychaetes). Bivalves such as the Queen scallop (*Aequipecten opercularis*) occur in smaller numbers along with the long-clawed porcelain crab (*Pisidia longicornis*) and the common	To ensure that the broad-scale habitat remain in or are brought into favourable condition, such that its: 1) extent is stable or increasing; and 2) structures and functions, its quality, and the composition of its characteristic biological communities are such as to ensure that it is in a condition which is healthy and not deteriorating. For each protected habitat feature, favourable condition means that, within a zone both: (a) its extent is stable or increasing; and (b) its structure and function, its quality, and the composition of its	No current Marine Condition Assessment.

[5] JNCC (2021). Offshore Overfalls MPA [online] Available at: https://jncc.gov.uk/our-work/offshore-overfalls-mpa/ [Accessed December 2022].

Feature	Feature description	Conservation objective(s)	Condition of features
	brittlestar (*Ophiothrix fragilis*). The epifauna, living on top of the sediment, are dominated by hydroids and bryozoans and also include a range of sponges, sea anemones and sea stars. Various species of fish are also present including thornback ray (*Raja clavata*), red gurnard (*Chelidonichthys cuculus*), small-spotted catshark (*Scyliorhinus canicula*), and bib (*Trisopterus luscus*).	characteristic biological communities (including diversity and abundance of species forming part or inhabiting the habitat) are sufficient to ensure that it remains in a condition which is healthy and does not deteriorate.	

6.4 Selsey Bill and the Hounds MCZ

Site description

6.4.1 Selsey Bill and the Hounds MCZ covers an area of approximately 16km^2 and is located by the town of Selsey in West Sussex on the south coast of England. The landward boundary is at Mean Low Water and the site adjoins the Bracklesham Bay Site of Special Scientific Interest. The MCZ lies within the Eastern Channel region of English waters.

6.4.2 Selsey Bill and the Hounds MCZ is well known for its high biodiversity and species richness, supported by a variety of different habitats ranging from rocky habitats to soft sandy sediments. The site provides additional protection for a series of geological interest features that are exposed on, and underlie, the foreshore within Bracklesham Bay. These rock features, known locally as “The Hounds”, consist of outcrops of limestone and clay exposures and are representative of a coherent rock system stretching across the MCZ from the northwest corner to the southeast. These rock features provide a range of habitats that support a wide variety of species, with deeper or vertical rock faces dominated by animals such as anemones, sponges, and sea squirts. The rare and cryptic short-snouted seahorse (*H. hippocampus*) is known to be present along this area of coastline.

6.4.3 The site also protects one of the best examples of peat and clay exposures on the southeast coast. Within the southeast of the site is the Mixon Hole, a dramatic 20m drop in the seafloor exposing clay cliffs capped with limestone.

6.4.4 The location of Selsey Bill and the Hounds MCZ in relation to Rampion 2 is shown in **Graphic 1-1**. The seabed habitats of the MCZ according to Broadscale regional habitat mapping to EUNIS Level 4, are predominantly infralittoral coarse sediment, sublittoral sediment and circalittoral coarse sediment. **Figure 9.3, Volume 3** of the ES (Document Reference: 6.3.9) provides a broad picture of the seabed substrate over the proposed DCO Order Limits and wider areas.

6.4.5 Reference to the mapped features (MAGIC, 2022)[6] obtained from Natural England’s ‘Conservation Advice for Marine Protected Areas’ for the Selsey Bill and the Hounds MCZ identifies a range of habitat types including predominantly intertidal sand and muddy sand, low energy infralittoral rock, and high energy infralittoral rock.

[6] Defra (2022). Magic Maps [online]. Available at: https://magic.defra.gov.uk/MagicMap.aspx?srs=WGS84&chosenLayers=mczIndex,mczfociPIndex,mczhociPIndex,mczbshPIndex,mczhociIndex,mczbshIndex,backdropDIndex,backdropIndex,europeIndex,vmlBWIndex,25kBWIndex,50kBWIndex,250kBWIndex,miniscaleBWIndex&box=-0.887409278999939:50.676248824:-0.721081329999939:50.766042785&useDefaultbackgroundMapping=false [Accessed December 2022].

Features screened into Stage 1 assessment

6.4.6 **Table 6-6** below presents the screening conclusions following a detailed review of impacts and features presented in **Section 5.2**, above.

Table 6-6 Selsey Bill and the Hounds MCZ screening conclusions

Site Name	Location relative to Rampion 2 proposed DCO Order Limits	Features screened into Stage 1	Justification for screening in
Selsey Bill and the Hounds MCZ	10km west of the offshore export cable corridor and falls within the benthic ecology ZOI. The MCZ falls outside of the noise ZOI, although there is the potential for a wider behavioural impact from underwater noise. Therefore, taking a precautionary approach, impacts from underwater noise on short snouted seahorse features have been assessed.	Short-snouted seahorse (*H. hippocampus*)	Potential for mortality, injury, behavioural changes and auditory masking arising from noise and vibration
		High energy infralittoral rock; Low energy infralittoral rock; Moderate energy circalittoral rock; Moderate energy infralittoral rock; Peat and clay exposures; Subtidal mixed sediments; Subtidal sand; and Short-snouted seahorse (*H. hippocampus*)	Potential for indirect impacts to benthic features from temporary localised increases in suspended sediment concentrations (SSC) and sediment deposition Potential for indirect impact to features from introduction or spread of Marine INNS

6.4.7 **Table 6-7** provides a description of the relevant features from Selsey Bill and the Hounds MCZ, which is assessed in Stage 1, and includes conservation objectives for these features. It should be noted that SACOs are also available for this site and presents attributes which are ecological characteristics or requirements of the designated features within a site. These attributes are considered to best describe the site's ecological integrity and, if safeguarded, will enable achievement of the conservation objectives. Due regard to SACOs will be given as part of Stage 1 assessment.

6.4.8 The conservation objectives for all features area are summarised below (**Table 6-7**).

Feature sensitivity

6.4.9 As part of the conservation advice package, Natural England provides AOO, which identifies pressures associated with the most commonly occurring marine activities and provides a detailed assessment of the feature sensitivity to these pressures. The AOO can inform an initial assessment of whether a proposed activity may have an impact on a feature in the site. The AOO from pressures associated with impacts scoped into this MCZ are presented in **Table 6-8**.

6.4.10 A detailed appraisal of feature sensitivity is presented in **Section 7**, which forms the basis of the Stage 1 assessment.

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Table 6-7 conservation objectives for the Selsey Bill and the Hounds MCZ[7]

Feature	Feature description	Conservation Objective(s)	Condition of features	
Short-snouted seahorse (*H. hippocampus*)	Short-snouted seahorse is one of only two species found in UK waters. They are usually brownish in colour, smooth and lack the fleshy "mane" seen in some other seahorse species. Seahorses have excellent eyesight and hunt for their food by sight. They feed on a variety of small crustaceans, such as shrimp, but do not have teeth so instead suck food up through their snouts. Seahorses require protection as they are particularly vulnerable to threats which cause damage to their habitat. Short snouted seahorses are found in shallow waters, often in estuaries or associated with seagrass meadows, particularly in the summer. For example, they have been recorded in the western zone of the Beachy Head West MCZ, in the east part of the Selsey Bill and the Hounds MCZ, and in shallow waters of Bembridge MCZ. During the winter months it is believed that short-snouted seahorses migrate out of the nearshore areas and into deeper and calmer waters in the English Channel.	Maintain in favourable condition For each species of marine fauna, favourable condition means that the population within a zone is supported in numbers which enable it to thrive, by maintaining: 1. The quality and quantity of its habitat 2. The number, age and sex ratio of its population	No current Marine Condition Assessment.

[7] Natural England (2022). Natural England Conservation Advice for Marine Protected Areas. Selsey Bill and the Hounds MCZ [online]. Available at: https://designatedsites.naturalengland.org.uk/Marine/MarineSiteDetail.aspx?SiteCode=UKMCZ0068&SiteName=selsey%20bill&countyCode=&responsiblePerson=&unitId=&SeaArea=&IFCAArea=&NumMarineSeasonality=&SiteNameDisplay=Selsey%20Bill%20and%20the%20Hounds%20MCZ&HasCA=1&NumMarineSeasonality=0&SiteNameDisplay=Selsey%20Bill%20and%20the%20Hounds%20MCZ [Accessed December 2022].

Feature	Feature description	Conservation Objective(s)	Condition of features	
High energy infralittoral rock	High energy infralittoral rock is found in shallow, subtidal areas and is often exposed to strong tides and wave action. Finer sediments are often swept clear from these areas leaving mostly bedrock, boulders, and large cobbles. Hardier communities of kelp and a mosaic of red seaweeds often dominate this habitat (Joint Nature Conservation Committee (JNCC), 2015). High energy infralittoral rock occurs across the South of the MCZ including areas known as 'the Grounds' and 'the Mixon'. The rocks themselves are invariably hardy limestone with larger sediments in some areas. Kelp communities are present, entwined with a turf of red algae. Unfortunately, some invasive seaweeds, including *Sargassum muticum* and *Halidrys siliquosa* dominate some areas of this feature. The total extent of this habitat has been mapped at 155.07 ha.		The conservation objective of each of the zones is that the protected habitats: 1) Are maintained in favourable condition if they are already in favourable condition 2) Be brought into favourable condition if they are not already in favourable condition For each protected habitat feature, favourable condition means that, within a zone both: (a) its extent is stable or increasing; and (b) its structure and function, its quality, and the composition of its characteristic biological communities (including diversity and abundance of species forming part or inhabiting the habitat) are	No current Marine Condition Assessment.

Feature	Feature description	Conservation Objective(s)	Condition of features	
			sufficient to ensure that it remains in a condition which is healthy and does not deteriorate.	
Moderate energy circalittoral rock	Moderate energy circalittoral rock is found in deeper, moderately exposed bed rock and boulders. The habitat is complex and often comprises a wide range of animal dominated communities. Moderate energy circalittoral rock in the MCZ is patchy, notably found to the south of the area within 'the Grounds' and 'the Mixon Hole' where light penetration is lower. The total extent of this habitat within the MCZ has been mapped at 4.26 ha.		*As presented above for high energy infralittoral rock.*	No current Marine Condition Assessment.
Peat and clay exposures	Peat and clay exposures are rare features occurring when peat and clay breach the surface sediment layers. Exposures are invariably either peat or clay however both strata can occur together. The influence of site energy as well as biological communities can cause areas of erosion and the mobilisation of fine sediments across a site. Peat and clay exposures can hence be ephemeral, as the local hydrodynamic regime can cover and uncover this feature in a thin veneer of sediment. Peat and clay exposures are found within the MCZ at 'the Hounds', 'the Mixon Hole', and subtidal locations within Bracklesham Bay. Some areas are characterised by mats of red and green seaweeds whilst some are entirely habitat to piddocks and a range of mobile species. Clay features within the		*As presented above for high energy infralittoral rock.*	No current Marine Condition Assessment.

Feature	Feature description	Conservation Objective(s)	Condition of features	
	Selsey Bill and the Hounds MCZ are considered the best example in the South East.			
Subtidal mixed sediments	Subtidal mixed sediments include a range of different sediment types from muddy gravelly sands to mosaics of cobbles and pebbles interspersed with sand or mud. These areas of mixed sediments occur where prevailing currents are not strong enough to scour the finer sediment from the seabed or where a natural barrier has caused a deposit of fine material to overlie cobbles and pebbles. Due to the mix of sediment types available, these areas normally host a diverse array of both epifauna and infauna. Within the MCZ, a relatively thin strip of subtidal mixed sediment extends through the site, extending across an east-west axis. This is most likely due to the tidal currents having deposited fine material in a natural depression out past the chalk beds. A second, more extensive area of mixed sediments occurs in the shallow waters along the coast, in the southeast portion of the site, between the chalk beds and the shore. The extent of this feature is currently not mapped.		*As presented above for high energy infralittoral rock.*	No current Marine Condition Assessment.
Subtidal sand	Subtidal sand is highly mobile and is shaped by wave and tidal energy within the area. The hydrodynamic pressures sculpt underwater sand waves and ripples and dictate where sediment can settle, primarily at lower energy sites. Within the MCZ, subtidal sand is one of the most abundant broad scale habitats. It is found primarily bordering areas of low energy infralittoral rock to the West of the MCZ, throughout Bracklesham Bay, and off the Selsey		*As presented above for high energy infralittoral rock.*	No current Marine Condition Assessment.

Feature	Feature description	Conservation Objective(s)	Condition of features
	Foreshore. The total extent of this habitat within the MCZ has been mapped at 196.58 ha.		

Table 6-8 AOO from impacts screened into Stage 1 for Selsey Bill and the Hounds MCZ and the associated feature sensitivity that may arise from impacts screened into Stage 1[8]

Pressure	Short-snouted seahorse	High energy infralittoral rock	Low energy infralittoral rock	Moderate energy circalittoral rock	Peat and clay exposures	Subtidal mixed sediments	Subtidal sand
Physical change (to another sediment type)	Not relevant	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive
Changes in suspended solids (water clarity)	Sensitive	Sensitive	Sensitive	Sensitive	Not sensitive	Sensitive	Sensitive
Introduction or spread of invasive non-indigenous species	Insufficient evidence	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive

[8] Natural England (2022). Selsey Bill and the Hounds MCZ [online]. Available at: https://designatedsites.naturalengland.org.uk/Marine/FAPMatrix.aspx?SiteCode=UKMCZ0068&SiteName=selsey%20bill&SiteNameDisplay=Selsey+Bill+and+the+Hounds+MCZ&countyCode=&responsiblePerson=&SeaArea=&IFCAArea=&NumMarineSeasonality= [Accessed December 2022].

Pressure	Short-snouted seahorse	High energy infralittoral rock	Low energy infralittoral rock	Moderate energy circalittoral rock	Peat and clay exposures	Subtidal mixed sediments	Subtidal sand
Smothering and siltation rate changes (Light)	Not relevant	Not sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive
Smothering and siltation rate changes (Heavy)	Not relevant	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive
Underwater noise changes, vibration	Sensitive	Not relevant	Not relevant	Not relevant	Not sensitive	Not sensitive	Not sensitive

6.5 Pagham Harbour MCZ

Site description

6.5.1 Pagham Harbour MCZ is one of the smallest designated MCZs which encompasses a total area of almost 3km^2, including the main harbour area, Ferry Pool lagoon and the shingle spits which form the mouth of the harbour. The long-term preservation of the harbour and surrounding habitats has allowed two extremely rare invertebrate species to thrive here – Defolin's lagoon snail (*C. armoricum*) and Lagoon sand shrimp (*G. insensibilis*). The MCZ also protects the intertidal seagrass beds in the harbour, conserving this valuable habitat in the face of global and national declines.

6.5.2 The location of Pagham Harbour MCZ in relation to Rampion 2 is shown in **Graphic 1-1**. Broadscale regional habitat mapping to EUNIS Level 4 identifies circalittoral rock as the predominant habitat type. **Figure 9.3, Volume 3** of the ES (Document Reference: 6.3.9) provides a broad picture of the seabed substrate over the proposed DCO Order Limits and wider areas.

Features screened into Stage 1 assessment

6.5.3 **Table 6-9** below presents the screening conclusions following a detailed review of impacts and features presented in **Section 5.2**, above.

Table 6-9 Pagham MCZ screening conclusions

Site Name	Location relative to Rampion 2 proposed DCO Order Limits	Features screened into Stage 1	Justification for screening in
Pagham Harbour MCZ	Lies 10.41km west of the export cable corridor and falls within the benthic ecology ZOI. The MCZ falls outside of the noise ZOI, although there is the potential for a wider behavioural impact from underwater noise. Therefore, taking a precautionary approach, impacts from underwater noise on the lagoon sand shrimp feature have been assessed.	Lagoon sand shrimp (*G. insensibilis*)	Potential for mortality, injury, behavioural changes and auditory masking arising from noise and vibration
		Defolin's lagoon snail (*C. armoricum*) Lagoon sand shrimp (*G. insensibilis*) Seagrass beds	Potential for indirect impacts to benthic features from temporary localised increases in suspended sediment concentrations (SSC) and sediment deposition Potential for indirect impact to features from introduction or spread of Marine INNS

6.5.4 **Table 6-10** provides a description of the relevant features from Pagham Harbour MCZ, which is assessed in Stage 1, and includes the conservation objectives for these features. It should be noted that SACOs is also available for Pagham Harbour MCZ and presents attributes which are ecological characteristics or requirements of the designated features within a site. These attributes are considered to best describe the site's ecological integrity and, if safeguarded, will enable achievement of the conservation objectives. Due regard to SACOs will be given as part of Stage 1 assessment.

6.6 Feature sensitivity

6.6.1 For Pagham Harbour MCZ, Natural England AOO is also available (**Table 6-11**). The AOO can inform an initial assessment of whether a proposed activity may have an impact on a feature in the site.

6.6.2 A detailed appraisal of feature sensitivity is presented in **Section 7**, which forms the basis of the Stage 1 assessment.

Table 6-10 Pagham Harbour MCZ feature description and conservation objectives[9]

	Feature description	Conservation objective(s)	Condition of features
Defolin's lagoon snail (*C. armoricum*)	Some of the sheltered shingle areas of Pagham Harbour host colonies of Defolin's lagoon snail – an extremely small and rare snail, measuring only 2 millimetres (mm) long, with an unusual, tubular shell structure. Within the UK live colonies have only ever been located in three sites. Limited information is available on the lifecycle of this mollusc – it inhabits the interstitial spaces between loose shingle where seawater percolates through the pebbles. Colonies have been found to have up to 100,000 individuals per m^2. Although they can migrate between the layers of shingle to reach better conditions, the small size of the snails make it difficult to migrate across longer distances to other populations, making them vulnerable to habitat loss, and any change to isolated coastal lagoons may result in the loss of existing colonies.	To ensure that the protected species are: 1) maintained in favourable condition if they are already in favourable condition; or 2) brought into favourable condition if they are not already in favourable condition. For each species of marine fauna, favourable condition means that the population within the MCZ is supported in numbers which enable it to thrive, by maintaining (a) the quality and quantity of its habitat; and (b) the number, age and sex ratio of its population. Any temporary reduction of numbers of a species is to be disregarded if the population is sufficiently thriving and resilient to enable its recovery. Any alteration to a feature brought about entirely by natural processes is to be disregarded when determining whether a protected feature is in favourable condition.	No current Marine Condition Assessment

[9] Defra (2019). Selsey Bill and the Hounds Marine Conservation Zone [online]. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/915676/mcz-selsey-bill-2019.pdf [Accessed December 2022].

	Feature description	Conservation objective(s)	Condition of features
Lagoon sand shrimp (*G. insensibilis*)	The lagoon sand shrimp is found only in Ferry Pool Lagoon. It is a nationally rare animal, and the coastal lagoons it inhabits are a priority 1 UK Biodiversity Action Plan (BAP) habitat. This small shrimp grows up to just 2cm long and inhabits shallow brackish lagoons with fine sediments. The shrimp's life-cycle and the enclosed nature of lagoons, means that there is little opportunity for the species to spread beyond their home lagoon. Significant alteration to the lagoon habitat may result in the local extinction. Populations of the shrimp are often found associated with the 'spaghetti algae' *Chaetomorpha linum*, a filamentous seaweed which can form large mats, and is a predominant food source for the shrimp. The seaweed acts as a supporting habitat and should be considered in relation to the conservation objectives of the site.	As above for Defolin's lagoon snail *(C. armoricum)*	No current Marine Condition Assessment
Seagrass beds	Seagrass beds are globally threatened and/or declining habitats. Seagrass beds are rich, highly productive habitats which provide numerous ecosystem services. In Pagham harbour the rhizomes (equivalent of roots) stabilise the soft sediments while the canopy of leaves creates a diverse and productive habitat providing shelter for small animals, settlement space for encrusting organisms and a source of food for herbivores (specifically dark-bellied brent geese). Two intertidal seagrass beds exist in Pagham: one small transient bed in the eastern side of the harbour,	To ensure that the protected habitats are: 1) maintained in favourable condition if they are already in favourable condition, or 2) brought into favourable condition if they are not already in favourable condition. For each protected feature, favourable condition means that, within a zone (a) its extent is stable or increasing; and (b) its structure and functions, its quality, and the composition of its characteristic biological	No current Marine Condition Assessment.

	Feature description	Conservation objective(s)	Condition of features
	and a larger, more permanent bed in the western side. Seagrass is also a useful indicator of environmental quality and is used as an indicator species in the Water Framework Directive (WFD).	communities (including diversity and abundance of species forming part or inhabiting the habitat) are sufficient to ensure that its condition remains healthy and does not deteriorate. Any temporary deterioration in condition is to be disregarded if the habitat is sufficiently healthy and resilient to enable its recovery.	

Table 6-11 AOO from impacts screened into Stage 1 for Pagham Harbour MCZ and the feature sensitivity to pressures that may arise from impacts screened into Stage 1[10]

Pressure	Seagrass beds	Defolin's lagoon snail (*C. armoricum*)	Lagoon sand shrimp (*G. insensibilis*)
Physical change (to another sediment type)	Sensitive	Sensitive	Not sensitive
Smothering and siltation rate changes (Light)	Sensitive	Sensitive	Sensitive
Changes in suspended solids (water clarity)	Sensitive	-	Sensitive

[10] Natural England (2022). Pagham Harbour MCZ [online]. Available at: https://designatedsites.naturalengland.org.uk/Marine/FAPMatrix.aspx?SiteCode=UKMCZ0013&SiteName=pagham&SiteNameDisplay=Pagham+Harbour+MCZ&countyCode=&responsiblePerson=&SeaArea=&IFCAArea=&NumMarineSeasonality= [Accessed December 2022].

Pressure	Seagrass beds	Defolin's lagoon snail (*C. armoricum*)	Lagoon sand shrimp (*G. insensibilis*)
Introduction or spread of invasive non-indigenous species	Sensitive	Insufficient evidence	Sensitive
Smothering and siltation rate changes (Heavy)	Sensitive	Sensitive	Sensitive
Deoxygenation	Not sensitive	Sensitive	Sensitive
Water flow (tidal current) changes, including sediment transport considerations	Sensitive	Not sensitive	Sensitive
Underwater noise changes	-	-	Insufficient evidence

6.7 Beachy Head West MCZ

Site description

6.7.1 The Beachy Head West MCZ runs parallel to the East Sussex coastline, extending from Brighton to the Beachy Head cliffs near Eastbourne, and protects a total area of approximately 24km^2.

6.7.2 The Beachy Head West MCZ protects a multitude of habitat types and their associated species. The extensive intertidal wave cut chalk platforms and subtidal chalk ridges present are considered to be among the best examples of chalk habitat in the southeast. The MCZ includes an extensive intertidal wave cut chalk platform and subtidal chalk ridges, of which the surface is pitted with holes. These holes are created by burrowing molluscs (piddocks) and, once empty, can be inhabited by and provide shelter to animals such as crabs and anemones. Blue mussel (*M. edulis*) beds and native oysters (*O. edulis*) are found densely packed on the chalk ridges creating a mosaic of habitats.

6.7.3 The rare and cryptic short-snouted seahorse (*H. hippocampus*) is known to be present along this area of coastline. The habitats present support large areas of sea squirt beds and areas of *Pentapora foliacea* (a colonial bryozoan) are thought to be present. Black legged kittiwakes, common and sandwich terns regularly feed within the site.

6.7.4 The location of Beachy Head West MCZ in relation to Rampion 2 is shown in **Graphic 1-1**. The seabed habitats of the MCZ according to Broadscale regional habitat mapping to EUNIS Level 4, are predominantly low to moderate energy infralittoral rock and high energy circalittoral rock. **Figure 9.3, Volume 3** of the ES (Document Reference: 6.3.9) provides a broad picture of the seabed substrate over the proposed DCO Order Limits and wider areas**.**

6.7.5 Reference to the mapped features (MAGIC, 2022)[11] obtained from Natural England's 'Conservation Advice for Marine Protected Areas' for the Beachy Head West MCZ reveals a habitat type of predominantly infralittoral muddy sand, infralittoral sandy mud and infralittoral rock and thin sandy sediment.

Features screened into Stage 1 assessment

6.7.6 **Table 6-12** below presents the screening conclusions following a detailed review of impacts and features presented in **Section 5.2**.

[11] Defra (2022). Magic maps [online]. Available at: https://magic.defra.gov.uk/MagicMap.aspx?srs=WGS84&chosenLayers=mczIndex,mczfociPIndex,mczhociPIndex,mczbshPIndex,mczhociIndex,mczbshIndex,backdropDIndex,backdropIndex,europeIndex,vmlBWIndex,25kBWIndex,50kBWIndex,250kBWIndex,miniscaleBWIndex&box=-0.1511196329999951:50.7035477810001:0.276994030000049:50.8360399480001&useDefaultbackgroundMapping=false [Accessed December 2022].

6.7.7 **Table 6-13** provides a description of the relevant features from Beachy Head West MCZ, which is assessed in Stage 1, and includes the conservation objectives for these features.

6.7.8 It should be noted that SACOs is also available for Beachy Head West MCZ and presents attributes which are ecological characteristics or requirements of the designated features within a site. These attributes are considered to best describe the site's ecological integrity and, if safeguarded, will enable achievement of the conservation objectives. Due regard to SACOs will be given as part of Stage 1 assessment.

Table 6-12 Beachy Head West MCZ screening conclusions

Site Name	Location relative to Rampion 2 proposed DCO Order Limits	Features screened into Stage 1	Justification for screening in
Beachy Head West MCZ	17km north-east of the offshore export cable corridor and falls outside the benthic ecology ZOI. The MCZ falls within the noise ZOI.	Short snouted seahorse (*H. hippocampus*) Native oyster (*O. edulis*) Blue mussel (*M. edulis*) beds	Potential for mortality, injury, behavioural changes and auditory masking arising from noise and vibration

6.8 Feature sensitivity

6.8.1 For Beachy Head West MCZ, Natural England AOO is also available. Pressures associated with impacts scoped into this MCZ assessment (as listed in **Section 5.2**) and sensitivity of features that have been screened into further assessment is presented in **Table 6-14**.

6.8.2 A detailed appraisal of feature sensitivity is presented in **Section 7**, which forms the basis of the Stage 1 assessment.

Table 6-13 Beachy Head West MCZ feature description and conservation objectives[12]

Feature	Feature description	Conservation objective(s)	Condition of features
Blue mussel (*M. edulis*) beds	Blue mussel beds are known to be present at Seaford Head and Beachy Head which are within the Seven Sisters Voluntary Marine Conservation Area in both the subtidal and intertidal zones, often densely packed on the chalk ridges. The rough, discontinuous chalk present in the Beachy Head West MCZ provides a suitable substrate for the settlement of the larval stages. Within the sites, settlement also occurs on broken shell or where sand and mud sediments are present as a thin veneer on a hard substrate.	To ensure that the protected habitats are 1) maintained in favourable condition if they are already in favourable condition; or 2) brought into favourable condition if they are not already in favourable condition. For each protected feature, favourable condition means that, within a zone (a) its extent is stable or increasing; and (b) its structure and functions, its quality, and the composition of its characteristic biological communities (including diversity and abundance of species forming part or inhabiting the habitat) are sufficient to ensure that its condition remains healthy and does not deteriorate. Any temporary deterioration in condition is to be disregarded if the habitat is sufficiently healthy and resilient to enable its recovery.	No current Marine Condition Assessment.

[12] Natural England (2022). Natural England Conservation Advice for Marine Protected Areas. Beachy Head West MCZ [online]. Available at: https://designatedsites.naturalengland.org.uk/Marine/MarineSiteDetail.aspx?SiteCode=UKMCZ0002&SiteName=beachy%20head%20west&SiteNameDisplay=Beachy%20Head%20West%20MCZ&countyCode=&responsiblePerson=&SeaArea=&IFCAArea=&NumMarineSeasonality=&HasCA=1 [Accessed December 2022].

Feature	Feature description	Conservation objective(s)	Condition of features
Native oyster (*O. edulis*)	Native oysters are present throughout the Beachy Head West MCZ but most notably at Peacehaven and Seaford bay where the hard chalk and rock substrates present are particularly suitable for settlement. They can however be found on a variety of seabed types, from bedrock to mud. At present all records have been of individual oysters and no beds or communities have been found.	To ensure that the protected species are: 3) maintained in favourable condition if they are already in favourable condition; or 4) brought into favourable condition if they are not already in favourable condition. For each species of marine fauna, favourable condition means that the population within the MCZ is supported in numbers which enable it to thrive, by maintaining (a) the quality and quantity of its habitat; and (b) the number, age and sex ratio of its population. Any temporary reduction of numbers of a species is to be disregarded if the population is sufficiently thriving and resilient to enable its recovery. Any alteration to a feature brought about entirely by natural processes is to be disregarded when determining whether a protected feature is in favourable condition.	No current Marine Condition Assessment.
Short snouted seahorse (*H. hippocampus*)	Short-snouted seahorse is one of only two species found in UK waters. They are usually brownish in colour, smooth and lack the fleshy "mane" seen in some other seahorse species.	*As above for Native oyster (O. edulis).*	No current Marine Condition Assessment.

Feature	Feature description	Conservation objective(s)	Condition of features
	Seahorses have excellent eyesight and hunt for their food by sight. They feed on a variety of small crustaceans, such as shrimp, but do not have teeth so instead suck food up through their snouts. Seahorses require protection as they are particularly vulnerable to threats which cause damage to their habitat. Short snouted seahorses are found in shallow waters, often in estuaries or associated with seagrass meadows, particularly in the summer. For example, they have been recorded in the western zone of the Beachy Head West MCZ, in the east part of the Selsey Bill and the Hounds MCZ, and in shallow waters of Bembridge MCZ. During the winter months it is believed that short-snouted seahorses migrate out of the nearshore areas and into deeper and calmer waters in the English Channel.		

Table 6-14 AOO from impacts screened into Stage 1 for Beachy Head West MCZ and the feature sensitivity that may arise from impacts screened into Stage 1[13]

Pressure	Blue mussel (*M. edulis*) beds	Native oyster (*O. edulis*)	Short-snouted seahorse (*H. hippocampus*)
Underwater noise changes, vibration	not relevant	not relevant	Sensitive

[13] Natural England (2022). Beachy Head West MCZ [online]. Available at: https://designatedsites.naturalengland.org.uk/Marine/SupAdvice.aspx?SiteCode=UKMCZ0002&SiteName=Beachy+Head+West+MCZ&SiteNameDisplay=Beachy+Head+West+MCZ&countyCode=&responsiblePerson=&SeaArea=&IFCAArea=&NumMarineSeasonality= [Accessed December 2022].

6.9 Beachy Head East MCZ

Site description

6.9.1 Beachy Head East MCZ is an inshore site that covers an area of 195km^2 and is located along the coast near Eastbourne in East Sussex, in the Eastern Channel region.

6.9.2 Beachy Head East has a sandstone and chalk reef system which provides a home for a wide range of species. Between Beachy Head point and Holywell, a chalk reef extends from the subtidal area up to the coast and white cliffs forming sheltered rockpools at low tide. The soft chalk is pitted by holes created by rock-boring piddocks. Once empty, these holes can also house crabs, sponges, anemones and worms. Chalk extending above the high water mark supports rich littoral chalk communities, dominated by seaweeds.

6.9.3 Short-snouted seahorses (*H. hippocampus*) and Ross worm (*S. spinulosa*) reefs are also found within this site. Ross worms build tubes from sand and shell fragments. Large colonies can form reefs, stabilising the seabed, providing shelter for other creatures and boosting the number and types of species in the area.

6.9.4 The site is also considered an important nursery area for herring, plaice and Dover sole. Plaice and Dover sole survive by camouflaging themselves in subtidal sand allowing them to avoid predators, whilst subtidal sand and coarse sediments provide a habitat for invertebrate species on which adult fish prey. High and moderate energy circalittoral rock features provide habitats for a wide variety of animals due to the varying conditions that can be found in these areas.

6.9.5 The location of Beachy Head East MCZ in relation to Rampion 2 is shown in **Graphic 1-1**. Broadscale regional habitat mapping to EUNIS Level 4 identifies circalittoral rock as the predominant habitat type. **Figure 9.3, Volume 3** of the ES (Document Reference: 6.3.9) provides a broad picture of the seabed substrate over the proposed DCO Order Limits and wider areas**.** Reference to the mapped features (MAGIC, 2022)[14] obtained from Natural England's 'Conservation Advice for Marine Protected Areas' for the Beachy Head East MCZ identifies subtidal coarse sediment as the dominant seabed sediment type.

Features screened into Stage 1 assessment

6.9.6 Short-snouted seahorse is the only feature that has been screened in for Stage 1 assessment on account of the potential behavioural impact from noise. **Table 6-15** presents the screening conclusions following a detailed review of impacts and features presented in **Section 5.2**.

[14] Defra (2022). Magic maps [online]. Available at: https://magic.defra.gov.uk/MagicMap.aspx?srs=WGS84&chosenLayers=mczIndex,mczfociPIndex,mczhociPIndex,mczbshPIndex,mczhociIndex,mczbshIndex,backdropDIndex,backdropIndex,europeIndex,vmlBWIndex,25kBWIndex,50kBWIndex,250kBWIndex,miniscaleBWIndex&box=0.205587191000063:50.6964292120001:0.607212171000063:50.875429593001&useDefaultbackgroundMapping=false [Accessed December 2022].

Table 6-15 Beachy Head East MCZ screening conclusions

Site Name	Location relative to Rampion 2 proposed DCO Order Limits	Features screened into Stage 1	Justification for screening in
Beachy Head East MCZ	28.2km north-east of the offshore export cable corridor, and falls outside the benthic ecology ZOI. The MCZ falls outside of the noise ZOI, although there is the potential for a wider behavioural impact from underwater noise. Therefore, taking a precautionary approach, impacts from underwater noise on short snouted seahorse features have been assessed.	Short snouted seahorse (*H. hippocampus*)	Potential for mortality, injury, behavioural changes and auditory masking arising from noise and vibration

Feature sensitivity

6.9.7 Natural England AOO is available for Beachy Head East MCZ (**Table 6-17**). A detailed appraisal of feature sensitivity is presented in **Section 7**, which forms the basis of the Stage 1 assessment.

Table 6-16 Conservation objectives for the Beachy Head East MCZ[15]

Feature	Conservation Objective(s)	Condition of feature
Short-snouted seahorse (*H. hippocampus*)	Maintain in favourable condition For each species of marine fauna, favourable condition means that the population within a zone is supported in numbers which enable it to thrive, by maintaining: 1. The quality and quantity of its habitat 2. The number, age and sex ratio of its population	No current Marine Condition Assessment.

Table 6-17 AOO from impacts screened into Stage 1 for Beachy Head East MCZ and the feature sensitivity that may arise from impacts screened into Stage 1[16]

Pressure	Short-snouted seahorse (*H. hippocampus*)
Underwater noise changes, vibration	Sensitive

[15] Defra (2019). Beachy Head East Marine Conservation Zone [online]. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/914351/mcz-beachy-head-east-2019.pdf {Accessed December 2022].

[16] Natural England (2022). Beachy Head East MCZ [online]. Available at: https://designatedsites.naturalengland.org.uk/Marine/FAPMatrix.aspx?SiteCode=UKMCZ0053&SiteName=Beachy+Head&SiteNameDisplay=Beachy+Head+East+MCZ&countyCode=&responsiblePerson=&SeaArea=&IFCAArea=&NumMarineSeasonality=%2c0 [Accessed December 2022].

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6.10 Bembridge MCZ

Site description

6.10.1 Bembridge MCZ is an inshore site that covers an area of approximately 75km². The site lies adjacent to the east coast of the Isle of Wight from Nettlestone Point in the north to Ventnor in the south. The site encompasses the intertidal and subtidal areas extending to the edge of the deep-water channel approach into the Eastern Solent. The site overlaps with the South Wight Maritime Special Area of Conservation (SAC) and includes species and features not protected by the SAC.

6.10.2 The area within Bembridge MCZ is highly diverse and includes a wide range of habitats, from rocky shores and intertidal sediments to deep water habitats supporting features such as sea pens and burrowing megafauna. Several species, including the peacock's tail seaweed (*P. pavonica*), are at the most eastern edge of their distribution and are considered to seed other populations around the Isle of Wight.

6.10.3 The central area of the site is dominated by an extensive area of limestone and chalk bedrock providing a complex system of crevices, tunnels and pools supporting very diverse algae and invertebrate species such as crustaceans (crabs, lobsters and barnacles) and molluscs (mussels, oysters and cockles).

6.10.4 The large areas of subtidal mixed sediments act as a supporting substrate to several important features such as maerl beds. Maerl is a fragile, calcareous, red seaweed that forms large mats and provides shelter for many other species. It is highly sensitive to seabed activities and takes a long time to recover from damage.

6.10.5 The site also designated for the short-snouted seahorse (*H. hippocampus*) as well as two species of stalked jellyfish.

6.10.6 The location of Bembridge MCZ in relation to Rampion 2 is shown in **Graphic 1-1**. Broadscale regional habitat mapping to EUNIS Level 4 identifies circalittoral coarse sediment as the predominant habitat type. **Figure 9.3, Volume 3** of the ES (Document Reference: 6.3.9) provides a broad picture of the seabed substrate over the proposed DCO Order Limits and wider areas.

Features screened into Stage 1 assessment

6.10.7 **Table 6-18** below presents the screening conclusions following a detailed review of impacts and features presented in **Section 5.2**.

Table 6-18 Bembridge MCZ screening conclusions

Site Name	Location relative to Rampion 2 proposed DCO Order Limits	Features screened into Stage 1	Justification for screening in
Bembridge MCZ	23.8km west of the proposed DCO Order Limits. The site falls outside the benthic ecology ZOI. The MCZ falls outside of the noise ZOI, although there is the potential for a wider behavioural impact from underwater noise. Therefore, taking a precautionary approach, impacts from underwater noise on fish and shellfish features have been assessed.	Short snouted seahorse (*H. hippocampus*) Native oyster (*O. edulis*)	Potential for mortality, injury, behavioural changes and auditory masking arising from noise and vibration.

6.10.8 **Table 6-19** provides a description of the relevant features from Bembridge MCZ, which is assessed in Stage 1, and includes the conservation objectives for these features. It should be noted that Supplementary Advice on Conservation Objectives (SACOs) is also available for Bembridge MCZ and presents attributes which are ecological characteristics or requirements of the designated features within a site. These attributes are considered to best describe the site's ecological integrity and, if safeguarded, will enable achievement of the conservation objectives. Due regard to SACOs will be given as part of Stage 1 assessment.

Feature sensitivity

6.10.9 The AOO from pressures associated with impacts scoped into this MCZ are presented in **Table 6-3**. A detailed appraisal of feature sensitivity is presented in **Section 7**, which forms the basis of the Stage 1 assessment.

Table 6-19 Conservation objectives for the Bembridge MCZ[17]

Feature	Conservation Objective(s)	Condition of feature
Short-snouted seahorse (*H. hippocampus*)	Maintain in favourable condition For each species of marine fauna, favourable condition means that the population within a zone is supported in numbers which enable it to thrive, by maintaining: 1. The quality and quantity of its habitat 2. The number, age and sex ratio of its population	No current Marine Condition Assessment.
Native oyster (*O. edulis*)	*As above for short-snouted seahorse*	No current Marine Condition Assessment.

[17] Natural England (2022). Natural England Conservation Advice for Marine Protected Areas Bembridge MCZ [online]. Available at: https://designatedsites.naturalengland.org.uk/Marine/MarineSiteDetail.aspx?SiteCode=UKMCZ0054&SiteName=bembridge%20mCZ&SiteNameDisplay=Bembridge%20MCZ&countyCode=&responsiblePerson=&SeaArea=&IFCAArea=&NumMarineSeasonality=&HasCA=1 [Accessed December 2022].

Table 6-20 AOO from impacts screened into Stage 1 for Bembridge MCZ and the feature sensitivity that may arise from impacts screened into Stage 1[18]

Pressure	Native oyster (*O. edulis*)	Short-snouted seahorse (*H. hippocampus*)
Underwater noise changes, vibration	Not relevant	Sensitive

[18] Natural England (2022). Bembridge MCZ [online]. Available at: https://designatedsites.naturalengland.org.uk/Marine/FAPMatrix.aspx?SiteCode=UKMCZ0054&SiteName=bembridge%20mCZ&SiteNameDisplay=Bembridge+MCZ&countyCode=&responsiblePerson=&SeaArea=&IFCAArea=&NumMarineSeasonality= [Accessed December 2022].

7. Stage 1 Assessment

7.1.1 It should be noted that for the purposes of this MCZ assessment, decommissioning impacts are assessed together with construction impacts, as it is assumed that effects arising during decommissioning will be much less than those resulting from construction. This approach is considered to be precautionary.

7.2 Kingmere MCZ

Construction and decommissioning phases - Mortality, injury, behavioural changes and auditory masking arising from noise and vibration

7.2.1 Construction activities, particularly the pile-driving of foundations for offshore structures, will result in levels of underwater noise that will be audible to fish over several kilometres around the Proposed Development (**Chapter 9: Benthic, subtidal and intertidal ecology, Volume 2** of the ES (Document Reference: 6.2.9) Impacts from underwater noise are only relevant for black seabream as a feature of the Kingmere MCZ.

7.2.2 The extent to which intense underwater sound might cause adverse impacts to the feature is dependent upon the incident sound level, source frequency, duration of exposure, and/or repetition rate of an impulsive sound (see, for example, Hastings and Popper, 2005). As a result, scientific interest in the hearing abilities of aquatic species has increased. Studies are primarily based on evidence from high level sources of underwater noise such as blasting or impact piling, as these sources are likely to have the greatest immediate environmental impact and therefore the clearest observable effects.

7.2.3 At the highest levels of noise, sub-lethal and lethal effects may occur, resulting in injury and in extreme cases, the death of exposed fish. The impacts of underwater sound on marine species can be broadly summarised as follows:

- mortality and mortal injury;
- recoverable injury;
- Temporary Threshold Shift (TTS) – a temporary reduction in hearing sensitivity caused by exposure to intense sound; and
- behavioural impacts and auditory masking.

7.2.4 A detailed assessment has been carried out and is presented in **Chapter 8: Fish and shellfish ecology, Volume 2** of the ES (Document Reference: 6.2.8). The assessment was informed by predictive underwater noise modelling at four representative locations, with consideration of the key parameters associated maximum design scenarios. Due to the proximity of the Kingmere MCZ to the Proposed Development, of which black seabream are a feature, and the spawning site fidelity displayed by nesting black seabream, and the consequential likelihood

of black seabream not fleeing from piling noise when engaged in spawning/nesting activity (if black seabream are nesting they will likely remain stationary in order to protect the nest), black seabream are considered stationary receptors for the sake of this assessment. Full details of the modelling undertaken are presented in **ES Appendix 11.3: Underwater noise assessment technical report, Volume 4** of the ES (Document Reference: 6.4.11.3)

7.2.5 The maximum design scenarios (spatial and temporal) with respect to underwater noise relate to the simultaneous and sequential piling of pin piles:

- Spatial worst case - Simultaneous installation of jacket foundations. (Piling of 396 pin piles (4 pin piles piled simultaneously at both the East and West piling locations in the array area)), driven with a 2,500 kilojoule (kJ) hammer energy; and
- Temporal worst case - Sequential piling of 396 pin piles (pin piles piled sequentially at separate locations within a period of 24 hours), driven with a 2,500kJ hammer energy.

7.2.6 Hammer energies will start at lower levels (during soft start/ramp up (C-52, **Table 3-1**)) and gradually increase to the required maximum required for installation (note this may be well below the maximum hammer energy assumed for the purposes of assessment). The piling of pin piles represents the longest duration of effects from subsea noise (99 piling days, four hours per pin pile) and assumes a scenario whereby piled multi-leg foundations are used for all offshore structures.

7.2.7 Activities resulting in vibration may relate to dredging, for example, for seabed preparation, foundation drilling and piling. Vibration produced by vessels has been assumed not to be significant, on the basis that the impacts of vibration are assumed not to exceed those of underwater noise that has been assessed in greater detail.

Relevant MCZ feature receptor- Black seabream *(S. cantharus)*

7.2.8 Black seabream, included here as the relevant feature of the Kingmere MCZ, are considered to be sensitive to noise and vibration pressure (**Table 6-3**), therefore consideration has been given to the results of the underwater noise modelling and the conclusions of **Appendix 11.2: Marine mammal quantitative underwater noise impact assessment, Volume 4** of the ES (Document Reference: 6.4.11.2).

7.2.9 Black seabream have a swim bladder that is involved in hearing, and therefore are known to be sensitive to underwater noise. Black seabream are demersal spawners and are therefore considered stationary receptors in the assessment during the spawning season, increasing their theoretical exposure to underwater noise from the construction phase of the development. Taking this into account, black seabream are considered to be of **medium** sensitivity to noise impacts.

7.2.10 **Chapter 9: Benthic, subtidal and intertidal ecology, Volume 2** of the ES (Document Reference: 6.2.9) has grouped black seabream with 'Fishes with swim bladders that are close, but not intimately connected to the ear.' **Table 7-1** summarises the noise thresholds used for black seabream as defined by Popper et al, 2014.

Table 7-1 Black seabream noise assessment criteria

Potential effect	Noise level (dB re 1 µPa SPL/ dB re 1 µPa2 s SEL/ re 1µPa SELss		
	SLP_{peak}	SEL_{cum}	SELss
Mortality and mortal injury	>207	207	-
Recoverable injury	>207	203	-
TTS	-	186	-
Behavioural impacts, auditory masking	-	-	141

7.2.11 The following SACO attributes relevant to black seabream MCZ feature may be impacted by noise and vibration:

- population age size frequency;
- population size;
- population recruitment and reproductive capability;
- presence and spatial distribution of the species; and
- structure and function: biological connectivity.

7.2.12 Regarding the potential for mortality and potential mortal injury of black seabream, there is no overlap of the impact ranges with the Kingmere MCZ (**Graphic 1-1**), therefore there will be no impact from underwater noise on nesting black seabream within the Kingmere MCZ, and the magnitude of impact is considered **negligible**. With respect to the above attributes the magnitude is **negligible** and the maximum sensitivity of black seabream is considered to be worst-case **medium**. Considering the short-term and intermittent nature of piling, and the localised impact ranges; the significance of effect is deemed **minor, Not Significant** in EIA terms.

7.2.13 Considering the potential for recoverable injury of black seabream, there is no overlap of the impact ranges with the Kingmere MCZ (see **Graphic 1-1**), therefore there will be no impact from underwater noise on nesting black seabream within the Kingmere MCZ, and the magnitude of impact is considered **negligible**. With respect to the above attributes the magnitude is **negligible** and the maximum sensitivity of black seabream is considered to be worst-case **medium**. Considering the short-term and intermittent nature of piling, and the localised impact ranges; the significance of effect is deemed **minor, Not Significant** in EIA terms.

7.2.14 Regarding the potential for TTS and behavioural effects on breeding seabream (from March to July), there is an interaction of the impact ranges from piling in the

array area, with the Kingmere MCZ. As a result, an in principle piling noise mitigation plan has been developed, that sets out the approaches and methodologies proposed to be employed to provide mitigation of construction noise impacts offshore identified in the ES that could lead to potentially significant behavioural effects on black seabream, submitted with the Rampion 2 Application: the **In principle sensitive features site integrity plan** (Document Reference 7.17). The Plan implements the commitments relating to noise mitigation set out in **Table 3-1**, i.e. C-265, C-274, C-280, and C-281.

7.2.15 The noise mitigation plan has been designed on the following principles:

- Noise abatement will be in place for the entirety of the piling operations with additional measures put in place during the breeding season.
- Noise abatement is focused on reducing noise immission levels at the locations of sensitive receptors (i.e. at relevant MCZs) below the level at which a meaningful behavioural response might be expected to occur, which could then result in a significant effect on the breeding population (of black seabream or seahorse) during the breeding/nesting season, subsequently impacting upon the conservation objectives for the MCZ.
- Assumptions on attenuation performance of the noise mitigation techniques are based on demonstrable performance of the technology, to ensure confidence in delivering the required noise level reductions.
- Actual installation equipment choice and secondary noise abatement techniques will be selected pre-construction but will conform to the noise reduction levels required to meet the criteria set for the piling zonation plan.

7.2.16 In developing the spatial zoning strategy, three main noise mitigation measures will be employed, as appropriate and practicable. These are:

- General hammer noise mitigation;
- Low noise installation hammers; and
- Double Big Bubble Curtain.

7.2.17 In order to design the noise mitigation zoning plan, it is necessary to establish a level of noise below which the risk of an effect arising is reduced to an acceptable level. This allows the areas within which piling can be undertaken to be delimited by identifying the relevant distances between noise source (piling location) and receptor (relevant MCZ) when applying different noise abatement techniques. In the absence of definitive empirical data, as is the case with behavioural responses of marine fish species, best use of relevant available data is required along with a proportionate level of precaution to address attendant uncertainties.

7.2.18 Whilst agreement on the appropriate threshold has not been reached through pre-application engagement and consultation, the zoning plan will apply a precautionary disturbance threshold of 141 decibels (dB) SEL_s [19] based on research by Kastelein *et al*. (2017), which concluded that seabass (a fish species of the same order as seabream) exhibited an initial reaction to impulsive noise at levels of 141 dB SEL_{ss}, noting that the response was short lived, and further that

[19] SELss : Sound Exposure Level (single strike)

there was no evidence for any consistent sustained response at levels up to 166 dB SEL_{ss}. The study concluded that exposure to noise at this level was unlikely to result on any adverse effects on their ecology. It is also important to note that this noise level is substantially below the 147 dB SEL_{ss} from research by Radford *et al*. (2016), which showed a minor stress response (increased ventilation) in the proxy species seabass when exposed to simulated pile driving noise.

7.2.19 The appropriateness of the 141 dB SEL_{ss} threshold was also supported by an alternative approach to defining a meaningful threshold for behavioural response using noise level relative to (i.e., above) the existing background (ambient) soundscape at Kingmere MCZ. There is supporting information in the literature for the importance of context (as well as physiology/anatomy) in the hearing ability and potential reactivity of fish to noise impacts (e.g. Popper and Hawkins, 2019), particularly in behavioural studies; the key distinction being the difference between background noise and the received sound of interest, often referred to as a signal-to-noise ratio. This approach also serves to reduce uncertainty around defining a threshold based on a low number of empirical studies, the majority of which are drawn from studies on suitable proxy species, by ensuring context relevance is factored in.

7.2.20 From the studies reviewed, an increase of 30 dB above ambient noise levels was identified as representing an appropriate benchmark and this was used in conjunction with existing data from measured ambient noise levels at sea at the Rampion 1 site (Collett *et al*., 2012). The values from the Collett *et al*. (2012) study showed a baseline of 113 to 120 dB SPL_{RMS}, which was recorded prior to wind turbine foundation installation. On this basis, 30 dB above the ambient noise at the site would therefore be 143 to 150 dB, which equates relatively closely to the thresholds for disturbance response developed from the studies noted above (i.e. 141-147 dB).

7.2.21 Additional information was obtained from the underwater noise monitoring survey at Kingmere MCZ in July 2022 (RED, 2022), recording background noise levels, including SPL_{RMS} (underlying noise level) and SPL_{peak} (highest noise level within sample period) over a 15-day period, at a resolution of one minute intervals. Clear cyclical variations were evident in the data, driven by tides: the periods of high tidal flow leading to the highest background noise in a day. A typical minimum background noise level during low tidal flow periods was 103 dB SPL_{RMS}, whereas during periods of high tidal flow the background level commonly exceeded 120 dB SPL_{RMS}. Peak noise levels naturally occurring were normally in excess of 140 dB SPL_{peak} and exceeded 160 dB SPL_{peak} at multiple times on any given day.

7.2.22 As it is recognised that the ambient noise survey undertaken at Kingmere MCZ was relatively short-term (15 days), the Applicant has commissioned further continuous monitoring at the same location through the March to July period in 2023. The aim of this work is to provide for a longer period of monitoring to provide the insight into variations, maxima and minima of ambient noise levels in the vicinity of the MCZ and provide a more robust basis for developing and supporting an acceptable disturbance threshold for black seabream, specifically relevant to the Kingmere MCZ site. These data will inform the Final Plan, which will be submitted to MMO in consultation with their advisors and Natural England prior to commencement of construction, as secured within Condition 11 and 12 of Schedules 11 and 12 of the draft DCO.

7.2.23 Underwater noise modelling was undertaken, using maximum design scenario parameters, to establish zones across the Array area where, with single or a combination of noise mitigation measures in place, noise levels at the MCZ would remain below the 141 dB SEL_{ss} threshold, and those areas where mitigation was not able to achieve compliance with this threshold, thereby defining piling exclusion areas during the March to July spawning/nesting season.

7.2.24 The initial zoning exercise demonstrated the way in which regions of the offshore array that remain piling exclusion areas during the March to July period will be quantified using modelling for the Final Plan, which would be submitted for approval pre-construciton. However, recognising that there remains disagreement on the acceptability of piling during the March to July period as a result of, *inter alia*, uncertainties in establishing a disturbance threshold relevant to black seabream, the Applicant proposes to increase the level of mitigation provision during this period. This additional mitigation will serve to increase the separation distance between piling operations, where noise is generated, and the Kingmere MCZ. The approach to delivering this additional layer of precaution is set out below, being based on further spatial and temporal zoning rules.

Piling restriction, March to June

7.2.25 During the majority of the black seabream nesting period (1st March to 30th June), the piling exclusion area will be extended to encompass the western part of the offshore Array. No piling will therefore be undertaken to in the western part of the Array as shown in **Figure 5.14** of the **In Principle Sensitive Features Mitigation Plan** (Document Reference 7.17).

7.2.26 Through this March to June period, piling will therefore only be undertaken in the eastern part of the offshore Array area, and subject to mitigation using the combination of a low noise hammer technology and DBBC. Additionally, piling in the eastern area will commence in the part of the array furthest from the Kingmere MCZ; i.e. in the south east corner as illustrated in **Figure 5.15** of the **In Principle Sensitive Features Mitigation Plan** (Document Reference 7.17). Under this scenario, piling would commence with foundations located in the part of the eastern area intersecting with the band A buffer shown on the chart, subsequently progressing to band B and so on as construction proceeds. The detailed scheduling of piling locations will be determined once the layout of WTGs and substations has been finalised, and will be detailed in the Final Plan.

Piling restriction, July

7.2.27 During July, if piling is to be undertaken in the western part of the offshore Array, foundation installation will again be conducted using the combination of a low noise hammer technology and DBBC. Activities will also be subject to a sequencing plan such that piling in July will commence at locations of the western part of the Array furthest from the Kingmere MCZ. The detailed scheduling of piling locations will be determined once the layout of WTGs and substations has been finalised, but will commence from the pile locations in the furthest south-west corner of the western part of the Array (commencing in the area of the western part of the Array intersecting with the band C buffer shown on **Figure 5.15** of the **In Principle Sensitive Features Mitigation Plan** (Document Reference 7.17).

7.2.28 Sequencing in this manner will ensure risk to sensitive noise receptors in the latter part of the spawning/nesting season, when the main spawning activity has been completed, is further minimised, whilst maintaining construction progress during what is a critical installation month for the Proposed Development. The proposed sequence of piling in the western part of the offshore Array will be presented within the Final Plan.

Piling mitigation, August through to February

7.2.29 Whilst there is no requirement for a spatial zoning plan for the remainder of the year, the Applicant will continue to mitigate piling noise. Therefore, for the purpose of this Plan, from 1 August through to 28 February during the construction period, the Applicant will propose to utilise at least one offshore piling noise mitigation technology as noted above.

7.2.30 The proposed approaches to delivering mitigation for potentially significant effects are supported by information and examples of the types of equipment that may be used. Details of available mitigation technology have been presented to provide confidence that the required levels of noise attenuation can be delivered (either through one of the examples given, or through other future potential mitigation technology) and can therefore be relied upon to avoid potentially significant effects that may arise in the absence of mitigation.

7.2.31 Delivery of the plan and measures are secured within the draft deemed Marine Licence (dML) Condition 11 of Schedules 11 and 12 of the draft DCO to provide certainty on the provision of the mitigation commitments made by the Applicant in progressing the development of Rampion 2, whilst maintaining the flexibility required at the pre-consent stage, allowing the Applicant to select the most appropriate options closer to the time of construction works, once project design has been finalised.

7.2.32 The implementation of embedded environmental measures (C-265, C-274, C-280, and C-281, **Table 3-1**) during the breeding season of black seabream (March to July) (when black seabream are within the impact ranges, and considered stationary receptors), and delivery of the Final Plan, secured within Condition 11 and 12 of Schedules 11 and 12 of the draft DCO including foundation installation equipment choice and secondary noise mitigation options, will ensure a noise reduction is achievable to reduce the impact ranges of TTS and behavioural effects to outside of areas of primary importance for breeding black seabream. Therefore, with the implementation of mitigation, there will be no impact from underwater noise on nesting black seabream within the Kingmere MCZ, and the magnitude of impact is considered to be **negligible**. With respect to the above attributes the magnitude is **negligible** with the implementation of mitigation, and the maximum sensitivity of black seabream is considered to be worst-case **medium**. Considering the short-term and intermittent nature of piling, the significance of effect is deemed **minor, Not Significant** in EIA terms.

7.2.33 Decommissioning of offshore infrastructure for the Proposed Development may result in temporarily elevated underwater noise levels, with the maximum levels of underwater noise during decommissioning would be from underwater cutting required to remove structures, with piled foundations cut approximately 1m below the seabed. The noise levels from this process are expected to be much less than

pile driving and therefore impacts would be less than as assessed during the construction phase. The magnitude of impacts during decommissioning on breeding black seabream are expected to be **negligible.** With respect to the above attributes the magnitude is **negligible**, and the maximum sensitivity of black seabream is considered to be worst-case **medium**. Considering the short-term and intermittent nature of decommissioning activities, the significance of effect is deemed **minor, Not Significant** in EIA terms.

7.2.34 The Proposed Development **will not hinder** the conservation targets of the above attributes or the overall conservation objectives of the black seabream feature of Kingmere MCZ.

Construction & decommissioning phase - Temporary localised increases in suspended sediment concentrations (SSC) and sediment deposition

7.2.35 During seabed preparation for foundation installation and cable burying, sediment re-suspension will occur followed by subsequent re-deposition on the seabed. The relevant MCZ receptors for this impact are black seabream, infralittoral rock and thin mixed sediment and subtidal chalk.

7.2.36 The siltation rates will depend on the hydrological conditions and the sediment particle size distribution. Though modern equipment and techniques reduce the re-suspension of sediment during cable burial, repair or removal, the magnitude of SSC increase will also depend on the equipment and methodology used. A greater sediment dispersion distance means the sediment will be more thinly dispersed over a wider area, whilst a smaller sediment dispersion distance gives a high deposition depth over a smaller distance. For example, ploughing on chalk may result in a wide-spreading suspended sediment plume, while dredged up gravelly sand will settle close to the source.

7.2.37 Three main sources of SSC and sediment deposition may arise from Rampion 2: drilling for foundations, trenching for cables, and seabed preparation activities (such as seabed levelling and sandwave clearance). **Chapter 9: Benthic, subtidal and intertidal ecology, Volume 2** of the ES (Document Reference: 6.2.9) concludes that sediment plumes caused by seabed preparation and installation activities are expected to go beyond the 15km tidal excursion buffer, with plumes expected to occur over a maximum distance of 16km (spring) from the source. Sediment plumes are expected to quickly dissipate after cessation of the activities, due to settling and wider dispersion with the concentrations reducing quickly over time to background levels. Sediment deposition will consist primarily of coarser sediments deposited close to the source, with a small proportion of silt deposition (reducing exponentially from source).

7.2.38 **Figure 6.3.4** within **Appendix 6.3: Coastal processes technical report: Impact assessment, Volume 4** of the ES (Document Reference: 6.4.6.3)**,** provides a useful schematic summarising the spatial extent of the impact zones associated with SSC and deposition in relation to Rampion 2. The figure details that the results of modelling can be summarised broadly in terms of four main zones of effect, based on the distance from the activity causing sediment disturbance:

- 0 to 50m – zone of highest SSC increase and greatest likely thickness of deposition. All gravel sized sediment likely deposited in this zone, also a large proportion of sands that are not resuspended high into the water column, and also most or all dredge spoil in the active phase. Plume dimensions and SSC, and deposit extent and thickness, are primarily controlled by the volume of sediment released and the manner in which the deposit settles;
- 50 to 500m – zone of measurable SSC increase and measurable but lesser thickness of deposition. Mainly sands that are released or resuspended higher in the water column and resettling to the seabed whilst being advected by ambient tidal currents. Plume dimensions and SSC, and deposit extent and thickness, are primarily controlled by the volume of sediment released, the height of resuspension or release above the seabed, and the ambient current speed and direction at the time; and
- 500m to the tidal excursion buffer distance – zone of lesser but measurable SSC increase and no measurable thickness of deposition. Mainly fines that are maintained in suspension for more than one tidal cycle and are advected by ambient tidal currents. Plume dimensions and SSC are primarily controlled by the volume of sediment released, the patterns of current speed and direction at the place and time of release and where the plume moves to over the following 24 hours.

7.2.39 Further information on sediment plume distances and modelling are provided in **Chapter 6: Coastal processes, Volume 2** of the ES (Document Reference: 6.2.6) and **Appendix 6.3: Coastal processes technical report: Impact assessment, Volume 4** of the ES (Document Reference: 6.4.6.3).

7.2.40 Taking the above into consideration, it can be concluded that there will be a quick dissipation of the sediment plume and local nature (0-50m) of deposition impacts where smothering effects on benthic habitats and features might be observed. Increased SSC and deposition are likely to occur where the offshore export cable corridor is in relatively close proximity to the Kingmere MCZ. However, as detailed above, these impacts will be limited at the outer 500m zone of effect (> 500m there will be no expected deposition).

7.2.41 **Figure 6.3.4** within **Appendix 6.3: Coastal processes technical report: Impact assessment, Volume 4** of the ES (Document Reference: 6.4.6.3) illustrates the 500m zone of effect in relation to MCZs, with the only anticipated overlap to a discrete area on the western boundary of the Kingmere MCZ. This is also regarded as worst case, which anticipates construction works being carried out directly on the proposed DCO Order Limits (which is not anticipated). The magnitude of the impact to neighbouring MCZs is therefore assessed as being **minor**.

Relevant MCZ feature receptor- Black seabream

7.2.42 Adult fish are normally able to detect significantly elevated levels of suspended sediment and avoid the affected area (ABP Research, 1999; EMU Limited, 2004). Juvenile fish are generally considered to be more sensitive to suspended sediment plumes than adults (Wilber and Clarke, 2001). This may arise as a consequence of their reduced mobility compared to adults and increased biological susceptibility

(for instance smaller gill surface areas (ABP Research, 1999)). The Proposed Development fish and shellfish study area (**Chapter 8: Fish and shellfish ecology, Volume 2** of the ES (Document Reference: 6.2.8)) has been identified as supporting both foraging and nursery grounds for a number of commercially and ecologically important species. These species are expected to be resilient to any increase in SSC as winter storm events in their natural environment cause temporary increases in suspended sediment concentration of a similar magnitude to that which will be produced by the construction operations.

7.2.43 **Table 6-3** states that black seabream feature is **sensitive** to pressures that may arise from temporary localised increases in SSC and sediment deposition. Black seabream spawn on the seabed, and their eggs and larvae do not have the same capacity to avoid increased SSCs as juvenile or adult fish as they are either passively drifting in the water column or present on/ attached to benthic substrates. The re-deposition of sediments may affect fish eggs and larvae through smothering. There is currently no evidence of black seabream nests being impacted from suspended sediment from nearby aggregate extraction work (EMU Limited, 2012a). Nonetheless, considering the locality of the Kingmere MCZ to the proposed DCO Order Limits, and the sensitivity of eggs to sediment deposition, black seabream are deemed to be of high vulnerability, medium recoverability and of regional importance, and therefore the sensitivity of this receptor is considered to be **high**.

7.2.44 **Chapter 8: Fish and shellfish ecology, Volume 2** of the ES (Document Reference: 6.2.8) concludes that temporary localised increase in SSC and sediment deposition associated with cable and foundation installation may affect black seabream nesting grounds. However, any interaction will inherently be of short-term duration.

7.2.45 The following SACO attributes relevant to black seabream MCZ feature (may be impacted by the increase in SSC and sediment deposition:

- nest abundance;
- population age size frequency;
- population size;
- population recruitment and reproductive capability;
- presence and spatial distribution of the species;
- structure and function: biological connectivity;
- supporting habitat: extent and distribution;
- supporting processes: water quality – dissolved oxygen; and
- supporting processes: water quality – turbidity.

7.2.46 With respect to the potential for temporary localised increases in SSC and sediment deposition associated with cable and foundation installation, this impact may affect black seabream nesting grounds within the Kingmere MCZ. The implementation of embedded environmental measures in the form of a seasonal restriction on cable installation activities in the export cable corridor during the black seabream nesting period (March to July) and the implementation of the

cable routeing design, as informed by pre-construction surveys, will ensure the avoidance of impacts from increased SSC and deposition on nesting black seabream during the breeding season (C-269 - C-273, **Table 3-1**). Therefore, with the implementation of embedded environmental measures, there will be no impact from increased SSC and sediment deposition on nesting black seabream within the Kingmere MCZ, and the magnitude of impact is considered to be **negligible**.

7.2.47 With respect to the above attributes the magnitude is **negligible** with the implementation of embedded environmental measures, and the maximum sensitivity of black seabream is considered to be **high**. Considering the short-term and localised nature of the higher SSCs and deposition rates; the significance of effect is deemed **minor**, **Not Significant** in EIA terms.

7.2.48 The Proposed Development **will not hinder** the conservation targets of the above attributes or the overall conservation objectives of the black seabream feature of Kingmere MCZ.

Relevant MCZ feature receptor- Infralittoral rock and thin mixed sediment

7.2.49 The faunal and algal communities within Kingmere MCZ are likely to have a certain tolerance to particles suspended in the water column. A range of background suspended sediment concentrations have been observed temporally within the vicinity of the site. Significant fluctuations could have a negative impact should the communities be at the limit of their tolerance in natural conditions. Sedimentation on benthic habitats can influence community composition, alter species growth rates and potentially affect reproductive success, reducing larval recruitment.

7.2.50 **Table 6-3** states that infralittoral rock and thin mixed sediment feature is **sensitive** to pressures that may arise from temporary localised increases in SSC and sediment deposition. Characteristic biotopes associated with the infralittoral rock and thin mixed sediments feature of the MCZ are assessed in **Chapter 9: Benthic, subtidal and intertidal ecology, Volume 2** of the ES (Document Reference: 6.2.9). Most biotopes are naturally subject to sedimentation and scour and characterising species are therefore likely to tolerate intermittent episodes of sediment movement and deposition. Where heavy deposition is likely to occur, this would result in complete burial of the characterising species and the effect of this pressure will be mediated by the length of exposure to the deposit, however, this is only likely to occur in small discreet areas close which are not expected to overlap with the MCZ.

7.2.51 As detailed within **Chapter 9: Benthic, subtidal and intertidal ecology, Volume 2** of the ES (Document Reference: 6.2.9) benthic receptors are known to have a medium to high degree of tolerance to this impact, based on Marine Evidence-based Sensitivity Assessments (MarESA). The sensitivity assessments are based on a detailed review of available evidence (the 'evidence base') on the effects of pressures on marine species or habitats, and a subsequent scoring of sensitivity against a standard list of pressures, and their benchmark levels of effect.

7.2.52 It is predicted that the sensitivity of the majority of receptors is worst-case **medium.**

7.2.53 The following SACO attributes relevant to the infralittoral rock and thin mixed sediment MCZ feature be impacted by the increase in SSC and sediment deposition:

- distribution: presence and spatial distribution of biological communities;
- extent and distribution;
- structure and function: presence and abundance of key structural and influential species;
- structure: sediment composition and distribution;
- structure: species composition of component communities;
- supporting processes: sedimentation rate;
- supporting processes: water quality – dissolved oxygen; and
- supporting processes: water quality – turbidity.

7.2.54 With respect to the above attributes the magnitude is deemed **minor** on account of the short-term and localised nature of the higher SSCs and deposition rates. The maximum sensitivity of the benthic receptors is **medium**, as a result of the tolerance and recoverability of the majority of the benthic receptors. The significance of effect is deemed **minor, Not Significant** in EIA terms

7.2.55 The Proposed Development **will not hinder** the conservation targets of the above attributes or the overall conservation objectives of the infralittoral rock and thin mixed sediment feature of Kingmere MCZ.

Relevant MCZ feature receptor- Subtidal chalk

7.2.56 **Table 6-3** states that subtidal chalk is **sensitive** to pressures that may arise from temporary localised increases in SSC and sediment deposition. Subtidal chalk feature includes a key representative biotope ‘piddocks with a sparse associated fauna in sublittoral very soft chalk or clay (A4.231)’, which has been assessed in **Chapter 9: Benthic, subtidal and intertidal ecology, Volume 2** of the ES (Document Reference: 6.2.9). This biotope has been identified as having a ‘medium’ sensitivity in EIA terms to both light and heavy smothering, as per the MarESA assessment. Piddocks are essentially sedentary and as siphons are relatively short, siltation from fine sediments that add to existing silt layers could be lethal. However, they are expected to fully recover within 2 to 10 years where the resource has not been completely impacted (Tillin and Hill, 2016).

7.2.57 The following SACO attributes relevant to the subtidal chalk MCZ feature may be impacted by the increase in SSC and sediment deposition:

- distribution: presence and spatial distribution of biological communities;
- structure and function: presence and abundance of key structural and influential species;
- structure: species composition of component communities;
- supporting processes: sedimentation rate;

- supporting processes: water quality – dissolved oxygen; and
- supporting processes: water quality – turbidity.

7.2.58 With respect to the above attributes the magnitude is deemed **minor** on account of the short-term and localised nature of the higher SSCs and deposition rates. The maximum sensitivity of the benthic receptors is **medium**, as a result of the tolerance and recoverability of the majority of the benthic receptors. The significance of effect is deemed **minor, Not Significant** in EIA terms.

7.2.59 The Proposed Development **will not hinder** the conservation targets of the above attributes or the overall conservation objectives of the subtidal chalk feature of Kingmere MCZ.

7.3 Operation & maintenance phase - Increased risk of introduction or spread of marine INNS

7.3.1 There is a risk that the introduction of hard substrate into a sedimentary habitat will enable the colonisation of the introduced substrate by Marine INNS that might otherwise not have had a suitable habitat for colonisation, thereby enabling their spread. Aquatic organisms may be transferred to new locations as biofouling. All craft have some biofouling, even if recently cleaned or anti-fouled. Moreover, thousands of marine species can be carried in ships' ballast water. Movement of operation and maintenance vessels in and out of the proposed DCO Order Limits has the potential to impact upon benthic ecology and biodiversity of benthic habitats.

7.3.2 Non-native species may become invasive and displace native organisms by preying on them or out-competing them for resources such as food, space or both. In some cases this has led to the loss of indigenous species from certain areas (JNCC, 2004). A pathogen causes disease or illness to its host. Pathogens include bacteria, viruses, protozoa and fungi. Within Kingmere MCZ, chains of the invasive slipper limpet (*Crepidula fornicata*) and heaps of dead shells have been observed on the mixed sediment areas (Fugro EMU Ltd., 2013) in the vicinity of Kingmere Rocks (Irving, 1999). There are currently no records of pathogens within Kingmere MCZ.

7.3.3 Embedded environmental measures (**Table 3-1**) which include an **Outline PEMP** (Document Reference: 7.11) with a biosecurity plan (C-95), will ensure that the risk of potential introduction and spread of Marine INNS from increased vessel traffic will be minimised. The magnitude of the impact of the introduction or spread of Marine INNS is considered to be **negligible** through the implementation of embedded environmental measures, indicating that there may only be a discernible change for any length of time, over a small area of the receptor that does not threaten benthic subtidal ecology features, undermine regional ecosystem functions or diminish biodiversity.

Relevant MCZ feature receptor- Infralittoral rock and thin mixed sediment and subtidal chalk

7.3.4 **Table 6-3** states that both habitat features from Kingmere MCZ are **sensitive** to pressures that may arise from introduction or spread of Marine INNS. **Chapter 9:**

Benthic, subtidal and intertidal ecology, Volume 2 (Application Reference Number 6.2) evaluated sensitivity of two key biotopes that are associated with the habitat features of Kingmere MCZ. These are A5.141 '*Spirobranchus triqueter* with barnacles and bryozoan crusts on unstable circalittoral cobbles and pebbles' and A4.231 'Piddocks with a sparse associated fauna in sublittoral very soft chalk or clay'. These two characteristic biotopes are expected to be not sensitive to Marine INNS based on a high resistance and high resilience. The confidence of this assessment is low as the assessment is based on expert judgement, as no baseline data is available. A precautionary sensitivity assessment of **medium** is therefore taken through to the assessment.

7.3.5 The following SACO attributes relevant to both infralittoral rock and thin mixed sediment and subtidal chalk features may be impacted by Marine INNS:

- extent and distribution;
- distribution: presence and spatial distribution of biological communities;
- structure and function: presence and abundance of key structural and influential species;
- structure: non-native species and pathogens; and
- structure: species composition of component communities.

7.3.6 With respect to the above attributes, implementation of embedded environmental measures (C-95, **Table 3-1**) through the **Outline PEMP** (Application Reference Number 7.11) and associated biosecurity mitigation plan, will ensure a reduction in the magnitude of the impact to **negligible**. On this basis, and considering the potentially **medium** sensitivity of benthic features, the residual effect significance will be **minor, Not Significant** in EIA terms.

7.3.7 The Proposed Development **will not hinder** the conservation targets of the above attributes or the overall conservation objectives of the infralittoral rock and thin mixed sediment or the subtidal chalk features of Kingmere MCZ.

Relevant MCZ feature receptor- Black seabream

7.3.8 **Table 6-3** states that there is insufficient evidence to indicate whether the black seabream feature of the Kingmere MCZ is sensitive to pressures that may arise from introduction or spread of Marine INNS. Therefore, to ensure a precautionary assessment, the potential for an effect on nesting black seabream has been assessed. A precautionary sensitivity assessment of **high** is taken through to the assessment, due to the specific habitat requirement of black seabream, and the potential for the spread of Marine INNS over nesting areas.

7.3.9 The following SACO attributes relevant to black seabream may be impacted by Marine INNS:

- population age size frequency;
- population size;
- population recruitment and reproductive capability;
- presence and spatial distribution of the species; and

- structure and function: biological connectivity.

7.3.10 With respect to the above attributes, the implementation of embedded environmental measures (C-95, **Table 3-1**) through the **Outline PEMP** (Application Reference Number 7.11) and associated biosecurity mitigation plan, will ensure a reduction in the magnitude of the impact to **negligible**. On this basis, and considering the potentially **high** sensitivity of black seabream, the residual effect significance will be **minor**, **Not Significant** in EIA terms.

7.3.11 The Proposed Development **will not hinder** the conservation targets of the above attributes or the overall conservation objectives of the black seabream feature of Kingmere MCZ.

7.4 Offshore Overfalls MCZ

Construction and decommissioning phase - Temporary localised increases in suspended sediment concentrations (SSC) and sediment deposition

7.4.1 **Section 7.2** includes a detailed description of potential impacts of temporary localised increases in SSC and sediment deposition at the Kingmere MCZ, as well as providing a description of the worst-case scenario and the approach to assessing this impact, with reference to **Chapter 9: Benthic, subtidal and intertidal ecology, Volume 2** of the ES (Document Reference: 6.2.9) . The same magnitude can be applied to the Offshore Overfalls MCZ as the distance from Rampion 2 is comparable (**Graphic 1-1**), whereby the MCZ lies adjacent to the Proposed Development.

7.4.2 Increased SSC and deposition are likely to occur across the array area, inclusive of areas in relatively close proximity to the Offshore Overfalls MCZ. However, as detailed within **paragraphs 7.2.38 *et seq*.**, these impacts will be limited at the outer 500m zone of effect (> 500m there will be no expected deposition). **Figure 6.3.4** within **Appendix 6.3: Coastal processes technical report: Impact assessment, Volume 4** of the ES (Document Reference: 6.4.6.3) illustrates the 500m zone of effect in relation to MCZs, with the only anticipated overlap to a discrete area on the northern boundary of the Offshore Overfalls MCZ. This is also regarded as worst case, which anticipates construction works being carried out directly on the proposed DCO Order Limits boundary (construction works directly on the boundary itself are not anticipated). The magnitude of the impact to neighbouring MCZ's is therefore assessed as being **minor.**

7.4.3 The nature of activities resulting in increases in SSC and sediment deposition during construction is described in **Section 7.2**. Further details of the worst-case scenario assessment can be found in **Chapter 9: Benthic, subtidal and intertidal ecology, Volume 2** of the ES (Document Reference: 6.2.9).

Relevant MCZ feature receptor- Subtidal coarse sediment, subtidal mixed sediments and subtidal sand

7.4.4 A range of background suspended sediment concentrations have been observed temporally within the vicinity of the site. Significant fluctuations could have a

negative impact should the communities be at the limit of their tolerance in natural conditions. Sedimentation on benthic habitats can influence community composition, alter species growth rates and potentially affect reproductive success, reducing larval recruitment.

7.4.5 Characteristic biotopes associated with the subtidal coarse and mixed sediments and sands of the MCZ are assessed in **Chapter 9: Benthic, subtidal and intertidal ecology, Volume 2** of the ES (Document Reference: 6.2.9). Most biotopes are naturally subject to sedimentation and scour and characterising species are therefore likely to tolerate intermittent episodes of sediment movement and deposition. Where heavy deposition is likely to occur, this would result in complete burial of the characterising species and the effect of this pressure will be mediated by the length of exposure to the deposit, however, this is only likely to occur in small discreet areas which are not expected to overlap with the MCZ.

7.4.6 Detailed SACOs for Offshore Overfalls MCZ are not available, however as detailed within **Chapter 9: Benthic, subtidal and intertidal ecology, Volume 2** of the ES (Document Reference: 6.2.9) benthic receptors are known to have a medium to high degree of tolerance to an impact of this nature, based on MarESA assessments. It is predicted that the sensitivity of the majority of sedimentary receptors is low.

7.4.7 The magnitude of temporary localised increases in SSC and sediment deposition is **minor** on account of the short-term and localised nature of the higher SSCs and deposition rates. The maximum sensitivity of the benthic receptors is **low**, as a result of the tolerance and recoverability of the majority of the benthic receptors. The significance of effect is deemed **minor, Not Significant** in EIA terms.

7.4.8 The Proposed Development **will not hinder** the conservation objectives of the broad-scale habitat features of Offshore Overfalls MCZ.

Operation & maintenance phase - Increased risk of introduction or spread of marine INNS

7.4.9 **Section 7.2** includes a detailed description of potential impacts of increased risk of introduction or spread of Marine INNS at the Kingmere MCZ, as well as providing a description of the worst-case scenario and the approach to assessing this impact with a reference to **Chapter 9: Benthic, subtidal and intertidal ecology, Volume 2** of the ES (Document Reference: 6.2.9).The same magnitude can be applied to the Offshore Overfalls MCZ as the distance from Rampion 2 is comparable (**Graphic 1-1**), whereby the MCZ lies adjacent to the Proposed Development.

7.4.10 As detailed, embedded environmental measures (**Table 3-1**) which include an **Outline PEMP** (Document Reference: 7.11) with a biosecurity plan (C-95), will ensure that the risk of potential introduction and spread of Marine INNS from increased vessel traffic will be minimised. The magnitude of the impact of the introduction or spread of Marine INNS is considered to be **negligible** through the implementation of embedded environmental measures, indicating that there may only be a discernible change for any length of time, over a small area of the receptor that does not threaten benthic subtidal ecology features, undermine regional ecosystem functions or diminish biodiversity.

7.4.11 The nature of activities resulting in increased risk of introduction or spread of Marine INNS is described in **Section 7.2**. Further details of the worst-case scenario assessment can be found in **Chapter 9: Benthic, subtidal and intertidal ecology, Volume 2** of the ES (Document Reference: 6.2.9).

Relevant MCZ feature receptor- Subtidal coarse sediment, subtidal mixed sediments and subtidal sand

7.4.12 In the absence of MCZ-specific pressure-sensitivity matrix, sensitivity of broad-scale habitat features was assumed from **Chapter 9: Benthic, subtidal and intertidal ecology, Volume 2** of the ES (Document Reference: 6.2.9). The sensitivity of benthic biotopes to the introduction or spread of Marine INNS is deemed to be 'not-sensitive' to having a 'high' sensitivity to an impact of this nature, according to the MarESA criteria. Therefore, the sensitivity of features of Offshore Overfalls MCZ is considered to be **high**, reflecting that at worst-case benthic receptors have 'none' or 'low' resistance (tolerance) to an impact of this nature.

7.4.13 **Section 3** describes that implementation of embedded environmental measures (C-95, **Table 3-1**) through the **Outline PEMP** (Document Reference: 7.11) and associated biosecurity mitigation plan, will ensure a reduction in the magnitude of the impact to **negligible**. On this basis, and considering the potentially **high** sensitivity of benthic features, the residual effect significance will be **minor, Not Significant** in EIA terms.

7.4.14 The Proposed Development **will not hinder** the conservation objectives of the broad-scale habitat features of Offshore Overfalls MCZ.

7.5 Selsey Bill and the Hounds MCZ

Construction and decommissioning phases - Mortality, injury, behavioural changes and auditory masking arising from noise and vibration

7.5.1 **Section 7.2** includes a detailed description of potential impacts of noise and vibration, as well as provides a description of the worst-case scenario and the approach to assessing this impact with a reference to **Chapter 9: Benthic, subtidal and intertidal ecology, Volume 2** of the ES (Document Reference: 6.2.9).

Relevant MCZ feature receptor- Short-snouted seahorse (*H. hippocampus*)

7.5.2 Little is known about hearing in seahorses, it is, therefore, difficult to assess the potential effects of anthropogenic sound on these animals. Studies on other seahorse species suggest, they may be sensitive to noise disturbance. There is limited literature and research on the effects of underwater noise on seahorse. A study by Anderson *et al.* (2011) examined the behavioural response of the lined seahorse (*Hippocampus erectus*) exposed to 123dB to 137dB root mean square (rms) re 1µPa in a tank for one month. Seahorses responded both behaviourally and physiologically, displaying a chronic stress response. Seahorse exposed to

loud noises showed a behavioural response such as irritation and distress, and a physiological response, including lower weight, worse body condition, higher plasma cortisol and other blood measures indicative of stress, and more parasites in their kidneys. In addition to the primary and secondary stress indices in the blood and plasma, seahorses exhibited tertiary indices (for example growth, behaviour, and mortality) (Anderson *et al.,* 2011). However, the study found that some of the variability in these measures (such as time spent mobile) subsided after the first week, presumably due to habituation. It is important to note that Radford *et al.* (2016) recorded shipping sound levels of 124dB rms re 1 pascal (µPa), seismic survey noise levels at 131dB rms, and pile driving at 141dB rms; in this context seahorses can be expected to habituate to the noise levels that may be experienced during piling for the Proposed Development. A study conducted by Hastings *et al.* (2010) determined hearing thresholds of lined seahorse (*H. erectus*) using exposures to tone bursts between 50 hertz (Hz) and 21.6 kilohertz (kHz). At low frequencies the seahorses have thresholds similar to bony fishes, however, at frequencies above 2kHz, their auditory sensitivity was similar to that of clupeiform species (such as herring) (Hastings *et al.,* 2020).

7.5.3 As such short-snouted seahorse were grouped with 'Fishes that have special structures mechanically linking the swim bladder to the ear' for the purposes of assessment in **Chapter 9: Benthic, subtidal and intertidal ecology, Volume 2** of the ES (Document Reference: 6.2.9). These fishes are sensitive primarily to sound pressure, although they also detect particle motion. These species have a wider frequency range, extending to several kHz and generally show higher sensitivity to sound pressure than fishes. The same assessment criteria were used for Group 4 fishes and as Group 3, thus noise thresholds as presented in **Table 7-1** for black seabream were also applied to short-snouted seahorse.

7.5.4 Short-snouted seahorse, a feature of the Selsey Bill and the Hounds MCZ, are considered to be **sensitive** to noise and vibration pressure (**Table 6-14**). Seahorse possess a swim bladder that is involved in hearing, and therefore are known to be sensitive to underwater noise. Seahorse have low mobility and are therefore considered unlikely to flee with the onset of piling, therefore seahorses are considered stationary receptors within the assessment. Taking this into consideration, sensitivity of seahorse to noise impacts is therefore considered to be **high**.

7.5.5 The following SACO attributes relevant to short-snouted seahorse MCZ feature may be impacted by noise and vibration:

- population size;
- population recruitment and reproductive capability;
- presence and spatial distribution of the species; and
- structure and function: biological connectivity.

7.5.6 Regarding the potential for mortality and mortal injury, recoverable injury and TTS there is no interaction with the MCZs whereby short snouted seahorse are a feature, therefore there will be no impact from underwater noise on breeding seahorse within the Selsey Bill and the Hounds MCZ, and therefore the magnitude of impacts is **negligible** and the maximum sensitivity of breeding seahorse is considered to be **high**. Taking into consideration the location the MCZ of which

short-snouted seahorse are a feature, relative to the piling locations and the limited temporal nature of the impact, the significance of effect is deemed **minor, Not Significant** in EIA terms.

7.5.7 Regarding the potential for behavioural effects on breeding seahorse, there is the potential for an interaction of the impact ranges from piling in the array area with the Selsey Bill and the Hounds MCZ. The implementation of embedded environmental measures to employ one or more noise abatement mitigations, during the summer breeding season of seahorse (C-265, C-274, C-280, and C-281, **Table 3-1**) will reduce the impact ranges of behavioural effects to outside of the MCZs. Therefore, with the implementation of embedded environmental measures, there will be no impact from underwater noise on breeding seahorse within the Selsey Bill and the Hounds MCZ, and the magnitude of impact is considered to be **negligible**. With respect to the above attributes the magnitude is **negligible** with the implementation of embedded environmental measures, and the maximum sensitivity of breeding seahorse is considered to be worst-case **high**. Considering the short-term and intermittent nature of piling, the significance of effect is deemed **minor, Not Significant** in EIA terms.

7.5.8 Decommissioning of offshore infrastructure for the Proposed Development may result in temporarily elevated underwater noise levels, with the maximum levels of underwater noise during decommissioning would be from underwater cutting required to remove structures, with piled foundations cut approximately 1m below the seabed. The noise levels from this process are expected to be much less than pile driving and therefore impacts would be less than as assessed during the construction phase. With respect to the above attributes the magnitude is **negligible**, and the maximum sensitivity of breeding seahorse is considered to be worst-case **high**. Considering the short-term and intermittent nature of decommissioning activities, the significance of effect is deemed **minor, Not Significant** in EIA terms.

7.5.9 The Proposed Development **will not hinder** the conservation targets of the above attributes or the overall conservation objectives of the breeding seahorse feature of Selsey Bill and the Hounds MCZ.

Construction & decommissioning phases - Temporary localised increases in suspended sediment concentrations (SSC) and sediment deposition

7.5.10 The nature of activities resulting in increases in SSC and sediment deposition during construction is described in **Section 6.2**. Further details of the worst-case scenario assessment can be found in **Chapter 9: Benthic, subtidal and intertidal ecology, Volume 2** of the ES (Document Reference: 6.2.9).

Relevant MCZ feature receptor- Short-snouted seahorse (*H. hippocampus*)

7.5.11 Short-snouted seahorse are unlikely to be affected by an increase in suspended sediment and smothering from construction activities as they are mobile and are able to slowly swim away from the affected area. Moreover, habitat preference is within shallow water, amongst seagrass and algae, although short-snouted seahorse can also be found in rocky areas to a depth of 77m (Sabatini and

Ballerstedt, 2007). It is considered that intolerance to smothering is low, with high recoverability for the species (Neish, 2007; Sabatini and Ballerstedt, 2007). Short-snouted seahorse feature is considered to be **sensitive** to changes in suspended solids (water clarity) – a pressure that may arise from increased SSC (**Table 6-8**). A sensitivity of **medium** is therefore considered to be worst-case.

7.5.12 Temporary sediment deposition from increased SSC may result in indirect effects to seahorses. As detailed in **Section 7.2,** there will be a quick dissipation of the sediment plume and local nature (0-50m) of deposition impacts where smothering effects on benthic habitats and features might be observed. Increased SSC and deposition are likely to be limited to the outer 500m zone of effect (> 500m there will be no expected deposition). **Figure 6.3.4** within **Appendix 6.3: Coastal processes technical report: Impact assessment, Volume 4** of the ES (Document Reference: 6.4.6.3) illustrates the 500m zone of effect in relation to MCZs, with no impact anticipated Selsey Bill and the Hounds MCZ. The magnitude of the impact is considered to be **negligible**. The following SACO attributes relevant to short-snouted seahorse MCZ feature may be impacted by increases in SSC and sediment deposition:

- supporting habitat: extent and distribution;
- water quality - dissolved oxygen; and
- water quality – turbidity.

7.5.13 With respect to the above attributes, due to **negligible** magnitude and temporary duration of the potential impacts and the maximum sensitivity of **medium**, the effect is deemed **minor, Not Significant** in EIA terms.

7.5.14 The Proposed Development **will not hinder** the conservation targets of these attributes or the overall conservation objectives of the short-snouted seahorse feature of Selsey Bill and the Hounds MCZ.

Relevant MCZ feature receptor- High energy infralittoral rock, low energy infralittoral rock, moderate energy circalittoral rock, moderate energy infralittoral rock, peat and clay exposures, subtidal mixed sediments and subtidal sands

7.5.15 The faunal and algal communities within Selsey and the Bills MCZ are likely to have a certain tolerance to particles suspended in the water column. Significant fluctuations could have a negative impact should the communities be at the limit of their tolerance in natural conditions. Sedimentation on benthic habitats can influence community composition, alter species growth rates and potentially affect reproductive success, reducing larval recruitment.

7.5.16 **Table 6-8** identifies that feature receptors identified are sensitive to pressures that may arise from temporary localised increases in SSC and sediment deposition.

7.5.17 Characteristic biotopes of the MCZ have been assessed in **Chapter 9: Benthic, subtidal and intertidal ecology, Volume 2** (Application Reference Number 6.2), which suggests that these biotopes are considered to have a worst-case sensitivity of **medium** according to the detailed MarESA criteria. These features are likely to be naturally subject to sedimentation and scour, therefore characterising species are likely to tolerate intermittent episodes of sediment movement and deposition.

7.5.18 As detailed in **paragraph 7.5.12 *et seq***., above, **Figure 6.3.4** within ES **Appendix 6.3: Coastal processes technical report: Impact assessment, Volume 4** of the ES (Document Reference: 6.4.6.3) illustrates the 500m zone of effect in relation to MCZs, with no impact from SSC and deposition anticipated for Selsey Bill and the Hounds MCZ. The magnitude of the impact is **negligible**.

7.5.19 The following SACO attributes relevant to the MCZ features have been identified to potentially be impacted by the increase in SSC and sediment deposition:

- distribution: presence and spatial distribution of biological communities;
- extent and distribution;
- structure and function: presence and abundance of key structural and influential species;
- structure: sediment composition and distribution;
- structure: species composition of component communities;
- supporting processes: sedimentation rate;
- supporting processes: water quality – dissolved oxygen; and
- supporting processes: water quality – turbidity.

7.5.20 Overall, due to **negligible** magnitude and temporary duration of the potential impacts and the maximum sensitivity of **medium**, the effect is deemed **minor, Not Significant** in EIA terms.

7.5.21 The Proposed Development **will not hinder** the conservation targets of these attributes or the overall conservation objectives of the broadscale habitat features of Selsey Bill and the Hounds MCZ.

Operation & Maintenance Phase - Increased risk of introduction or spread of Marine INNS

7.5.22 The nature of activities resulting in increased risk of introduction or spread of Marine INNS is described in **Section 7.2**. Further details of the worst-case scenario assessment can be found in **Chapter 9: Benthic, subtidal and intertidal ecology, Volume 2** of the ES (Document Reference: 6.2.9).

7.5.23 As detailed, embedded environmental measures (**Table 3-1**) which include an **Outline PEMP** (Document Reference: 7.11) with a biosecurity plan (C-95), will ensure that the risk of potential introduction and spread of Marine INNS from increased vessel traffic will be minimised. The magnitude of the impact of the introduction or spread of Marine INNS is considered to be **negligible** through the implementation of embedded environmental measures, indicating that there may only be a discernible change for any length of time, over a small area of the receptor that does not threaten benthic subtidal ecology features, undermine regional ecosystem functions or diminish biodiversity.

Relevant MCZ feature receptor- Short-snouted seahorse (*H. hippocampus*)

7.5.24 **Table 6-8** states that there is insufficient evidence to indicate whether the short snouted seahorse feature of the Selsey Bill and the Hounds MCZ is sensitive to pressures that may arise from introduction or spread of Marine INNS. Therefore, to ensure a precautionary assessment, the potential for an effect on short snouted seahorse has been assessed. A precautionary sensitivity assessment of **medium** is taken through to the assessment.

7.5.25 The following SACO attributes relevant to short-snouted seahorse MCZ feature may be impacted by noise and vibration:

- population size;
- population recruitment and reproductive capability;
- presence and spatial distribution of the species; and
- structure and function: biological connectivity.

7.5.26 With respect to the above attributes, due to **negligible** magnitude and temporary duration of the potential impacts and the maximum sensitivity of **medium**, the effect is deemed **minor, Not Significant** in EIA terms.

7.5.27 The Proposed Development **will not hinder** the conservation targets of these attributes or the overall conservation objectives of the short-snouted seahorse feature of Selsey Bill and the Hounds MCZ.

Relevant MCZ feature receptor- High energy infralittoral rock, low energy infralittoral rock, moderate energy circalittoral rock, moderate energy infralittoral rock, peat and clay exposures, subtidal mixed sediments and subtidal sands

7.5.28 **Table 6-3** states that habitat features of Selsey Bill and the Hounds MCZ are **sensitive** to pressures that may arise from introduction or spread of Marine INNS. The sensitivity of representative benthic biotopes to the introduction or spread of Marine INNS is deemed to be 'not-sensitive' to having a 'high' sensitivity to an impact of this nature, according to the MarESA criteria. Therefore, the sensitivity of features of Selsey Bill and the Hounds MCZ is considered to be **high**, reflecting that at worst-case benthic receptors have 'none' or 'low' resistance (tolerance) to an impact of this nature.

7.5.29 The following SACO attributes relevant to the identified features of the MCZ may be impacted by Marine INNS:

- extent and distribution;
- distribution: presence and spatial distribution of biological communities;
- structure and function: presence and abundance of key structural and influential species;
- structure: non-native species and pathogens; and
- structure: species composition of component communities.

7.5.30 **Section 3** describes that implementation of embedded environmental measures (C-95, **Table 3-1**) through the **Outline PEMP** (Document Reference: 7.11) and

associated biosecurity mitigation plan, will ensure a reduction in the magnitude of the impact to **negligible**. On this basis, with respect the above attributes, and considering the potentially **high** sensitivity of benthic features, the residual effect significance will be **minor, Not Significant** in EIA terms.

7.5.31 The Proposed Development **will not hinder** the conservation objectives of the broad-scale habitat features of Selsey Bill and the Hounds MCZ.

7.6 Pagham Harbour MCZ

Construction phase - Mortality, injury, behavioural changes and auditory masking arising from noise and vibration

7.6.1 Noise and vibration impacts have been screened out for benthic species and habitats (see **Section 5.2**). In addition, for broad-scale habitat features of Pagham Harbour MCZ no pathway for noise impacts to affect the feature was identified for seagrass beds and Defolin's lagoon snail features, based on Natural England's AOO indicating no interaction with said pressures (**Table 6-11**).

Relevant MCZ feature receptor- Lagoon sand shrimp

7.6.2 With respect to lagoon sand shrimp, there is currently 'insufficient evidence' whether it might be affected by noise and vibration, therefore, to ensure a precautionary assessment, the potential for an effect on this feature from underwater noise has been assessed.

7.6.3 A precautionary sensitivity assessment of **medium** is taken through to the assessment, on the basis that the lagoon sand shrimp lacks a swim bladder but has the potential to be sensitive to particle motion.

7.6.4 The following SACO attributes relevant to the lagoon sand shrimp MCZ feature may be impacted by underwater noise and vibration:

- Population: population size;
- Population: recruitment and reproductive capability;
- Presence and spatial distribution of the species; and
- Structure and function: biological connectivity.

7.6.5 It is understood that particle motion attenuates rapidly, therefore any impacts from particle motion are likely to occur local to the source. Taking into consideration the locations of the MCZ relative to the piling locations and the extremely limited spatial nature of the effect, there are not anticipated to be any effects from underwater noise on the lagoon sand shrimp feature of the MCZ. The magnitude of impact that construction activities relating to Rampion 2 will have on lagoon sand shrimp is therefore considered be **negligible** for mortality and potential mortal injury, recoverable injury, TTS and behavioural effects.

7.6.6 With respect to the above attributes the magnitude is **negligible,** and the maximum sensitivity of the receptors is considered to be worst-case **medium**. Considering the short-term and intermittent nature of piling, and the localised

impact ranges; the significance of effect is deemed **minor**, **Not Significant** in EIA terms.

7.6.7 The Proposed Development **will not hinder** the conservation objectives of the the langoon sand shrimp features of Pagham Harbour MCZ.

Construction and decommissioning phase - Temporary localised increases in suspended sediment concentrations (SSC) and sediment deposition

7.6.8 The nature of activities resulting in increases in SSC and sediment deposition during construction is described in **Section 7.2.** Further details of the worst-case scenario assessment can be found in **Chapter 9: Benthic, subtidal and intertidal ecology, Volume 2** of the ES (Document Reference: 6.2.9). Pagham Harbour MCZ is located over 10km from the Proposed Development, at the furthest extent of the secondary ZOI (as defined in **Chapter 9: Benthic, subtidal and intertidal ecology, Volume 2** of the ES (Document Reference: 6.2.9)).

Relevant MCZ feature receptor- Seagrass beds

7.6.9 Seagrass can colonise a wide variety of sediments, from sheltered gravel to sand or mud (JNCC, 2014), but requires a substrate soft enough for rhizomes to elongate and fasten. Sediment composition is important in determining the biological communities supported by the seagrass. There is a relationship between seagrass density and sediment composition that can vary across the seagrass bed, increasing the diversity of communities present. Seagrass relies on sediment but the seagrass rhizomes also help to bind sediment and prevent erosion. A change to sediment composition can result in a loss or change to seagrass distribution and character.

7.6.10 The rate of sediment deposition is known to influence the status of habitats and / or their associated communities. Beds are usually in more sheltered areas where suspended sediments tend to settle, providing suitable conditions for colonisation. If suspended sediment is artificially high due to human activity, this may smother seagrass beds.

7.6.11 In coastal environments turbidity levels can rise and fall rapidly as a result of biological, physical (for example, storm events) or human factors. Prolonged changes in turbidity may influence the amount of light reaching the seabed, affecting the primary production.

7.6.12 The seagrass beds feature is considered to be **sensitive** to pressures that may arise from increases in SSC and sediment deposition, namely: smothering and siltation rate changes, physical change to another seabed type and changes in suspended solids (water clarity) (**Table 6-11**). Seagrass beds are therefore considered to be of worst-case **high** sensitivity to increases in SSC and sediment deposition.

7.6.13 As detailed in **paragraph 7.4.12** *et seq*., above, **Figure 6.3.4** within **Appendix 6.3: Coastal processes technical report: Impact assessment, Volume 4** of the ES (Document Reference: 6.4.6.3) illustrates the 500m zone of effect in relation to

MCZs, with no impact from SSC and deposition anticipated on Pagham Harbour MCZ. The magnitude of the impact is **negligible**.

7.6.14 The following SACO attributes relevant to seagrass beds MCZ feature may be impacted by increases in SSC and sediment deposition:

- extent of supporting habitat;
- structure and function: presence and abundance of key structural and influential species;
- structure: biomass;
- structure: sediment composition and distribution;
- structure: species composition of component communities;
- supporting processes: light levels;
- supporting processes: sedimentation rate;
- water quality - dissolved oxygen; and
- water quality – turbidity.

7.6.15 With respect to the above attributes, due to **negligible** magnitude, and the maximum sensitivity of the receptors is considered to be worst-case **high;** the significance of effect is deemed **minor**, **Not Significant** in EIA terms.

7.6.16 The Proposed Development **will not hinder** the conservation targets of these attributes, or the overall conservation objectives of the seagrass beds feature of Pagham Harbour MCZ.

Relevant MCZ feature receptor- Defolin's lagoon snail (*C. armoricum*) and Lagoon sand shrimp (*G. insensibilis*)

7.6.17 Defolin's lagoon snail inhabits loose shingle where sea water percolates and where soft flocculent silty material is present but leaving plenty space subject to gently flowing water. Therefore, increases in fine sediments might reduce the suitability of the habitat to support this species (Little *et al.,* 1989).

7.6.18 Changes in suspended solids are not likely to directly affect the lagoon sand shrimp. However, limited water movement in the closed lagoon habitat where this species is found could result in any sediment deposits remaining in-situ, causing smothering.

7.6.19 As detailed in **paragraph 7.5.12** *et seq*., above, **Figure 6.3.4** within **Appendix 6.3: Coastal processes technical report: Impact assessment, Volume 4** of the ES (Document Reference: 6.4.6.3) illustrates the 500m zone of effect in relation to MCZs, with no impact from SSC and deposition anticipated on Pagham Harbour MCZ. The magnitude of the impact is **negligible**.

7.6.20 Both species are considered to be **sensitive** to pressures that may arise from increases in SSC and sediment deposition (**Table 6-11**). Defolin's lagoon snail typically inhabit gravel and shingle substrates, and fine sediments washed into the shingle may reduce the suitability of the habitat to support this species. Defolin's lagoon snail are therefore considered to be of **high** sensitivity to increases in SSC

and sediment deposition. Lagoon sand shrimp are likely to be able to burrow and regain the surface following sediment deposition. However, algal mats that lagoon shrimp feed on and shelter within would likely remain buried leading to indirect effects through feeding and increased exposure to predators. Lagoon sand shrimp are therefore considered to be of **medium** sensitivity to increases in SSC and sediment deposition.

7.6.21 The following SACO attributes relevant to Defolin's lagoon snail and lagoon sand shrimp may be impacted by increases in SSC and sediment deposition:

- population size;
- recruitment and reproductive capability;
- presence and spatial distribution of the species;
- supporting habitat: extent and distribution;
- supporting habitat: sediment composition and distribution;
- water quality - dissolved oxygen; and
- water quality – turbidity.

7.6.22 With respect to the above attributes of both Defolin's lagoon snail and lagoon sand shrimp, due to **negligible** magnitude, and the maximum sensitivity of the receptors is considered to be worst-case **medium** to **high;** the significance of effect is deemed **minor**, **Not Significant** in EIA terms.

7.6.23 The Proposed Development **will not hinder** the conservation targets of these attributes or the overall conservation objectives of the Defolin's lagoon snail and lagoon sand shrimp features of Pagham Harbour MCZ.

Operation and maintenance phase - Increased risk of introduction or spread of marine INNS

7.6.24 **Section 7.2** summarises the nature of activities that may result in an increased risk of introduction or spread of Marine INNS (such as presence of infrastructure and ballast water from vessels). Further details of the worst-case scenario assessment can be found in **Chapter 9: Benthic, subtidal and intertidal ecology, Volume 2** of the ES (Document Reference: 6.2.9).

7.6.25 Embedded environmental measures (**Table 3-1**) which include an **Outline PEMP** (Document Reference: 7.11) with a biosecurity plan (C-95), will ensure that the risk of potential introduction and spread of Marine INNS from increased vessel traffic will be minimised. The magnitude of the impact of the introduction or spread of Marine INNS is considered to be **negligible** through the implementation of embedded environmental measures, indicating that there may only be a discernible change for any length of time, over a small area of the receptor that does not threaten benthic subtidal ecology features, undermine regional ecosystem functions or diminish biodiversity.

Relevant MCZ feature receptor- Seagrass beds

7.6.26 The seagrass beds feature is considered to be **sensitive** to introduction or spread of Marine INNS (**Table 6-11**). Seagrass beds are considered sensitive to the introduction of invasive pioneer species (such as common cord grass (*Spartina anglica*) and wire weed (*Sargassum muticum*), which may compete for space preventing recolonization. Seagrass beds are therefore considered to be of **high** sensitivity to the introduction or spread of Marine INNS.

7.6.27 The following SACO attributes relevant to seagrass beds MCZ feature may be impacted:

- presence and spatial distribution of biological communities;
- presence and abundance of key structural and influential species;
- non-native species and pathogens; and
- species composition of component communities.

7.6.28 With respect to the above attributes, due to **negligible** magnitude, and the maximum sensitivity of the receptors is considered to be worst-case **high**; the significance of effect is deemed minor, **Not Significant** in EIA terms.

7.6.29 The Proposed Development **will not hinder** the conservation targets of these attributes or the overall conservation objectives of the seagrass beds feature of Pagham Harbour MCZ.

Relevant MCZ feature receptor- Defolin's lagoon snail (*C. armoricum*) and Lagoon sand shrimp (*G. insensibilis*)

7.6.30 Lagoon sand shrimp is considered to be **sensitive** to pressures that may arise from introduction or spread of Marine INNS and there is not sufficient evidence to assess the pressure for Defolin's lagoon snail (**Table 6-11**. As a precautionary approach, both species have been assessed as worst-case **high** sensitivity to the introduction or spread of Marine INNS.

7.6.31 The following SACO attributes relevant to Defolin's lagoon snail and lagoon sand shrimp form Pagham Harbour MCZ may be impacted by introduction or spread of Marine INNS:

- presence and spatial distribution of the species; and
- structure: Non-native species and pathogens.

7.6.32 With respect to the above attributes, due to **negligible** magnitude, and the maximum sensitivity of the receptors is considered to be worst-case **high**; the significance of effect is deemed minor, **Not Significant** in EIA terms.

7.6.33 The Proposed Development **will not hinder** the conservation targets of these attributes or the overall conservation objectives of the Defolin's lagoon snail and lagoon sand shrimp features of Pagham Harbour MCZ.

7.7 Beachy Head West MCZ, Beachy Head East MCZ and Bembridge MCZ

Construction and decommissioning phases - Mortality, injury, behavioural changes and auditory masking arising from noise and vibration

7.7.1 **Section 7.2** includes a detailed description of potential impacts of noise and vibration, as well as provides a description of the worst-case scenario and the approach to assessing this impact with a reference to **Chapter 9: Benthic, subtidal and intertidal ecology, Volume 2** of the ES (Document Reference: 6.2.9).

Relevant MCZ feature receptor- Short-snouted seahorse (*H. hippocampus*)

7.7.2 Short-snouted seahorse, a feature of the Beachy Head West MCZ, Beachy Head East MCZ and Bembridge MCZ, are considered to be sensitive to noise and vibration pressure in Natural England's AOO (**Table 6-14**). As detailed in **Section 7.5**, seahorse are considered to be of **high** sensitivity to underwater noise and vibration.

7.7.3 The following SACO attributes relevant to short-snouted seahorse MCZ feature may be impacted by noise and vibration:

- population size;
- population recruitment and reproductive capability;
- presence and spatial distribution of the species; and
- structure and function: biological connectivity.

7.7.4 Regarding the potential for mortality and mortal injury, recoverable injury and TTS there is no interaction with the Beachy Head East MCZ and Bembridge MCZ, whereby short snouted seahorse are a feature, consequently there will be no impact from underwater noise on breeding seahorse within the MCZs, and therefore the magnitude of impacts is **negligible** and the maximum sensitivity of breeding seahorse is considered to be **high**. Taking into consideration the location of the Beachy Head East MCZ and Bembridge MCZ of which short-snouted seahorse are a feature, relative to the piling locations and the limited temporal nature of the impact, the significance of effect is deemed **minor, Not Significant** in EIA terms.

7.7.5 When regarding potential impacts to seahorse as a feature of the Beachy Head West MCZ, there is no interaction with the mortality and mortal injury, recoverable injury contours with the site, and therefore there will be no injurious effects on breeding seahorse within the MCZ. Regarding the potential for TTS on breeding seahorse, there is an interaction of the impact ranges from piling in the array area, with the Beachy Head West MCZ. However embedded mitigation to reduce impacts from underwater noise on sensitive receptors will be implemented (C-265, C-274, C-280, and C-281, **Table 3-1**), which will reduce the impact ranges of TTS to outside of the MCZ. Therefore, with the implementation of embedded mitigation, the magnitude of the impact that construction activities relating to the Proposed Development will have on breeding seahorse in the Beachy Head West MCZ is considered **negligible**, and the maximum sensitivity of breeding seahorse is considered to be **high**. Taking into consideration the location of the Beachy Head

West MCZ of which short-snouted seahorse are a feature, relative to the piling locations and the limited temporal nature of the impact, the significance of effect is deemed **minor, Not Significant** in EIA terms.

7.7.6 Regarding the potential for behavioural effects on breeding seahorse, there is the potential for an interaction of the impact ranges from piling in the array area with the Beachy Head West MCZ, Beachy Head East MCZ and Bembridge MCZ. The implementation of embedded environmental measures to employ one or more noise abatement mitigations, during the summer breeding season of seahorse (C-265, C-274, C-280, and C-281, **Table 3-1**) will reduce the impact ranges of behavioural effects to outside of the MCZs. Therefore, with the implementation of embedded environmental measures, there will be no impact from underwater noise on breeding seahorse within the MCZs, and the magnitude of impact is considered to be **negligible**. With respect to the above attributes the magnitude is **negligible** with the implementation of embedded environmental measures, and the maximum sensitivity of breeding seahorse is considered to be worst-case **high**. Considering the short-term and intermittent nature of piling, the significance of effect is deemed **minor, Not Significant** in EIA terms.

7.7.7 Decommissioning of offshore infrastructure for the Proposed Development may result in temporarily elevated underwater noise levels, with the maximum levels of underwater noise during decommissioning would be from underwater cutting required to remove structures, with piled foundations cut approximately 1 m below the seabed. The noise levels from this process are expected to be much less than pile driving and therefore impacts would be less than as assessed during the construction phase. With respect to the above attributes the magnitude is **negligible**, and the maximum sensitivity of breeding seahorse is considered to be worst-case **high**. Considering the short-term and intermittent nature of decommissioning activities, the significance of effect is deemed **minor, Not Significant** in EIA terms.

7.7.8 The Proposed Development **will not hinder** the conservation targets of the above attributes or the overall conservation objectives of the breeding seahorse feature of Selsey Bill and the Hounds MCZ.

Relevant MCZ feature receptor- Native oyster (*O. edulis*) and Blue mussel (*M. edulis*) beds

7.7.9 Native oyster, and blue mussel, features of the Beachy Head West MCZ, and the Bembridge MCZ (native oyster only) do not possess swim bladders or other gas filled organs. It is therefore considered that these species (as features of the MCZ) are primarily sensitive to particle motion rather than sound pressure (e.g., Popper and Hawkins 2018). Taking this into consideration, native oyster and blue mussel are considered to be of **medium** sensitivity to effects from underwater noise.

7.7.10 It is understood that particle motion attenuates rapidly, therefore any impacts from particle motion are likely to occur local to the source. Taking into consideration the locations of the MCZs relative to the piling locations and the extremely limited spatial nature of the effect, there are not anticipated to be any effects from underwater noise on native oyster and blue mussel, as features of the MCZs. The magnitude of impact that construction activities relating to Rampion 2 will have on native oyster and blue mussels is considered be **negligible** for mortality and potential mortal injury, recoverable injury, TTS and behavioural effects.

7.7.11 With respect to the above attributes the magnitude is **negligible** and the maximum sensitivity of the receptors is considered to be worst-case **medium**. Considering the short-term and intermittent nature of piling, and the localised impact ranges; the significance of effect is deemed **minor**, **Not Significant** in EIA terms. This is supported by Natural England's AOO (**Table 6-14**), which indicate that noise and vibration pressures are not relevant to either blue mussel beds or native oyster features of Beachy Head West MCZ and Bembridge MCZ.

7.7.12 The Proposed Development **will not hinder** the conservation objectives of the native oyster (*O. edulis*) and blue mussel (*M. edulis*) beds features of Beachy Head West MCZ and Bembridge MCZ (native oyster only).

7.8 Cumulative effects

7.8.1 The MCAA does not provide any explicit legislative requirement for cumulative effects on features of MCZs to be considered during the assessment process. However, the MMO guidelines (MMO, 2013) state that the MMO considers that in order for the MMO to fully discharge its duties under section 69 (1) of the MCAA, cumulative effects must be considered.

7.8.2 A cumulative effects assessment (CEA) examines the combined impacts of Rampion 2 in combination with other developments on the same single receptor or resource and the contribution of Rampion 2 to those impacts. The overall method followed in identifying and assessing potential cumulative effects in relation to the offshore environment is set out in **Chapter 5: Approach to the EIA, Volume 2** of the ES (Document Reference: 6.2.5)

7.8.3 A buffer of 16km from the boundary has been used to identify any projects that may have a cumulative effect on the MCZs. A buffer of 16km represents a maximum distance sediment will travel, as sediment plumes, from the construction, operation and maintenance, or decommissioning activity in one tidal excursion. For the impact of underwater noise, a larger area of search was used (100km), as noise is predicted to have a greater area of effect than the other effects identified.

7.8.4 A shortlist of 'other developments' that may interact with the Rampion 2 ZOIs during their construction, operation or decommissioning is presented in **Appendix 5.4: Cumulative effects assessment shortlisted developments, Volume 4** of the ES (Document Reference: 6.4.5.4) and on **Figure 5.4.1, Volume 4** of the ES (Document Reference: 6.4.5). This list has been generated applying criteria set out in **Chapter 5: Approach to the EIA, Volume 2** of the ES (Document Reference: 6.2.5) and has been collated up to the finalisation of the ES through desk study, consultation and engagement.

7.8.5 Only those 'other developments' in the short list that fall within the ZOI of 16km (and 100km for potential cumulative underwater noise impacts) have the potential to result in cumulative effects with the Proposed Development on MCZ designated features.

7.8.6 The following types of 'other development' have the potential to result in cumulative effects on MCZ designated features:

- sub-sea cables (telecommunication and power cables) and pipelines:

- aggregate production areas;
- disposal sites;
- tidal energy; and
- offshore wind farms.

7.8.7 On the basis of the above, the 'other developments' that are scoped into the MCZ assessment CEA are outlined in **Table 7-2**. It should be noted that developments which are proposed or under construction, at the time of writing this chapter, are included in the table below due to lack of certainty around any ongoing effect.

7.8.8 The cumulative Project Design Envelope is described in **Table 7-2**.

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Table 7-2 Developments considered as part of the MCZ assessment CEA

ID (Figure 5.4.1)	Development type	Development name	Application reference	Status	Confidence in assessment	Tier[20]	Distance to Rampion 2 (km)
W10	Offshore wind farm	Dieppe – Le Treport	Dieppe – Le Treport (France)	Under construction (2019 to 2023)	Medium – Third-party project details published in the public domain but not confirmed as being 'accurate'.	1	<50
W20	Offshore wind farm	Fécamp	Fécamp (France)	Under construction (2019 to 2023)	High – Third-party project details published in the public domain and confirmed as being 'accurate' by the developer.	1	<50
W48	Offshore wind farm	Rampion **1**	Rampion **1**	Operational[21]	High – Third-party project details published in the public domain and	1	0

[20] **Chapter 5: Approach to the EIA, Volume 2** of the ES (Document Reference: 6.2.5) sets out the full definitions of the tiers. Tier 1: high level of certainty or information availability (including under construction or where a planning application has been approved or is awaiting decision). Tier 2: medium level of certainty or information (such as developments on PINS Programme of Projects where a Scoping Report has been submitted). Tier 3: low level of certainty or information available (no planning applications submitted or identified for potential future development only).

[21] PINS Advice Note 17 states 'Where other projects are expected to be completed before construction of the proposed NSIP and the effects of those projects are fully determined, effects arising from them should be considered as part of the baseline and may be considered as part of both the construction and operational assessment.' Rampion 1, IFA-2 and CrossChannel Fibre are therefore included in the CEA because the full effects of the project offshore are considered to not yet be fully realised.

ID (Figure 5.4.1)	Development type	Development name	Application reference	Status	Confidence in assessment	Tier[20]	Distance to Rampion 2 (km)
					confirmed as being 'accurate' by the developer.		
T1	Tidal energy	Perpetuus Tidal Energy Centre (PTEC)	Perpetuus Tidal Energy Centre (PTEC)	Proposed (Offshore plans approved 2016, plan to be operational 2025 for 25 years)	Medium – Third-party project details published in the public domain but not confirmed as being 'accurate'	1	47.7
C1	Cable	AQUIND	AQUIND (UK to France)	Proposed (offshore installation date uncertain; assumed potential for overlap)[22]	High – Third-party project details published in the public domain and confirmed as being 'accurate' by the developer.	1	0
C2	Cable	IFA-2	Interconnexion France-	Operational	High – Third-party project details published in the public domain and	1	0.9

[22] The AQUIND interconnector is currently being redetermined by the Secretary of State of the Department of Energy Security and Net Zero.

ID (Figure 5.4.1)	Development type	Development name	Application reference	Status	Confidence in assessment	Tier[20]	Distance to Rampion 2 (km)
			Angleterre 2 – IFA-2 HVDC		confirmed as being 'accurate' by the developer.		
C3	Cable	CrossChannel Fibre	CrossChannel Fibre	Operational	Low, ES not available.	1	5
TC1	Telecommun-ication	ATLANTIC CROSSING 1	ATLANTIC CROSSING 1 Century Link	Active	Low, ES not available	1	14.6
A396/1	Aggregates	396/1 Inner Owers	396/1 Inner Owers – Tarmac Marine Ltd	Active (end date 07/07/2030)	High – Third-party project details published in the public domain and confirmed as being 'accurate' by the developer.	1	0.1
A396/2	Aggregates	396/2 Inner Owers	396/2 Inner Owers – Tarmac Marine Ltd	Active (end date 07/07/2030)	High – Third-party project details published in the public domain and confirmed as being 'accurate' by the developer.	1	2
A435/1	Aggregates	435/1 Inner Owers	435/1 Inner Owers – Hanson Aggregates Marine Ltd	Active (end date 07/07/2030)	High – Third-party project details published in the public domain and confirmed as being 'accurate' by the developer.	1	0.7

ID (Figure 5.4.1)	Development type	Development name	Application reference	Status	Confidence in assessment	Tier[20]	Distance to Rampion 2 (km)
A435/2	Aggregates	435/2 Inner Owers	435/2 Inner Owers – Hanson Aggregates Marine Ltd	Active (end date 07/07/2030)	High – Third-party project details published in the public domain and confirmed as being 'accurate' by the developer.	1	1.5
A453	Aggregates	453 Owers Extension	453 Owers Extension – CEMEX UK Marine Ltd.	Active (end date 31/03/2032)	High – Third-party project details published in the public domain and confirmed as being 'accurate' by the developer.	1	0.4
A488	Aggregates	488 Inner Owers North	488 Inner Owers North – Tarmac Marine Ltd.	Active (end date 07/07/2030)	High – Third-party project details published in the public domain and confirmed as being 'accurate' by the developer.	1	0.5
D1[23]	Burial at sea	Newhaven	Open disposal site - Newhaven	Open	High – Third-party project details published in the public domain and confirmed as being 'accurate' by the developer.	1	17

[23] Open disposal sites are those where activities are still ongoing, hence effects arising from them may still be ongoing. In line with PINS Advice Note 17, all such sites are included in the CEA as the effects are considered to not yet be fully realised.

ID (Figure 5.4.1)	Development type	Development name	Application reference	Status	Confidence in assessment	Tier[20]	Distance to Rampion 2 (km)
D2	Disposal for the existing Rampion 1 project	Rampion 1	Open disposal site - Rampion 1	Open	High – Third-party project details published in the public domain and confirmed as being 'accurate' by the developer.	1	0
D3	Maintenance dredging	Shoreham	Open disposal site - Shoreham	Open	High – Third-party project details published in the public domain and confirmed as being 'accurate' by the developer.	1	12.4
D4	Dredged material from Brighton Marina	Brighton/ Rottingdean	Open disposal site - Brighton/ Rottingdean	Open	High – Third-party project details published in the public domain and confirmed as being 'accurate' by the developer.	1	13.3
D6	Unknown waste type	AQUIND Cable Site A	Open disposal site - AQUIND Cable Site A	Open	High – Third-party project details published in the public domain and confirmed as being 'accurate' by the developer.	1	0

Table 7-3 Cumulative project design envelope for MCZs

Project phase and activity/impact	Scenario	Justification
Construction Phase		
Mortality, injury, behavioural changes and auditory masking arising from noise and vibration	Maximum design scenario as described for the construction of the Proposed Development assessed cumulatively with the following projects within the ZOI: Tier 1: 1) offshore wind farm under construction (Dieppe – Le Treport and Fécamp) 2) planned PTEC (construction phase) Tier 2: No other developments to consider. Tier 3: No other developments to consider.	Maximum potential for interactive effects from underwater noise associated with construction and offshore wind farm piling activities is considered within a representative 100km buffer of the Proposed Development array area. This buffer was chosen as underwater noise effects are expected to occur over a wider area (further detail is presented in **Chapter 8: Fish and shellfish ecology, Volume 2** of the ES (Document Reference: 6.2.8)
Cumulative temporary increase in SSC **and sediment deposition**	Maximum design scenario as described for the construction of the Proposed Development assessed cumulatively with the following projects within the ZOI: Tier 1: 1) operation and maintenance of operational cables (AQUIND) 2) active aggregates (operation and maintenance phase) Tier 2: No other developments to consider. Tier 3: No other developments to consider.	Maximum cumulative increases in SSC and smothering is calculated within a representative buffer of the Proposed Development to represent the maximum distance sediments may travel in one tidal excursion buffer distance (16km) (further detail is presented in **Chapter 9: Benthic, subtidal and intertidal ecology, Volume 2** of the ES (Document Reference: 6.2.9)).

Cumulative mortality, injury, behavioural changes and auditory masking arising from noise and vibration during construction

7.8.9 There is potential for mortality and potential mortal injury, recoverable injury, behavioural changes and auditory masking arising from noise and vibration as a result of construction activities associated with the Proposed Development and other projects (**Table 7-2**). For the impact of underwater noise, a larger search area was used (100 km), as noise is predicted to have a greater area of effect than the other effects identified.

7.8.10 The only Tier 1 projects identified within the 100km buffer that may be under construction at the same time as the Proposed Development, is PTEC (see **Table 7-2**). PTEC is aimed at the deployment of up to full scale single units and, in particular, small arrays of tidal devices. As PTEC is a tidal energy demonstration facility, to date no known tidal construction is detailed, however various tidal devices and array configurations have the potential to be deployed at PTEC over its 25-year life. As a result, the demonstration facility is also categorised as Tier 3 to take into consideration potential deployment of tidal testing infrastructure which may require drilling or piling activities. Both French offshore wind farm Dieppe – Le Treport and Fécamp will be operational by 2023 with no temporal overlap or piling or drilling activities with the Proposed Development. No other Tier 1 projects will have significant noise implications, so have not be included in this assessment (**Table 7-2**). No Tier 2 projects have been identified.

7.8.11 The greatest risk of cumulative impacts of underwater noise on MCZ designated features has been identified as being that produced by impact piling during the construction phase at other offshore wind farm sites in the wider underwater noise ZOI. Injury or mortality of fish from piling noise is not expected to occur cumulatively due to the small range within which potential injury effects will be expected (i.e. predicted to occur within tens of kilometres of piling activity within each of the offshore wind farm projects). Cumulative effects of underwater noise are therefore discussed in the context of behavioural effects, particularly on spawning or nursery habitats.

7.8.12 Due to the lack of temporal overlap (construction to be completed for both Dieppe – Le Treport and Fécamp by 2023), there is not considered to be a cumulative impact of these three projects on MCZ receptors. PTEC Tier 1 and Tier 3 related construction and associated underwater noise during installation may result in a cumulative impact with the Proposed Development construction phase. Particularly as PTEC is a demonstration facility and underwater noise may result from the drilling of foundations, and removal of infrastructure at repowering phases or on final decommissioning. However, as it is a demonstration facility the number of tidal turbines and type of turbines will vary, e.g. the use of mooring chains and anchors, gravity-based foundations (PTEC, 2014). Furthermore, these impacts will be highly localised, temporary in nature and unlikely to greatly exceed background underwater noise levels (PTEC, 2014). As evidenced by McCauley *et al*. (2000), it is expected that fish will resume normal behaviour and distribution well within this time period, and as such, significant effects are not expected to occur in terms of cumulative duration of exposure. The cumulative impact of underwater noise is predicted to be of regional spatial extent, short-term duration, intermittent and

reversible. The magnitude of the cumulative impact is therefore considered to be **negligible**.

7.8.13 Full discussion of the sensitivity of MCZ receptors to underwater noise is discussed throughout **Section 7**, with the maximum sensitivity of receptors assessed as **high**.

7.8.14 Considering the distance between projects, and the lack of temporal overlap, the cumulative effect from underwater noise will be of **minor adverse significance** (**Not Significant** in EIA terms). It is therefore concluded that there will be no significant cumulative impacts from these plans and projects.

Cumulative temporary increases in SSC and sediment deposition during construction

7.8.15 There is potential for cumulative increases in SSC and smothering as a result of construction activities associated with the Proposed Development and other developments (see **Table 7-2**). For the purposes of this assessment, this additive impact has been assessed within the ZOI, which extends 16km around the proposed DCO Order Limits, representing the maximum tidal excursion in the area, and therefore the furthest distance sediments can travel from the site. The projects identified in Tier 1 are the AQUIND interconnector cables and aggregate licence areas 395/1, 396/1, 396/2, 435/1, 435/2, 453 and 488. There are no Tier 2 or Tier 3 projects.

7.8.16 The AQUIND interconnector cable is located within the Proposed Development array area and it is assumed that construction will coincide with the construction of the Proposed Development. From kilometre point (KP) 21 to 109 the worst-case scenario for increased SSC is considered to be surface release of up to 1,754,000m^3 of sediment (AQUIND Limited, 2019a). Cumulatively with the Proposed Development construction this may result in the disturbance and deposition of up to 4,645,000m^3 of sediment. However, only a small portion of the AQUIND interconnector cable intersects with the proposed DCO Order Limits (9.34km of cable) with a total of 24.72km overlapping the secondary ZOI, and therefore, the maximum amount of sediment released cumulatively with the Proposed Development will be considerably less. Any cable maintenance repairs undertaken within the operational phase of the developments will be short term, intermittent and localised to the site and therefore cumulative impacts are expected to be minimal. Additionally, due to the naturally dynamic environment of the site, any sediment released from these operations during the construction and operational phases of the development will likely be dispersed in the faster flows. Therefore, taking this into consideration, there are not predicted to be any significant cumulative impacts from the construction or operation of the AQUIND interconnector cable.

7.8.17 Aggregate licence areas 395/1, 396/1, 396/2, 435/1, 435/2, 453 and 488 will be operational during the construction of the Proposed Development, therefore the potential for cumulative temporary increases in SSC and sediment deposition from these active dredge operations. A small number of active aggregate dredging license areas, see **Table 7-2**, are sufficiently close to Rampion 2 (within one tidal excursion distance) that an overlapping plume effect is at all likely. The target material at these marine aggregate areas is sands and gravels and

characteristically, the aggregate deposits in the MAREA region contain 1 to 3% mud (silt and clay) *in situ* and therefore the SSCs in the overflow from dredging vessels are relatively low compared to other regions of the UK (EMU Limited, 2012). As part of the Rampion 1 offshore wind farm ES changes to seabed sediment thickness as a result of combined foundation installation and aggregate extraction works were modelled as part of the impact assessment (ABPmer, 2012). The modelling predicted that bed level changes of up to around 1mm could occur; however, it was expected that this sediment will be widely remobilised. The addition of 1mm of sediment is not anticipated to cause any significant impacts to fish or shellfish associated with the proposed DCO Order Limits. Furthermore, EMU Limited (2012) reported that there was no evidence of black seabream nests being impacted by nearby aggregate extraction work. ABPmer (2012) also considered that there was only a minimal potential for any interaction between suspended sediment from export cable installation and aggregate extraction. Similar observations are anticipated for the Proposed Development.

7.8.18 The aggregate dredging sites are located immediately to the north of the array area and immediately to the east of the offshore export cable corridor. The interaction between plumes created by aggregate dredging and activities in the array area are very unlikely, although, some overlap of plumes might occur in relation to export cable burial in the offshore end of the export cable corridor only, however, as assessed in **Chapter 6: Coastal processes, Volume 2** of the ES (Document Reference: 6.2.6) the extent and duration of sediment plumes from cable burial are very limited. Overall, it is therefore considered that there will be limited scope for cumulative impacts to fish and shellfish from seabed disturbance.

7.8.19 Cumulative effects can also be considered in terms of duration of exposure from multiple projects which do not overlap but happen consecutively. However, as the effects from the majority of the projects will be short-lived, there are likely to be significant temporal gaps between the discrete construction and maintenance events, which will have localised effects. Moreover, as detailed in **Chapter 6: Coastal processes, Volume 2** of the ES (Document Reference: 6.2.6) it can be confirmed that there is sufficient distance between the array area and the aggregate sites that any increase in bed level will be immeasurable in practice. As aggregate activities are not considered to cause a significant cumulative increase to SSC and deposition and as a result of the 'not sensitive' to 'high' sensitivity of MCZ receptors in the ZOI, cumulative effects in terms of duration of exposure are not expected.

7.8.20 The cumulative impacts of increased SSC and sediment deposition is considered to be **minor**, indicating that the potential is for localised disturbance that does not threaten the long-term viability of the resource.

7.8.21 Full discussion of the sensitivity of MCZ receptors to increased SSC and sediment deposition is discussed throughout **Section 7**. The maximum sensitivity of receptors throughout **Section 7** is assessed as **high**, with a **minor** magnitude of impact. Taking into consideration the localised, short-term nature of the SSCs and deposition rates and the tolerance and recoverability of MCZ receptors, the significance of the residual effect is deemed **minor adverse significance** (**Not Significant** in EIA terms).

7.9 Inter-related effects

7.9.1 The inter-related effects assessment considers likely significant effects from multiple impacts and activities from the construction, operation and maintenance and decommissioning phases of Rampion 2 on the same receptor, or group of receptors.

7.9.2 Inter-related effects could potentially arise in one of two ways. The first type of inter-related effect is a Proposed Development lifetime effect, where multiple phases of the Proposed Development interact to create a potentially more significant effect on a receptor than in one phase alone. The phases for Rampion 2 are construction, operation and maintenance, and decommissioning. All Proposed Development lifetime effects are assessed in **Chapter 30: Inter-related effects, Volume 2** of the ES (Document Reference: 6.2.30)

7.9.3 The second type of inter-related effect is receptor-led effects. Receptor-led effects are where effects from different environmental aspects combine spatially and temporally on a receptor. These effects may be short-term, temporary, transient or longer-term.

7.9.4 Receptor-led effects have been considered, where relevant, in this chapter for potential interactions between fish and shellfish ecology and the following environmental aspects:

- **Chapter 6: Coastal processes, Volume 2** of the ES (Document Reference: 6.2.6);
- **Chapter 8: Fish and shellfish ecology, Volume 2** of the ES (Document Reference: 6.2.8) and
- **Chapter 9: Benthic, subtidal and intertidal ecology, Volume 2** of the ES (Document Reference: 6.2.9).

7.9.5 Full results of the receptor-led effects assessment can be found in **Chapter 30: Inter-related effects, Volume 2** of the ES (Document Reference: 6.2.30) the conclusions of which reveal that there are no significant inter-related effects.

8. Conclusions

8.1.1 MCZs that have the potential to be affected by the Proposed Development have been identified. A screening exercise was carried out to:

i. identify impacts that will not have a direct overlap with any of the MCZs and screen those out;

ii. review relevant sections of **Chapter 30: Inter-related effects, Volume 2** of the ES (Document Reference: 6.2.30) and **Chapter 9: Benthic, subtidal and intertidal ecology, Volume 2** of the ES (Document Reference: 6.2.9) and identify impacts that have been assigned a 'negligible' magnitude in the EIA assessment and screen those out on the basis of "insignificance"; and

iii. screen the full list of designated features of each MCZ and identify those that have the potential to be affected by those impacts that were screened in.

8.1.2 Five impacts were screened in for Stage 1 assessment:

- mortality, injury, behavioural changes and auditory masking arising from noise and vibration (fish and shellfish features during construction);
- temporary localised increases in suspended sediment concentrations (SSC) and sediment deposition (during construction);
- increased risk of introduction or spread of Marine INNS (due to presence of infrastructure and vessel movements during operation);
- mortality, injury, behavioural changes and auditory masking arising from noise and vibration (fish and shellfish features during decommissioning); and
- temporary increase in SSC and sediment deposition from removal of foundations, cables and rock protection (during decommissioning).

8.1.3 For the purposes of this MCZ assessment, decommissioning impacts were assessed together with construction impacts.

8.1.4 Based on Stage 1 assessment of relevant features it can be concluded that there is no significant risk of the Proposed Development hindering the achievement of the conservation objectives stated for the following MCZs:

- Kingmere MCZ;
- Offshore Overfalls MCZ;
- Beachy Head West MCZ;
- Beachy Head East MCZ;
- Selsey Bill and the Hounds MCZ;
- Bembridge MCZ; and
- Pagham Harbour MCZ.

8.1.5 A summary of impacts on MCZ features and stage 1 assessment is presented in **Table 8-1.**

Table 8-1 Summary of impacts on MCZ features and stage 1 assessment

Activity and Impact	Designated feature	Magnitude of impact	Receptor and sensitivity	Embedded environmental measures & mitigation	Summary of Stage 1 Assessment
Kingmere MCZ					
Mortality, injury, behavioural changes and auditory masking arising from noise and vibration during construction	Black seabream	Mortality and potential mortal injury: **Negligible** Recoverable injury: **Negligible** TTS: **Negligible** Behavioural effects: **Negligible**	**Medium**	C-52, C-265, C-274, C-280, C-281	**Not Significant** with implementation of embedded environmental measures and **will not hinder** MCZ objectives.
Temporary localised increases in SSC and sediment deposition during construction	Black seabream	**Negligible**	**High**	C-269, C-270, C-271, C-272, C-273	**Not Significant** with implementation of embedded environmental measures and **will not hinder** MCZ objectives.
	Infralittoral rock and thin mixed sediment	**Minor**	**Medium**	This precautionary scenario presents impacts of heavy smothering to the features of the	**Not Significant** due to precautionary nature of assessment and
	Subtidal chalk	**Minor**	**Medium**		

Activity and Impact	Designated feature	Magnitude of impact	Receptor and sensitivity	Embedded environmental measures & mitigation	Summary of Stage 1 Assessment
				Kingmere MCZ. This is not anticipated due to the distance (this would assume construction work are undertaken on the proposed DCO Order Limits), therefore the assessment is considered not significant (rather than potentially significant)	**will not hinder** MCZ objectives.
Increased risk of introduction or spread of Marine INNS during O&M	Infralittoral rock and thin mixed sediment	**Negligible**	**Medium**	C-95	**Not Significant** and **will not hinder** MCZ objectives
	Subtidal chalk	**Negligible**	**Medium**	C-95	**Not Significant** and **will not hinder** MCZ objectives
	Black seabream	**Negligible**	**High**	C-95	**Not Significant** and **will not hinder** MCZ objectives

Activity and Impact	Designated feature	Magnitude of impact	Receptor and sensitivity	Embedded environmental measures & mitigation	Summary of Stage 1 Assessment
Offshore Overfalls MCZ					
Temporary localised increases in SSC and sediment deposition during construction	Subtidal coarse sediment	**Minor**	**Low**	N/A	**Not Significant** and **will not hinder** MCZ objectives
	Subtidal mixed sediments	**Minor**	**Low**	N/A	**Not Significant** and **will not hinder** MCZ objectives
	Subtidal sand	**Minor**	**Low**	N/A	**Not Significant** and **will not hinder** MCZ objectives
Increased risk of introduction or spread of Marine INNS during O&M	Subtidal coarse sediment	**Negligible**	**High**	C-95	**Not Significant** and **will not hinder** MCZ objectives
	Subtidal mixed sediments	**Negligible**	**High**	C-95	**Not Significant** and **will not hinder** MCZ objectives
	Subtidal sand	**Negligible**	**High**	C-95	**Not Significant** and **will not hinder** MCZ objectives

Activity and Impact	Designated feature	Magnitude of impact	Receptor and sensitivity	Embedded environmental measures & mitigation	Summary of Stage 1 Assessment
Selsey Bill and the Hounds MCZ					
Mortality, injury, behavioural changes and auditory masking arising from noise and vibration during construction	Short-snouted seahorse	Mortality and potential mortal injury: **Negligible** Recoverable injury: **Negligible** TTS: **Negligible** Behavioural effects: **Negligible**	**High**	C-52, C-265	**Not Significant** with implementation of embedded environmental measures and **will not hinder** MCZ objectives
Temporary localised increases in SSC and sediment deposition during construction	Short-snouted seahorse	**Negligible**	**Medium**	N/A	**Not Significant** and **will not hinder** MCZ objectives
	High energy infralittoral rock	**Negligible**	**Medium**	N/A	**Not Significant** and **will not hinder** MCZ objectives
	low energy infralittoral rock	**Negligible**	**Medium**	N/A	**Not Significant** and **will not hinder** MCZ objectives
	moderate energy circalittoral rock	**Negligible**	**Medium**	N/A	**Not Significant** and **will not hinder** MCZ objectives

Activity and Impact	Designated feature	Magnitude of impact	Receptor and sensitivity	Embedded environmental measures & mitigation	Summary of Stage 1 Assessment
	moderate energy infralittoral rock	**Negligible**	**Medium**	N/A	**Not Significant** and **will not hinder** MCZ objectives
	peat and clay exposures	**Negligible**	**Medium**	N/A	**Not Significant** and **will not hinder** MCZ objectives
	subtidal mixed sediments	**Negligible**	**Medium**	N/A	**Not Significant** and **will not hinder** MCZ objectives
	subtidal sand	**Negligible**	**Medium**	N/A	**Not Significant** and **will not hinder** MCZ objectives
Increased risk of introduction or spread of Marine INNS during O&M	Short-snouted seahorse	**Negligible**	**Medium**	C-95	**Not Significant** and **will not hinder** MCZ objectives
	High energy infralittoral rock	**Negligible**	**High**	C-95	**Not Significant** and **will not hinder** MCZ objectives
	low energy infralittoral rock	**Negligible**	**High**	C-95	**Not Significant** and **will not hinder** MCZ objectives

Activity and Impact	Designated feature	Magnitude of impact	Receptor and sensitivity	Embedded environmental measures & mitigation	Summary of Stage 1 Assessment
	moderate energy circalittoral rock	**Negligible**	**High**	C-95	**Not Significant** and **will not hinder** MCZ objectives
	moderate energy infralittoral rock	**Negligible**	**High**	C-95	**Not Significant** and **will not hinder** MCZ objectives
	peat and clay exposures	**Negligible**	**High**	C-95	**Not Significant** and **will not hinder** MCZ objectives
	subtidal mixed sediments	**Negligible**	**High**	C-95	**Not Significant** and **will not hinder** MCZ objectives
	subtidal sand	**Negligible**	**High**	C-95	**Not Significant** and **will not hinder** MCZ objectives
Beachy Head West MCZ					
Mortality, injury, behavioural changes and auditory masking arising from noise and vibration during construction	Short-snouted seahorse	Mortality and potential mortal injury: **Negligible** Recoverable injury: **Negligible** TTS: **Negligible**	**High**	C-52, C-265	**Not Significant** with implementation of embedded environmental measures and **will**

Activity and Impact	Designated feature	Magnitude of impact	Receptor and sensitivity	Embedded environmental measures & mitigation	Summary of Stage 1 Assessment
		Behavioural effects: **Negligible** (breeding seahorse only)			**not hinder** MCZ objectives.
	Native oyster	**Negligible**	**Medium**	C-52, C-265	**Not Significant** and **will not hinder** MCZ objectives
	Blue mussel beds	**Negligible**	**Medium**	C-52, C-265	**Not Significant** and **will not hinder** MCZ objectives
Beachy Head East MCZ					
Mortality, injury, behavioural changes and auditory masking arising from noise and vibration during construction	Short-snouted seahorse	Mortality and potential mortal injury: **Negligible** Recoverable injury: **Negligible** TTS: **Negligible** Behavioural effects: **Negligible** (breeding seahorse only)	**High**	C-52, C-265	**Not Significant** with implementation of embedded environmental measures and **will not hinder** MCZ objectives
Bembridge MCZ					

Activity and Impact	Designated feature	Magnitude of impact	Receptor and sensitivity	Embedded environmental measures & mitigation	Summary of Stage 1 Assessment
Mortality, injury, behavioural changes and auditory masking arising from noise and vibration during construction	Short-snouted seahorse	Mortality and potential mortal injury: **Negligible** Recoverable injury: **Negligible** TTS: **Negligible** Behavioural effects: **Negligible** (breeding seahorse)	**High**	C-52, C-265	**Not Significant** with implementation of embedded environmental measures and **will not hinder** MCZ objectives.
	Native oyster	**Negligible**	**Medium**	C-52, C-265	**Not Significant** and **will not hinder** MCZ objectives
Pagham Harbour MCZ					
Mortality, injury, behavioural changes and auditory masking arising from noise and vibration during construction	Lagoon sand shrimp	**Negligible**	**Medium**	C-52, C-265	**Not Significant** and **will not hinder** MCZ objectives
Temporary localised increases in SSC and sediment deposition during construction	Defolin's lagoon snail	**Negligible**	**High**	N/A	**Not Significant** and **will not hinder** MCZ objectives
	Lagoon sand shrimp	**Negligible**	**Medium**	N/A	**Not Significant** and **will not hinder** MCZ objectives

Activity and Impact	Designated feature	Magnitude of impact	Receptor and sensitivity	Embedded environmental measures & mitigation	Summary of Stage 1 Assessment
	Seagrass beds	**Negligible**	**High**	N/A	**Not Significant** and **will not hinder** MCZ objectives
Increased risk of introduction or spread of Marine INNS during O&M	Seagrass beds	**Negligible**	**High**	C-95	**Not Significant** and **will not hinder** MCZ objectives hinder MCZ objectives
	Defolin's lagoon snail	**Negligible**	**High**	C-95	**Not Significant** and **will not hinder** MCZ objectives hinder MCZ objectives
	Lagoon sand shrimp	**Negligible**	**High**	C-95	**Not Significant** and **will not hinder** MCZ objectives hinder MCZ objectives

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9. Glossary of terms and abbreviations

Table 9-1 Glossary of terms and abbreviations

Term (acronym)	Definition
AOO	Advice on Operations
Aspect	Used to refer to the individual environmental topics.
BAP	Biodiversity Action Plan
Baseline	Refers to existing conditions as represented by latest available survey and other data which is used as a benchmark for making comparisons to assess the impact of development.
Benthic ecology	Benthic ecology encompasses the study of the organisms living in and on the sea floor, the interactions between them and impacts on the surrounding environment.
BGS	British Geological Survey
Coastal processes	The processes that interact to control the physical characteristics of a natural environment, for example: winds, waves, currents, water levels, sediment transport, turbidity, coastline, beach and seabed morphology.
cm	Centimetre
Compensation	Loss of value is remedied or offset by a corresponding compensatory action on the same site or elsewhere, determined through the process of Environmental Impact Assessment.
Crustacea	Arthropod of the large, mainly aquatic group Crustacea, such as a crab, lobster, shrimp, or barnacle.
dB	Decibel
Decommissioning	The period during which a development and its associated processes are removed from active operation.
Development Consent Order (DCO)	This is the means of obtaining permission for developments categorised as Nationally Significant Infrastructure Projects, under the Planning Act 2008.
Development Consent Order (DCO) Application	An application for consent to undertake a Nationally Significant Infrastructure Project made to the Planning Inspectorate who will consider the application and make a

Term (acronym)	Definition
	recommendation to the Secretary of State, who will decide on whether development consent should be granted for the Proposed Development.
Drop Down Video (DDV)	A survey method in which imagery of habitat is collected, used predominantly to survey marine environment.
Electromagnetic field (EMF)	An electromagnetic field is an electric and magnetic force field that surrounds a moving electric charge.
Embedded environmental measures	Equate to 'primary environmental measures' as defined by Institute of Environmental Management and Assessment (2016). They are measures to avoid or reduce environmental effects that are directly incorporated into the preferred masterplan for the Proposed Development.
Environmental Impact Assessment (EIA)	The process of evaluating the likely significant environmental effects of a proposed project or development over and above the existing circumstances (or 'baseline').
Environmental Statement (ES)	The written output presenting the full findings of the Environmental Impact Assessment.
Expert Topic Groups (ETGs)	Expert groups established as part of the Evidence Plan Process to discuss and agree the evidence and assessment requirements for each EIA and HRA topic area identified.
European site	European sites are those that are designated through the Habitats Directive and Birds Directive (via national legislation as appropriate). Within England additional sites designated through international convention are given the same protection through policy – overall all of these are referred to as European sites. European sites in England are considered to be SPAs, SACs, candidate SACs and Sites of Community Importance (SCI). Potential SPAs (pSPA), possible SACs (pSACs), Ramsar sites (designated under international convention) and proposed Ramsar sites.
Evidence Plan Process (EPP)	A voluntary consultation process with specialists' stakeholders to agree the approach, the information to support, the EIA and HRA for certain aspects.
Geophysical	Relating to the physical properties of the earth.
HDD	Horizontal Directional Drilling
Hz	Hertz
Impact	The changes resulting from an action.

Term (acronym)	Definition
Indirect effects	Effects that result indirectly from the Proposed Development as a consequence of the direct effects, often occurring away from the site, or as a result of a sequence of interrelationships or a complex pathway. They may be separated by distance or in time from the source of the effects. Often used to describe effects on landscape character that are not directly impacted by the Proposed Development such as effects on perceptual characteristics and qualities of the landscape.
INNS	Invasive Non-Native Species
Inshore	The sea up to two miles from the coast.
Intertidal	The area of the shoreline which is covered at high tide and uncovered at low tide.
Joint Nature Conservation Committee (JNCC)	JNCC is the public body that advises the UK Government and devolved administrations on UK-wide and international nature conservation.
kHz	Kilohertz
kJ	Kilojoules
km	Kilometre
km^2	Squared Kilometre
Level of effect	Determined through the combination of sensitivity of the receptor and the proposed magnitude of change brought about by the development.
LWS	Local Wildlife Sites
m	Metre
Magnitude (of change)	A term that combines judgements about the size and scale of the effect, the extent of the area over which it occurs, whether it is reversible or irreversible and whether it is short term or long term in duration'. Also known as the 'degree' or 'nature' of change.
Marine aggregate	Marine dredged sand and/or gravel.
MCAA	The Marine and Coastal Access Act (2009)
Marine Conservation Zone (MCZ)	Marine Conservation Zone (MCZ) is a type of marine nature reserve in UK waters. They were established under the

Term (acronym)	Definition
	Marine and Coastal Access Act (2009) and are areas designated with the aim to protect nationally important, rare or threatened habitats and species.
Marine Management Organisation (MMO)	MMO is an executive non-departmental public body, sponsored by the Department for Environment, Food & Rural Affairs. MMO license, regulate and plan marine activities in the seas around England so that they're carried out in a sustainable way.
MCAA	Marine and Coastal Access Act 2009
MEEB	Measures of Equivalent Environmental Benefit
MarESA	Marine Evidence-based Sensitivity Assessments
MHWS	Mean High Water Spring
mm	Millimetres
ms^{-1}	Meters per Second
Natural England	The government advisor for the natural environment in England. NE is the Statutory Nature Conservation Body (SNCB) for England.
Nursery habitat	Habitats where high numbers of juveniles of a species occur, having a greater level of productivity per unit area than other juvenile habitats.
OEL	Ocean Ecology Limited
Offshore	The sea further than two miles from the coast.
Offshore Wind Farm	An offshore wind farm is a group of wind turbines in the same location (offshore) in the sea which are used to produce electricity.
Onshore	Landward of Mean High Water Spring (MHWS)
PEMP	Project Environment Management Plan
Planning Inspectorate	The Planning Inspectorate deals with planning appeals, national infrastructure planning applications, examinations of local plans and other planning-related and specialist casework in England and Wales.
Preliminary Environmental	The written output of the Environmental Impact Assessment undertaken to date for the Proposed Development. It is developed to support formal consultation and presents the

Term (acronym)	Definition
Information Report (PEIR)	preliminary findings of the assessment to allow an informed view to be developed of the Proposed Development, the assessment approach that has been undertaken, and the preliminary conclusions on the likely significant effects of the Proposed Development and environmental measures proposed.
Proposed Development	The development that is subject to the application for development consent, as described in **Chapter 4: The Proposed Development, Volume 2** (Document Reference: 6.2.4) of the ES.
PTEC	Perpetuus Tidal Energy Centre
Rampion 1	The existing Rampion Offshore Wind Farm located in the English Channel in the south of England.
Receptor	These are as defined in Regulation 5(2) of The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 and include population and human health, biodiversity, land, soil, water, air, climate, material assets, cultural heritage and landscape that may be at risk from exposure to pollutants (or other impacts) which could potentially arise as a result of the Proposed Development.
Recoverable injury	Recoverable injury is a survivable injury with full recovery occurring after exposure.
RED	Rampion Extension Development Limited
rms	Root Mean Square
SACO	Supplementary Advice on Conservation Objectives
Scoping Opinion	A Scoping Opinion is adopted by the Secretary of State for a Proposed Development.
Scoping Report	A report that presents the findings of an initial stage in the Environmental Impact Assessment process.
Scour	A localised sediment erosion feature caused by local enhancement of flow speed and turbulence due to interaction with an obstacle.
Secretary of State	The Minister for Department for Energy Security and Net Zero (DESNZ).
Sediment deposition	Settlement of sediment in suspension back to the seabed, causing a localised accumulation.

Term (acronym)	Definition
Sediment transport	The movement of sediment by natural processes, as individual grains or as a collective volume.
SEL	Sound Exposure Level
Significance	A measure of the importance of the environmental effect, defined by criteria specific to the environmental aspect.
Significant effects	It is a requirement of the EIA Regulations to determine the likely significant effects of the development on the environment which should relate to the level of an effect and the type of effect. Where possible significant effects should be mitigated. The significance of an effect gives an indication as to the degree of importance (based on the magnitude of the effect and the sensitivity of the receptor) that should be attached to the impact described. Whether or not an effect should be considered significant is not absolute and requires the application of professional judgement. Significant – 'noteworthy, of considerable amount or effect or importance, not insignificant or negligible'. The Concise Oxford Dictionary.
SNCB	Statutory Nature Conservation Body
Spatial Scope	Spatial scope is the area over which changes to the environment are predicted to occur as a consequence of a Proposed Development.
Spawning	The release or deposition of eggs and sperm, usually into water, by aquatic animals.
Special Area of Conservation (SAC)	International designation implemented under the Habitats Regulations for the protection of habitats and (non-bird) species. Sites designated to protect habitats and species on Annexes I and II of the Habitats Directive. Sufficient habitat to maintain favourable conservation status of the particular feature in each member state needs to be identified and designated.
SPL	Sound Pressure Level
SPM	Suspended Particulate Matter
Stakeholder	Person or organisation with a specific interest (commercial, professional or personal) in a particular issue.

Term (acronym)	Definition
Study area	Area where potential impacts from the Proposed Development could occur, as defined for each aspect.
Subtidal	The region of shallow waters which are below the level of low tide.
Susceptibility	The ability of a defined landscape or visual receptor to accommodate the specific Proposed Development without undue negative consequences.
Suspended sediment concentration (SSC)	The mass concentration (mass/volume) of sediment in suspension.
Temporal Scope	The temporal scope covers the time period over which changes to the environment and the resultant effects are predicted to occur and are typically defined as either being temporary or permanent.
Temporary Threshold Shift (TTS)	A temporary reduction in an animals sensitivity to sound.
The Applicant	Rampion Extension Development Limited (RED)
Tidal excursion buffer	The greatest distance and direction that water carrying an impact might be carried during one mean spring tide, from a given location or area.
TWT	The Wildlife Trust
UK	United Kingdom
µPa	Micro Pascal
Water Framework Directive (WFD)	A substantial piece of EU water legislation that came into force in 2000, with the overarching objective to get all water bodies in Europe to attain Good or High Ecological Status. River Basin Management Plans have been created which set out measures and potential mitigation to ensure that water bodies in England and Wales achieve 'Good Ecological Status'.
WTG	Wind Turbine Generator
Zone of Influence (ZOI)	The area surrounding the Proposed Development which could result in likely significant effects.

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10. References

ABPmer. (2012). *Rampion 1 Offshore Wind Farm: Coastal Processes Assessment*, Report No R.1945

Anderson, P.A., Berzins, I.K., Fogarty, F., Hamlin, H.J. and Guillette, L.J. (2011). Sound, stress, and seahorses: the consequences of a noisy environment to animal health. *Aquaculture*, 311(1), pp. 129–138.

Collett A G, Mason T I, Cheesman S and Bird H. (2012). *Measurement and assessment of underwater noise during impact piling operations of the Met Mast Foundation at Rampion wind farm*. Subacoustech report E356R0204.

Degraer, S., Carey, D.A., Coolen, J.W.P., Hutchison, Z.L., Kerckhof, F., Rumes, B. and Vanaverbeke, J. (2020). Offshore Wind Farm Artificial Reefs Affect Ecosystem Structure and Functioning: A Synthesis. *Oceanography,* 33(4), pp.48 – 57.

Department for Environment, Food and Rural Affairs (Defra), (2019). *Beachy Head East Marine Conservation Zone Factsheet.* Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/914351/mcz-beachy-head-east-2019.pdf [Accessed 5 April 2021].

Department for Environment, Food and Rural Affairs (Defra), (2019). *Bembridge Marine Conservation Zone Factsheet.* Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/915592/mcz-bembridge-2019.pdf [Accessed 5 April 2021].

Department for Environment, Food and Rural Affairs (Defra), (2019). *Selsey Bill and the Hounds Marine Conservation Zone Factsheet.* Available at; https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/915676/mcz-selsey-bill-2019.pdf [Accessed 5 April 2021].

Department for Environment, Food and Rural Affairs (Defra), (2016). *Utopia Marine Conservation Zone Factsheet.* Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/492467/mcz-utopia-factsheet.pdf [Accessed 5 April 2021].

EMU Limited. (2012). South Coast Marine Aggregate Regional Environmental Assessment, Volume 1 and 2. Report for the South Coast Dredging Association.

Hooper, T. and Austen, M. (2014). The co-location of offshore windfarms and decapod fisheries in the UK: Constraints and opportunities. *Marine Policy*, 43, pp.295–300.

Joint Nature Conservation Committee (JNCC), (2018). *Offshore Brighton Marine Protected Area*. Available at: https://jncc.gov.uk/our-work/offshore-brighton-mpa/ [Accessed 15 April 2021].

Joint Nature Conservation Committee (JNCC), (2017). *Offshore Overfalls Marine Conservation Zone. Conservation Advice*. Available at: https://jncc.gov.uk/our-work/offshore-overfalls-mpa/#conservation-advice [Accessed 15 April 2021].

Kastelein, R.A., Jennings, N., Kommeren, A., Helder-Hoek, L. and Schop, J. (2017). *Acoustic dose-behavioural response relationship in sea bass (Dicentrarchus labrax)*

exposed to playbacks of pile driving sounds. Marine environmental research, 130, pp.315-324.

Marine Management Organisation (MMO), (2013). *Marine conservation zones and marine licensing.* Available at: https://www.gov.uk/government/publications/marine-conservation-zones-mczs-and-marine-licensing [Accessed 10 June 2021].

Natural England (2022). *Natural England Conservation Advice for Marine Protected Areas. Beachy Head East MCZ*. Available at: Marine site detail (naturalengland.org.uk) [Accessed 23 September 2022].

Natural England (2021). *Natural England Conservation Advice for Marine Protected Areas. Beachy Head West MCZ*. Available at: https://designatedsites.naturalengland.org.uk/Marine/MarineSiteDetail.aspx?SiteCode=UKMCZ0002&SiteName=beachy%20head&SiteNameDisplay=Beachy%20Head%20West%20MCZ&countyCode=&responsiblePerson=&SeaArea=&IFCAArea=&NumMarineSeasonality=&HasCA=1 [Accessed 20 May 2021].

Natural England (2022). *Natural England Conservation Advice for Marine Protected Areas. Bembridge MCZ*. Available at: Marine site detail (naturalengland.org.uk) [Accessed 23 September 2022].

Natural England (2021). *Natural England Conservation Advice for Marine Protected Areas. Kingmere MCZ*. Available at: https://designatedsites.naturalengland.org.uk/Marine/MarineSiteDetail.aspx?SiteCode=UKMCZ0009&SiteName=kingmere&SiteNameDisplay=Kingmere%20MCZ&countyCode=&responsiblePerson=&SeaArea=&IFCAArea=&NumMarineSeasonality=1&HasCA=1 [Accessed 20 May 2021].

Natural England (2021). *Natural England Conservation Advice for Marine Protected Areas. Pagham Harbour MCZ*. Available at: https://designatedsites.naturalengland.org.uk/Marine/MarineSiteDetail.aspx?SiteCode=UKMCZ0013&SiteName=pagham&SiteNameDisplay=Pagham%20Harbour%20MCZ&countyCode=&responsiblePerson=&SeaArea=&IFCAArea=&NumMarineSeasonality=&HasCA=1 [Accessed 20 May 2021].

Natural England (2022). *Natural England Conservation Advice for Marine Protected Areas. Selsey Bill and the Hounds MCZ*. Available at: Marine site detail (naturalengland.org.uk) [Accessed 23 September 2022].

Popper, A.N., Hawkins, A.D., Fay, R.R., Mann, D.A., Bartol, S., Carlson, T.J., Coombs, S., Ellison, W.T., Gentry, R.L., Halvorsen, M.B., Løkkeborg, S., Rogers, P.H., Southall, B.L., Zeddies, D.G. and Tavolga, W.N. (2014). S*ound exposure guidelines for Fishes and Sea Turtles. Springer Briefs in Oceanography.*

Radford, A.N., Lebre, L., Lecaillon, G., Nedelec, S.L., and Simpson, S.D. (2016). *Repeated exposure reduces the response to impulsive noise in European seabass*. Global Change Biology, 22, pp. 3349–3360.

Rampion Extension Development Ltd (RED) (2022). *Rampion 2: Underwater Noise Study for Sea Bream Disturbance*. Dated August 2022. 12pp.

The Planning Inspectorate. (2020). Scoping Opinion: Proposed Rampion 2 Offshore Wind Farm. Case Reference EN010117. Available at: https://infrastructure.planninginspectorate.gov.uk/wp-

content/ipc/uploads/projects/EN010117/EN010117-000045-EN010117%20Scoping%20Opinion.pdf [Accessed 10 March 2021].

Tillin, H.M. and Hill, J.M. (2016). *Piddocks with a sparse associated fauna in sublittoral very soft chalk or clay. In Tyler-Walters H. and Hiscock K. (eds) Marine Life Information Network: Biology and Sensitivity Key Information Reviews. Plymouth: Marine Biological Association of the United Kingdom.* [online] Available at: httpxs://www.marlin.ac.uk/habitats/detail/152/piddocks_with_a_sparse_associated_fauna_in_sublittoral_very_soft_chalk_or_clay [Accessed: 9 February 2022].

Radford, A.N., Lèbre, L., Lecaillon, G., Nedelec, S.L. and Simpson, S.D. (2016). Repeated exposure reduces the response to impulsive noise in European seabass. Global Change Biology, 22(10), pp. 3349–3360.

Seasearch (2012). Seasearch Site Surveys 2012. *Selsey Bill and the Hounds recommended MCZ Mixon Hole recommended Reference Area*. Available at: http://www.seasearch.org.uk/downloads/SelseyandHoundsSurveyReport.pdf [Accessed 15 April 2021].

Smaal, A.C., Kamermans, P., Van der Have, T.M., Engelsma, M.Y. and Sas, H. (2015). *Feasibility of Flat Oyster (Ostrea edulis L.) restoration in the Dutch part of the North Sea (No. C028/15).* IMARES.

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