BERWICK BANK WIND FARM

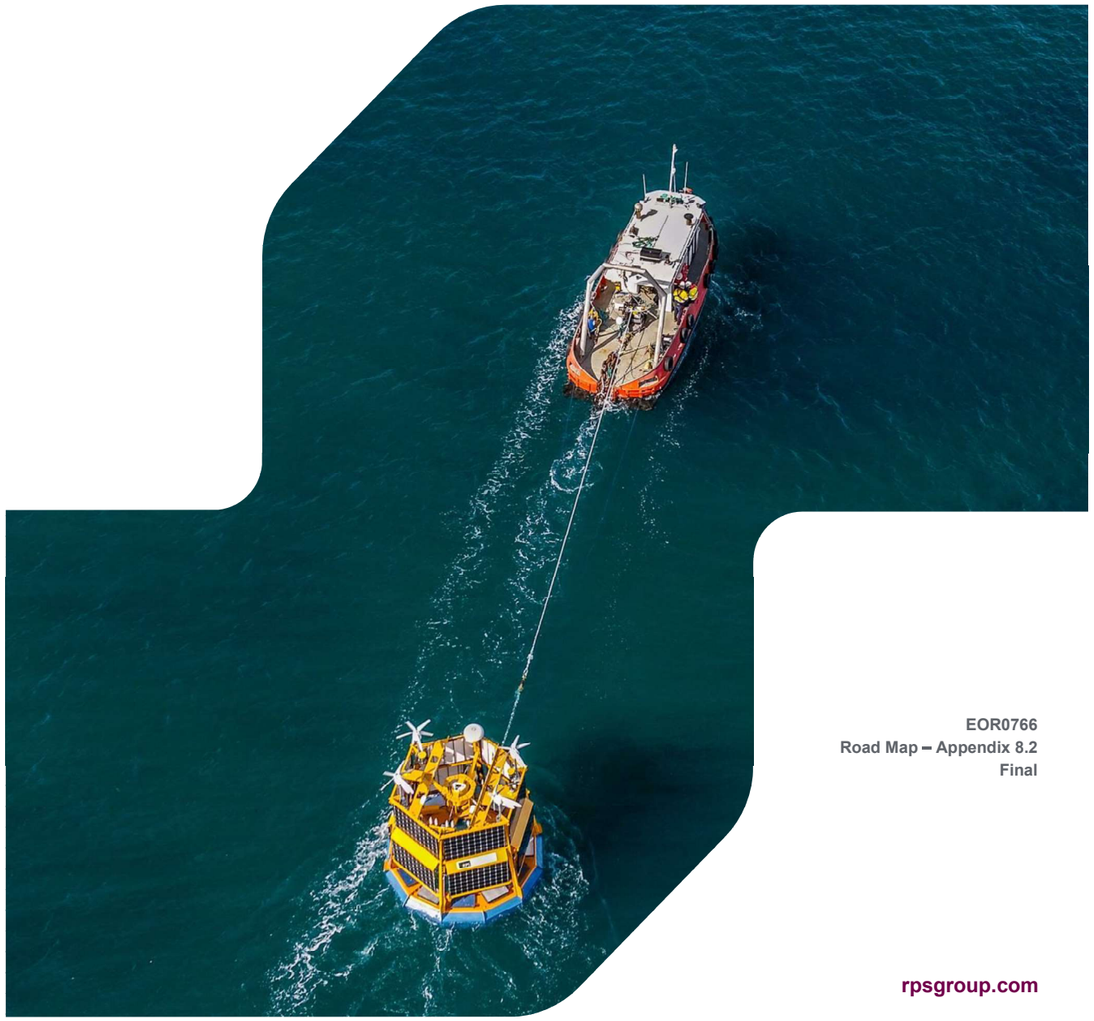
OFFSHORE ENVIRONMENTAL IMPACT ASSESSMENT

APPENDIX 8.2: BENTHIC ECOLOGY, FISH AND SHELLFISH ECOLOGY AND PHYSICAL PROCESSES ROAD MAP

EOR0766
Environmental Impact Assessment – Appendix 8.2
FINAL

BERWICK BANK WIND FARM ROAD MAP

Benthic Ecology, Fish and Shellfish Ecology and Physical Processes



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Road Map – Appendix 8.2
Final

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1 AIMS, SCOPE AND FORMAT OF THE ROAD MAP

1.1 Background and Aims

Phase 2 of the former Firth of Forth Zone includes Berwick Bank Wind Farm for which consents and licences (as set out below) are being sought. This Project includes both the offshore wind turbine generators (hereafter referred to as wind turbines) and associated offshore infrastructure, as well as onshore grid connection and associated infrastructure.

The Benthic Ecology, Fish and Shellfish Ecology and Physical Processes Road Map covers assessment in relation to the Berwick Bank Wind Farm, seaward of Mean High Water Springs (MHWS). This Road Map does not consider onshore impacts of onshore infrastructure (landward of MHWS). Consent and licence applications for the onshore and offshore components of the Project are being submitted separately. The offshore components of the Project are hereafter referred to as 'The Proposed Development'.

Key components of the Proposed Development include:

- wind turbines;
- wind turbine foundations;
- inter-array cables;
- offshore substation platforms (OSP)/Offshore convertor station platforms; and
- offshore export cables.

The Proposed Development requires the following consents, licences and permissions:

- a Section 36 consent under the Electricity Act 1989;
- a marine licence under the Marine and Coastal Access Act (MCAA) 2009;
- a marine licence under the Marine (Scotland) Act 2010 for the part of the offshore export cables which is within 12 nautical miles (nm) of the coast; and
- planning permission under the Town and Country Planning (Scotland) Act 1997 for all infrastructure located landward of Mean Low Water Springs (MLWS) and seaward of MHWS.

The aim of this Benthic Ecology, Fish and Shellfish Ecology and Physical Processes Road Map is to support reached agreement with key stakeholders on the information provided by SSE Renewables (hereafter referred to as "the Applicant") in relation to benthic subtidal and intertidal ecology, fish and shellfish ecology and physical processes Environmental Impact Assessment (EIA) and the Report to Inform the Appropriate Assessment (RIAA), as part of the Section 36 Consent Application and Marine Licence Applications for the Proposed Development. This Benthic Ecology, Fish and Shellfish Ecology and Physical Processes Road Map documents discussions and agreements between the Applicant and the key stakeholders listed in section 2.

This Benthic Ecology, Fish and Shellfish Ecology and Physical Processes Road Map seeks to ensure that the information supplied in the consent Applications listed above is compliant with the requirements of the following regulations, hereafter referred to as the EIA Regulations:

- Section 36 consent application: The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017;
- marine licence application: The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017 and The Marine Works (Environmental Impact Assessment) Regulations 2007; and
- a planning application: The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017.
- As well as the following regulations, hereafter referred to as the Habitats Regulations:
- the Conservation (Natural Habitats &c.) Regulations 1994 (as amended);

- the Conservation of Habitats and Species Regulations 2017 (as amended)[1]; and
- the Conservation of Offshore Marine Habitats and Species Regulations 2017 (as amended)[1] (which apply to marine licences and Section 36 applications within the Scottish Offshore region.

As part of engagement in the Benthic Ecology, Fish and Shellfish Ecology and Physical Processes Road Map process, it was envisaged that the Applicant and key stakeholders would:

- provide information in a timely manner;
- be transparent and consistent in provision of advice;
- provide effective involvement in the stakeholder engagement process;
- aim to adhere to the programme of meetings set out in this Road Map (see section 3); and
- seek to identify any issues or additional data requirements as early as possible.
- The Applicant sought to provide this Road Map as an accurate record of meetings held, discussions undertaken and points of agreement relating to the offshore EIA and Habitats Regulations Appraisal (HRA) benthic ecology, fish and shellfish and physical processes assessments.

Engagement with regard to the Habitats Regulations Appraisal (HRA) process focused primarily on benthic ecology and fish and shellfish, however it was acknowledged there may be overlap of physical processes aspects such as physical processes modelling.

1.2 Scope

The Benthic Ecology, Fish and Shellfish Ecology and Physical Processes Road Map was used as a tool to facilitate early and on-going engagement with key stakeholders, throughout the pre-application phase of the Proposed Development up to the point of Application submission. This included consultation on the developing baseline characterisation, including approaches to data collection for benthic subtidal and intertidal ecology, underwater noise modelling for fish ecology, physical processes modelling, assessment of significance, and development of the final application documentation. This Benthic Ecology, Fish and Shellfish Ecology and Physical Processes Road Map was a 'live' document which was used to reach and record points of agreement, for example on scoping impacts out of the EIA, RIAA and Marine Protected Area (MPA) assessment, and agreeing the level of assessment that were presented for impacts scoped in to the EIARIAA and MPA assessment, so that the focus in the assessment documents in support of the Application are on likely significant effects as defined by the EIA Regulations, and Likely Significant Effects (LSE) as defined by European caselaw associated with the Habitat Directive.

The Benthic Ecology, Fish and Shellfish Ecology and Physical Processes Road Map sought to agree the following as a minimum, however additional points of agreement/discussion were required, and these were discussed with key stakeholders and documented within this Road Map:

- present evidence base (including site-specific subtidal and intertidal surveys);
- baseline datasets;
- baseline characterisation (including key marine fish and diadromous fish species and habitats);
- impacts and receptors to scoped in/out of the Offshore EIA Report;
- HRA screening including agreeing the relevant sites, receptors and phases to be screened into the RIAA;
- assessment of effects approach (including sensitivity of receptors, method of quantifying impacts and approach to hydrodynamic and hydro-sedimentary modelling);
- MPA assessment; and
- initial findings of assessments of effects, appropriate mitigation and monitoring.

[1] By the Conservation of Habitats and Species Amendment (EU Exit) Regulations 2019

For all the above, the Benthic Ecology, Fish and Shellfish Ecology and Physical Processes Road Map sought to record key areas of agreement and/or outstanding points of discussion.

1.3 Format

Figure 1.1 outlines the key stages of the offshore EIA and HRA processes, and how the Benthic Ecology, Fish and Shellfish Ecology and Physical Processes Road Map proposed to facilitate engagement during key stages. The first stage of the Benthic Ecology, Fish and Shellfish Ecology and Physical Processes Road Map process was to agree the aims, scope and format of the Road Map, and the proposed timetable for engagement as set-out in this document.

The remainder of the Benthic Ecology, Fish and Shellfish Ecology and Physical Processes Road Map is set out as follows:

- section 2: identifies the key statutory stakeholders to the Benthic Ecology, Fish and Shellfish Ecology and Physical Processes Road Map;
- section 3: outlines the proposed benthic ecology, fish and shellfish ecology and physical processes offshore EIA programme, and the benthic ecology and fish and shellfish ecology HRA programmes for the Proposed Development. It includes a record of meetings that have taken place in relation to the benthic ecology, fish and shellfish ecology and physical processes offshore EIA and the benthic ecology and fish and shellfish ecology HRA assessments;
- section 4: provides a summary of discussions, areas of agreement and areas of outstanding discussion in relation to the benthic ecology, fish and shellfish ecology and physical processes offshore EIA and the benthic ecology and fish and shellfish ecology HRA assessments. The aim has been to have as few issues as possible with outstanding discussion at the point of Application submission; and
- section 5: summarises the position (agreement/areas of outstanding discussion) at the point of Application submission.

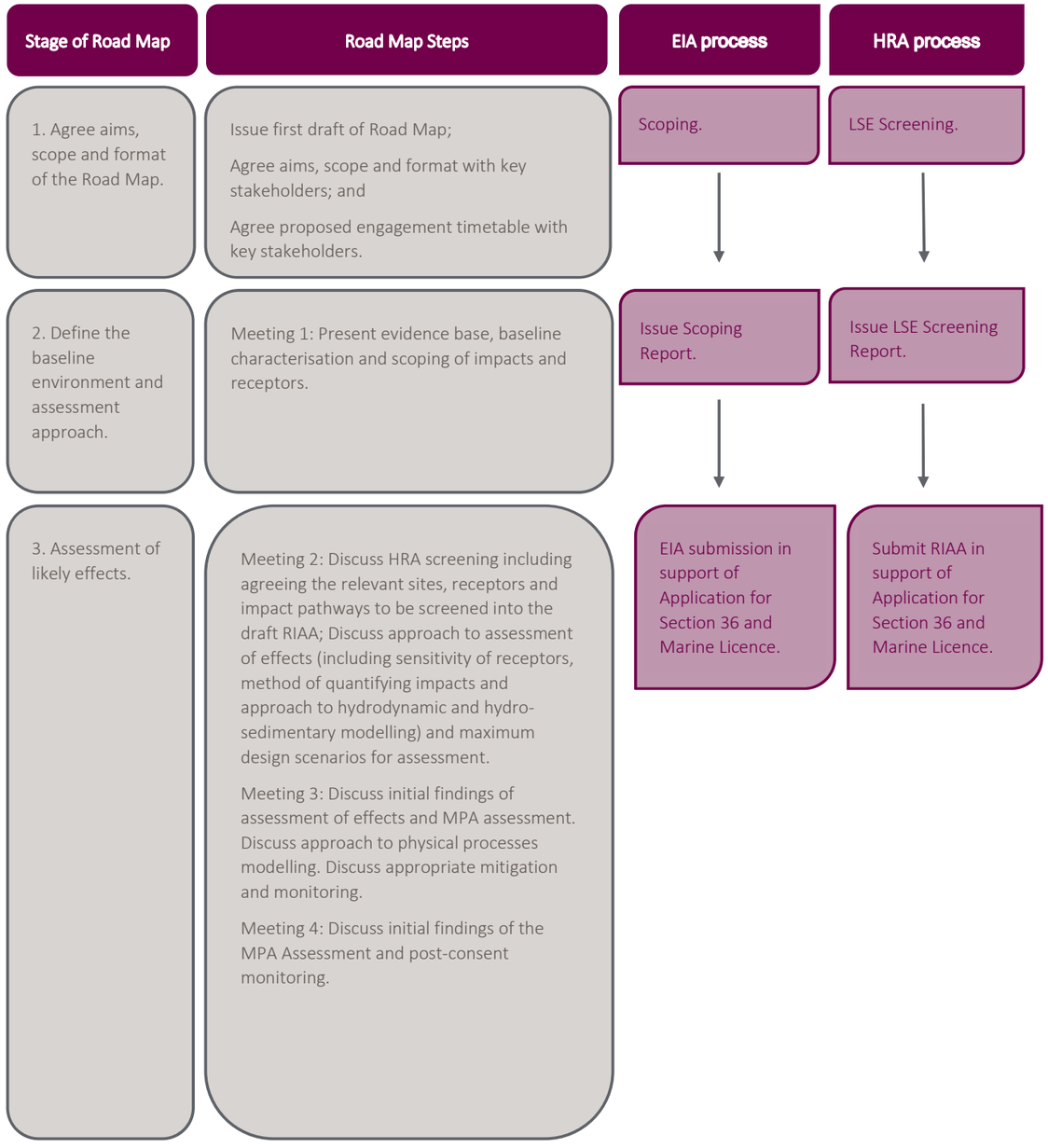

Figure 1.1: Key Stages of the Proposed Development

2 KEY STAKEHOLDERS

It was proposed that the aims of the Benthic Ecology, Fish and Shellfish Ecology and Physical Processes Road Map would be achieved through engagement with the following key statutory stakeholders:

- Marine Scotland Licencing and Operations Team (MS-LOT);
- Marine Scotland Science (MSS);
- NatureScot; and
- Joint Nature Conservation Committee (JNCC).

The aforementioned key stakeholders attended all the meeting held except for JNCC that attended the meetings three and four only.

Table 2.1 sets out the remit, role in the offshore EIA/HRA processes and the key contact for each of the stakeholders listed above.

Table 2.1: Remit, Role and Contact for Key Stakeholders Associated with the Benthic Ecology, Fish and Shellfish Ecology and Marine Processes EIA and HRA Road Map

Stakeholder	Remit	Role in EIA/HRA process	Contact
MS-LOT	Authority responsible for issue of Marine Licences for licensable activities in Scottish Waters	Regulatory Authority under the EIA regulations, and Competent Authority under the HRA regulations.	Kerry Bell
MSS	Supporting Scottish Government in managing marine and coastal environments to meet the long-term needs of both nature and people.	Statutory Advisor to MS-LOT	Ross Gardiner
NatureScot	Lead advisory body to Scottish Government on nature, wildlife management and landscape management across Scotland	Nature Conservation advisor to Regulator and Competent Authority (HRA process) Scottish Government (Marine Scotland).	Karen Taylor/Caitlin Cunningham
JNCC	Statutory adviser to the government and devolved administrations on United Kingdom and international nature conservation.	Statutory Advisor to NatureScot	Kerstin Kroger

3 PROGRAMME

3.1 Benthic Ecology, Fish and Shellfish Ecology and Physical Processes EIA programme, and Benthic Ecology and Fish and Shellfish Ecology HRA programme for the Proposed Development

Table 3.1 below sets out the programme for key stages of the pre-application process in relation to the Berwick Bank Wind Farm.

Table 3.1: Offshore EIA and HRA Project Programme for the Proposed Development

Detail	2020					2021													2022									
	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV
Submission of the 2020 Berwick Bank Wind Farm EIA Scoping Report																												
Submission of the Berwick Bank Wind Farm EIA Scoping Report																												
Submission of the 2020 Berwick Bank Wind Farm LSE Screening Report																												
Submission of the Berwick Bank Wind Farm LSE Screening Report																												
Submission of the Berwick Bank Wind Farm Consent Application																												

3.2 Programme of Benthic Ecology, Fish and Shellfish Ecology and Physical Processes Road Map Meeting

Table 3.2 sets out the programme of stakeholder meetings in relation to key aspects of the benthic ecology, fish and shellfish ecology and physical processes technical assessments. These were scheduled to take place at key points of the pre-application phase and were in line with the key deliverables set out in Table 3.1: and the Benthic Ecology, Fish and Shellfish Ecology and Physical Processes Road Map process. The meetings listed in are also listed within Figure 1.1. All meetings were held via conference calls unless otherwise specified. This was due to COVID-19 pandemic restrictions throughout the pre-Application phase.

The Applicant has presented an overview of the consenting and Road Map process and the points of discussion that have taken place as part of this Road Map. In addition, an Audit Document for Post-Scoping Discussions has also been provided in volume 3, appendix 5.1, summarising key points of advice received subsequent to receipt of the Berwick Bank Scoping Opinion in February 2022, and how these have been addressed in the Application documents.

Table 3.2: Programme for Stakeholder Engagement: Benthic Ecology, Fish and Shellfish Ecology and Physical Processes

Detail	2020					2021												2022										
	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV
Stage 1: Agree aims, scope and format of the Road Map																												
Stage 2: Define the baseline environment and assessment approach.																												
Meeting 1: Present evidence base, baseline characterisation and scoping of impacts and receptors.																												
Stage 3: Assessment of likely effects																												
Meeting 2: Discuss HRA screening including agreeing the relevant sites, receptors and impact pathways to be screened into the draft RIAA; Discuss approach to assessment of effects (including sensitivity of receptors, method of quantifying impacts and approach to hydrodynamic and hydro-sedimentary modelling) and maximum design scenarios for assessment.																												
Meeting 3: Discuss initial findings of assessment of effects and MPA assessment. Discuss approach to physical processes modelling. Discuss appropriate mitigation and monitoring.																												
Meeting 4: Discuss initial findings of the MPA Assessment and post-consent monitoring.																												

3.3 Record of Benthic Ecology, Fish and Shellfish Ecology and Physical Processes Road Map Meetings

Table 3.3 records the meetings that have taken place, the attendees and the key discussion points in relation to the benthic ecology, fish and shellfish ecology and physical processes offshore EIA, and the benthic ecology and fish and shellfish ecology offshore HRA assessments. This table (and link to reference material) was updated after each meeting and circulated to all attendees as a record of the meeting and the key points of discussion. Table 3.3 does not record full minutes, however a meeting minute reference is provided for each meeting in this table and meeting minutes have been circulated following each meeting.

Table 3.3: Record of Benthic Ecology, Fish and Shellfish Ecology and Marine Processes Meetings Undertaken as part of the Benthic Ecology, Fish and Shellfish Ecology and Physical Processes Road Map

Meeting Reference	Stage of EIA Process	Date	Attendees	Key Discussion Points	Meeting Minutes Document Reference
00-BE,FS,PP	Pre-scoping	30 June 2020	The Applicant NatureScot MS-LOT MSS RPS	• Project and programme update; • benthic ecology survey updates; • approach to scoping for fish and shellfish and benthic ecology; • approach and timing of LSE screening report; and • approach to Stakeholder Engagement (Road Map).	06302020 (SG2 & SG3 Pre-Scoping Meeting: Marine Mammals, Fish and Shellfish and Benthic Ecology)
01-BE,FS,PP	Pre-scoping	03 September 2021	The Applicant NatureScot MSS RPS	• overview of Berwick Bank Wind Farm Project; • benthic ecology baseline characterisation and scoping impacts; • physical processes baseline characterisation and scoping of impacts and receptors; and • fish and shellfish baseline characterisation and scoping of impacts.	F000010&11-DEV-MOM-075
02-BE,FS,PP	Post-scoping	16 December 2021	The Applicant NatureScot MS-LOT MSS RPS	• overview of the Master Road Map Tracker; • benthic ecology approach to assessment of effects including CEA; • fish and shellfish approach to assessment of effects including CEA; • maximum design scenarios; and • HRA relevant European sites identification and designation.	LF00001010-DEV-MOM-008

Meeting Reference	Stage of EIA Process	Date	Attendees	Key Discussion Points	Meeting Minutes Document Reference
03-BE,FS,PP	Post-scoping	07 March 2022	The Applicant NatureScot MS-LOT MSS JNCC RPS	• overview of benthic ecology assessment; • overview of MPA assessment; • overview of fish and shellfish assessment; • mitigation and monitoring; and • overview of physical processes modelling.	LF000010&11-DEV-MOM-088
04-BE,FS,PP	Post-scoping	31 May 2022	The Applicant NatureScot MS-LOT MSS JNCC RPS	• update on Proposed Development • recalculation of draft MPA assessment; • post-consent monitoring; and • discussions on NatureScot/JNCC joint advice.	LF000010&11-DEV-MOM-098

4 RECORD OF DISCUSSIONS

This section of the Benthic Ecology, Fish and Shellfish Ecology and Physical Processes Road Map documents discussions and areas of agreement and outstanding discussion points following each meeting as set out in section 3. Further details on key aspects of discussion are provided in meeting notes.

The following subsections record associated discussion:

- evidence base (including site-specific subtidal and intertidal surveys) - section 4.1;
- baseline datasets - section 4.1;
- baseline characterisation (including key marine fish and diadromous fish species and habitats) - section 4.1;
- impacts and receptors to be scoped in/out of the Offshore EIA Report - section 4.1;
- developments to be screened into the Cumulative Effects Assessment (CEA) - section 4.1;
- HRA screening including agreeing the relevant sites, receptors and impact pathways to be screened into the RIAA - section 4.1;
- approach to assessment of effects (including sensitivity of receptors, method of quantifying impacts and approach to hydrodynamic and hydro-sedimentary modelling – section 4.2;
- MPA assessment – section 4.2;
- physical processes modelling approach – section 4.2;
- initial findings of assessment of effects, appropriate mitigation and monitoring – section 4.3; and
- initials findings of MPA assessment – section 4.3.

4.1 Receptors, Key Impacts and Data Sources

This section aims to document and agree key areas of agreement and outstanding discussion points associated with the benthic ecology, fish and shellfish ecology and physical processes baseline for the Berwick Bank Wind Farm offshore EIA, HRA and MPA assessment. These include the following:

- evidence base (including site-specific subtidal and intertidal surveys);
- baseline datasets;
- baseline characterisation (including key marine fish and diadromous fish species and habitats);
- impacts and receptors to be scoped in/out of the Offshore EIA Report;
- developments to be screened into the CEA; and
- HRA screening including agreeing the relevant sites, receptors and impact pathways to be screened into the RIAA.
- Table 4.1 summarises the points of discussion, areas of agreement and outstanding agreements in relation to the benthic ecology, fish and shellfish ecology and physical processes baselines for the Proposed Development.

Table 4.1: Summary of Discussion and Agreed Position on Benthic Ecology, Fish and Shellfish Ecology and Physical Processes Baseline Data for EIA and HRA

Topic	The Applicant Proposed Approach	Data Gaps	MS-LOT Advice/Position	MSS Advice/Position	NatureScot Advice/Position	Summary of Final Position
Benthic ecology: list of Important Ecological Features (IEFs)	List of IEFs identified for the Benthic Ecology assessment: • Intertidal habitats: – intertidal rock; – fucus dominated intertidal rock; and – intertidal sand. • Subtidal habitats: – subtidal sand and muddy sand sediments; – subtidal coarse and mixed sediments; – moderate energy subtidal rock; – sea pens and burrowing megafauna; – cobble/stony reef outside of a Special Area of Conservation (SAC); – rocky reef outside an SAC; and – *Sabellaria* reef outside of an SAC. • Qualifying features of MPAs: – subtidal sands and gravels; – shelf banks and mounds; and – ocean quahog *Arctica islandica.* • Annex I habitat features of SACs: – mudflats and sandflats not covered by seawater at low tide; – large shallow inlets and bays; – reefs (subtidal and intertidal rocky reef); and – submerged or partially submerged sea caves.	None identified.	Mentioned the addition of kelp forests to OSPAR list of threatening and declining habitats.	No specific point raised.	No specific point raised.	The list of IEFs suggested by the Applicant has been agreed with the listed stakeholders. Consideration of kelp forests to be included in the Benthic Ecology technical report and EIA chapter.
Benthic ecology: additional consideration of seabed habitats and species of conservation importance	List of seabed habitat and species of conservation importance taken forward for further assessment to determine their potential to align with features of conservation habitats: • 2 sites in Proposed Development export cable corridor classified as medium potential Annex I cobble/stony reef;	None identified.	No specific point raised.	Requested for all *Sabellaria spinulosa* reef to be considered as Annex I regardless of level of reefiness. Recommended micro-siting around *Sabellaria* reef.	Agreed with MSS position. Advised that if the landfall will be by trenchless technique and there would be no entry & exit works within the SSSI,	MSS position was agreed with the SSSI scoped out, and the Applicant will consider micro-siting as mitigation.

Topic	The Applicant Proposed Approach	Data Gaps	MS-LOT Advice/Position	MSS Advice/Position	NatureScot Advice/Position	Summary of Final Position
	• 1 site in nearshore area of the Proposed Development export cable corridor classified as medium potential Annex I stony reef; and • 8 ocean quahog recorded in grab samples in Proposed Development array area and export cable corridor. Additional details in section 4.1.1.1. Direct impacts to the geological features of the Barns Ness Coast SSSI to be scoped out.				the geological interest can be scoped out. If works at the landward end of the exit punch out would be within the SSSI but inland of the vegetated coastal edge, the geological interest can also be scoped out. Otherwise, the geological interest should be scoped in.	
Benthic ecology: screened in MPAs	List of MPAs relevant to the benthic ecology assessment: • Firth of Forth Banks Complex Nature Conservation MPA (ncMPA); • Turbot Bank ncMPA; and • Southern Trench ncMPA (minke whale only).	None identified.	No specific point raised.	No specific point raised.	Suggested to screen out Turbot Bank MPA and Southern Trench MPA	The MPA assessment is only addressing the Firth of Forth Banks Complex ncMPA.
Benthic ecology: scoping of impacts	List of impacts scoped in and out suggested for the benthic ecology assessment: **Scoped in Impacts:** • temporary subtidal and intertidal habitat loss/disturbance; • increased suspended sediment concentrations and associated sediment deposition; • long term subtidal habitat loss; • colonisation of foundations, sour protection and cable protection; • increased risk of introduction and spread of invasive and non-native species; • alteration of seabed habitats arising from effects of physical processes;	None identified.	Requested to scope in EMF Agreed with impacts scoped in, noting that consultation from other parties must be addressed. Requested expanding scope of suspended sediment concentration (SSC) to include impact on primary productivity. Requested to consider sampling stations and	Asked to consider life history traits of species such as ocean quahog and PMFs. In addition, asked to consider Shelf Banks and Mounds features in MPA assessment for the alteration of seabed habitats arising from effects of physical processes. Agreed impacts from accidental pollution during all phases to be scoped out as it is not	Requested consideration of UXOs Highlighted the assessment of impact of changes in prey species. Requested EMF to be scoped in due to large amount of uncertainty of the potential effects (Hutchison *et al*., 2020).	The Applicant considered the PMF value and sensitivity, and the sensitivity of receptors. EMF from subsea cabling impact is considered in the assessments and the UXOs and impact of drilling are addressed in the habitat loss/disturbance impact and increased SSC impact respectively. Impacts from underwater noise/vibration during

Topic	The Applicant Proposed Approach	Data Gaps	MS-LOT Advice/Position	MSS Advice/Position	NatureScot Advice/Position	Summary of Final Position
	• removal of hard substrates resulting in loss of colonising communities. **Scoped out Impacts:** • accidental pollution during construction, operation and maintenance, and decommissioning; • impacts from release of sediment bound contaminants (see section 4.1.1.1); and • impact from underwater noise/vibration during construction (in volume 2, chapter 9) and during operation and maintenance. Suggested to scope electromagnetic fields (EMF) impact out on the basis that effects are of negligible adverse significance.		potential dredging aspects prior to confirming scoping out accidental pollution during all phases. Agreed with scoped out impacts except impacts from release of sediment bound contaminants. Highlighted there may be additional introduction of chemicals due to sacrificial anodes.	a concern and not unusual for the area. Requested to scope in impacts of changes in prey species, changes in hydrodynamics, impacts, Unexploded Ordnance (UXOs) (consider maximum design scenario), of drilling, of EMF and underwater noise during construction. Agreed to scope out underwater noise during operation and maintenance. Advised to review assumptions within emerging studies on EMF and to include information up front in the Offshore EIA Report.		constructions and changes in prey species are addressed in volume 2, chapter 9. Impacts from changes in hydrodynamics addressed in volume 2, chapter 7.
Benthic ecology: evidence base	List of data used for the evidence base of the benthic ecology assessment: • benthic subtidal survey, grab and Drop-Down Video (DDV) sampling, epibenthic trawls, sediment chemistry analysis; • benthic intertidal walkover survey at Skateraw landfall (Aug 2020); • geophysical survey using SSS for infaunal biotopes; • species of conservation importance; • Annex I Reef Assessment; • MPA assessment; and • desktop data.	None identified.	Requested confirmation that baseline characterisation made use of FeAST tool. Requested survey details to be provided including additional DDV.	Stated that the MPA assessment needs to include cumulative effects.	No specific point raised.	The approach suggested by the Applicant was agreed with cumulative effects considered for the MPA assessment. The FeAST was used to inform the sensitivity assessment of the receptors and the Benthic Ecology Technical Report (volume 3, appendix 8.1) included additional survey details to clarify where DDV sampling was

Topic	The Applicant Proposed Approach	Data Gaps	MS-LOT Advice/Position	MSS Advice/Position	NatureScot Advice/Position	Summary of Final Position
						undertaken in nearshore area.
Physical processes: evidence base	List of means to evidence the physical processes assessment: • monitoring/field data; • reports/studies; and • models/simulated Data supported by site specific data. See section 4.1.1.2 for further details.	None identified.	No specific point raised.	No specific point raised.	No specific point raised.	The approach suggested by the Applicant was agreed.
Physical processes: baseline characterisation	List of means to estimate the baseline characterisation for the physical processes assessment: • bathymetry (site survey, Marine Environmental Data and Information Network (MEDIN) (including Admiralty portal)); • tides (DTU10 based flather boundaries by the Danish Hydraulic Institute (DHI)); • currents; • waves (monitoring data and European Centre for Medium-Range Weather Forecasts (ECMWF) operational database); • sedimentology and transport, and bed/sediment characteristics (site survey and European Marine Observation and Data Network (EMODnet)); • MIKE by DHI integrated modelling software: – hydrodynamics MIKE21 Flexible Mesh (FM); – spectral Waves MIKE21 Spectral Wave (SW) (coupled FM); and – sediment transport MIKE21 Sand Transport (ST) (coupled FM and SW).	None identified.	No specific point raised.	No specific point raised.	Asked that large scale features of MPA to be assessed and to consider cumulative effects particularly to the MPA.	The approach suggested by the Applicant was agreed with modelling area covering the whole MPA and cumulative effects considered.
Physical processes: scoping of receptors	List of receptors scoped in the physical processes assessment: • coastal features. As a pathway: • benthic subtidal and intertidal ecology; • fish and shellfish ecology;	None identified.	No specific point raised.	No specific point raised.	No specific point raised.	The approach suggested by the Applicant was agreed.

Topic	The Applicant Proposed Approach	Data Gaps	MS-LOT Advice/Position	MSS Advice/Position	NatureScot Advice/Position	Summary of Final Position
	• marine mammals; • marine archaeology and ordnance; and • infrastructures and other users. No receptor scoped out.					
Physical processes: scoping of impacts	List of impacts scoped in the physical processes assessment: Long-term potential changes due to the presence of infrastructure on: • wave climate; • tidal regime; • sediment transport; – littoral currents; and – sediment pathways. Short-term potential changes due to increase in suspended sediment concentration during construction activities. No impact scoped out.	None identified.	No specific point raised.	No specific point raised.	No specific point raised.	The approach suggested by the Applicant was agreed.
Fish and shellfish ecology: baseline characterisation	Followed the methods in the Offshore Renewables Joint Industry Programme (ORJIP) (Boyle and New, 2018) to identify core spawning areas. List of means to estimate the baseline characterisation for the fish and shellfish ecology assessment: • Two study areas: – the Proposed Development fish and shellfish study area; and – the northern North Sea fish and shellfish study area. • Desktop literature review: – general habitat and fish assemblage data; – fish spawning and nursery (followed the methods in the ORJIP (Boyle and New, 2018));	Lack of consultation with fisheries.	No specific point raised.	No specific point raised.	No specific point raised.	The approach suggested by the Applicant was agreed with characterisation undertaken from the commercial fisheries assessment covered.

Topic	The Applicant Proposed Approach	Data Gaps	MS-LOT Advice/Position	MSS Advice/Position	NatureScot Advice/Position	Summary of Final Position
	– diadromous fish (will be supported by rod catch data); and – Seagreen data (2018). • Site specific surveys: – benthic subtidal surveys (same as Benthic Ecology) No intention to undertake fieldwork to complement fish and shellfish baseline characterisation but the Applicant will contribute to strategic monitoring. Suggested that site specific characterisation was not required as regardless, the assessment, it would assume that diadromous species are within and migrating through the Proposed Development area. See section 4.1.1.3 for further details					
Fish and shellfish ecology: list of IEFs and Priority Marine Features (PMFs)	List of IEFs and PMFs for the fish and shellfish ecology assessment: • 16 Marine fish IEF species among which seven are PMFs; • seven Shellfish IEF species; • seven Diadromous fish IEF species among which five are PMFs. Considered if a species is a feature of SACs. Full list in section 4.1.1.4.	None identified.	No specific point raised.	Suggested that river lamprey and sparling could be missed out. Requested to bring all the latest information relevant to occurrence of diadromous fish in the area which could be made available.	No specific point raised.	The list of IEFs and PMFs suggested by the Applicant has been agreed and sparling and river lamprey are included in the fish and shellfish technical report (volume 3, appendix 9.1).
Fish and shellfish ecology: scoping of impacts	List of impacts scoped in and out suggested for the fish and shellfish ecology assessment: **Scoped in Impacts:** • temporary habitat loss and disturbance (construction and decommissioning); • underwater noise impacting fish and shellfish receptors (construction and decommissioning); • increased suspended sediment concentrations and associated sediment deposition (construction and decommissioning); • EMFs from subsea cabling (operation and maintenance); • long term habitat loss (operation and maintenance);	None identified.	No specific point raised.	Requested to scope in the potential reef effect of the structures with potential increase in number of predators that may prey on migratory fish.	No specific point raised.	The approach suggested by the Applicant was agreed with the potential reef effects covered under colonisation of hard substrate impact, including consideration of predation (volume 2, chapter 9)

Topic	The Applicant Proposed Approach	Data Gaps	MS-LOT Advice/Position	MSS Advice/Position	NatureScot Advice/Position	Summary of Final Position
	• temporary habitat loss (operation and maintenance); and • colonisation of hard structures (operation and maintenance). **Scoped out Impacts:** • accidental pollution during construction, operation and maintenance and decommissioning; • underwater noise from wind turbine operation; and • underwater noise from vessels.					
Benthic ecology: developments screened into the CEA	List of developments screened in the benthic ecology CEA: • Tier 2: – Inch Cape Offshore Wind Farm; – Neart na Gaoithe Offshore Wind Farm; – Seagreen 1 Offshore Wind Farm; – Seagreen 1A Export Cable Corridor; and – Eyemouth Disposal Site (FO0080). • Tier 3: – Eastern Link 1; – Eastern Link 2; and – Cambois connection. No tier 1 or 4 screened in.	None identified.	No specific point raised.	No specific point raised.	None identified.	The approach suggested by the Applicant was agreed. Eastern Link projects have subsequently become Tier 2 projects due to submission of applications for both projects.
Fish and shellfish ecology: developments screened in for the CEA	List of developments screened in the fish and shellfish ecology CEA: • Tier 2: – Inch Cape Offshore Wind Far (Construction; Operation and maintenance); – Seagreen 1 Offshore Wind Farm (Construction; Operation and maintenance); – Neart na Gaoithe (Operation and maintenance); – Seagreen 1A Export Cable Corridor (Construction; Operation and maintenance); and	None identified.	No specific point raised.	No specific point raised.	No specific point raised.	The approach suggested by the Applicant was agreed.

Topic	The Applicant Proposed Approach	Data Gaps	MS-LOT Advice/Position	MSS Advice/Position	NatureScot Advice/Position	Summary of Final Position
	– Eyemouth Disposal Site (Construction, Operation and maintenance) • Tier 3: – Eastern Link 1 (Construction; Operation and maintenance); – Eastern Link 2 (Construction; Operation and maintenance): and – Cambois connection (Construction; Operation and maintenance).					
European sites for Annex I habitats (HRA)	List of relevant sites screened in suggested for the HRA (Annex I): • Berwickshire and North Northumberland SAC identified and screened for consideration of LSE. • Further details in section 4.1.1.5.	None identified.	No specific point raised.	No specific point raised.	No specific point raised.	The approach suggested by the Applicant was agreed.
HRA screening of impacts for Annex I habitat	List of screened in impacts suggested for the HRA (Annex I): Potential LSE: • Construction/Decommissioning: – increased suspended sediment concentrations and associated sediment deposition (Proposed Development export cable corridor works only). • Operation and maintenance: – increased suspended sediment concentrations and associated sediment deposition (Proposed Development export cable corridor works only); and – changes in physical processes (Proposed Development export cable corridor works only). No LSE: • Construction/Decommissioning: – temporary habitat loss/disturbance; – release of sediment bound contaminants; – accidental pollution; – removal or hard structures; and	None identified.	No specific point raised.	No specific point raised.	No specific point raised.	The approach suggested by the Applicant was agreed.

Topic	The Applicant Proposed Approach	Data Gaps	MS-LOT Advice/Position	MSS Advice/Position	NatureScot Advice/Position	Summary of Final Position
	– introduction and spread of marine invasive species. • Operation and maintenance: – long-term habitat loss; – temporary habitat loss; – colonisation of hard structures; – EMFs from subsea cables; and – accidental pollution.					
European sites for Annex II diadromous fish (HRA)	List of screened in relevant sites suggested for the HRA (Annex II): SACs identified and screened for consideration of LSE: • Tweed Estuary SAC; • River South Esk SAC; • River Dee SAC; • River Tweed SAC ; • River Tay SAC; and • River Teith SAC. Further details in section 4.1.1.6.	None identified.	No specific point raised.	No specific point raised.	No specific point raised.	The approach suggested by the Applicant was agreed.

Topic	The Applicant Proposed Approach	Data Gaps	MS-LOT Advice/Position	MSS Advice/Position	NatureScot Advice/Position	Summary of Final Position
HRA screening of impacts for Annex II diadromous fish	List of screened in impacts suggested for the HRA (Annex II): Potential LSE: • Construction/Decommissioning: – underwater noise. • Operation and maintenance: – EMF from subsea cables; and – colonisation of hard structure. No LSE: • Construction/Decommissioning: – temporary habitat loss/disturbance; – release of sediment bound contaminants; – accidental pollution; and – operational noise and vessel noise. • Operation and maintenance: – temporary habitat loss/disturbance; – release of sediment bound contaminants; – accidental pollution; – operational noise and vessel noise; and – long-term habitat loss. There is evidence that suggests fish are directionally swimming and that they are not easily deterred even when they enter waters of high sedimentation.	None identified.	Agreed to screen out LSE increased SSC and associated sediment deposition regarding barrier effects for diadromous fish species at stage two.	No specific point raised.	No specific point raised.	The approach suggested by the Applicant was agreed.

4.1.1 Additional Detail on Key Discussions

4.1.1.1 Benthic ecology scoping of receptors and impacts

a. **Benthic Seabed Habitats:**
No Annex I stony/rocky reef in Proposed Development array area nor Annex I *Sabellaria spinulosa* reef observed although individuals *S. spinulosa* present. No *Modiolus modiolus* beds recorded, although individual *M. modiolus* present.

b. **Benthic Ecology Scope of Impacts:**
No sediment contamination levels exceeding AL1/AL2 and Canadian Threshold Effect Levels (TEL) except five stations, therefore impact suggested to be scoped out by the Applicant.

4.1.1.2 Physical processes evidence base

a. Monitoring/Field Data:
- Berwick Bank surveys: geophysical and metocean (Fugro 2020a, 2020b);
- Seagreen Alpha/Bravo surveys: geophysical and metocean (Fugro 2012);
- EMODnet: bathymetry and seabed sediment;
- MEDIN – bathymetric data;
- Centre for Environment, Fisheries and Aquaculture Science (Cefas): salinity, temperature and turbidity;
- British Oceanographic Data Centre (BODC): metocean;
- United Kingdom Hydrographic Office (UKHO): tidal data;

b. Reports/Studies:
- Baseline Characteristics: Dynamic Coast, Ramsay & Brampton (2009), Forth & Tay offshore wind farms (Inch Cape, Neart na Gaoithe, Seagreen);
- Designations & Marine Activities: JNCC & MSS mapping resources;

c. Models/Simulated Data
- Berwick Bank Wind Farm model: tidal current, wave climate, littoral current (sediment transport), particle tracking (sediment releases); and
- Model Forcing/Scoping: ECMWF, Met Office, Scottish Shelf Model, Seagreen, models cited in studies.

4.1.1.3 Fish and shellfish ecology baseline characterisation

a. General habitat and fish assemblage data:
- Marine Scotland NMPi maps;
- EIA characterisation surveys for Seagreen Alpha/Bravo, Inch Cape and Neart na Gaoithe Offshore Wind Farms;
- EMODnet seabed habitats; and
- Biotope mapping (benthic ecology).

b. Fish spawning and nursery:
- Cefas spawning and nursery grounds (Ellis *et al.* (2012), Coull *et al.* (1998));
- Sandeels – site specific data; Latto *et al.* (2013);
- Herring – site specific data; Reach *et al.* (2013); and

- International Council for the Exploration of the Sea (ICES) programme of International Herring Larval Surveys (IHLS) in the North Sea (2007 - 2016);

c. Diadromous fish:
- Fish and shellfish ecology assessment for Seagreen 1 (Seagreen, 2018); and
- Rod catch data.

4.1.1.4 Fish and shellfish ecology IEFS (*PMFs)

- Marine Fish: plaice *Pleuronectes platessa*, lemon sole *Microstomus kitt*, other flatfish species, cod* *Gadus morhua*, haddock *Melanogrammus aeglefinus*, whiting* *Merlangius merlangus*, saithe* *Pollachius virens*, other demersal species, lesser sandeel* *Ammodytes tobianus*, raitt's sandeel* *Ammodytes marinus*, herring* *Clupea harengus*, mackerel* *Scomber scombrus*, sprat *Sprattus sprattus*, basking shark* *Cetorhinus maximus*, tope *Galeorhinus galeus*, spurdog* *Squalus acanthias*, common skate* *Dipturus batis*, rays
- Shellfish IEF: edible crab *Cancer pagurus*, Norway lobster *Nephrops norvegicus*, European lobster *Homarus gammarus*, king scallop *Pecten maximus,* velvet swimming carb *Necora puber*, other crustaceans, freshwater pearl mussel *Margaritifera margaritifera*.
- Diadromous Fish IEF: sea trout* *Salmo trutta*, European eel* *Anguilla anguilla*, sea lamprey* *Petromyzon marinus*, river lamprey* *Lampetra fluviatilis*, twaite shad *Alosa fallax*, allis shad *Alosa alosa*, Atlantic salmon *Salmo salar*, sparling/European smelt* *Osmerus eperlanus.*

4.1.1.5 Berwickshire and North Northumberland SAC identified and screened for consideration of LSE

a. Site features:
- large shallow inlets and bays;
- mudflats and sandflats not covered by seawater at low tide;
- reefs; and
- submerged or partially submerged sea caves.

b. Closest distance to:
- Proposed Development array area – 34.67 km; and
- Proposed Development export cable corridor – 4.12 km.

4.1.1.6 Sites designated for Annex II diadromous fish

a. For sea and river lamprey:
- Tweed Estuary SAC (46.5 km to Proposed Development array area/29 km to Proposed Development export cable corridor).

b. For Atlantic salmon and freshwater pearl mussel:
- River South Esk SAC (51.4 km to Proposed Development array area/76.5 km to Proposed Development export cable corridor); and
- River Dee SAC (79.8 km to Proposed Development array area/106.6 km to Proposed Development export cable corridor).

c. For Atlantic salmon, sea lamprey and river lamprey:
- River Tweed SAC (51.6 km to Proposed Development array area/34.1 km to Proposed Development export cable corridor);
- River Tay SAC (87.2 km to Proposed Development array area/102.7 km to Proposed Development export cable corridor);and

- River Teith SAC (148.1 km to Proposed Development array area/113.8 km to Proposed Development export cable corridor).

4.1.2 Summary Statement of Final Position

The lists of receptors, impacts and relevant sites to be scoped in/out of the offshore EIA report assessment and screened in/out of the offshore RIAA, as well as the evidence base and baseline characterisation, followed the suggestions from the Applicant in Table 4.1 with the inclusion of the following advice from the stakeholders. These have been agreed by the Applicant during Road Map Meetings:

- kelp forests to be considered as an IEF in the benthic ecology technical report and offshore EIA chapter (volume 3, appendix 8.1 and volume 2, chapter 8 respectively);
- micro-siting considered as a designed in measure in the offshore EIA benthic ecology chapter (volume 2, chapter 8);
- FeAST used to inform the sensitivity assessment of the receptor;
- impact of EMFs from subsea cabling scoped in the offshore EIA benthic ecology chapter (volume 2, chapter 8);
- only the Firth of Forth Banks Complex ncMPA requires to be considered in the MPA assessment;
- cumulative effects to be considered in the MPA assessment;
- the list of in IEFs and PMFs from section 4.1.1.4, without sparling and river lamprey, are to be considered in the offshore EIA fish and shellfish ecology chapter (volume 2, chapter 9).

4.2 Data Analyses, Sensitivity of Relevant Receptors and Approach to Modelling

This section aims to document and agree key elements of the benthic ecology, fish and shellfish, and physical processes data analysis for the Proposed Development offshore EIA and HRA. These include the following:

- approach to assessment of effects (including sensitivity of receptors, method of quantifying impacts and approach to hydrodynamic and hydro-sedimentary modelling); and
- approach to MPA assessment.
- Table 4.2 summarises the points of discussion, areas of agreement and areas of outstanding discussion in relation to the benthic ecology, fish and shellfish ecology and physical processes baseline data analysis for the Proposed Development.

Table 4.2: Summary of Discussion and Agreed Position on Benthic Ecology, Fish and Shellfish Ecology and Physical Processes Data Analysis

Topic	The Applicant Proposed Approach	MS-LOT Advice/Position	MSS Advice/Position	NatureScot Advice/Position	Summary of Final Position
Benthic ecology: temporary habitat loss/disturbance	Activities during construction are jack-up footprints, seabed preparation (sand wave and boulder clearance), cable installation and exit punches out for offshore export cables. Maximum design scenario gives 113.97 km^2 of temporary subtidal habitat loss/disturbance. No intertidal habitat loss (use of trenchless techniques at landfall). Impact is intermittent and affecting a small proportion of the total impacted area at any one time. **Magnitude:** as proportion of benthic study area and Firth of Forth Banks MPA for infrastructure within it. **Sensitivity**: pressures include: • habitat structure changes - removal of substratum (extraction); • abrasion/disturbance at the surface of the substratum or seabed; • penetration and/or disturbance of the substratum subsurface; and • smothering and siltation rate changes (heavy).	No specific point raised.	No specific point raised.	No specific point raised.	The approach suggested by the Applicant was agreed.

Topic	The Applicant Proposed Approach	MS-LOT Advice/Position	MSS Advice/Position	NatureScot Advice/Position	Summary of Final Position
	Additional support from available published scientific papers and results of offshore wind farm monitoring.				
Benthic ecology: increased suspended sediment concentrations and associated sediment deposition	Activities during construction are drilling, seabed preparation and cable installation (via jetting). **Magnitude:** based on Physical Processes modelling (greatest volume of material released) to quantify the increase in SSC compared to background levels, the dispersal of plumes and the levels of subsequent deposition. **Sensitivity:** pressures include changes in suspended solids (water clarity) and smothering and siltation rate changes (light). Additional support from available published scientific papers and results of offshore wind farm monitoring.	No specific point raised.	No specific point raised.	No specific point raised.	The approach suggested by the Applicant was agreed.
Benthic ecology: long term subtidal habitat loss	Activities during operation and maintenance phase: presence of foundations with scour protection and cable protection. Maximum design scenario gives up to 7.8 km2 long term subtidal habitat loss (No long-term intertidal habitat loss). **Magnitude**: as proportion of benthic study area and Firth of Forth Banks MPA for infrastructure within it. **Sensitivity:** pressures include physical changes to another substratum type.	No specific point raised.	No specific point raised.	No specific point raised.	The approach suggested by the Applicant was agreed.
Fish and shellfish ecology: temporary habitat loss and disturbance	Activities during construction are jack-up footprints, seabed preparation (sand wave and boulder clearance), cable installation and exit punches out for offshore export cables. Maximum design scenario gives 113.97 km^2 of temporary subtidal habitat loss/disturbance. No intertidal habitat loss (use of trenchless techniques at landfall). Impact is intermittent and affecting a small proportion of the total impacted area at any one time. **Magnitude:** as proportion of the Proposed Development boundary and the northern North Sea fish and shellfish ecology study area.	No specific point raised.	No specific point raised.	FeAST tool for fish is available from March 2022 and can support the assessment of sensitivity for fish and shellfish receptors.	The approach suggested by the Applicant was agreed with the use of the FeAST tool to support the assessment of the sensitivity of the fish and shellfish ecology receptors

Topic	The Applicant Proposed Approach	MS-LOT Advice/Position	MSS Advice/Position	NatureScot Advice/Position	Summary of Final Position
	Sensitivity: use best available scientific data, allowing the identification of the relevant pressures for temporary habitat loss with a focus on potential for recovery of the from benthic ecology assessment and focus on IEFs particularly sensitive to habitat loss. Include monitoring of fish populations in Belgian wind farms and long term monitoring of sandeels from Danish wind farm.				
Fish and shellfish ecology: underwater noise impacting fish and shellfish receptors	Activities during construction are pilling, site investigation surveys and UXOs clearance. **Receptors:** fish spawning habitats overlapping, particularly noise sensitive species (e.g. herring) and diadromous fish for potential migration barrier during pilling. **Magnitude:** underwater noise modelling conducted for magnitude of pilling noise emissions and best available scientific literature including studies from offshore wind farms and oil and gas industry. **Sensitivity:** thresholds for injury and behavioural (qualitative) (avoidance behaviour and deterrence) effect for fish from Acoustical Society of America (ASA) Guidelines (Popper *et al.,* 2014) and best available scientific literature and underwater noise outputs to demonstrate the extent of potential effects. Including studies from offshore wind and oil and gas industry (e.g. seismic surveys).	No specific point raised.	No specific point raised.	No specific point raised.	The approach suggested by the Applicant was agreed.
Fish and shellfish ecology: colonisation of hard structure	Activities during operation and maintenance phase are the wind turbines and OSP/Offshore convertor station platforms with jacket foundation and scour protection, protection of 15% of the cables. According to maximum design scenario, a total of 10,198,971 m^2 created. Use of outputs of benthic ecology assessment regarding the change from sandy sediments dominated substrate to an increased proportion of hard substrates. Use of best available scientific information on fish reef effects including monitoring at Belgian wind farms (fish assemblages, soft sediment and hard bottom species and fish feeding on colonisation	No specific point raised.	No specific point raised.	Advised to have a realistic figure for the percentage of cable protection, especially being mindful from other projects experience.	The approach suggested by the Applicant was agreed.

Topic	The Applicant Proposed Approach	MS-LOT Advice/Position	MSS Advice/Position	NatureScot Advice/Position	Summary of Final Position
	benthic species as well as studies from Denmark and Sweden. For diadromous fish, published information on predator aggregation around wind turbines will be reviewed. 15% of cable protected is a conservative approach and take into account recent experience in the area (notably Seagreen). Once Front End Engineering Design (FEED) stage is reached, moving from percentage to assess what areas need additional protection based on actual conditions.				
Physical processes: modelling approach	• Construction phase modelling: Mike 21 mud transport: – not limited to mud, cohesive if required; – spatially and temporally variation of release; and – includes sediment grading. Modelled scenarios (maximum design scenario): – seabed preparation; – drilled pile foundations; and – cable trenching (inter-array/inter-connector and offshore export cables). Model outputs: – sediments plumes; – sedimentation; – snap-shots; – statistical data; and – used to inform pathway disciplines. • Post-construction modelling: Applied changes to bathymetry (scour & cable protection), bed sediment & include sub-cell structures (700+) using maximum design scenario parameters. Undertake comparative study for range of parameters & conditions: – tidal currents; – wave climate;	No specific point raised.	Required clarification regarding the dredging of sediment and disposal into the surrounding environment and to better understand the licensable activities (dredging and disposal activities) (see section 4.2.1.4).	Advised to consider how modelling results are presented. Advised that the degree of uncertainty is presented alongside any modelling results, as well as any limitations of the modelling approach. Advised that any modelling or calculations of scour should take into account secondary scour around any installed scour protection. Advised that the Offshore EIA Report should include evidence that the sand waves are indeed active, therefore able to dynamically reform either in-situ or by migration. Additionally, requested to see an indication of how fast	The modelling approach suggested by the Applicant for the Physical Processes assessment was agreed. Heat maps are provided in the physical processes technical report (volume 3, appendix 7.1) for suspended sediment and deposition. Information on waves and currents are presented in baseline, post construction and difference plots for specific scenarios to cover the range of metocean conditions. For the different figures, appropriate plotting scales was applied – generally log scale palettes are implemented to allow both the range and extent of values to be documented. Data limitations are discussed in a dedicated section of the physical processes chapter (volume 2, chapter 7) and

Topic	The Applicant Proposed Approach	MS-LOT Advice/Position	MSS Advice/Position	NatureScot Advice/Position	Summary of Final Position
	– littoral currents; and – sediment transport. The physical processes modelling assessment acknowledged the potential for scouring of seabed sediments due to interactions between the Metocean regime (wave and currents) and foundations or other seabed structures. Further, during the operation and maintenance phase, activities will include the routine inspection of installed assets.			the sand waves are likely to move and reform if they are active (see section 4.2.1.4). Advised to consider the risk of trenched cable being re-exposed due to the dynamics of migrating sand waves (see section 4.2.1.4).	where there was uncertainty related to the findings reported, this is documented in the chapter. The modelled scenarios used within the assessment of effects account for the proposed scour and secondary scour protection.
MPA assessment	Only the Firth of Forth Banks Complex MPA to be considered in the assessment. The extent of overlap between the Proposed Development and the Firth of Forth Banks Complex MPA is 331.7 km^2, which equates to 15.57% of the total area of the MPA. This overlap represents the boundary overlap only while the scale of activities that will actually occurs will not cover this whole extent. No overlap with Montrose Bank section of the MPA. For the purposes of the MPA assessment it is assumed: • up to 31.3% of the array infrastructure could be placed in the part of the Proposed Development array area which coincides with the MPA (based on maximum design scenario); • up to 13.08% of the offshore export cables could be installed in the part of the Proposed Development export cable corridor which coincides with the MPA; and • for activities (e.g. anchor placements) could occur in both the Proposed Development array area and Proposed Development export cable corridor, it is assumed that 35.73% of these activities could occur in the parts of the Proposed Development that overlap with the Firth of Forth Banks Complex MPA; • All infrastructure which could be placed within the MPA could be placed within offshore	No specific point raised.	No specific point raised.	Recommended clearer and more consistent terminology (i.e. any impact that is temporary should be described as disturbance and permanent impact described as loss) (see section 4.2.1.3). Requested that the various area extents and percentages related to temporary habitat disturbance and permanent habitat loss are presented more clearly in a single table to allow clearer interpretation. Requested provision of maps which illustrate the component parts of the ncMPA together with baseline habitat information as well as the wind farm project information (see section 4.2.1.2). Noted that the attributes for each	The Applicant's approach for MPA assessment was agreed. The terminology for long term/permanent/temporary was made consistent with additional clarification/definitions in the MPA assessment (i.e. habitat lost beneath the wind turbines be a long term impact and if it doesn't resolve within its lifetime, it is permanent;. If temporary, described as 'disturbance' and if permanent, described as 'loss'). Greater transparency regarding the calculation with the maximum design scenario is included. The various area extents and percentages related to temporary habitat disturbance and permanent habit loss are included as a summary table in an appendix to the MPA assessment.

Topic	The Applicant Proposed Approach	MS-LOT Advice/Position	MSS Advice/Position	NatureScot Advice/Position	Summary of Final Position
	subtidal sands and gravels, and Ocean Quahog aggregation; • 19.48% of the infrastructure which could be placed within the MPA could be placed within the Shelf Banks and Mounds; and • 22.17% of the infrastructure which could be placed within the MPA could be placed within the Moraines.			feature differ in conservation objectives of the Firth of Forth Banks ncMPA (i.e. maintain versus recover) and need to be evidenced in the assessment.	An indicative layout of the wind turbines is included in the MPA assessment with justification on its translation into maximum design scenario for each impact. The attributes for each feature of the ncMPA is considered in the MPA assessment.

4.2.1 Additional Details on Key Discussions

- The construction phase is expected to last approximately 8 years. The operation and maintenance phase is 35 years long. Decommission is expected to have similar impacts as the construction phase.

4.2.1.1 General approach to assessment of effects

Benthic ecology and fish and shellfish ecology:

Following the Chartered Institute of Ecology and Environmental Management (CIEEM) Guidelines for EcIA in the UK and Ireland (CIEEM, 2019) and Environmental Protection Agency (EPA) Guidelines on the Information to be Contained in EIA Reports (EPA, 2017), the approach is summarised as follow:

- identify the IEFs;
- define the magnitude of the impact (based on the maximum design scenario which is determined by the PDE);
- define the sensitivity of receptors (considering vulnerability, recoverability and value using the MarESA (benthic ecology only) and FeAST tool, scientific literature and results from other offshore wind farm monitoring programme); and
- conclusion of significance in EIA terms based on the assessment matrix (magnitude x sensitivity).

CEA for benthic ecology, fish and shellfish, and physical processes:

- the CEA for benthic ecology and physical processes will take into account the impact associated with the Proposed Development together with other relevant plans, projects and activities (i.e. other offshore wind farm projects, aggregate extraction/disposal areas); and
- CEA will consider other plans, projects and activities within two tidal excursions (~20 km) of the Proposed Development.

4.2.1.2 MPA assessment

The MPA assessment will:

- be a stand-alone report accompanying the Offshore EIA Report;
- consider whether there is, or may be, a significant risk of the Proposed Development hindering the achievement of the conservation objectives of the ncMPA; and
- draw on the output of other technical chapters such as physical processes, benthic ecology, fish and shellfish and marine mammals.

NatureScot and JNCC requested to see the extent of impacted area for each protected feature, as well as the percentage from the overall ncMPA and each component part of the ncMPA. They requested to see this for each component of the proposed development (e.g. foundations, inter-array/interconnector cabling, export cabling, scour/cable protection), individually and in combination with Seagreen (Seagreen 1 & 1A). They also requested to better understand the extent to which each feature could be protected by the proposed 50 m safety exclusion zone around each wind turbine foundation. From this, they can better evaluate the context of such protection, against the extent that is predicted to be disturbed and permanently lost through the proposed development. The Applicant provided further detail for each of the maximum design scenarios for the assessments presented in the main body of the report to enable calculations to be followed and replicated by the Statutory Nature Conservation Bodies (SNCBs). These changes are actioned for both the project alone assessment and the assessment considering Berwick Bank Wind Farm in combination with Seagreen and Seagreen 1A (including the Seagreen 1A Export Cable Corridor).

The Applicant highlighted that the final wind farm layout is still to be determined and will be informed by more detailed geophysical/geotechnical studies, and engineering design work. The MPA assessment has been based on a series of maximum design scenario related to the proportion of

infrastructure that could be installed within the MPA. A map showing the indicative wind turbine layout for the largest wind turbine option (which represents the maximum design scenario for long term habitat loss) is included in the MPA assessment Report, but the Applicant would emphasise that this is only an indicative layout.

4.2.1.3 Long term versus permanent terminology

Habitat lost beneath the wind turbines is considered by the stakeholders to be a long term impact. An effect is permanent to most species if it doesn't resolve within its lifetime. As to effects following decommissioning, the sediments will recover, however, even if structures are removed, the impact would be permanent. There is also no guarantee that they can be removed. Attempts to remove the mattress can result in significant levels of disturbance. As this cannot be predicted, it should be considered on precautionary basis as a permanent footprint. Although long term may be described as not infinite but persevering in the ecological sense, if the impact is temporary, it was advised to be described as 'disturbance', whereas for permanent impacts, to be described as 'loss'.

4.2.1.4 Modelling approach to physical processes

The material is taken from the peak of the sand waves and running them into the troughs in order to perform the simulation modelling. Dredged materials are not relocated off site but along the route and within the Proposed Development array area.

Sand waves

Dynamically active:

The physical processes assessment modelled different scenarios (specific tides, waves & storm events) to examine the potential for change and determined that the physical processes underpinning the marine environment would be maintained with little change after the project was built. This modelling can also be used to indicate sediment transport patterns for particular scenarios, however, the study was not designed or intended to examine the detailed sand wave mobility and longer-term morphology. Sand wave mobility and migration studies usually involve a combination of multiple geophysical surveys (i.e. current and historic) recorded over a reasonably long period, sometimes supplemented with very high resolution computational modelling. Such an assessment would be much more focussed than the comparative modelling implemented within the context of an EIA. However, the baseline modelled scenarios undertaken for the offshore EIA do indicate seabed sediment activity. Similarly, a study of bedform migration undertaken using historic geophysical surveys within the Seagreen 1 development area (Wallingford, 2012) also indicated that seabed sediments are mobile and prone to accretion although the underlying bedforms were stable. Thus, from the limited amount of available data the Applicant suggests that sand wave recovery would be expected to occur gradually over a period of several years. Evidence for other industries and regions suggests that sand based sediments can recover over shorter periods. For example, Newell *et al.* (2004) reports recovery times of months to one or two years. However, the Applicant's commitment to pre and post construction monitoring will provide important information on this hypothesis both in terms of the recovery of the MPA features but also in terms of providing a more robust dataset relating to the impact of offshore developments in areas of sand waves and seabed features more generally.

Risk of re-exposure of cables:

The Project Design Envelope (PDE) prescribes the provision of cable and scour protection and defines the required cable burial depths to account for coastal recession. The cable installation strategy will be designed to avoid free spanning (i.e. through the derivation of seabed clearance parameters and, armouring). The risk of cable exposure is therefore managed through project design (as with the justification of the scour protection depths/extents etc.). These parameters were precautionary and have been developed based on experience. A full cable burial risk assessment (CBRA) will be developed with the aim of avoiding areas of extensive sand waves where they are present along the offshore export cable route, and if this cannot be achieved, by setting a burial depth that will prevent any de-burial of the cable over the lifetime of the project whilst maintaining the electrical integrity of the cable.

NatureScot and JNCC reiterated that any armouring of the cable through areas of sand waves/megaripples (whether at installation or in response to future re-exposure) could disrupt the

hydrodynamics that underpin the ncMPA features. Therefore, the CBRA should not rely solely on armouring as an expected method of cable protection.

4.2.2 Summary Statement of Final Position

The approach to assessment of effects suggested by the Applicant for each effect were undertaken as agreed with the stakeholders as in Table 4.2 with regards to the following agreed points:

- the FeAST tool was used, in addition to the Applicant's proposed approach, for the assessment of the sensitivity of the fish and shellfish ecology receptors; and
- further details and clear figures requested in Table 4.2 for the MPA assessment and for the physical processes assessment were provided in the respective chapters

4.3 Approach to EIA and HRA

This section aims to document and agree key topics associated with the realistic maximum design scenarios assessed in relation to the benthic ecology, fish and shellfish ecology and physical processes assessments for Proposed Development offshore EIA and HRA. These include the following:

- initial findings of assessment of effects appropriate mitigation and monitoring; and
- initial findings of the MPA assessment.
- Table 4.3 summarises the points of discussion, areas of agreement and areas of outstanding agreements in relation to the approach to offshore EIA for the Proposed Development.

Table 4.3: Summary of Discussion and Agreed Position on Benthic Ecology, Fish and Shellfish Ecology and Physical Processes Approach to EIA

Topic	The Applicant Proposed Approach	MS-LOT Advice/Position	MSS Advice/Position	NatureScot Advice/Position	JNCC Advice/Position	Summary of Final Position
Benthic ecology: temporary habitat disturbance/loss	Construction Phase: Total temporary habitat disturbance/loss of up to 113.97 km^2 (approximately 7% of the benthic subtidal and intertidal study area) with 24.7 km^2 (1.16%) within the Firth of Forth Banks Complex MPA (details on maximum design scenario used in section 4.3.1.2). Trenchless techniques will result in no impact on intertidal receptors. **Magnitude:** The impact is predicted to be of local spatial extent, medium term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptors directly with a medium magnitude. Medium for subtidal IEFs and low for IEFs in MPA. Effects localised and temporary, with strong evidence of sediment recovery (RPS, 2019) which will facilitate recovery of associated benthic communities. **Sensitivity:** medium (subtidal sand and muddy sand sediments, subtidal coarse and mixed sediment and *Sabellaria* reef outside of an SAC) to high (sea pens and burrowing megafauna, ocean quahog).	No specific point raised.	No specific point raised.	No specific point raised.	Suggested considering boulder and sand wave clearance as long-term/permanent loss/disturbance	The initial findings presented by the Applicant were satisfactory with an agreement to consider sand waves and boulder clearance as temporary habitat disturbance/loss (see section 4.3.1.1).

Topic	The Applicant Proposed Approach	MS-LOT Advice/Position	MSS Advice/Position	NatureScot Advice/Position	JNCC Advice/Position	Summary of Final Position
	Significance: – subtidal IEFs: moderate in short term, decreasing to minor adverse significance in the medium to long term. No significant long-term effects; and – MPA IEFs (offshore subtidal sands and gravels, shelf banks and mounds and moraines): minor adverse significance; – MPA ocean quahog IEF: moderate in medium term, decreasing to minor adverse significance in long term. No significant long-term effects; **Designed In measures:** – commitment to locate exit punches out in area to allow onwards burial of the cable (avoid nearshore rocky habitats); and – pre-construction Annex I survey. CEA: **Magnitude:** medium **Significance:** moderate in the short term, decreasing to minor adverse significance in medium to long term. No significant long-term effects Operation and maintenance phase: Total temporary habitat disturbance/loss of up to 989,000 m^2 (0.06% of the benthic subtidal and intertidal study area) (details on maximum design scenario used in section 4.3.1.2). **Magnitude:** The impact is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be negligible. **Sensitivity:** The sensitivity of the subtidal habitat IEFs is the same as described for the construction phase (medium to high).					

Topic	The Applicant Proposed Approach	MS-LOT Advice/Position	MSS Advice/Position	NatureScot Advice/Position	JNCC Advice/Position	Summary of Final Position
	Significance: – subtidal IEFs: negligible except sea pens and burrowing megafauna which is minor.					
Benthic ecology: long term habitat loss	Operation and maintenance phase (including all the infrastructure installed in the construction phase): Total long term habitat loss of up to 7,798,856 m^2 (approximately 0.5% of the Benthic Subtidal and Intertidal Study Area) (details on maximum design scenario used in section 4.3.1.2). Trenchless techniques will result in no impact on intertidal receptors. **Magnitude:** low. The impact is predicted to be of local spatial extent, long term duration, continuous and high reversibility. It is predicted that the impact will affect the receptor directly. **Sensitivity:** High. All subtidal IEFs are sensitive to the physical change to another substrate type. Habitat will be lost within the footprint of the foundations, but cable protection will likely represent a shift/alteration in substrate type with opportunities for colonisation. **Significance:** minor (not significant in EIA terms) for all IEFs. CEA: **Magnitude:** low. **Significance**: minor adverse significance.	No specific point raised.	No specific point raised.	No specific point raised.	No specific point raised.	The initial findings presented by the Applicant were satisfactory.
Benthic ecology: colonisation of hard structures	Operation and maintenance phase: Creation of up to 10.2 km^2 of new habitat (over-estimate as it assumes the jacket foundation structures are solid) (details on maximum design scenario used in section 4.3.1.2). Expected colonisation of hard substrate by species already occurring in study area (e.g. mussels, tunicates, Bryozoa).	No specific point raised.	No specific point raised.	No specific point raised.	No specific point raised.	The initial findings presented by the Applicant were satisfactory.

Topic	The Applicant Proposed Approach	MS-LOT Advice/Position	MSS Advice/Position	NatureScot Advice/Position	JNCC Advice/Position	Summary of Final Position
	Magnitude: low. The impact is predicted to be of local spatial extent, long term duration (35-year operation and maintenance phase), continuous and irreversible during the lifetime of the Proposed Development. It is predicted that the impact will affect the receptors indirectly. Addition of hard substrate to previously soft sediment habitat, an increase in species diversity is likely to occur. Studies from offshore wind farms in Belgium suggest major changes in the soft sediment epibenthos are unlikely (De Backer *et al.,* 2020). Studies from the US found no strong gradients of change in sediment grain size, enrichment, or benthic macrofauna within 30-90 m distance bands of the wind turbines (Hutchison *et al.,* 2020).Latest monitoring from Beatrice offshore wind farm revealed that biofouling on all the wind turbines with signs of zonation and successional development, hermit crabs, flatfish and common sea urchin were recorded at the base in the immediate vicinity of the wind turbines and limited evidence for effects of biofouling communities on the epibenthic community composition in the immediate vicinity of the wind turbines, other than the presence of some mobile species. **Sensitivity:** High. The sensitivity of all the IEFs is the same as for long-term habitat loss, high sensitivity as physical change to another substratum is the only relevant pressure. **Significance:** minor (not significant in EIA terms).					
MPA assessment	**Temporary Habitat Disturbance/Loss:** The total temporary habitat disturbance/loss extent is up to 24.7 km^2 (1.16% of the overall MPA) (details on maximum design scenario used in section 4.3.1.2).	Relied on the advice from JNCC and NatureScot for the initial findings of the MPA assessment.	Relied on the advice from JNCC and Nature Scot for the initial findings of the MPA assessment.	Stated that concerns on all features of the MPA especially in relation to permanent habitat loss.	Joint advice with NatureScot for the initial findings of the MPA assessment.	The Applicant has incorporated all advice in the latest iteration of the MPA

Topic	The Applicant Proposed Approach	MS-LOT Advice/Position	MSS Advice/Position	NatureScot Advice/Position	JNCC Advice/Position	Summary of Final Position
	The high sensitivity of ocean quahog has been noted. There may be mortality associated with construction activities, but not all individuals impacted are expected to experience mortality. The approached taken assumed precautionary impact zones and not to quantify proportion of individuals. The reference population for ocean quahog was considered as the proportion of the MPA population from the wider OSPAR population. The maximum design scenario assumes a disturbance corridor of up to 25 m wide related to the offshore export cables, but direct impacts associated with the cable installation tool itself will be within a much smaller trench width of up to 2 m. Therefore, the project could have beneficial effects on ocean quahog. The maximum design scenario assumes 50 m advisory safety zones around wind turbines, and whilst these will not be enforced, they could potentially result in a reduction in fishing activity within the array as a result of logistical and safety issues. Therefore, ocean quahog could experience reduced pressures from commercial fishing which could benefit the overall recovery of the population. The Applicant will not attempt to quantify this benefit. Assessment against conservation objectives: – offshore subtidal Sands and Gravel: no significant risk of hindering the achievement of the conservation objectives (i.e. recover to favourable condition); – Shelf Banks and Mounds: no significant risk of hindering the achievement of the conservation objectives (i.e. maintain to favourable condition); – Ocean quahog aggregation: no significant risk of hindering the achievement of the conservation	Stated that the exclusion of fishermen from certain areas could result in displacement of fishing pressure within the MPA.	Requested to consider 3D area of the Proposed Development infrastructure in the habitat creation impact.	Stated that the safety zones (50m around each wind turbine) are very small in scale relative to the widespread nature of the habitat suitable for ocean quahog. Any benefit is likely to be difficult to quantify as there are many unknown variables, as outlined below: • limited information available on the ocean quahog population including distribution, age structure and recruitment; • limited evidence on likely levels of mortality from fishing activity; and • limited understanding as to the scale to which fishing activity may be reduced or excluded in response to the presence of wind turbines and associated cabling etc. In addition, there is little evidence relating to the distribution and abundance of ocean quahog within the MPA, or the likely level of mortality caused by disturbance. Therefore, no advice can be given on the potential degree of mortality associated with the Proposed Development. Stated that their assessment would likely be	Raised concerns regarding the impact on ocean quahog as the population size is unknown and which proportion might be affected. Advised to avoid relying too heavily on findings that an impact footprint is small. Areas less than 1% may still amount to significant impacts in some circumstances and the assessment cannot rely on this finding entirely. Small does not necessarily equate to “not significant”. Agreed that there is no particular value to quantify the benefit on ocean quahog from the 50 m safety zones around wind turbines and stated that the assessment would use supporting habitat as a proxy for impact on ocean quahog.	assessment. Additional details regarding the workings of the values are included in the latest iteration of the MPA assessment. The MPA assessment tried to account for the presence of 3D foundations in the water and assumed the structures are solid. More details and justification for significance of impact from small impact footprint are presented in the MPA assessment. Recovery of sand waves will be monitored, at a representative number of locations where sandwave clearance activity has taken place,

Topic	The Applicant Proposed Approach	MS-LOT Advice/Position	MSS Advice/Position	NatureScot Advice/Position	JNCC Advice/Position	Summary of Final Position
	objectives (i.e. recover to favourable condition). Focus on maintaining the sediment (ocean quahog habitat) as the abundance/distribution is unknown; and – Wee Bankie Key Geodiversity Area (Moraines): no significant risk of hindering the achievement of the conservation objectives (i.e. maintain in favourable condition). <u>CEA:</u> The cumulative temporary habitat disturbance/loss extent is up to 29.28 km^2 (1.37% of the MPA). Habitat disturbance from the construction of the Seagreen 1 offshore wind farm (36 wind turbines) will only overlap for a year with the construction of the Proposed Development. No spatial overlap and so no repeat disturbance to the same areas of this feature within the MPA. Conclusions for the Proposed Development alone assessment remain applicable. No significant risk of hindering the achievement of the conservation objectives for any of the features of the Firth of Forth Banks Complex MPA. **Long Term Habitat Loss:** Total long term habitat loss of up to 1.96 km^2 (0.09% of the MPA). Assessment against conservation objectives: – offshore Subtidal Sands and Gravel: no significant risk of hindering the achievement of the conservation objectives (i.e. recover to favourable condition); – Shelf Banks and Mounds: no significant risk of hindering the achievement of the			based on the percentage of suitable habitat (offshore Subtidal Sands and Gravel) that would be disturbed or permanently lost. Broadly agreed with the initial findings of the MPA assessment (from the draft assessment) Expect the offshore EIA report to present summary figures in the main text with accompanying tables and values used for each calculation to be provided (e.g. in annexes) to be able to replicate calculations or better understand derived values. In the summary section, a table should present an overview of the predicted temporary disturbance and permanent habitat loss across the development zone for each feature. Requested clarification on the maximum design scenario selected for the assessment as it should cover the maximum design scenario on the seabed and features within the MPA. Stated that there are no defined thresholds for hindering the conservation	Requested an explanation as to why the footprint, even though small, is not significant and suggested avoiding relying too much on findings that an impact footprint is small.	within the Firth of Forth Banks Complex MPA. Monitoring will be undertaken via pre- and post-construction geophysical surveys (combination of multibeam echosounder and high resolution side scan sonar).

Topic	The Applicant Proposed Approach	MS-LOT Advice/Position	MSS Advice/Position	NatureScot Advice/Position	JNCC Advice/Position	Summary of Final Position
	conservation objectives (i.e. maintain to favourable condition); – Ocean Quahog aggregation: no significant risk of hindering the achievement of the conservation objectives (i.e. recover to favourable condition); and – Wee Bankie Key Geodiversity Area (Moraines): no significant risk of hindering the achievement of the conservation objectives (i.e. maintain in favourable condition). <u>CEA:</u> Cumulative long term habitat loss of up to 3 km^2 (0.14% of the MPA). Small increase from the Proposed Development alone scenario. Conclusions for the Proposed Development alone assessment remain applicable. No significant risk of hindering the achievement of the conservation objectives for any of the features of the Firth of Forth Banks Complex MPA. **Colonisation of Hard Structures:** Introduction of up to 2.72 km^2 of new hard substrate (0.13% of the MPA). Assessment against conservation objectives: – offshore Subtidal Sands and Gravel: no significant risk of hindering the achievement of the conservation objectives (i.e. recover to favourable condition); and – Ocean quahog aggregation: no significant risk of hindering the achievement of the conservation objectives (i.e. recover to favourable condition). <u>CEA:</u>			objectives of a ncMPA; each case is assessed individually based on the information provided. However, advice was given, on a without prejudice basis, that the direction of travel of the MPA assessment would mean that the conservation objectives of the MPA are unlikely to be hindered. Asked to see evidence (e.g. fishing effort) from existing offshore wind farms in the southern North Sea to support the assessment and better understand whether fishers are observing safety zones or adopting wider voluntary zones.		

Topic	The Applicant Proposed Approach	MS-LOT Advice/Position	MSS Advice/Position	NatureScot Advice/Position	JNCC Advice/Position	Summary of Final Position
	Neither the Seagreen 1 Offshore Wind Farm nor Seagreen 1A Export Cable Corridor MPA assessments provide figures for habitat creation as part of their projects. Habitat creation is however likely to occur on the foundations of wind turbines and OSPs/offshore convertor station platform as well as on cable protection and scour protection as predicted for the Proposed Development. The communities which will colonise these structures will be ecologically distinct from those typically found across the largely sedimentary environment of the Firth of Forth Banks Complex MPA, comprising mostly of epifauna. Studies suggest that new communities are unlikely to have a significant impact upon the wider soft sediment habitats. There will be a small increase from the Proposed Development alone scenario. Conclusions for the Proposed Development alone assessment remain applicable. No significant risk of hindering the achievement of the conservation objectives for any of the features of the Firth of Forth Banks Complex MPA.					
Benthic ecology: monitoring	• No generic benthic monitoring is proposed but commitment to engage with MSS, NatureScot and other relevant key stakeholders to identify and deliver proportionate measures for contributing to strategic monitoring to understand the impact of hard structure colonisation and change in community structure and local species diversity in the immediate vicinity of hard structures. • In addition, commitment to engage in discussions with MSS and the SNCBs post consent to identify opportunities for contributing to proportionate and appropriate strategic monitoring of	No specific point raised.	Requested to assess marine growth removal/die off around wind turbines.	Advised to seek to validate key predictions made within the environmental assessments, by comparing areas inside and outside the wind farm (e.g. Before-After-Control Impact (BACI) type monitoring). Suggested that quantifying the beneficial effect of 50 m safety zones around wind turbines would be useful in terms of post-consent monitoring. Similarly monitoring to validate the	Stated that no current survey method to monitor ocean quahog that does not harm the ocean quahog. Supported the potential for eDNA techniques.	The monitoring approach suggested by the Applicant was agreed with possible monitoring commitments fully set out in the appropriate chapters and appendices of the Offshore EIA Report. The marine growth

Topic	The Applicant Proposed Approach	MS-LOT Advice/Position	MSS Advice/Position	NatureScot Advice/Position	JNCC Advice/Position	Summary of Final Position
	temporary habitat disturbance to sensitive features of the FFBC MPA features (e.g. ocean quahog).			assumption that sand waves are active and that they will reform.		removal/die off is part of the assessment with a qualitative description of material naturally falling off.
Fish and shellfish ecology: temporary habitat disturbance/loss	Construction phase: Total temporary subtidal habitat loss of 113.97 km^2 (7% of the Proposed Development fish and shellfish study area **Magnitude:** low. **Sensitivity (sandeel):** medium. Majority of favourable habitat in Proposed Development array area but habitat in Proposed Development export cable corridor is less favourable. Habitat loss not simultaneous (spread over 96 months). Sandeel shown to recover after installation of wind farms (Beatrice or Belgian offshore wind farm). **Significance (sandeel):** minor. Nephrops are sensitive to habitat disturbance, their distribution concentrated nearshore and their habitat extents north and south of the Proposed Development export cable corridor. Along with sediments, *Nephrops* will be able to recover.	No specific point raised.	No specific point raised.	No specific point raised.	No specific point raised.	The initial findings presented by the Applicant were satisfactory.
Fish and shellfish ecology: underwater noise	Construction phase: Details on maximum design scenario used in section 4.3.1.2. **Magnitude:** low. **Sensitivity (herring):** medium. Injury/mortality is only expected in very close proximity to piling operations. Use of Soft Starts will minimise potential for injury. Only a slight overlap with key herring spawning grounds to the north, at lower range of noise levels (130 dB -140 dB re 1 µPa SPL_{peak}). Levels lower	No specific point raised.	No specific point raised.	Advised that herring are considered important to the site as there is a slight overlap with key herring spawning grounds to the north of the Proposed Development array area.	No specific point raised.	The initial findings presented by the Applicant were satisfactory.

Topic	The Applicant Proposed Approach	MS-LOT Advice/Position	MSS Advice/Position	NatureScot Advice/Position	JNCC Advice/Position	Summary of Final Position
	than expected to cause any behavioural impacts. **Significance (herring):** minor. **Sensitivity (diadromous fish):** low**.** Species including Atlantic salmon and sea trout may experience behavioural effects (e.g. startle response, avoidance of an area, disruption of feeding) but unlikely to extensively utilise Proposed Development Fish and Shellfish study area, other than whilst migrating through. Individuals which happen to be in the very near vicinity of piling activity may experience injury or mortality. Highly mobile species are likely to flee area of ensonification, especially with use of soft start procedures. There is a small area around piling activities where noise levels are loud enough to cause behavioural effects. Distance from coastline means low likelihood of causing barrier effects to migration into Scottish rivers (and further afield).Freshwater Pearl Mussel would only be affected in the event that Atlantic salmon and sea trout were impacted adversely, which is not the case. **Significance (diadromous fish):** minor.					
Fish and shellfish ecology: colonisation of hard substrate	Up to 10.2 km^2 of habitat created but overestimate as jacket foundation walls are not solid. It is expected that colonisation of hard substrates will be by species already occurring in the study area (e.g. mussels, tunicates, Bryozoa). The increase in prey species may lead to increase fish and shellfish IEFs utilising foraging conditions. **Magnitude:** low **Sensitivity (marine species):** low. With the addition of hard substrate to previously soft sediment habitat, an increase in species diversity is likely to occur. Baseline assemblages may be displaced locally by new	No specific point raised.	No specific point raised.	No specific point raised.	No specific point raised.	The initial findings presented by the Applicant were satisfactory.

Topic	The Applicant Proposed Approach	MS-LOT Advice/Position	MSS Advice/Position	NatureScot Advice/Position	JNCC Advice/Position	Summary of Final Position
	species favouring the introduced hard substrate. Uncertainty of whether biomass increases around hard substrates or whether only a biomass concentration from surrounding areas. Studies conclude that finfish have neutral to beneficial likelihood of benefitting from introduction of wind turbine foundations (Linley *et al*., 2007).In contrast, other studies conclude that negligible effect on fish abundance can be seen (adverse or beneficial) (Cefas, 2009; BOWind, 2008). Crustaceans likely to benefit mainly due to the increased foraging opportunities and hard substrate habitat (depending on final design). **Significance (marine species):** negligible to minor. **Sensitivity (diadromous species):** low. It is expected that most diadromous species are unlikely to utilise increase in hard substrate, as mostly are just passing through for migration. There is some evidence of attraction of predators such as seal species (Russel *et al.,* 2014). Sea trout may be at higher risk than salmon due to higher usage of coastal environments (increased prey species on hard substrates may attract sea trout to wind turbines). Sandeel are a major prey resource for sea trout. Due to habitat preferences, sandeel are unlikely to be attracted to hard substrate. An abundance of sandeel throughout study area may reduce sea trout attraction to hard substrate. **Significance (diadromous species):** negligible to minor.					
Fish and shellfish ecology: CEA	All cumulative effects are predicted to be of negligible to minor adverse significance.	No specific point raised.	No specific point raised.	No specific point raised.	No specific point raised.	The initial findings presented by the Applicant were satisfactory.

Topic	The Applicant Proposed Approach	MS-LOT Advice/Position	MSS Advice/Position	NatureScot Advice/Position	JNCC Advice/Position	Summary of Final Position
Fish and shellfish ecology: monitoring	No specific monitoring is proposed but potential to input strategic monitoring. Potential ideas for sandeel include: – Monitoring of seabed sediments both pre and post construction (e.g. geophysical survey data, Particle Size Analysis (PSA)) to monitor recovery of sediments suitable for sandeels. – Sandeel monitoring (e.g. sandeel dredge surveys) focussing on areas identified as high suitability for sandeels both pre and post construction. – and for diadromous fish: – Potential deployment of listening stations throughout the Proposed Development array area (e.g. close to foundations to avoid fisheries interactions). – Commit to involvement in ScotMER diadromous fish group if available.	No specific point raised.	No specific point raised.	Agreed with the approach for monitoring the recovery of sediments that are suitable for sandeels together with dedicated sandeel dredge surveys in areas identified as high suitability for sandeels. Suggested that this monitoring should also take account of any fisheries returning to the development site (e.g. surveys conducted: pre-construction, post-construction pre-fisheries and post-construction with fishery activity). Supported the proposed monitoring of diadromous fish. Recommended further discussion including with MSS colleagues as to potential options and further exploration and discussion around the suitability of listening stations potentially being used for monitoring marine fish. However, feasibility of this option is unclear as fish would need to be tagged. Supported the willingness by the Applicant to be	No specific point raised.	The Applicant is committed to engage in discussions with MSS and the SNCBs post-consent to identify opportunities for contributing to proportionate and appropriate strategic monitoring of diadromous fish species. This may include research priorities identified by ScotMER steering group.

Topic	The Applicant Proposed Approach	MS-LOT Advice/Position	MSS Advice/Position	NatureScot Advice/Position	JNCC Advice/Position	Summary of Final Position
				involved in strategic monitoring		
Intertidal assessment	An assessment on the intertidal area was not planned as open trenching will not be used - only trenchless techniques. The landfall is at Skateraw. However, an assessment of indirect impacts on intertidal receptors within the benthic ecology assessment has been included, including effects such as suspended sediments. Direct impacts (e.g. habitat loss) were screened out. Due to the combined lack of direct impacts on intertidal habitats and that the fish and shellfish receptors are unlikely to use these intertidal habitats, intertidal impacts on fish and shellfish receptors are scoped out from the EIA.	No specific point raised.	No specific point raised.	Agreed that direct impacts to benthic and fish and shellfish receptors at the intertidal can be scoped out.	No specific point raised.	The approach suggested by the Applicant was agreed.

4.3.1 Additional Details on Key Discussions

4.3.1.1 Boulder and sand waves clearance

The Applicant clarified that boulder and sand waves clearance is more a redistribution. Therefore, with physical processes maintained in the area, sand waves are predicted to recover together with associated sediments and benthic communities. PDE assumes that up to 20% of the offshore export cables and 30% of the inter-array cables will require sand wave clearance, and 20% of all cables that will require boulder clearance. Material is removed during this clearance and deposited along the seabed that will cause temporary habitat loss. The volume of the material to be cleared is assumed to be deposited over an area up to a depth of 0.5 m. This "mound" will likely disperse over time. As engineers are able to refine the final design parameters pre-construction, the habitat loss figures will change. Maximum design scenario assumed a dredging-disposal technique but could create a less intense construction plume with plough dredging. In addition, the deposition of the sand wave clearance material is assessed as temporary habitat loss rather than in the assessment of suspended sediments and sediment deposition because of the scale of the activity/depth of deposition.

4.3.1.2 Maximum design scenario used in the assessment of effects

Temporary habitat disturbance/loss (construction) – benthic ecology:

- PDE assumes that up to 20% of the offshore export cables and 30% of the inter-array cables will require sand wave clearance and 20% of all cables that will require boulder clearance;
- cable installation: 1,225 km of inter-array cables, 94 km of interconnector and 872 km of offshore export cables (total of 42,948,000 m^2);
- anchor footprint: 438,200 m^2;
- jack-up footprint: up to four jack-up locations per wind turbine and OSPs/Offshore convertor station platform; and
- the deposition of the sand wave clearance material is assessed as temporary habitat loss rather than in the assessment of suspended sediments and sediment deposition because of the scale of the activity/depth of deposition.

Temporary habitat disturbance/loss (operation and maintenance) – benthic ecology:

- cable repair and reburial (inter-array and interconnector 450,000 m^2 for repair and 150,000 m^2 for reburial) = 720,000 m^2;
- jack-up footprint (used for all component repairs) = 269,000 m^2; and
- total = 989,000 m^2.

Long term habitat loss – benthic ecology:

- cable protection (15% of each cable type) = 5,470,500 m^2;
- foundations and scour protection (179 wind turbines and ten OSP/Offshore convertor station platform foundations) = 2,265,776 m^2; and
- total = 7,798,856 m^2.

Colonisation of hard structures – benthic ecology:

- cable protection (15% of all cables) = 6,442,200 m^2;
- OSP/Offshore convertor station platform foundations and scour protection (ten OSP/Offshore convertor station platforms foundations, and associated scour protection);
- wind turbine foundations and scour protection (307 wind turbine foundations); and
- total = 10,198,971 m^2.

MPA assessment:

Temporary habitat disturbance/loss:

- sand wave and boulder clearance 6,306,405 m^2;
- assuming clearance occur within a 25 m wide corridor within which the cables are subsequently buried;
- sand wave and boulder clearance deposition 13,762,343 m^2;
- temporary habitat disturbance/loss from the placement of dredged material to a uniform thickness of 0.5 m as a result of sand wave clearance placed on the seabed within the Firth of Forth Banks Complex MPA;
- cable installation 4,126,083 m^2;
- assumes a maximum of 31.33% of the total temporary habitat disturbance/loss from 612.5 km of inter-array cables, and 47 km of substation interconnector cables, as well as 13.08% of the total temporary habitat disturbance/loss from 872 km of offshore export cables, affecting a corridor of up to 15 m width;
- jack-up events 397,270 m^2;
- assumes maximum of 31.33% of total temporary habitat disturbance/loss from jack-up placements within the Proposed Development array area and export cable corridor;
- anchoring during cable installation 105,466 m^2;
- assumes maximum of 31.33% of total temporary habitat disturbance/loss from anchor placement across the Proposed Development array area and Proposed Development export cable corridor; and
- total 24,697,555 m^2 (equates to 1.32% of the total area of the MPA).

Underwater noise magnitude – fish and shellfish ecology:

- installation of up to 179 piled jacket foundations: 1,432 piles;
- maximum hammer energy of 4,000 kJ, but realistic max hammer energy 3,000 kJ;
- up to 10 hours piling per pile (up to 8 hours for OSPs/Offshore convertor station platforms)
- maximum number of days when piling may occur: 372 days;
- up to 14 UXO clearances may be required – assumed 5% of detonations will be higher order (due to unsuccessful deflagration), with the remaining detonated by deflagration, or microsited around if possible; and
- all other noise sources (e.g. cable installation, foundation drilling etc.) have much smaller injury ranges than predicted for piling operations.

4.3.2 Summary Statement of Final Position

The initial findings for the assessment of effects and the MPA assessment as presented by the Applicant in Table 4.3 were agreed by the stakeholders and maintained with regards to the following agreed points:

- sand waves and boulder clearance maintained as temporary habitat disturbance/loss;
- monitoring of sand waves recovery in the Firth of Forth Banks Complex MPA;
- additional details regarding the workings of the values and for significance of impact from small impact footprint included in the MPA assessment;
- impact of EMF on benthic invertebrates included in the MPA assessment;
- calculation for determining the maximum design scenario for wind turbine and OSPs/Offshore convertor station platform included in the MPA assessment;
- the use of percentage of suitable habitat that would be disturbed or permanently lost to assess the degree of mortality for ocean quahog in the MPA assessment; and

- overall belief that conservations objectives of the Firth of Forth Banks Complex MPA are unlikely to be hindered.

5 AREAS OF AGREEMENT AND OUTSTANDING NON-ALIGNMENT

Table 5.1 summarises the position following completion of the Road Map process for benthic ecology, fish and shellfish ecology and physical processes at the point of Application submission. This forms the basis of the offshore EIA and HRA assessments presented within the offshore EIA Report and RIAA for the Proposed Development.

Table 5.1: Areas of Agreement and Outstanding Non-Alignment Following Completion of the Road Map Process for Benthic Ecology, Fish and Shellfish Ecology and Physical Processes

Area of Agreement and Outstanding Non-Alignment	Summary of Issue	Suggested Solution	Status at EIA Submission		
			MS-LOT	MSS	NatureScot
Scope of receptors and key impacts	No specific issue remaining following the agreement that: • kelp forests are considered as benthic ecology receptor; • micro-sitting is considered as a benthic ecology designed in measure; • FeAST tool is used to inform the sensitivity assessment of benthic ecology receptors; • impact of EMFs from subsea cabling is scoped in in the benthic ecology assessment of effects; • the Firth of Forth Banks Complex ncMPA is the only MPA considered in the MPA assessment; • cumulative effects are considered in the MPA assessment; and • sparling and river lamprey are not considered in the fish and shellfish ecology assessment of effects.	No solution required.	Aligned with the Applicant.	Aligned with the Applicant.	Aligned with the Applicant.
Approach to assessments of effects (benthic ecology, fish and shellfish, and physical processes) and MPA assessment	No specific issue remaining following the agreement that: • the FeAST tool is used for the sensitivity of the fish and shellfish ecology receptors.	No solution required.	Aligned with the Applicant.	Aligned with the Applicant.	Aligned with the Applicant.
Assessments of effects initial findings (benthic ecology, fish and shellfish, and physical processes)	No specific issue remaining following the agreement that: • sand waves and boulder clearance are maintained as temporary habitat disturbance/loss,	No solution required.	Aligned with the Applicant.	Aligned with the Applicant.	Aligned with the Applicant.

Area of Agreement and Outstanding Non-Alignment	Summary of Issue	Suggested Solution	Status at EIA Submission		
			MS-LOT	MSS	NatureScot
	• monitoring of sand waves recovery in the Firth of Forth Banks Complex MPA; • additional details regarding the workings of the values and for significance of impact from small impact footprint included in the MPA assessment; • impact of EMF on benthic invertebrates included in the MPA assessment; • calculation for determining the maximum design scenario for wind turbine and OSPs/Offshore convertor station platform included in the MPA assessment; • the use of percentage of suitable habitat that would be disturbed or permanently lost to assess the degree of mortality for ocean quahog in the MPA assessment; and • overall belief that conservations objectives of the Firth of Forth Banks Complex MPA are unlikely to be hindered.				

6 CONCLUSION

The aim of the Benthic Ecology, Fish and Shellfish Ecology and Physical Processes Road Map was to ensure that the final consent Application submitted provides MS-LOT and its statutory advisors with sufficient information with which to make a determination. This document has set-out the meetings, agreements and areas of outstanding discussion that have been achieved in relation to the benthic ecology, fish and shellfish ecology and physical processes topics for the offshore EIA, and benthic ecology and fish and shellfish ecology topics for the offshore HRA.

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