BERWICK BANK WIND FARM
OFFSHORE SCOPING REPORT

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Approval for issue

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GLOSSARY

Term	Definition
Anthropogenic	Man-made
Bryozoan	Aquatic invertebrate
Covid-19	Pandemic caused by the coronavirus 2 (SARS-CoV-2)
Cumulative Effects	Changes to the environment caused by a combination of present and future projects, plans or activities
Digital Aerial Surveys	Digital surveys carried out by aeroplane
Echolocation	The location of objects by reflected sound
EIA Regulations	Collectively the term used to refer to The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017; The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017; The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017.
Embedded mitigation	Mitigation measures included in the design of a proposed development
Ensonification	To fill an area with sound
Environmental Impact Assessment	Assessment of the consequences to the environment of a plan, project or activity
Epibenthic	Flora or fauna that live on the seabed
Epifaunal	Animals living on the seabed
EUSeaMap	Broadscale habitat maps produced by EMODnet for Europe
Former Firth of Forth Zone	Suitable areas for the development of offshore wind assessed through a statutory process of Strategic Environmental Assessment (SEA) undertaken by Department of Energy and Climate Change (DECC), now Department for Business, Energy and Industrial Strategy (BEIS).
Geodiversity	Geological materials, forms and processes that shape the Earth
Grab sample	A technique used to sample benthic flora and fauna
Important Ecological Feature	Ecologically important features that require further consideration within the EIA process
Infaunal	Animals that live in the sediments occurring on the sea floor
Macrobenthic	Animals that inhabit the bottom of the water column
Marine Licence	Licence granted under either the Marine and Coastal Access Act 2009 or the Marine (Scotland) Act 2010
Marine Scotland	Organisation who's purpose is to manage Scotland's seas

Term	Definition
Marine Strategy Framework	The European Union Directive (2008/56/EC) seeking to achieve good environmental status (GES) in Europe's seas by 2020.
MARPOL	International Convention for the Prevention of Pollution from Ships
Moraine	Accumulation of glacial debris
MRSea	Statistical modelling of Bird and Cetacea Distributions in Offshore Renewables Development Areas
Natura 2000	A network of core breeding and resting sites for rare and threatened species and habitats
Nursery Ground	An area that is suitable for young fish to grow and live
Offshore Scoping Report	Scoping Report assessing all of the offshore infrastructure of the Project, seaward of MHWS
Onshore Scoping Report	Scoping Report assessing all onshore infrastructure of the Project landward of MLWS
OSPAR Convention	The Convention for the Protection of the Marine Environment of the North-East Atlantic
Permanent Threshold Shift (PTS)	Irreversible loss of hearing
Phase 1	Development of two offshore wind farms: Seagreen Alpha and Seagreen Bravo
Planning Permission	Permission granted under the Town and Country Planning (Scotland) Act 1997 for all Project infrastructure located landward of MLWS
Project	Berwick Bank Wind Farm
Project Design Envelope	Project Parameters that are assessed as part of the EcIA process for a proposed development
Proposed Development	Offshore components of the Project
Scottish Ministers	The devolved government of Scotland
SeaBORD	A tool to Estimate the Fate of Birds Displaced by Offshore Renewable Development
Seagreen 1	Seagreen Alpha and Seagreen Bravo Offshore Wind Farms
Berwick Bank	Berwick Bank Wind Farm (formerly Seagreen 2 Offshore Wind Farm)
Marr Bank	Marr Bank Wind Farm (formerly Seagreen 3 Offshore Wind Farm)
Section 36 consent	Consent which can be granted under section 36 of the Electricity Act 1989 for the construction or extension, and operation, of electricity generating stations
SOLAS	International Convention for the Safety of Life at Sea
Spawning Ground	Area where a fish leaves their eggs for fertilization and development

Term	Definition
Temporary Threshold Shift (TTS)	Reversible and temporary hearing loss
The Applicant	Berwick Bank Wind Limited
Zone of Theoretical Visibility	Tool to identify the likely extent of visibility of a proposed development

ACRONYMS

Acronym	Description
AD	Air Defence
ADD	Acoustic Deterrent Device
AEZ	Archaeological Exclusion Zones
AfL	Agreement for Lease
AIS	Automatic Identification System
ANO	Air Navigation Order
AOD	Above Ordnance Datum
AONB	Area of Outstanding Natural Beauty
ASA	Acoustical Society of America
ATC	Air Traffic Control
AtoN	Aids to Navigation
ATS	Air Traffic Services
BDMPS	Biologically Defined Minimum Population Scales
BEIS	Department for Business, Energy and Industrial Strategy
BIS	British Ice Sheet
BODC	British Oceanographic Data Centre
BSI	British Standards Institute
BTO	British Trust for Ornithology
CAA	Civil Aviation Authority
CAFS	Cleaner Air for Scotland
CaP	Cable Plan
CAP	Civil Aviation Publication
CEA	Cumulative Effect Assessment
Cefas	Centre for Environment Fisheries and Aquaculture Science
CES	Crown Estate Scotland
CfD	Contract for Difference

Acronym	Description
CI	Confidence Interval
CIEEM	Chartered Institute of Ecology and Environmental Management
CO_2	Carbon dioxide
CoCP	Code of Construction Practice
COWRIE	Collaborative Offshore Wind Research Into The Environment
CRM	Collision Risk Modelling
CTV	Crew Transfer Vessel
DDV	Drop-Down Video
DECC	Department of Energy and Climate Change
Defra	Department for Environment, Food and Rural Affairs
DGC	Defence Geographic Centre
EC	European Commission
EcIA	Ecological Impact Assessment
ECML	East Coast Main Line
ECMWF	European Centre for Medium-range Weather Forecast
EEA	European Economic Area
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
ELC	East Lothian Council
EMEC	European Marine Energy Centre
EMF	Electromagnetic Field
EMODnet	European Marine Observation and Data Network
EPS	European Protected Species
ESAS	European Seabirds at Sea
ESCA	European Subsea Cables UK Association
EU	European Union
EUNIS	European University Information Systems
FAME	Future of the Atlantic Marine Environment

Acronym	Description
FLO	Fisheries Liaison Officer
FLOWW	Fishing Liaison with Offshore Wind and Wet Renewables Group
FM	Flexible Mesh
FMMS	Fisheries Management and Mitigation Strategy
FSA	Formal Safety Assessment
GES	Good Environmental Status
GLVIA	Guidelines for Landscape and Visual Impact Assessment
GVA	Gross Value Added
HDD	Horizontal Directional Drilling
HES	Historic Environment Scotland
HLV	Heavy lift vessel
HMRs	Helicopter Main Routes
HRA	Habitats Regulation Appraisal
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
HW	High water
IAMMWG	Inter-Agency Marine Mammal Working Group
IAQM	Institute of Air Quality Management
IBA	Important Bird Areas
ICAO	International Civil Aviation Organization
ICES	*International Council for the Exploration of the Sea*
ICPC	*International Cable Protection Committee*
ID	Identification
IEF	Important Ecological Feature
IEMA	Institute of Environmental Management of Assessment
IEP	Industry Evidence Programme
IMO	International Maritime Organization
INIS	Invasive Non-Indigenous Species

Acronym	Description
IROPI	Imperative reasons of overriding public interest
JNCC	Joint Nature Conservation Committee
KP	Kilometre point
LAT	Lowest Astronomical Tide
LCA	Landscape Character areas
LCT	Landscape Character Types
LMP	Lighting and Marking Plan
LSE	Likely Significant Effects
LUC	Land Use Consultants
MAA	Military Aviation Authority
MAIB	Marine Accident Investigation Branch
MBES	Multibeam echo sounder
MCA	Maritime and Coastguard Agency
MCAA	Marine and Coastal Access Act
MCZ	Marine Conservation Zone
MEDIN	Marine Environmental Data Information Network
MGN	Marine Guidance Note
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
MMMU	Marine Mammal Management Unit
MMO	Marine Management Organisation
MNCR	Marine Nature Conservation Review
MoD	Ministry of Defence
MPA	Marine Protected Area
MS LOT	Marine Scotland Licensing Operations Team
MU	Management Unit
N/A	Not Applicable
NBN	National Biodiversity Network

Acronym	Description
NCC	Northumberland County Council
NECD	National Emission Ceilings Directive
NERL	National Air Traffic Services En-Route PLC
NH_3	Ammonia
NLB	Northern Lighthouse Board
NMFS	National Marine Fisheries Service
NMPi	National Marine Plan Interactive
NO	Nitrogen oxide
NO_2	Nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NO_x	Oxides of nitrogen
NPF	National Planning Framework
NPL	National Physics Laboratory
NRA	Navigational Risk Assessment
NRHE	National Record of the Historic Environment
NtM	Notice to Mariners
OFLOS	Offshore Fisheries Liaison Officers
OGA	Oil and Gas Authority
OREI	Offshore Renewable Energy Installations
OSP	Offshore Substation Platforms
OSPAR	Oslo-Paris
PAC	Pre-application consultation
PAD	Protocol for Archaeological Discoveries
Pb	Lead
PCDD/F	Dioxins
PDE	Project Design Envelope
PM_{10}	Particular Matter
PM2.5	Particular Matter

Acronym	Description
PSA	Particle Size Analysis
pSPA	Proposed Special Protection Area
PTS	Permanent Threshold Shift
Q4	Quarter four
REZ	Renewable Energy Zone
RIAA	Report to Inform Appropriate Assessment
RLOS	Radar-Line-Of-Sight
RMNC	Review of Marine Nature Conservation
ROV	Remotely Operated underwater Vehicle
RSMP	Regional Seabed Monitoring Programme
RSPB	Royal Society for the Protection of Birds
RYA	Royal Yachting Association
S.D.	Standard Deviation
SAC	Special Areas of Conservation
SAR	Search and Rescue
SAS	Surfers Against Sewage
SBP	Sub-bottom profiler
SCANS	Small Cetaceans in European Atlantic Waters
SCOS	Special Committee on Seals
sCRM	Stochastic Collision Risk Model
SEA	Strategic Environmental Assessment
SEL	Sound Exposure Level
SEL_{cum}	Cumulative Sound Exposure Level
SEPA	Scottish Environment Protection Agency
SFF	Scottish Fishermen's Federation
SM	Scheduled Monument
SMA	Seal Management Area
SMP	Seabird Monitoring Plan

Acronym	Description
SMR	Scottish Marine Region
SMRU	Sea Mammal Research Unit
SNCB	Statutory Nature Conservation Bodies
SNH	Scottish Natural Heritage
SO_2	Sulphur dioxide
SOV	Service Operations Vessel
SOWEC	Scottish Offshore Wind Energy Council
SPA	Special Protection Area
SPL_{peak}	Peak Sound Pressure Level
SPM	Suspended particulate matter
SPP	Scottish Planning Policy
SSC	Suspended sediment concentration
SSS	Sidescan sonar
SSSI	Site of Special Scientific Interest
STAR	Seabird Tracking and Research
TCE	The Crown Estate
TLP	Tensioned-leg platforms
TP	Transition piece
TSS	Total Suspended Solids
UHRS	Ultra-high resolution seismic
UK	United Kingdom
UKCS	UK Continental Shelf
UKFEN	UK Fisheries Economics Network
UKHO	United Kingdom Hydrographic Office
UKOOA	United Kingdom Offshore Operators Association
UXO	Unexploded ordnance
VMP	Vessel Management Plan
VMS	Vessel Monitoring System

Acronym	Description
WSI	Written Scheme of Investigation
WWT	Wildfowl and Wetlands Trust
ZAP	Zone Appraisal and Planning
ZDA	Zone Development Agreement
ZOI	Zone of Influence
ZTV	Zones of Theoretical Visibility

UNITS

Unit	Description
%	Percentage
£	Pound Sterling
GT	Gross Tonnage (Volume)
GW	*Gigawatt (power)*
Hrs	Hours
kHz	KiloHertz
kJ	Kilojoule
Km	Kilometres (distance)
km^2	Square kilometres
L	Litre
M	*Metre (distance)*
m^2	*Square metres*
m^3	*Cubic metres*
Mg	Milligram
Mm	*Millimetre (length)*
m/m	*Percent by mass*
MW	Mega Watt
Nm	*Nautical mile (distance)*
nT	Nanotesal (magnetic flux density)
Rms	Root-mean-square
S	second
Tonnes	non-SI metric unit of mass equal to 1,000 kilograms
$\mu g/m^3$	Micrograms per Cubic Meter of Air.

EXECUTIVE SUMMARY

Berwick Bank Wind Limited (BBW) (the Applicant) is proposing the development of the Berwick Bank Offshore Wind Farm (hereafter referred to as the Project) in the outer Firth of Forth and Firth of Tay, 39.2 km east of the East Lothian coastline. The export cables will make landfall on the East Lothian coast, specifically at Thorntonloch and/or at Skateraw Harbour. From here, the export cables will connect to a Scottish Power Transmission (SPT) 400kV Grid Substation located at Branxton, which is located southeast of Torness Power station.

The Applicant intends to submit separate consents, licences and permissions for the offshore (seaward of mean high water springs (MHWS)) and onshore (landward of mean low water springs (MLWS)) infrastructure of the Project. This Offshore Scoping Report considers all of the offshore infrastructure of the Project, seaward of MHWS, which is hereafter referred to as the Proposed Development. The consents, licences and permissions which will be sought by the Applicant for the Proposed Development include:

- 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 export cable which is within 12 nm of the coast; and
- planning permission under the Town and Country Planning (Scotland) Act 1997 for all Project infrastructure located landward of MLWS.

In applying for these consents, licences and permissions, an Environmental Impact Assessment (EIA) Report is required to be prepared and submitted to support these applications. The EIA is required to fulfil the requirements of the following regulations: The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017; The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017; and The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017. This Offshore Scoping Report has been prepared to support a request for a formal Scoping Opinion in relation to the Proposed Development from Scottish Ministers. The Offshore EIA Report will be informed by the Scoping Opinion on this Offshore Scoping Report.

This Offshore Scoping Report provides an overview of the existing physical, human and biological environment, identified by known and accessible data sources, and outlines planned surveys to acquire additional data where required. An overview of both the project specific and cumulative potential effects associated with the construction, operation and maintenance, and decommissioning phases of the Proposed Development are provided. This Offshore Scoping Report also outlines the proposed methods to be employed to assess the significance of effect for the technical topics. For the purpose of this Offshore Scoping Report, the following technical topics have been considered:

- offshore physical environment
  - physical processes;
  - subsea noise;
  - airborne noise; and
  - air quality.
- offshore biological environment
  - benthic subtidal and intertidal ecology;
  - fish and shellfish ecology;
  - marine mammals; and
  - ornithology.

- offshore human and socio-economic environment
  - commercial fisheries;
  - shipping and navigation;
  - aviation, military and communications;
  - marine archaeology;
  - seascape, visual resources and cultural heritage setting;
  - infrastructure and other users; and
  - offshore socio-economic and tourism.

The Applicant invites consultees to respond to this Offshore Scoping Report by providing a response to the topic specific questions which are included in each technical topic and through providing a formal opinion on the key areas identified, the data sources and the methodology proposed.

1 INTRODUCTION

1.1 BACKGROUND

Berwick Bank Wind Limited (BBW) is a wholly owned subsidiary of SSE Renewables Developments (UK) Limited ("SSE Renewables"). BBW (hereafter referred to as the Applicant) is proposing the development of the Berwick Bank Wind Farm (hereafter referred to as the Project). The Project includes both the offshore and onshore infrastructure required to generate and transmit electricity from the array area to a Scottish Power Transmission (SPT) 400kV Grid Substation located at Branxton, southeast of Torness Power station. The array area is located in the outer Firth of Forth and Firth of Tay, 39.2 km east of the East Lothian coastline from the nearest boundary and is the second project to be developed in the former Firth of Forth Zone (see Figure 1.1).

The Applicant intends to submit separate consents, licences and permissions for the offshore (seaward of Mean High Water Springs (MHWS) and onshore (landward of Mean Low Water Springs (MLWS)) infrastructure of the Project. This Offshore Scoping Report therefore considers all of the offshore infrastructure of the Project, seaward of MHWS. A separate Onshore Scoping Report has also been prepared for all onshore infrastructure of the Project landward of MLWS Berwick Bank Wind Farm Onshore EIA Scoping Report and is not therefore discussed further within this Offshore Scoping Report. The offshore components of the Project are hereafter referred to as the Proposed Development.

As the Proposed Development is a generating station with a capacity of greater than 1 MW, it 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 export cable which is within 12 nm of the coast; and
- planning permission under the Town and Country Planning (Scotland) Act 1997 for all Project infrastructure located landward of MLWS.

All consents and licences required for site investigation surveys which are to be undertaken during the pre-application phase will be sought separately and have therefore not been considered further within this Offshore Scoping Report.

In applying for these consents, licences and permissions, an Environmental Impact Assessment (EIA) Report is required to be prepared and submitted to support these applications (see section 2.3). The EIA is required to fulfil the requirements of the following regulations:

- in respect to a Section 36 consent application: The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017;
- in respect to a marine licence application: The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017; and
- in respect to a planning application: The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017.

Hereafter, these regulations have collectively been referred to as the EIA Regulations.

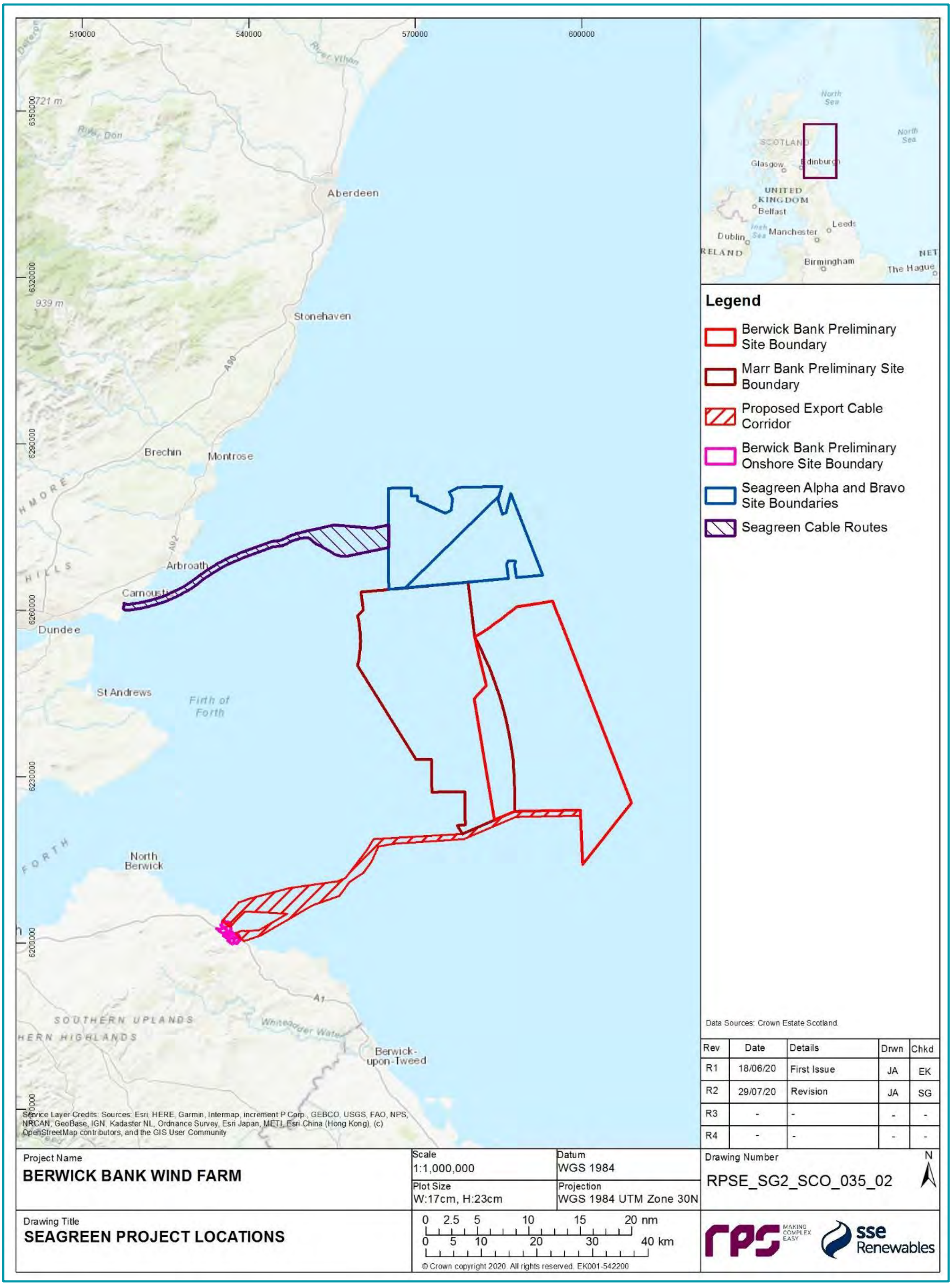

Figure 1.1: **Location of the Array Area, Within the Former Firth of Forth Zone, and proposed Offshore and Onshore Export Cable Corridor.**

In support of the consents, licences and permission applications for the Proposed Development (i.e. all works seaward of MHWS), an Offshore EIA Report will detail, and will be informed by, stakeholder consultation on this Offshore Scoping Report. Details of the proposed approach to Stakeholder Consultation is outlined in section 5.3.4. The Offshore EIA Report will be submitted to Scottish Ministers in 2021.

The applicant is seeking a 50-year consent period to allow the wind farm to continue operating should the lifespan of the wind turbines allow. If, in the future, the applicant sought to repower the wind farm then they would do so through the submission of an application to cover any proposed new development.

1.2 PROJECT OVERVIEW

1.2.1 FIRTH OF FORTH ZONE

The Round 3 offshore wind development programme was instigated by The Crown Estate (TCE) in 2008. Suitable areas for the development of offshore wind were assessed through a statutory process of Strategic Environmental Assessment (SEA) undertaken by Department of Energy and Climate Change (DECC), now Department for Business, Energy and Industrial Strategy (BEIS). As part of a competitive tender, Seagreen Wind Energy Limited was awarded the exclusive rights to the development of the Firth of Forth Zone by TCE in 2010. The subsequent Zone Development Agreement (ZDA) between Seagreen Wind Energy Ltd and TCE established a target generation capacity of 3,465 MW within the Zone, which is to be met through the development of several offshore wind farms. Subsequently in 2019, the Firth of Forth ZDA was terminated, with Agreement for Leases (AfLs) now agreed with Crown Estate Scotland (CES) for Seagreen 1 (consisting of Seagreen Alpha and Seagreen Bravo), Berwick Bank and Marr Bank.

1.2.2 PHASE 1

Phase 1 within the former Firth of Forth Zone included the development of two offshore wind farms: Seagreen Alpha and Seagreen Bravo (hereafter collectively referred to as Seagreen 1), located around 27 km from the Angus coastline (Figure 1.1), which have the potential combined capacity of up to 1,500 MWs. The export cable for Seagreen 1 will make landfall at Carnoustie and connects to a substation at Tealing.

Offshore consent for Seagreen 1 was received in October 2014 from Scottish Ministers and was confirmed in November 2017 following a legal challenge by the Royal Society for the Protection of Birds (RSPB). A 15-year Contract for Difference (CfD) was awarded in September 2019 for 42% of the total project capacity (454 MW) and Seagreen 1 reached financial close in June 2020.

Construction of Seagreen 1 will begin with offshore site establishment in May 2021. Construction will occur in two stages. Stage 1 will cover installation of up to 114 wind turbines on suction bucket caisson foundations, and installation of the first offshore substation platform (OSP). Stage 2 will cover installation of up to 36 wind turbines with piled foundations, and installation of the second OSP. There is potential that wind turbines on suction buckets may be commissioned and begin generating in Stage 1 after installation of the OSP.

Seabed preparation activities will be required in advance of foundation installation activities and inter-array cable installation activities, Pre-campaign surveys and seabed preparation activities will take place between April 2021 and June 2021.

1.2.3 PHASE 2

Phase 2 of the former Firth of Forth Zone includes Berwick Bank (the Project), which will have an approximate installed capacity of 2,300 MW, and Marr Bank, which will have an approximate installed capacity of 1,850 MW.

Berwick Bank Wind Ltd has a 50-year AfL agreement with Crown Estate Scotland. in addition to advances in technology, operations and maintenance means wind farms may operate beyond 25 years. Therefore a 50-year consent life under S 36 of the Electricity Act will be applied for.

The Project will include 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. Key components of the Proposed Development (i.e. the offshore components of the Project) include:

- wind turbines;
- wind turbine foundations;
- array cables;
- interconnection cables;
- offshore platform(s); and
- offshore export cable/s.

The Project array area, which is located approximately 5 km south of Seagreen 1, is approximately 775 km^2, and is located to the east of the large-scale morphological banks 'Marr Bank' and overlapping the 'Berwick Bank' in the south.

The proposed export cable corridor is illustrated in Figure 1.1 and is approximately 80 km in length. The Applicant is currently assessing the feasibility of one or both selected landfall locations on the East Lothian coast, one at Thorntonloch (hereafter referred to as 'Thorntonloch Landfall') and one at Skateraw Harbour (hereafter referred to as the 'Skateraw Landfall')'. Both cable landfalls may be utilised.

The electricity generated from the wind turbines will be transmitted to the landfall via buried High Voltage (HV) cables using either Direct Current (DC) or Alternating Current (AC).

The Project development area, including both offshore and onshore components, was selected following both engineering and environmental considerations. Further details regarding the site selection of the Proposed Development is provided in chapter 3.

Marr Bank Wind Farm is located to the west of the Project (Figure 1.1). The Offshore Scoping Report for Marr Bank Wind Farm is due to be published in Quarter 1 of 2021.

1.3 OFFSHORE SCOPING REPORT

1.3.1 PURPOSE

This Offshore Scoping Report has been prepared in order to support a request for a formal Scoping Opinion in relation to the Proposed Development from Scottish Ministers. It is anticipated that the Scoping Opinion will be based on responses to this Offshore Scoping Report from key statutory and non-statutory consultees, which will help guide the Applicant in progressing the Offshore EIA Report.

The purpose of this Offshore Scoping Report is to provide stakeholders with information on the Proposed Development and allow for engagement with stakeholders on the key topics to be addressed in the Offshore EIA Report, as well as the baseline data sources and assessment methodologies to be used to inform the Offshore EIA Report. Table 1.1 summarises the information requirements set out in the EIA Regulations and where these can be found in this Offshore Scoping Report.

Table 1.1: Scoping Requirements of the EIA Regulations and Where the Information is Included in the Offshore Scoping Report.

EIA Regulation Topic Requirement	Summary content
A description of the location of the Proposed Development, including a plan sufficient to identify the land	Chapter 3 includes a description of the Proposed Development including a plan.
A brief description of the nature and purpose of the Proposed Development and of its likely significant effects (LSE) on the environment	Chapter 3 includes a description of the nature and purpose of the Proposed Development, and chapters 6 to 8 and Annex A includes a description of the LSE on the environment from the Proposed Development.
Information on the Proposed Development and the associated environmental impacts in order to sufficiently define the potential effects and therefore extent of the EIA	Chapters 6 to 8 and Annex A includes a description of the potential effects on the environment and therefore the extent of the EIA.

Within this Offshore Scoping Report, a number of potential environmental impacts are considered. These include impacts which are proposed to be scoped out of the EIA due to no likely significant effect in EIA terms or no effect-receptor pathways identified. Agreement with key stakeholders will be sought to determine final impacts to be scoped in and scoped out of the Offshore EIA Report (see section 5.3.4).

The Applicant welcomes the opportunity for engagement with stakeholders and feedback on the Proposed Development and the scope (proposed content) of the Offshore EIA Report.

1.3.2 APPROACH

This section sets out the approach to scoping that has been taken in the preparation of this Offshore Scoping Report with the aim of achieving the following objectives:

- providing a high-level overview of the baseline environment and the data collection and survey methodologies that will be implemented to inform the EIA baseline characterisation for each technical assessment (see section 1.3.3);
- proposing impacts to be scoped out of the Proposed Development EIA where there is clear justification for doing so; and
- proposing impacts to scope in to the Proposed Development EIA, draw upon the existing evidence base where appropriate.

This approach will allow the Offshore EIA Report to focus on those potential impacts which either have the potential to lead to a significant effect, or where significant uncertainty exists on potential effect, thereby supporting the development of a proportionate Offshore EIA Report.

Each of the topic specific sections of this Offshore Scoping Report provides:

- an overview of existing data that will support the development of the Proposed Development EIA baseline characterisation;
- identifies where additional survey data may be required to inform the Proposed Development EIA baseline characterisation and Impact Assessment;
- identifies potential impacts to be scoped in and scoped out the Proposed Development EIA;
- presents a screening assessment of potential transboundary impacts; and

- sets out questions to the stakeholders associated with each technical section.

Further information on the approach to the Offshore Scoping Report is set out in chapter 5.

1.3.3 STRUCTURE

This Offshore Scoping Report and the subsequent Offshore EIA Report relate to those impacts and receptors associated with the offshore environment, including potential impacts of offshore infrastructure on onshore and offshore receptors. A separate Onshore Scoping report (and associated Onshore EIA Report) relating to impacts of onshore infrastructure on onshore receptors will be submitted in support of the onshore Proposed Development consent Application. The Offshore Scoping Report relates to those impacts from infrastructure seawards of MHWS. The Onshore Scoping Report will relate to those impacts from infrastructure landwards of MLWS and therefore there is an overlap in assessment within the intertidal area (between MHWS and MLWS). Where there is an overlap in jurisdiction in the intertidal area between MHWS and MLWS of the offshore and onshore consenting and regulatory regimes, both the Offshore Scoping Report and the Onshore Scoping Report presents the relevant technical assessments (Figure 1.2).

Within this Offshore Scoping Report, 'offshore' generally refers to the receptors on the seaward side of MHWS and 'onshore' refers to the receptors on the landward side of MHWS.

The structure of the Offshore Scoping Report is set out in Table 1.2 below. It should be noted that consideration to human health in the Offshore Scoping Report is given in the airborne noise and air quality sections (section 6.3 and section 6.4).

It is intended that the Offshore EIA Report will follow the same general layout as Table 1.2.

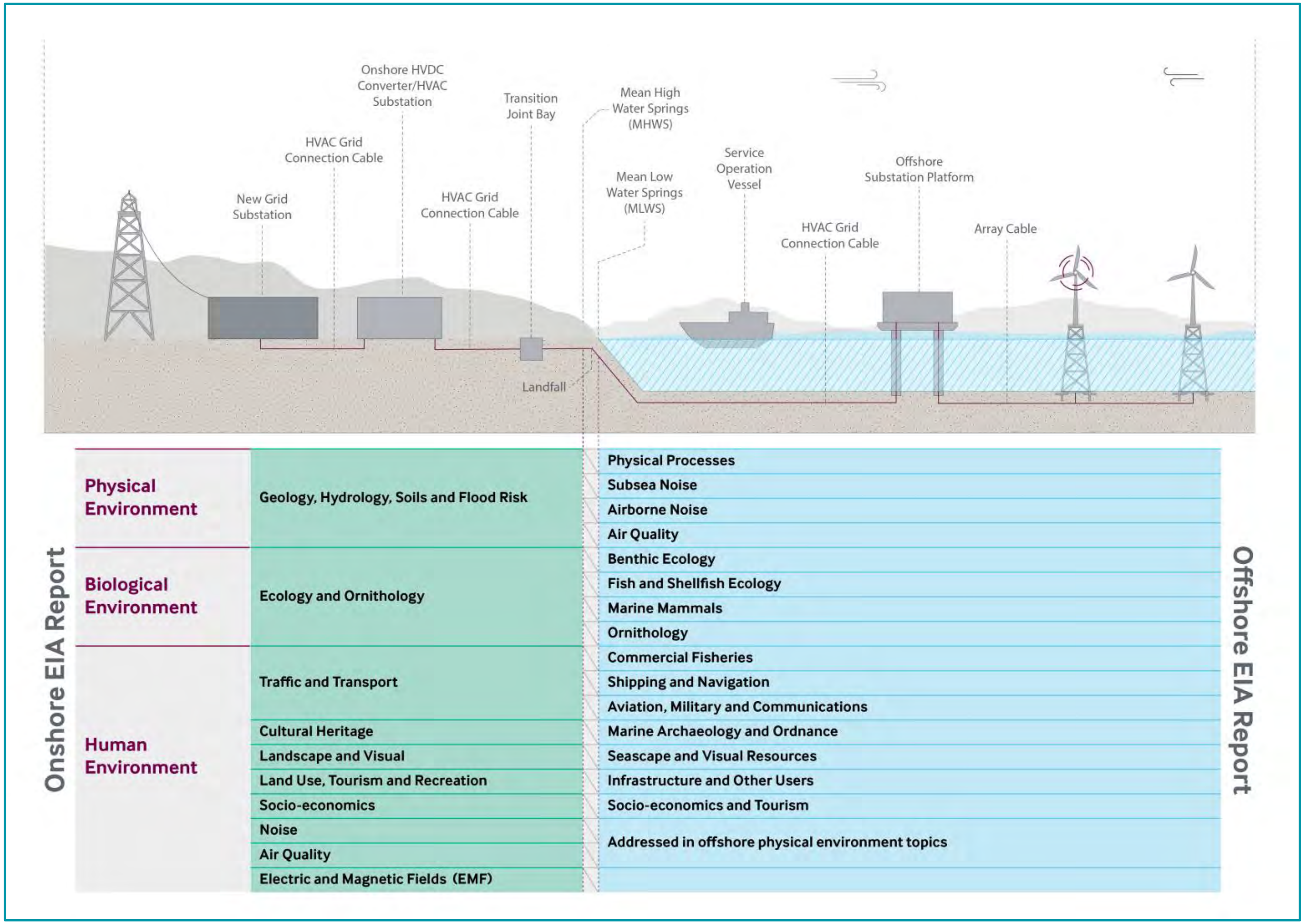

Figure 1.2: **Extent of the Offshore Scoping Report and the Onshore Scoping Report and Associated Onshore and Offshore EIA Reports.**

Table 1.2: Topics within the Offshore Scoping Report.

Topic	Summary content	Section	Author
Introductory Chapters			
Introduction	Background to the Proposed Development and outlines the purpose and approach of the Offshore Scoping Report.	This chapter (Chapter 1)	RPS
Policy and Legislation	Overview of internal obligations, and national legislation and policy applicable to the Proposed Development.	Chapter 2	RPS
Proposed Development Description	Description of the proposed design for the Proposed Development, based on preliminary conceptual design information and current understanding of the environment from initial site investigation studies.	Chapter 3	SSE Renewables and RPS
Site Selection Methodology and Consideration of Alternatives	Description of the site selection process and the approach undertaken by the Applicant to identify the siting of the Proposed Development and reasonable alternatives considered to date.	Chapter 4	RPS
Environmental Impact Assessment Methodology	Description of the proposed principles of the EIA process and the approach that will be applied in the Offshore EIA Report to identify and evaluate the likely impacts and, subsequently, evaluate the significance of effects, associated with the Proposed Development.	Chapter 5	RPS
Offshore Physical Environment			
Physical Processes	Overview of the offshore physical environment (tidal elevations, current, waves, bathymetry, geology and seabed sediments, suspended sediments and sediment transport) within the Proposed Development. Required for understanding of potential impacts to the offshore physical environment from construction, operation and maintenance and decommissioning.	Section 6.1	RPS
Subsea Noise	Overview of ambient subsea noise within the Proposed Development. Required for understanding of potential impact to subsea noise sensitive receptors such as marine mammals and fish from construction, operation and maintenance and decommissioning.	Section 6.2	RPS
Airborne Noise	Overview of ambient airborne noise within the Proposed Development. Required for understanding of potential impact to airborne noise sensitive receptors such as fishing vessels, offshore oil and gas platforms and commercial shipping from construction, operation and maintenance and decommissioning.	Section 6.3	RPS
Air Quality	Overview of the offshore air quality within the vicinity of the Proposed Development. Required for understanding of potential impact to offshore air quality from construction, operation and maintenance and decommissioning.	Section 6.4	RPS

Topic	Summary content	Section	Author
Offshore Biological Environment			
Benthic Subtidal and Intertidal Ecology	Overview of the ecology of the seabed within the Proposed Development. Required for understanding of potential impacts to seabed ecology from construction, operation and maintenance and decommissioning.	Section 7.1	RPS
Fish and Shellfish Ecology	Overview of the fish and shellfish ecology of the seabed within the Proposed Development. Required for understanding of potential impact to fish and shellfish ecology from construction, operation and maintenance and decommissioning.	Section 7.1.7	RPS
Marine Mammals	Overview of the marine mammals within the vicinity of the Proposed Development. Required for understanding of potential impacts to marine mammals from construction, operation and maintenance and decommissioning.	Section 7.3	RPS and Sea Mammal Research Unit (SMRU)
Ornithology	Overview of the ornithology features within the vicinity of the Proposed Development. Required for understanding of potential impacts to ornithology from construction, operation and maintenance and decommissioning.	Section 7.4	RPS
Offshore Human and Socio-economic Environment			
Commercial Fisheries	Overview of commercial fisheries within the vicinity of the Proposed Development. Required for understanding of potential impacts to commercial fisheries from construction, operation and maintenance and decommissioning.	Section 8.1	Brown and May Marine
Shipping and Navigation	Overview of the baseline shipping and navigation within the vicinity of the Proposed Development. Required for understanding of potential impacts to shipping and navigation from construction, operation and maintenance and decommissioning.	Section 8.2	Anatec
Aviation, Military and Communicatio ns	Overview of aviation, military and communications within the vicinity of the Proposed Development. Required for understanding of potential impacts to aviation, military and communications from construction, operation and maintenance and decommissioning.	Section 8.3	Coleman Aviation
Marine Archaeology and Ordnance	Overview of marine archaeology within the vicinity of the Proposed Development. Required for understanding of potential impacts to marine archaeology from construction, operation and maintenance and decommissioning.	Section 8.4	RPS
Seascape, Visual Resources and Cultural Heritage Setting	Overview of the seascape and visual resources within the vicinity of the Proposed Development. Required for understanding of potential impacts to seascape, visual resources and cultural heritage setting from construction, operation and maintenance and decommissioning.	Section 8.4.7	RPS
Infrastructure and Other Users	Overview of aviation, military and communications within the vicinity of the Proposed Development. Required for understanding of potential impacts to aviation, military and communications from construction, operation and maintenance and decommissioning.	Section 8.6	RPS

Topic	Summary content	Section	Author
Offshore Socio-economics and Tourism	Overview of the baseline offshore socio-economics and tourism within the vicinity of the Proposed Development. Required for understanding of potential impacts to baseline offshore socio-economics and tourism from construction, operation and maintenance and decommissioning.	Section 8.7	RPS
Concluding Chapters and Annexes			
Summary	Presents a summary of those impacts that are proposed to be scoped in and out of the Offshore EIA Report.	Section 9	RPS
References	Includes a list of all references included in the Offshore Scoping Report.	Section 10	RPS
Scoping Road Map Annex	For each technical topic, it considers the expected receptors, sensitivity and evidence, baseline data sources, mitigation and approach to the EIA.	Annex A	RPS
Enhancement, Mitigation and Monitoring Commitments	Includes all enhancement, mitigation and monitoring commitments that have been committed to within the Offshore Scoping Report.	Annex B	RPS
Transboundary Screening Annex	Includes a screening assessment of potential transboundary impacts arising from the Proposed Development.	Annex C	RPS

1.4 THE APPLICANT AND THE PROJECT EIA TEAM

1.4.1 THE APPLICANT

Berwick Bank Wind Limited (BBW) is a wholly owned subsidiary of SSE Renewables Developments (UK) Limited (hereafter referred to as SSE Renewables).

SSE Renewables is a leading developer, owner and operator of renewable energy across the UK and Ireland, with a portfolio of around 4GW of onshore wind, offshore wind and hydro. Part of the FTSE-listed SSE plc, its strategy is to drive the transition to a net zero future through the world class development, construction and operation of renewable energy assets.

SSE Renewables owns nearly 2GW of operational onshore wind capacity with over 1GW under development. Its 1,459MW hydro portfolio includes 300MW of pumped storage and 750MW of flexible hydro. Its operational offshore wind portfolio consists of 580MW across three offshore sites, two of which it operates on behalf of its joint venture partners. SSE Renewables has the largest offshore wind development pipeline in the UK and Ireland at over 6GW.

Offshore wind farms developed by SSE Renewables, and associated equity share, include:

- Beatrice (235 MW) - operational;
- Greater Gabbard (252 MW) – operational; and
- Walney (92 MW) – operational.
- Seagreen 1 (526 MW) – in construction;
- Dogger Bank A (600 MW) – in construction;
- Dogger Bank B (600 MW) – in construction;
- Dogger Bank C (600 MW) – in construction;
- Berwick Bank Wind Farm (around 2,300 MW) – pre-application;
- Marr Bank Wind Farm (around1,850 MW) – pre-application;
- Arklow Bank (520 MW) – consented;
- Braymore Point – initial site investigation;
- Celtic Sea Array – initial site investigation; and
- North Falls (504 MW) – pre-application.

1.4.2 THE PROJECT EIA TEAM

RPS has been instructed by the Applicant to lead the offshore EIA for the Proposed Development and ITPEnergised Group (ITPE) to lead the onshore EIA. This includes the initial review of the key environmental issues associated with the construction, operation and maintenance, and decommissioning of the Project as part of the Offshore Scoping Report and Onshore Scoping Report respectively.

2 POLICY AND LEGISLATION

This chapter of the Offshore Scoping Report presents the key policy and legislation of relevance to the Proposed Development.

2.1 NEED FOR THE DEVELOPMENT

2.1.1 UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE

The UK is a signatory to the Kyoto Protocol which commits state parties to reduce greenhouse gas emissions. The protocol came into effect in 2005 and its commitments were transposed into UK law by the Climate Change Act 2008, which requires the net UK carbon account for the year 2050 to be 80% lower than the 1990 baseline.

2.1.2 EUROPEAN PARLIAMENT AND COUNCIL DIRECTIVES

2.1.2.1 Brexit

On 31 January 2020, the UK formally left the European Union (EU) (hereafter referred to as Brexit) after triggering article 50 of the Lisbon Treaty. Whilst the UK has now formally left the EU, it is currently in the transition period which is due to last until 31 December 2020. The transition period allows the UK and EU to determine their future relationship. During the transition period, all EU policies and legislation are required to be implemented by the UK. Following the transition period, if no deal is reached between the UK and EU, the UK Government has committed to implement international environmental obligations in accordance with the EU (Withdrawal) Act 2018 and to maintain environmental commitments and legislation already made following the departure of the UK (HM Government, 2018).

On this basis, the existing EU renewable energy targets for the UK, including the EU Renewable Energy Directive 2009/28/EC will remain applicable. It is however considered unlikely that any new EU legislation or updates to existing directives will be transposed into UK law.

2.1.2.2 European Union Renewable Energy Directive

In December 2018, the Revised Renewable Energy Directive (2018/2001/EU) entered into force, as part of the Clean energy for all Europeans package, aimed at keeping the EU a global leader in renewables and, more broadly, helping the EU to meet its emissions reduction commitments under the Paris Agreement. The Revised Renewable Energy Directive set the following targets:

- at least a 32% share of renewable energy consumption within the EU; and
- member States to establish their contribution to the renewable energy consumption target as part of integrated national energy and climate plans, pursuant to Regulation (EU) 2018/1999 of the European Parliament and of the Council.

2.1.3 SCOTTISH POLICY AND LEGISLATION

2.1.3.1 Scotland's Emission Reduction Targets

The Climate Change (Emissions Reduction Targets) (Scotland) Act 2019 sets targets for the reduction of greenhouse gases emissions. The objective is to contribute appropriately to the world's efforts to deliver on the Paris Agreement reached at the 21st Conference of the Parties of the United Nations Framework Convention on Climate Change. The Emissions Reduction Targets include a reduction of all greenhouse gases to net-zero by 2045 at the latest, with interim targets for reductions of at least 56% by 2020, 75% by 2030 and 90% by 2040.

2.1.3.2 The Scottish Energy Strategy: The Future of Energy in Scotland

The Scottish Energy Strategy: The Future of Energy in Scotland (Scottish Government, 2017) sets out the Scottish Government 2050 vision for energy in Scotland. One of the six 2050 vision includes renewable and low carbon solutions, specifically championing and exploring Scotland's huge renewable energy resources and ability to support energy targets.

2.1.3.3 National Planning Framework 3

The National Planning Framework 3 (NPF3) (Scottish Government, 2014a) is a long-term strategy developed in 2014 which expresses plans for development and investment in infrastructure by the Scottish Government over the next 25 years. The NPF3 is supported by the Scottish Planning Policy (SPP) (Scottish Government, 2014b). This includes policy on a series of topics, including renewable energy, and acknowledges Scotland's offshore renewable energy resources.

With regard to the offshore wind and renewable energy sector, NPF3 presents a key vision for the enhancement of the low carbon economy and to be a world leader in low carbon energy generation, both onshore and offshore.

2.1.3.4 Draft Sectoral Marine Plan for Offshore Wind Energy

Scotland is committed to ensuring secure, reliable and affordable energy supplies, within the context of long-term decarbonised energy generation. In 2011, the first Sectoral Marine Plan for Offshore Wind Energy (Blue Seas Green Energy) (Marine Scotland, 2011) was adopted. In 2013, draft wind, wave and tidal plans were subsequently produced (Marine Scotland, 2013).

Building upon the work undertaken in the 2011 and 2013 plans, Draft Sectoral Marine Plan for Offshore Wind Energy (Scottish Government, 2019a) incorporates recent technological, policy, regulatory and market developments to develop a new strategic planning process. The Plan seeks to contribute to the achievement of Scottish and UK energy targets through the provision of a spatial strategy to inform the seabed leasing process for commercial offshore wind energy in Scottish waters, which:

- minimises the potential adverse effects on other marine users, economic sectors and the environment resulting from further commercial-scale offshore wind development; and
- maximises opportunities for economic development, investment and employment in Scotland, by identifying new opportunities for commercial scale offshore wind development, including deeper water wind technologies.

The Draft Sectoral Marine Plan for Offshore Wind Energy identifies 17 draft plan options across five regions which are capable of generating several GW of renewable energy. There is the potential for up to 10 GW to be deployed to reflect the anticipated future demand and market appetite, exceeding the Scottish Offshore Wind Energy Council's (SOWEC) goal to deliver at least 8 GW of offshore wind in Scottish waters by 2030. The final Sectoral Marine Plan for Offshore Wind Energy will guide relevant consenting bodies with decision making on licence and consent applications but will not predetermine decision-making processes.

The Draft Sectoral Marine Plan for Offshore Wind Energy has been developed in accordance with the strategic aims of the National Marine Plan (Marine Scotland, 2015a), which addresses the potential for interactions between renewable energy development and other marine users. The National Marine Plan also recognises that significant development of the offshore wind energy sector will require investment and improvement to the current electricity transmission and distribution systems, and efforts to reduce barrier connection costs for generators.

2.1.3.5 Draft Offshore Wind Policy Statement

The Draft Offshore Wind Energy Policy Statement (Scottish Government, 2019b) sets out ambitions to capitalise offshore wind development and the role this technology could play in meeting commitments of net zero by 2045, as required by The Climate Change (Emissions Reduction Targets) (Scotland) Act 2019. The Draft Offshore Wind Energy Policy Statement builds upon the ambitions outlined in Scotland's Energy Strategy (Scottish Government, 2017), which sets out the 2050 energy vision. Scotland's Energy Strategy forms a key component of the implementation of The Draft Offshore Wind Energy Policy Statement through the identification of suitable offshore wind farm development areas. The Draft Offshore Wind Energy Policy Statement is currently undergoing consultation and will be finalised in 2020.

2.2 PLANNING LEGISLATION

As the Proposed Development is a generating station with a capacity of greater than 1 MW, it requires the following consents, licences and permissions:

- a Section 36 consent under the Electricity Act 1989;
- a marine licence under the MCAA 2009;
- a marine licence under the Marine (Scotland) Act 2010 for the part of the export cable which is within 12 nm of the coast; and
- planning permission under the Town and Country Planning (Scotland) Act 1997 for all Project infrastructure located landward of MLWS.

Each of these consents, licences and permissions are described below.

Should additional pre-construction licences be required, these will be discussed and agreed with the relevant consenting authority during the pre-construction phase of the Proposed Development,

2.2.1 SECTION 36 CONSENT

As the Proposed Development is an offshore generating station which is greater than 50 MW and located in Scottish Offshore Waters (between 12 nm and up to 200 nm offshore) within the Scottish Renewable Energy Zone (REZ), there is a requirement for consent under Section 36 of the Electricity Act 1989. Section 36 consent will allow for the installation, operation and maintenance of wind turbines and inter-array cables associated with the Proposed Development.

2.2.2 MARINE LICENCE

Within the UK offshore waters (between 12 nm and up to 200 nm offshore), REZ, the MCAA 2009 applies. Under the MCAA 2009 (as amended) there is the requirement for a marine licence to be obtained prior to the construction, alteration or improvement of any works or deposit any object in or over the sea, or on or under the seabed. Similarly, under the Marine (Scotland) Act 2010 which applies to Scottish Territorial Waters (between 0 and 12 nm from MHWS) there is also the requirement for a marine licence prior to the construction, alteration or improvement of any works or deposit any object in or over the sea, or on or under the seabed.

Where applications for both a marine licence under the MCAA 2009 and consent under Section 36 of the Electricity Act 1989 are made and where the Scottish Ministers are the determining authority, they may issue a note to the applicant stating that both applications will be subject to the same administrative procedure. Where that is the case then that will ensure that the two related applications may be considered at the same time.

2.2.3 PLANNING PERMISSION

In defining an appropriate consenting strategy for the onshore transmission works, the Applicant has drawn from a wide range of experience of comparable projects, both in East Lothian and elsewhere. The consenting strategy is underpinned by the onshore Proposed Development's national development status by way of National Planning Framework (NPF) 3's national development 4, as well as NPF3's identification of the Torness area as a hub for energy-related investment.

The Applicant has considered a series of potential consenting options. Marine Scotland advocates a streamlined "one stop shop" consenting process including ancillary onshore infrastructure associated with offshore generation being consented via a direction for deemed planning permission under S57 of the Town and Country Planning (Scotland) Act 1997 (as amended by the Growth and Infrastructure Act 2013) as part of a single application for consent under Section 36 of the Electricity Act 1989. Whilst the option of a single application for off- and onshore elements of the Project remains available to the Applicant, this is not the option the Applicant is currently proposing.

Instead, as previously discussed, it is intended that separate offshore and onshore applications will be made to Marine Scotland and East Lothian Council (ELC), respectively, the latter being a single application for full planning permission, in accordance with the Town and Country Planning (Scotland) Act 1997. It is currently anticipated that the applications will be made in 2021.

2.3 ENVIRONMENTAL IMPACT ASSESSMENT REGULATIONS

2.3.1 OVERVIEW

In compliance with the EU Directive on the assessment of the effects of certain public and private projects on the environment (EIA Directive) (2011/92/EU, as amended by Directive 2014/52/EU), when applying for Section 36 consent, a marine licence or planning permission, an EIA Report is required to be prepared and submitted to support these applications if they are likely to have a significant effect on the environment due to factors such as their size nature or location. An EIA is specifically required (Schedule 2) for installations for the harnessing of wind power for energy production (wind farms) if:

- the development involves the installation of more than two wind turbines; or
- the hub height of any wind turbine or height of any other structure exceeds 15 m.

The Proposed Development will consist of more than two wind turbines, with a hub height over 15 m, and therefore requires an EIA to be undertaken.

The EIA must fulfil the requirements of the following regulations:

- in respect to a Section 36 consent application: The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017;
- in respect to a marine licence application: The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017; and
- in respect to a planning application: The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017.

Under Regulation 15 (2) of the EIA Regulations (The Marine Works (Environmental Impact Assessment (Scotland) Regulations) the information provided must include that which is necessary to *"identify the location, nature and purpose of the works, and must indicate the main environmental consequences to which the applicant proposed to refer in the EIA Report*". This is supplemented by Schedule 4 of the 2017 EIA Regulations which specify the requirements of the information for inclusion in environmental impact assessment reports. Table 2.1 below outlines where the requirements of Schedule 4 will be considered within the Proposed Development EIA Report.

2.3.2 PRE-APPLICATION CONSULTATION

Where activity is planned within the Scottish Territorial Waters, the Marine Licensing (Pre-application Consultation) (Scotland) Regulations 2013 (hereafter referred to as the PAC Regulations) apply. There is no provision for PAC in the MCAA 2009, so these requirements do not apply in respect of relevant applications in the Scottish Offshore Region. There are no statutory requirements for consultation during the pre-application stage for Section 36 consent applications, however the principles of the PAC Regulations will be followed for all offshore components of the Proposed Development (below MHWS).

Public consultation will be carried out for the onshore and offshore elements at the same events to give 3rd parties a full understanding of the whole project.

The PAC Regulations require Applicants for a 'prescribed class' of activity to notify the Maritime and Coastguard Agency (MCA), Northern Lighthouse Board (NLB), Scottish Natural Heritage (SNH), Scottish Environment Protection Agency (SEPA), and any delegate for a relevant marine region. Applicants must hold at least one pre-application event at which these bodies are notified, and members of the public may provide comments to the applicant. Applicants must publish in a local newspaper a notice containing a description of the activity, detail where further information may be obtained, the date and place of the event, how and when comments should be submitted to the applicant. A PAC report must be submitted alongside the marine licence application.

Further information on the proposed consultation for the Proposed Development is outlined in section 5.3.4 below.

Table 2.1: Requirements Under The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017and where these are proposed to be Addressed in the Offshore EIA Report.

Information Required Under Schedule 4 of the 2017 EIA Regulations		How Matter will be Addressed in the Offshore EIA Report
Part	**Information Requirement**	
1	A description of the development, including in particular: • a description of the location of the works; • a description of the physical characteristics of the whole works, including, where relevant, requisite demolition works, and the land-use requirements during the construction and operational phases; • a description of the main characteristics of the operational phase of the works (in particular any production process), for instance, energy demand and energy used, nature and quantity of the materials and natural resources (including water, land, soil and biodiversity) used; • an estimate, by type and quantity, of expected residues and emissions (such as water, air, soil and subsoil pollution, noise, vibration, light, heat, radiation) and quantities and types of waste produced during the construction and operation phases.	The Offshore EIA Report will contain a detailed project description, building upon the project description outlined in chapter 3 of this Offshore Scoping Report. This will include details of the physical characteristics of the Proposed Development including construction, operation and maintenance, and decommissioning phases. The Offshore EIA Report will also provide consideration of the mitigation measures adopted by the Applicant and will set out the realistic maximum adverse scenario (Rochdale Envelope) for each topic.
2	A description of the reasonable alternatives (for example in terms of development design, technology, location, size and scale) studied by the applicant, which are relevant to the proposed works and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects.	The Offshore EIA Report will provide detail of the site selection process undertaken by the Applicant (this will expand on the description provided in this offshore Scoping Report in section 4.2), including the consideration of alternatives and the rationale for the selection and progression of the Proposed Development. A comparison of the environmental effects of alternatives and consideration of potential alternatives for topic specific mitigation will be provided, where relevant.
3	A description of the relevant aspects of the current state of the environment (the "baseline scenario") and an outline of the likely evolution thereof without implementation of the project as far as natural changes from the baseline scenario can be assessed with	Each of the technical topics within the Offshore EIA Report will contain a 'Future Baseline' description, which will provide consideration of the potential future baseline and natural changes which may occur for the given technical topic without the development of the Proposed Development.

Information Required Under Schedule 4 of the 2017 EIA Regulations		How Matter will be Addressed in the Offshore EIA Report
Part	**Information Requirement**	
	reasonable effort on the basis of the availability of environmental information and scientific knowledge.	
4	A description of the factors specified in regulation 5(3) likely to be significantly affected by the works: population, human health, biodiversity (for example fauna and flora), land (for example land take), soil (for example organic matter, erosion, compaction, sealing), water (for example hydromorphological changes, quantity and quality), air, climate (for example greenhouse gas emissions, impacts relevant to adaptation), material assets, cultural heritage, including architectural and archaeological aspects, and landscape.	The Offshore EIA Report will contain technical chapters with descriptions of the existing conditions and identification of the topic specific receptors which may be impacted by the Proposed Development. A stand-alone chapter for human health will not be developed within the Offshore EIA Report as this is considered to be assessed within technical topics such as airborne noise and air quality within this Offshore Scoping Report (sections 6.3 and 6.4 respectively). Where these topics are scoped-out of further assessment, it is assumed that there will be no adverse effect on these receptors. Likewise, a stand-alone chapter for climate will not be developed within the Offshore EIA Report. However, the potential effects on climate will be considered within the ecosystem assessment for ecological topics.
5	A description of the likely significant effects of the works on the environment resulting from, inter alia: • the construction and existence of the works, including, where relevant, demolition works; • the use of natural resources, in particular land, soil, water and biodiversity, considering as far as possible the sustainable availability of these resources; • the emission of pollutants, noise, vibration, light, heat and radiation, the creation of nuisances, and the disposal and recovery of waste; • the risks to human health, cultural heritage or the environment (for example due to accidents or disasters); • the cumulation of effects with other existing and/or approved works, taking into account any existing environmental problems relating to areas of particular environmental	Each of the topic chapters within the Offshore EIA Report will provide an assessment of the likely significance of effect for each topic. This assessment will follow the process for assessment of significance as set out in section 5. Likewise, the Offshore EIA Report will contain the cumulative effects assessment as per the methodology outlined in section 5.3.7. Likewise, a stand-alone chapter for climate will not be developed within the Offshore EIA Report. However, the potential effects on climate will be considered within the ecosystem assessment for ecological topics. The vulnerability of the Proposed Development to climate change will be provided in relevant topic chapters.

Information Required Under Schedule 4 of the 2017 EIA Regulations		How Matter will be Addressed in the Offshore EIA Report
Part	**Information Requirement**	
	importance likely to be affected or the use of natural resources; • the impact of the works on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change; • the technologies and the substances used. The description of the likely significant effects on the factors specified in regulation 5(3) should cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the works. This description should take into account the environmental protection objectives established at Union or Member State level which are relevant to the works, including in particular those established under Council Directive 92/43/EEC(1) and Directive 2009/147/EC(2).	
6	The description of the likely significant effects on the factors specified in regulation 5(3) should cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the works. This description should take into account the environmental protection objectives established at Union or Member State level which are relevant to the works including in particular those established under Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora(1) and Directive 2009/147/EC of the European Parliament and of the Council on the conservation of wild birds.	The approach and methodology which will be followed in the Offshore EIA Report is outlined in section 5 of this Offshore Scoping Report. An assessment of potential impacts on European and Ramsar sites will be presented within the Report to Inform Appropriate Assessment (RIAA).
7	A description of the forecasting methods or evidence, used to identify and assess the significant effects on the environment, including details of difficulties (for example technical deficiencies	Offshore EIA Report, each of the topic chapters will contain a summary of the topic-specific methodology, including modelling methods and an overview of the evidence used and any limitations of the data.

Information Required Under Schedule 4 of the 2017 EIA Regulations		How Matter will be Addressed in the Offshore EIA Report
Part	**Information Requirement**	
	or lack of knowledge) encountered compiling the required information and the main uncertainties involved.	There will also be consideration of the uncertainty in each of the topic chapters of the Offshore EIA Report, including a discussion on how this uncertainty has been dealt with.
8	A description of the measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment and, where appropriate, of any proposed monitoring arrangements (for example the preparation of a post-project analysis). That description should explain the extent to which significant adverse effects on the environment are avoided, prevented, reduced or offset, and should cover both the construction and operational phases.	The Offshore EIA Report will contain a detailed project description, building upon the project description outlined in chapter 3 of this Offshore Scoping Report. This project description will contain primary 'built in' mitigation measures for the Proposed Development. Topic-specific mitigation measures are discussed within this Offshore Scoping Report and will be further discussed in each relevant topic chapter of the Offshore EIA Report. If mitigation measures (including monitoring leading to identification of mitigation) are required, these will be discussed and summarised in an Annex of the Offshore EIA Report, together with how they will be secured and their means of delivery.
9	A description of the expected significant adverse effects of the works on the environment deriving from the vulnerability of the works to risks of major accidents and/or disasters which are relevant to the project concerned. Relevant information available and obtained through risk assessments pursuant to legislation of the European Union such as Directive 2012/18/EU of the European Parliament and of the Council on the control of major-accident hazards involving dangerous substances, amending and subsequently repealing Council Directive 96/82/EC(3) or Council Directive 2009/71/Euratom establishing a community framework for the nuclear safety of nuclear installations(4) or relevant assessments carried out pursuant to national legislation may be used for this purpose provided that the requirements of the Directive are met. Where appropriate, this description should include measures envisaged to prevent or mitigate the significant adverse effects of such events on the environment and details of the preparedness for and proposed response to such emergencies.	Individual topic chapters will contain an assessment of the potential effects arising from accidental scenarios and the associated control measures which will be employed to address these.

Information Required Under Schedule 4 of the 2017 EIA Regulations		How Matter will be Addressed in the Offshore EIA Report
Part	**Information Requirement**	
10	A non-technical summary of the information provided under paragraphs 1 to 9.	The Applicant will develop and submit a Non-Technical Summary of the Offshore EIA Report.
11	A reference list detailing the sources used for the descriptions and assessments included in the EIA report.	Each topic chapter will contain a list of key sources of information used to support the development of the technical assessment. Further, all cited literature and webpages will be detailed in a bibliography in the Offshore EIA Report. Project specific data such as survey data will be discussed in the relevant topic chapter, with a full survey report appended to the Offshore EIA Report.

2.4 THE HABITATS AND BIRD DIRECTIVE AND ASSOCIATED REGULATIONS

The Council Directive 92/43/EEC (the Habitats Directive) was adopted in 1992, providing a means for the EU to meet its obligations under the Bern Convention. The aim of the Directive is to maintain or restore natural habitats and wild species listed on the Annexes at a favourable conservation status. This protection is granted through the designation of European Sites and European Protected Species (EPS). The European Directive (2009/147/EC) on the conservation of wild birds (The Birds Directive) provides a framework for the conservation and management of wild birds within Europe. The Directive affords rare and vulnerable species listed under Annex I of the Directive, and regularly occurring migratory species, protection through the identification and designation of Special Protection Areas (SPAs).

The Directives have been transposed into Scottish Law by various regulations, those of relevance to the Project include:

- the Conservation (Natural Habitats &c.) Regulations 1994 (as amended);
- the Conservation of Habitats and Species Regulations 2017; and
- the Conservation of Offshore Marine Habitats and Species Regulations 2017 (which apply to marine licences and Section 36 applications within the Scottish Offshore region).

These are hereafter referred to as the Habitats Regulations.

The Habitat Regulations require that where a plan or project that is not directly connected with, or necessary to the management of a Natura 2000 site, but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives. Marine Scotland must therefore consider whether the Proposed Development is likely to have significant effects on the conservation objectives of the sites considered in the Habitats Regulations Appraisal (HRA), and, where LSE cannot be excluded at the screening stage, and in the absence of mitigation measures[1], an 'Appropriate Assessment' of the implication of the plan or project must be undertaken by the competent authority before consent may be given for the proposed project.

The HRA process is a multi-stage process aligned with European Commission (EC) guidance documents 'Assessment of plans and projects significantly affecting Natura 2000 sites' (EC, 2001) and 'Managing Natura 2000 sites: The Provisions of Article 6 of the 'Habitats' Directive 92/43/EEC' (EC, 2019). In accordance with this guidance from the Commission, the obligations arising under Article 6 establish a step-wise procedure, as set out below:

1. the first part of this procedure consists of a preliminary 'screening' stage to determine whether, firstly, the plan or project is directly connected with or necessary to the management of the site, and secondly, whether it is likely to have a significant effect on the site; it is governed by the first sentence of Article 6(3);
2. the second part of the procedure, governed by the second sentence of Article 6(3), relates to the appropriate assessment and the decision of the competent national authorities; and
3. a third part of the procedure (governed by Article 6(4)) comes into play if, despite a negative assessment, it is proposed not to reject a plan or project but to give it further consideration. In this case Article 6(4) allows for derogations from Article 6(3) under certain conditions.

[1] The following 'Measures' (as per SNH guidance note (2019) "The handling of mitigation in Habitats Regulations Appraisal – the People Over Wind CJEU judgement" are proposed to be included for consideration at LSE screening: Project Environmental Management Plan, Biosecurity Plan, cables to be buried between 1-2 m depth, and installation of appropriate lighting on offshore structures.

The Proposed Development offshore HRA screening assessment is currently being prepared and will be consulted on in Quarter 4 of 2020.

The step-wise procedure has the aim of determining LSEs and, where necessary, assesses the implications of the Proposed Development for their potential to adversely affect the integrity of a European site or sites in accordance with Article 6(3) of the Habitats Directive. If a determination of adverse effect on site integrity is made despite the application of mitigation measures intended to avoid or reduce the harmful effects of the project(s) on the sites concerned, the step-wise procedure then provides for a derogation procedure under Article 6(4). Such a derogation is available to the competent authorities concerned following three tests to be met in sequential order:

1. there are no feasible alternative solutions to the project which are less damaging;
2. there are "imperative reasons of overriding public interest" (IROPI) for the project to proceed; and
3. compensatory measures are secured to ensure that the overall coherence of the network of European sites is maintained.

2.5 EUROPEAN PROTECTED SPECIES (EPS) LICENSING

EPS are animals and plants (species listed in Annex IV of the Habitats Directive) that are afforded protection under The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) and the Conservation of Offshore Marine Habitats and Species Regulations 2017. All cetacean species (whales, dolphins and porpoise) are EPSs. If any activity is likely to cause disturbance or injury to an EPS a licence is required to undertake the activity legally.

Activities which can be licenced under EPS licences include those such as subsea noise disturbance to marine mammals due to piling construction activities. EPS licences are obtained from Scottish National Heritage (SNH) or the Scottish Ministers, depending on the reason for the licence application. Although the grant of EPS licences is separate to the Section 36 and marine licence application process, it can be considered in parallel by Marine Scotland in order to constrict timelines.

Should additional pre-construction licences be required, these will be discussed and agreed with the relevant consenting authority during the pre-construction phase of the Proposed Development.

2.6 DECOMMISSIONING

Sections 105 to 114 of the Energy Act 2004 (as amended by the Energy Act 2008 and the Scotland Act 2016[1]) (hereafter referred to as the Energy Act) contain statutory requirements in relation to the decommissioning of offshore renewable energy installations (OREI) and their related electricity lines. Under the terms of the Energy Act, Scottish Ministers may require a person who is responsible for these installations or lines in Scottish Waters or in a Scottish part of a REZ to prepare (and carry out) a costed decommissioning programme for submission to and approval by Scottish Ministers (Marine Scotland, 2020).

The responsibilities and powers associated with decommissioning for Offshore Renewables Energy Installation within Scottish Waters transferred from the Secretary of State, to Scottish Ministers in April 2017 (Section 62 of the Scotland Act 2016 transfers to Scottish Ministers powers under the Energy Act Part II chapter 2). Up to this point, BEIS was responsible for requiring decommissioning programmes and securities for Offshore Substation Platforms (OSP) (Scottish Government, 2019c). As part of this change in responsibilities, Marine Scotland are seeking to establish robust policies and procedures covering decommissioning, including securities, for offshore wind, wave and tidal projects. A consultation on future plans for decommissioning for Offshore Renewable Energy Installations in Scottish waters commenced in

November 2019 and closed on 18 March 2020. Following this consultation, guidance will be finalised and made available to industry.

Scottish Ministers also have the power to determine specific approaches to decommissioning, including stipulating what form, timing and size of financial securities are required. The expected content of a decommissioning programme includes: decommissioning standards, financial security, residual liability, and, industry cooperation and collaboration.

The draft Offshore Renewable energy decommissioning guidance states (Section 5 – Submission, approval and review of decommissioning programmes) that "*an indication of the decommissioning proposals should be included as part of the statutory consenting or licensing process so that the feasibility of removing the infrastructure can be assessed as part of the application process*" (Scottish Government, 2019c). Question set out as part of this consultation state that the Scottish Government "*aims to ensure that all future offshore renewable energy installations have an approved decommissioning programme in place prior to construction, as this will help manage the risk of projects going into the water without proper plans in place for removal*" (Scottish Government, 2019)".

The scope of decommissioning requirements in Scotland is between the MLWS mark and the seaward limits of the territorial waters, including coastal water and the Scottish part of the REZ. The Energy Act does not cover the intertidal zone, however decommissioning of infrastructure within the intertidal zone should be carried out under any conditions attached to a Marine Licence (under the Marine Scotland Act 2010).

3 PROPOSED DEVELOPMENT DESCRIPTION

3.1 INTRODUCTION

This section of the Offshore Scoping Report provides an outline description of the Proposed Development and describes activities associated with the construction, operation and maintenance, and decommissioning of the Proposed Development. It summarises the design and components for the Proposed Development infrastructure, based on preliminary conceptual design information and current understanding of the environment from initial survey work.

3.2 DESIGN ENVELOPE APPROACH

The Project Design Envelope (PDE) approach (also known as the Rochdale Envelope approach) will be adopted for the assessment of the Project, in accordance with current best practice and the "Rochdale Envelope Principle[2]". The PDE concept allows for some flexibility in project design options, particularly for foundations and wind turbine type, where the full details of a project are not known at application submission.

The Rochdale cases established a process by which the effects of a project, where the final design is not available at the time of consent assessment, are assessed against a series of minimum and maximum design parameters. This approach allows for the design of a project to vary within a given 'design envelope' without disqualifying the significance of effect assessments made.

This approach has been approved legally by courts and endorsed by the Scottish Government as enabling the legal requirements of the relevant EIA Regulations to be complied with, as long as conditions are built into the issued consents which ensure that the maximum potential likely impacts will not be exceeded by the final built development, and lead to a significant effect which was not been assessed.

The use of the Design Envelope approach has also been recognised in the UK Overarching National Policy Statement (NPS) for Energy (NPS EN-1) (DECC, 2011a) and the NPS for Renewable Energy Infrastructure (NPS EN-3) (DECC, 2011b). This approach has been used in the majority of offshore wind farm applications in the UK to date. NPS states that '*although the IPC (infra planning committee) will not examine projects in Scottish waters - energy policy is generally a matter reserved to UK Ministers and this NPS may therefore be a relevant consideration in planning decisions in Scotland*.'

In the case of offshore wind farms, NPS EN-3 (paragraph 2.6.42) recognises that: "*Owing to the complex nature of offshore wind farm development, many of the details of a proposed scheme may be unknown to the applicant at the time of the application, possibly including:*

- *precise location and configuration of wind turbines and associated development;*
- *foundation type;*
- *exact wind turbine tip height;*
- *cable type and cable route; and*
- *exact locations of offshore and/or onshore substations."*

An example of the Design Envelope approach would be where several types of wind turbine foundation are being considered, then the assessment is based on the foundation known to have the greatest impact (the maximum adverse impact). In this instance, the Design Envelope for the foundation with the greatest seabed disturbance potential would be the foundation with the largest footprint and the greatest number

[2] Case law (i.e. R v Rochdale MBC ex parte Tew (1999) and R v Rochdale MBC ex parte Milne (2000)). In respect of S36 consent, whichever scheme is ultimately built must have been covered by the scope of the EIA.

of wind turbines. If, after undertaking the impact assessment, it is shown that no significant effect is anticipated, it can be assumed that any project parameters equal to or less than those assessed in the PDE will have environmental effects of the same level or less and will therefore also have no significant effect upon the receptors for the topic under consideration.

Throughout this Offshore Scoping Report (and subsequent Offshore EIA Report), the Design Envelope approach has been undertaken to allow meaningful assessments of the Proposed Development to proceed, whilst still allowing reasonable flexibility for future project design decisions.

3.3 PROPOSED DEVELOPMENT SUMMARY

The array area is located 39.2 km offshore, east of the East Lothian coastline in Scotland and located within the south eastern extent of the former Firth of Forth Zone (Figure 3.1). The array area comprises an area of approximately 775 km^2 located to the east of the large-scale morphological banks 'Marr Bank' and overlapping the 'Berwick Bank' in the south.

The Applicant is currently assessing the feasibility of one or both landfall locations on the East Lothian coast, Thorntonloch Landfall and Skateraw Landfall. A grid connection point has been confirmed at a new 400kV Branxton substation, south west of Torness Power station under an existing grid connection agreement for 2.3 GW. A potential export cable corridor has been identified (Figure 3.1).

Due to the early stage of the Project, the boundaries of the Proposed Development are indicative and the Design Envelope allows for sufficient flexibility to accommodate further project refinement. The following sections provide the design parameters, which constitute the realistic maximum adverse design scenario for each technical assessment. Through the EIA process, the Proposed Development design will be refined to provide a final realistic maximum adverse design scenario. This will be detailed in the Offshore EIA Report project description chapter.

Berwick Bank Wind Ltd has a 50 year AfL agreement with Crown Estate Scotland. in addition to advances in technology, operations and maintenance means wind farms may operate beyond 25 years. Therefore a 50-year consent life under S 36 of the Electricity Act. Will be applied for.

3.3.1 PROPOSED DEVELOPMENT BOUNDARY/AGREEMENT FOR LEASE AREA

An AfL allows the Applicant to carry out investigations, such as survey activities, to identify the potential design within the array area for the wind farm by understanding environmental sensitivities that may exist, in advance of submitting the consent application. As discussed in section 3.2 the detailed design cannot be proposed at this stage, however further information on the site will inform the refinement of the Design Envelope.

The AfL area for the Proposed Development covers approximately 656km^2 and is located approximately 39.2 km offshore at its closest distance to shore. However, the scoping area for the Proposed Development has been expanded to include part of the Marr Bank Wind Farm AfL area. This expansion into the Marr Bank Wind Farm AfL area is to allow flexibility in final design and layout of the Proposed Development. The area considered within this Offshore Scoping Report for the Proposed Development therefore covers a total area of 775 km^2. This area is where the offshore infrastructure, such as the wind turbines, offshore substation(s),array cables, and the start of the proposed export cable corridor will be located and is hereafter referred to as the 'array area' throughout the Offshore Scoping Report.

The proposed export cable corridor has been identified and will connect the array area to Thorntonloch Landfall or Skateraw Landfall, or both.

The Proposed Development boundary is illustrated within Figure 3.1. This area encompasses the:

- array area: This is where the offshore wind farm will be located, which will include the wind turbines, wind turbine foundations, array cables, and a range of offshore substations and offshore interconnector cables; and
- proposed export cable corridor: This is where the offshore electrical infrastructure such as offshore export cable(s) will be located.

3.3.2 WATER DEPTHS AND SEABED WITHIN THE AGREEMENT FOR LEASE AREA

A recent geophysical survey across the array area provided geophysical and bathymetric data. The bathymetry of the array area is influenced by the presence of large-scale morphological bank features of the Marr Bank and the northern extent of the Berwick Bank. These two bank features are defined as Shelf Banks and Mounds and are part of the Firth of Forth Banks Complex.

The geophysical data suggests the water depth varies between 39 m and 68 m below Lowest Astronomical Tide (LAT) with average depths of generally 50 m to 60 m below LAT. Across all of the array area, there is approximately 80 km^2 of depths greater than 60 m.

The seafloor morphology is very varied and can be classified into four types of morphological features:

- large scale banks;
- arcuate ridges;
- incised valleys, relic glacial lakes and channels; and
- bedforms.

Seabed sediments within the array area are classified into several groups including coarse shelly cobbly gravel or shelly gravelly sand, gravelly sand, mixed sediment, including clay and sand. Further details of the bathymetry and seabed composition are presented within section 6.1.

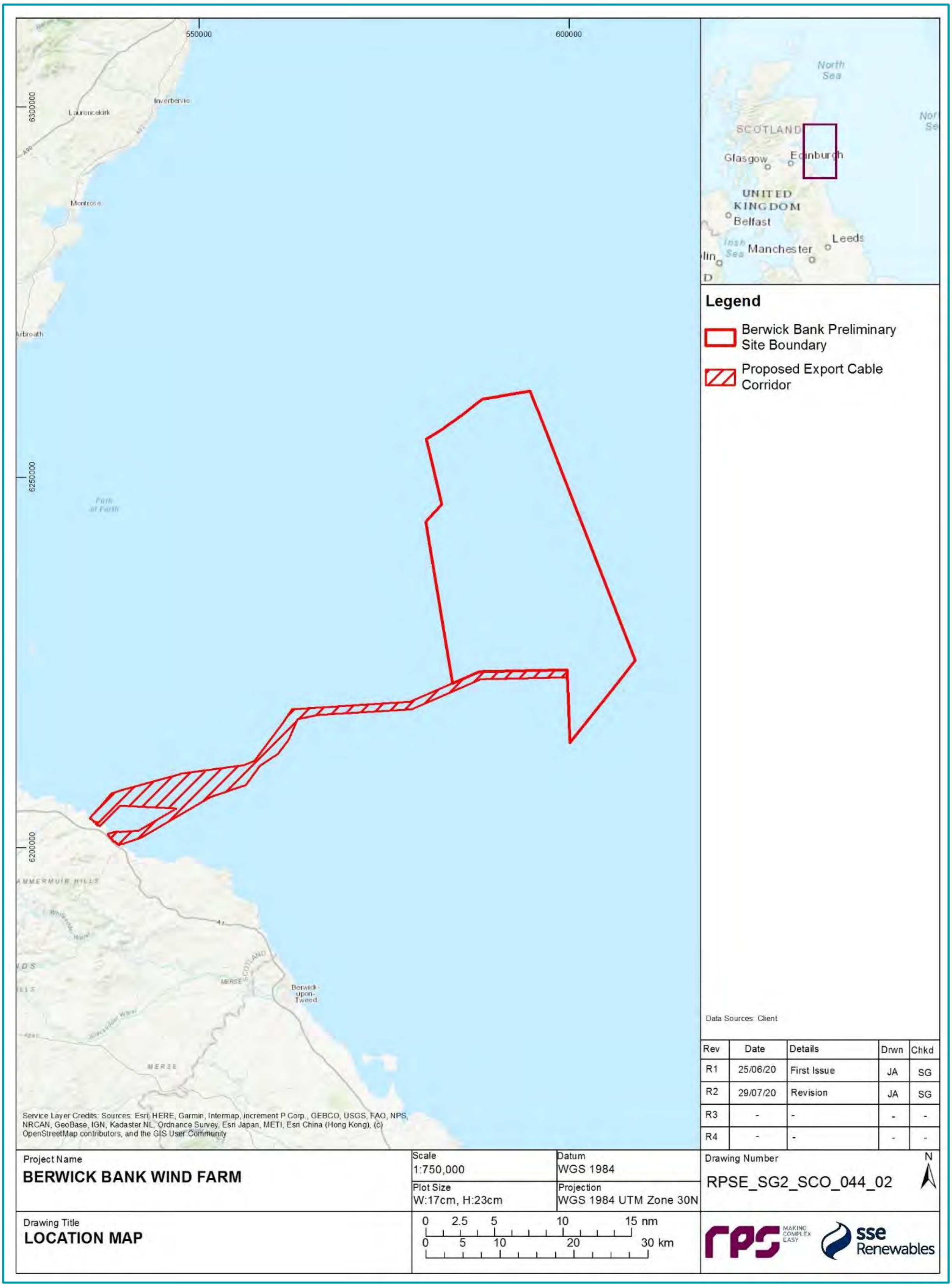

Figure 3.1: Location of the Proposed Development, Including the Array Area and Proposed Export Cable Corridor.

3.3.3 OFFSHORE PROPOSED DEVELOPMENT INFRASTRUCTURE OVERVIEW

The key offshore components of the Proposed Development are likely to include:

- up to 242 wind wind turbines (each comprising a tower section, nacelle and three rotor blades) and associated support structures and foundations);
- up to ten OSP and associated support structures and foundations;
- scour protection of up to 2,280,000 m^3 (0.00228 km^3);
- a network of inter-array cabling linking the individual wind turbines to the offshore substation(s), end links plus inter-connections between substations (approximately 1,036 km of array cabling); and
- up to ten offshore export cables connecting the offshore substation(s) to the onshore substation.

3.3.4 WIND TURBINES

The Proposed Development will be comprised of up to 242 wind turbines, and the final number of wind turbines will be dependent on the capacity of individual wind turbines used and also environmental and engineering survey results. There is the potential for a reduced number of wind turbines to be used if an increased rated output of wind turbine model is chosen when the final project design is developed.

The maximum rotor blade diameter is expected to be no greater than 270 m, with a maximum blade tip height of 310 m above LAT and a minimum blade tip height of 186 m above LAT. The top of the wind turbine (the nacelle) will be approximately 175 m above LAT. A scheme for wind turbine lighting and navigation marking will be agreed with consultees. The minimum distance between the bottom of the blade and the water surface (LAT) will be between 22 m and 40 m.

The layout of the wind turbines will be developed to best utilise both the available wind resource and suitability of seabed conditions, while ensuring environmental effects and impacts on other marine users (such as fisheries and shipping routes) are minimised. The final layout of the wind turbines will be decided at the final design stage.

A schematic of a typical offshore wind turbine is illustrated within Figure 3.2, and the design envelope for how wind turbines are presented is in Table 3.1.

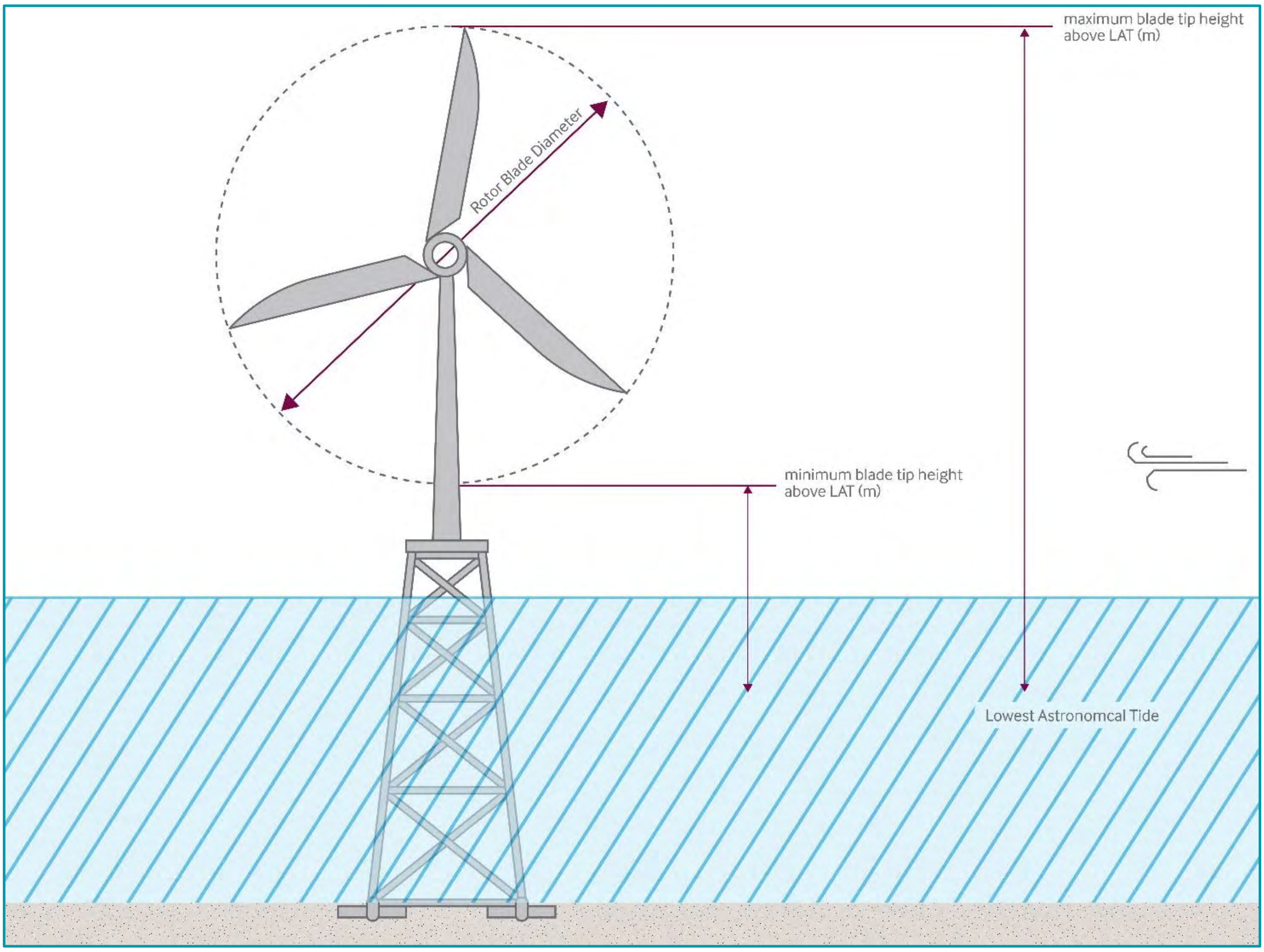

Figure 3.2: **Offshore Wind Turbine Schematic.**

Table 3.1: **Design Envelope: Wind Turbines.**

Parameter	Maximum Design Envelope
Maximum number of wind turbines	242
Maximum rotor blade diameter (m)	270
Maximum nacelle height (m above LAT)	175
Minimum blade tip height above LAT (m)	186
Maximum blade tip height above LAT (m)	310

3.3.5 WIND TURBINE FOUNDATIONS AND SUPPORT STRUCTURES

To allow for flexibility in foundation choice, several wind turbine support structures and foundations are being considered for the Proposed Development. The final selection will depend on factors including wind turbine type, soil conditions, water depth, wave, wind and tidal conditions, Applicant economics and procurement approach.

The wind turbines, offshore substation(s) are fixed to the seabed by foundation structures. Several types of foundation are commonly used, and the foundation type for the Proposed Development will not be confirmed until the final design of the wind farm. Consequently, the Offshore EIA Report will consider a range of types, including monopiles, suction bucket jacket foundations, piled jacket foundations, gravity base structures and floating foundations. Floating foundations are only being considered as a demonstrator in deeper water depth areas of the Proposed Development.

There is the potential for seabed preparation to be required for each foundation type, which may include seabed levelling and removing surface and subsurface debris such as (for example) boulders, fishing nets or lost anchors. Excavation may be required to access and remove any debris which is present below the seabed surface.

Foundations will be fabricated offsite, stored at a suitable port facility (if required) and transported to site as needed. Specialist vessels will be needed to transport and install foundations. Scour protection (typically rock) may be required on the seabed and will be installed either before and/or after foundation installation. The following section provides an overview of the various foundation types which are being considered.

All foundation types and maximum parameters stated in the following section are for wind turbines only. The foundation structures being considered for offshore platforms are discussed in section 3.3.7.

3.3.5.1 Monopile Foundations

Monopile foundations typically consist of a single steel tubular section and a transition piece (TP) which may include boat landing features, ladders, a crane, and other ancillary components as well as a flange for connection to the wind turbine tower (as illustrated in Figure 3.3). The TP is usually painted yellow and marked according to relevant regulatory guidance and may be installed separately following the monopile installation.

In most instances, monopiles are driven into the seabed from either a floating vessel or a jack-up barge using hydraulic hammers, which are available in various capacities for operation either above or under the water surface. In areas of hard soil or bedrock close to the seabed surface, where piling with a hammer is difficult or impossible, drilling may be used to assist piling. Drilling operations produce spoil which is typically disposed of at the drill site.

During the construction phase of the Proposed Development, multiple installation vessels may be in operation at any one time, operating over a 24-hour period, to support up to two piling operations simultaneously. The project description included in the Offshore EIA Report will provide further detail on the installation phase. The installation of a single monopile foundation may take up to three days allowing for vessel re-positioning and commissioning at each installation location, although continuous piling itself will be completed over a period of hours rather than days. Piling usually commences with low hammer energies (‘soft start’) and maximum hammer energies (if required) are attained after a predefined ‘ramp up’ and typically only used where ground conditions require.

The design envelope for monopile foundations is shown in Table 3.2.

Table 3.2: Design Envelope: Monopile Foundations.

Parameter	Maximum Design Envelope
Number of monopiles	242
Diameter (m)	15
Realistic maximum hammer energy (kJ)	6000*
Diameter of foundation footprint (largest single foundation) (m) including scour protection	60
Number of simultaneous piling events	2
Cumulative wind farm area of foundation footprint (greater number of smaller structures) (m^2)	194,628
Piling duration (per monopile)	TBC – to be listed in EIA Report

* The maximum hammer energy required for the installation of the monopile foundations will be refined following analysis of the data collected during the geotechnical surveys.

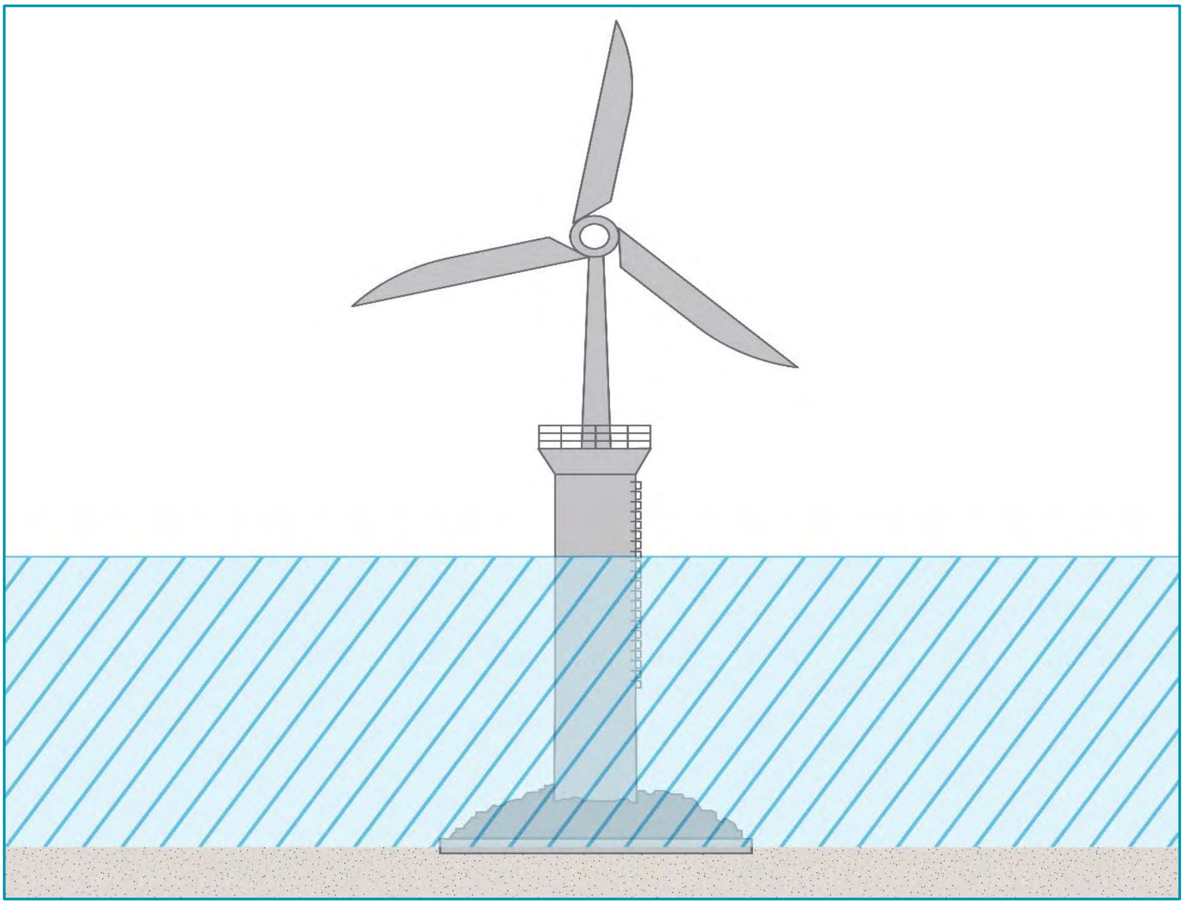

Figure 3.3: Example of a Monopile Foundation.

3.3.5.2 Piled Jacket Foundations

Piled jacket foundations are formed of a steel lattice construction (comprising tubular steel members and welded joints) secured to the seabed by driven and/or drilled pin piles attached to the jacket feet (as illustrated in Figure 3.4). Jacket structures can be used to support wind turbines. The hollow steel pin piles are typically driven, drilled or vibrated into the seabed relying on the frictional and end bearing properties of the seabed for support. Unlike monopiles, there is no separate TP. The TP and ancillary structure are fabricated as an integrated part of the jacket structure and is not installed separately offshore. Pin piles will typically be narrower than monopoles.

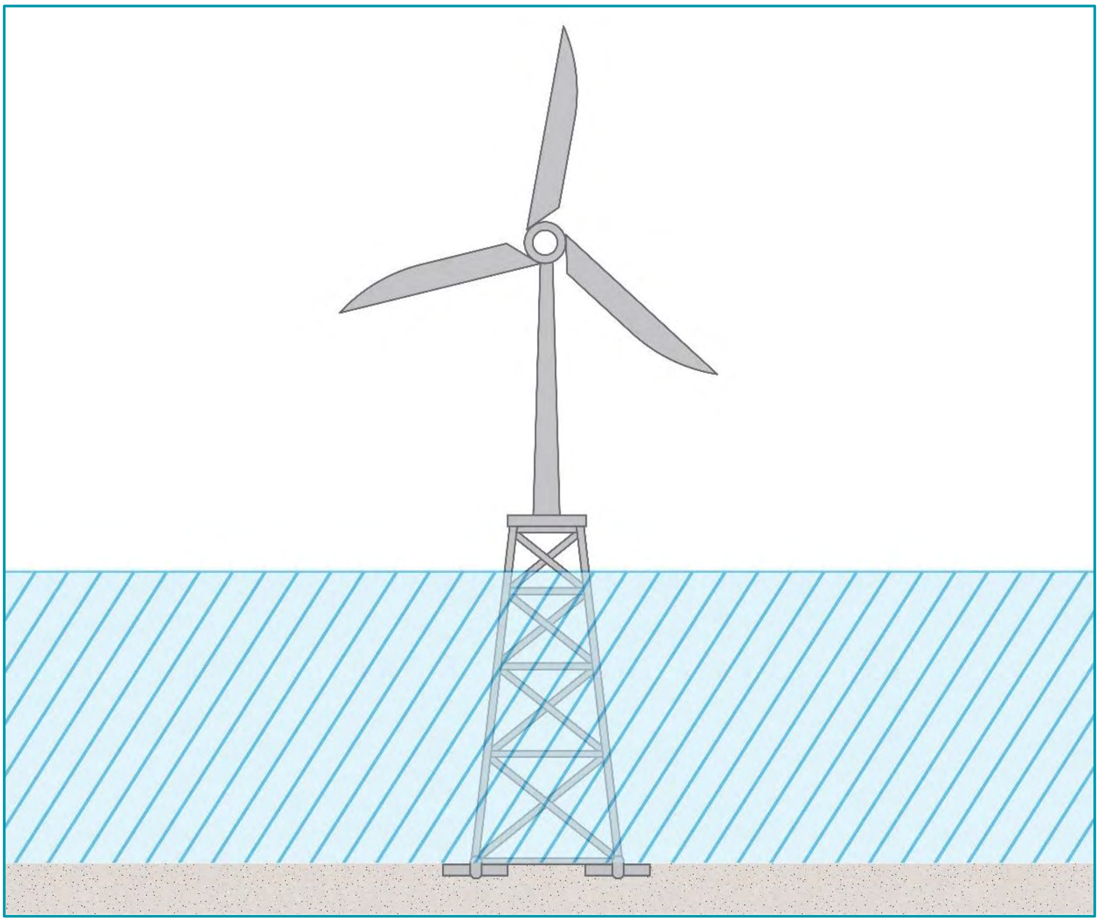

Figure 3.4: Example of a Jacket Foundation with Pin Piles.

The design envelope for jacket foundations with pin piles is shown in Table 3.3.

Table 3.3: Design Envelope: Jacket Foundation with Pin Piles.

Parameter	Maximum Design Envelope
Number of jackets	242
Maximum number of legs	4
Approximate height of platform above LAT (m)	30
Leg diameter (m)	4
Pin pile diameter (m)	4
Diameter foundation footprint (per jacket) (m^2) including scour protection	64
Hammer energy (kJ)	3000

3.3.5.3 Suction Bucket Jacket Foundations

Suction bucket jacket foundations are formed with a steel lattice construction (comprising tubular steel members and welded joints) fixed to the seabed by suction buckets installed below each leg of the jacket. The suction buckets are typically hollow steel cylinders, capped at the upper end, which are fitted underneath the legs of the jacket structure. They do not require a hammer or drill for installation. Unlike monopiles, but similarly to piled jacket foundations, there is no separate TP. The TP and ancillary structure is fabricated as an integrated part of the jacket structure and is not installed separately offshore. An example of a suction bucket jacket is provided in Figure 3.5.

Once at site, the jacket foundation will be lifted by the installation vessel using a crane and lowered towards the seabed in a controlled manner (see Figure 3.5). When the steel caisson reaches the seabed, a pipe running up through the stem above each caisson will begin to suck water out of each bucket. The buckets are pressed down into the seabed by the resulting suction force. When the bucket has penetrated the seabed to the desired depth, the pump is turned off. A thin layer of grout is then injected under the bucket to fill the air gap and ensure contact between the soil within the bucket, and the top of the bucket itself.

The design envelope for jacket foundations with suction buckets is provided in Table 3.4.

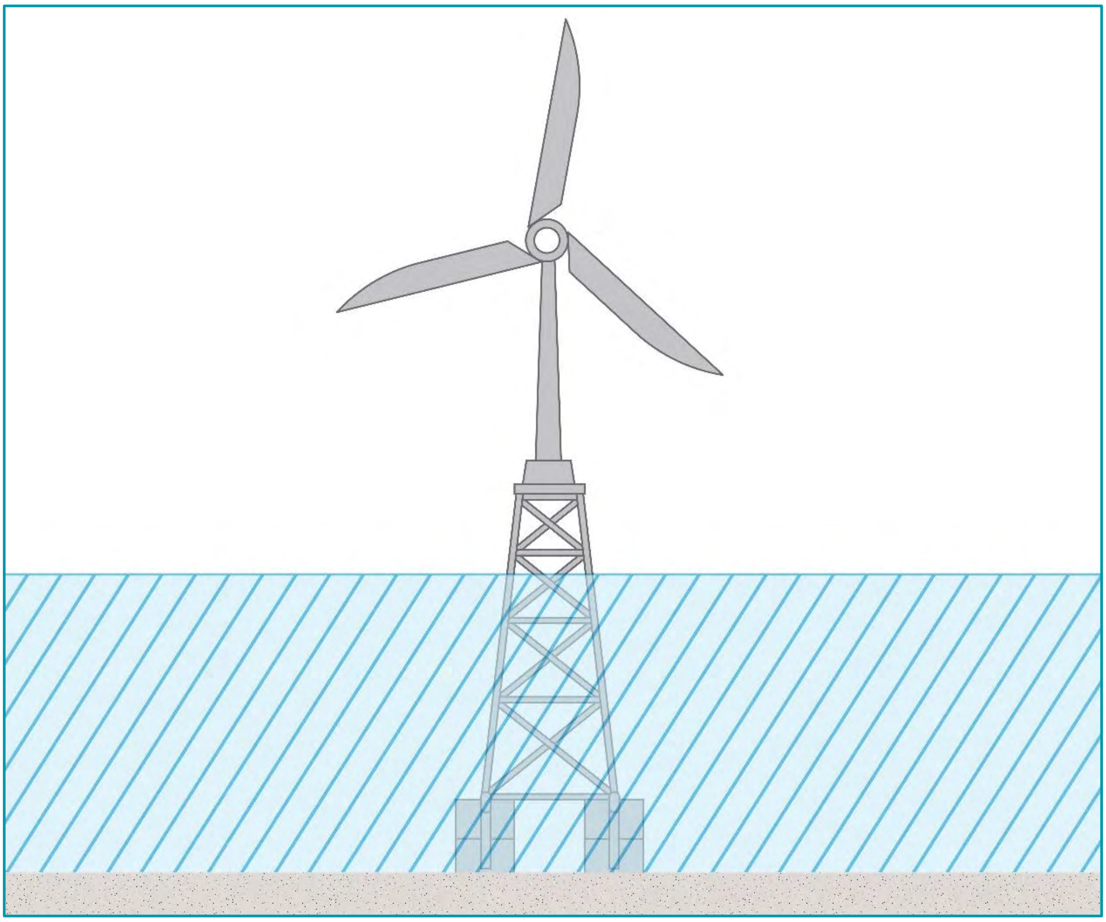

Figure 3.5: Jacket foundation with Suction Buckets.

Table 3.4: Design Envelope: Suction Bucket Jacket Foundations.

Parameter	Maximum Design Envelope
Number of jackets with suction buckets	242
Maximum number of legs with suction buckets	4
Approximate height of platform above LAT (m)	30
Diameter of foundation footprint (m) including scour protection	320
Suction bucket diameter (m)	20
Expected penetration depth (m)	17

3.3.5.4 Gravity Base Foundations

Gravity base foundations are heavy steel, concrete, or steel and concrete structures sometimes including additional ballast, that sit on the seabed to support the wind turbine tower (as illustrated in Figure 3.6). Gravity bases vary in shape and are placed in pre-prepared areas of seabed. Seabed preparation may involve levelling and dredging of the soft mobile sediments.

A gravity base does not require piling or drilling to remain in place. Scour protection is usually required to avoid the structure being undermined. The amount of ballast and scour protection will depend on structure design and location. The maximum adverse design scenario for gravity base foundations is shown in Table 3.5.

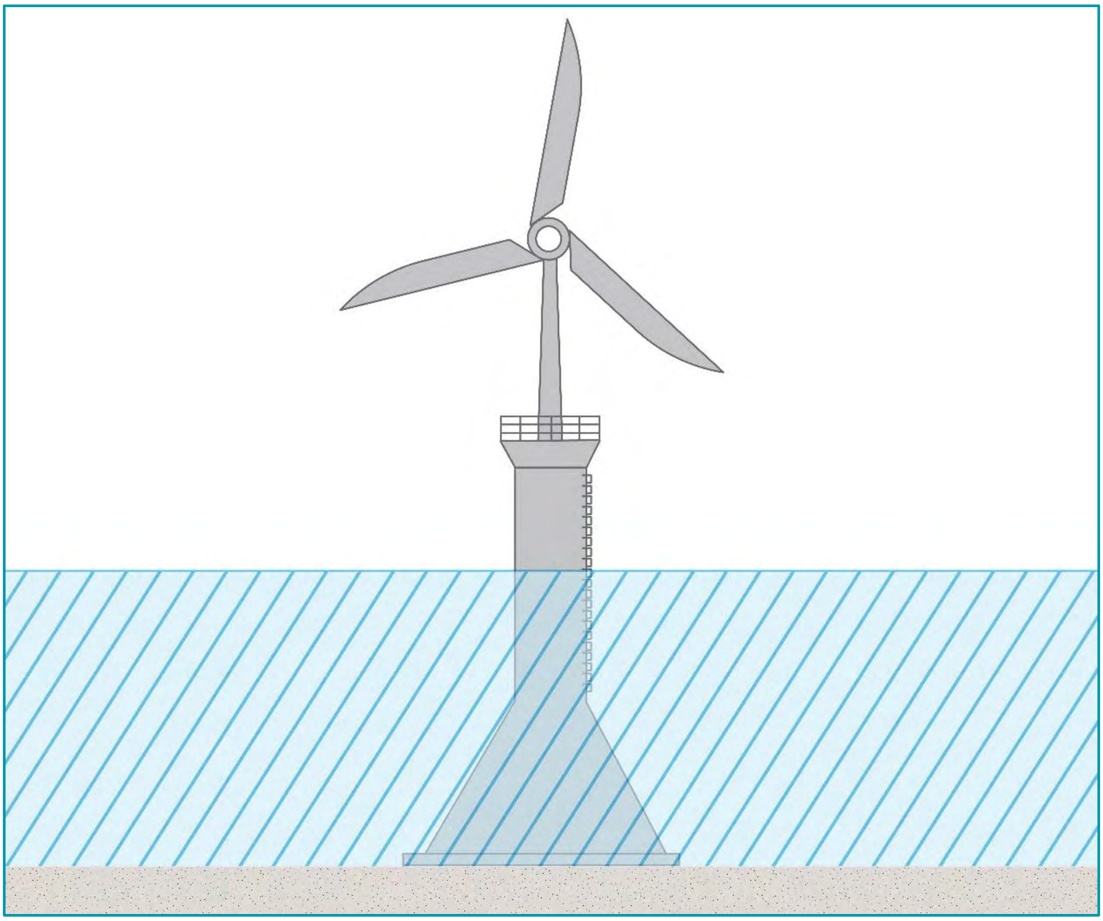

Figure 3.6: Example of a Gravity Base Foundation.

Table 3.5: Design Envelope: Gravity Base Foundation.

Parameter	Maximum Design Envelope
External diameter (excluding scour protection) (m)	55
Number of gravity base foundations	242
Diameter foundation footprint (m)	220
Seabed preparation diameter (m)	220
Scour protection width (m)	220

3.3.5.5 Floating Foundations

Floating foundations can consist of a range of structure types, typically classed as spar buoys, semi-submersibles or tensioned-leg platforms (TLPs). The classification of floating foundations depends on how stability is achieved; by ballast at the base of the spar, by a wide structure at the water surface for a semi-submersible or by tension in the mooring lines for a TLP. The structure typically consists of either a single slender vertical cylindrical structure, called a spar buoy, a semi-submersible platform or a shallower and more complex structure consisting of various tubular and plate elements, called a TLP.

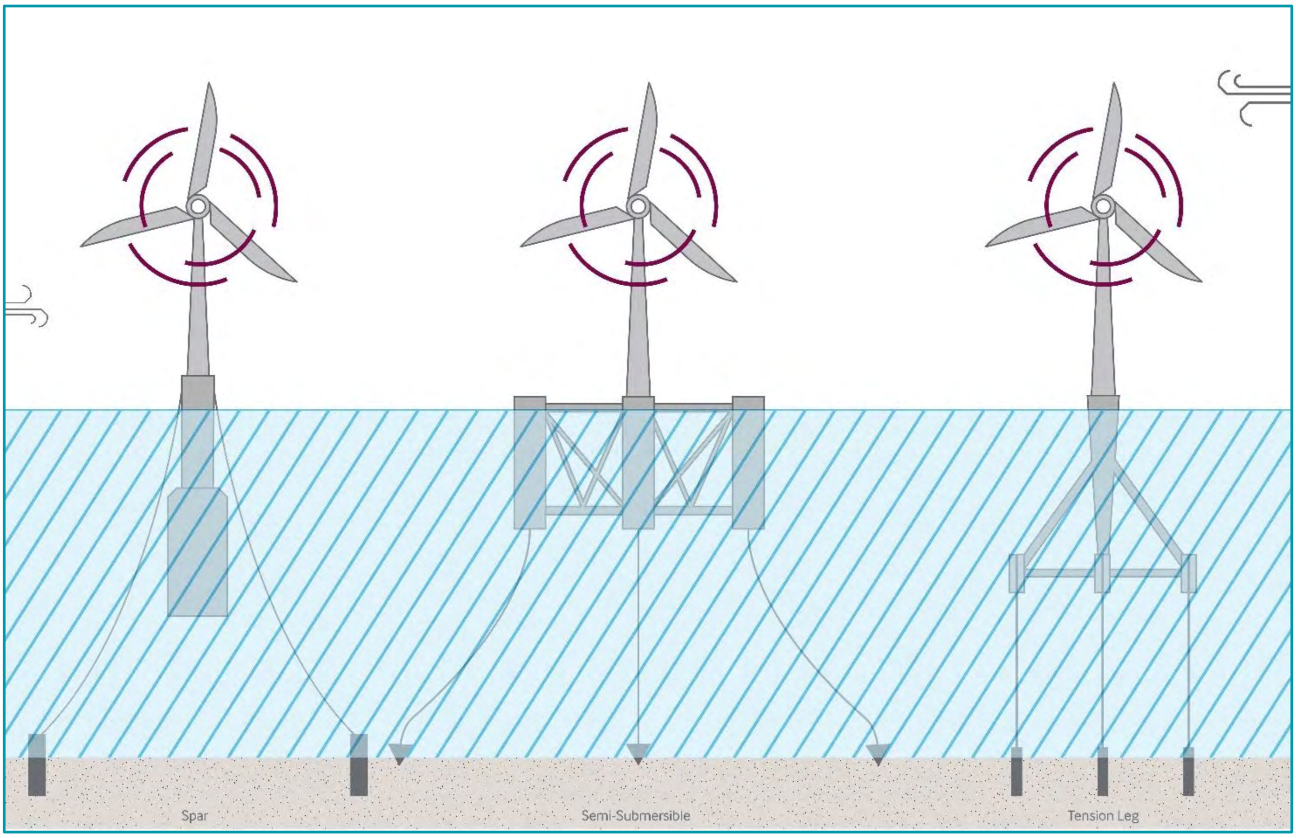

Figure 3.7: Example of Floating Foundations.

The foundations are typically fabricated from steel and/or concrete and are held in place by mooring lines connected to anchors in the seabed. The anchors could be piles, suction buckets, gravity structures or drag anchors. The structures will either be floated into place from harbour or brought to site on suitable installation vessels and lifted into the water. The anchors will be installed using a range of methods dependent on the anchor type, including piling, drilling, suction, and placement. The installation of the anchors is likely to be carried out by a separate vessel. Please note that floating foundations are only being considered as a demonstrator for this project and will not form the foundations for any of the main wind turbines in the wind farm. As such, only a small number of floating foundations have the potential to be installed. Given the less mature nature of floating foundations, it is difficult to make an accurate estimation of substructure size at this stage in the project. The industry has not selected a preferred foundation type at this time. The parameters set out in Table 3.6 are therefore a high-level estimate of the design envelope for a floating foundation.

Table 3.6: Design Envelope: Floating Foundation.

Parameter	Maximum Design Envelope
Foundation surface dimension (m)	100 x 100
Depth of structure (m) in the water column	60
Number of mooring lines and anchors (per wind turbine)	3
Mooring cable radius (m)	200
Length of mooring cables (m)	150
Number of floating foundations	TBC

3.3.6 SCOUR PROTECTION FOR FOUNDATIONS

Foundation structures for wind turbines and substations are at risk of seabed erosion and 'scour hole' formation due to natural hydrodynamic and sedimentary processes. The development of scour holes is influenced by the shape of the foundation structure, seabed sedimentology and site specific metocean conditions such as waves, currents and storms. Scour protection may be employed to mitigate scour around foundations. There are several commonly used scour protection types, such as:

- concrete mattresses: several metres wide and long, cast of articulated concrete blocks which are linked by a polypropylene rope lattice which are placed on and/or around structures to stabilise the seabed and inhibit erosion;
- rock: either layers of graded stones placed on and/or around structures to inhibit erosion or rock filled mesh fibre bags which adopt the shape of the seabed/structure as they are lowered on to it; or
- artificial fronds: mats typically several metres wide and long, composed of continuous lines of overlapping buoyant polypropylene fronds that create a drag barrier which prevents sediment in their vicinity being transported away. The frond lines are secured to a polyester webbing mesh base that is itself secured to the seabed by a weighted perimeter or anchors pre-attached to the mesh base.

The most frequently used scour protection method is 'rock placement', which entails the placement of crushed rock around the base of the foundation structure.

The amount of scour protection required will vary for the different foundation types being considered for the Proposed Development. The final choice of scour protection will be made after design of the foundation structure, taking into account a range of aspects including geotechnical data, meteorological and oceanographical data, water depth, foundation type, maintenance strategy and cost. Table 3.7 provides an overview of the design envelope for scour protection.

Table 3.7: Design Envelope: Scour Protection.

Parameter	Maximum Design Envelope
Total wind farm scour protection material volume (m^3)	2,280,000
Total wind farm scour protection seabed area (km^2)	4.56

3.3.7 OFFSHORE PLATFORMS

The Proposed Development may require up to a total of ten offshore platforms. These offshore platforms will be utilised as OSP which transform electricity generated by the wind turbines to a higher voltage and thereby allowing the power to be efficiently transmitted to shore. The platform topsides will be approximately 70 m (length) by 44 m (width), and approximately 50 m in height (above LAT), excluding the helideck or lightning protection (Table 3.8). The Project Description in the Offshore EIA Report will provide further detail on the design of offshore platform and topside specification.

Table 3.8: Design Envelope: Offshore Platforms.

Parameter	Maximum Design Envelope
Maximum number of platforms	10
Scour protection footprint (m^2)	2880
Length of topside (m)	70
Width of topside (m)	44
Height (excluding helideck or lightning protection) (LAT) (m)	70

The platforms locations have not yet been selected and will be identified through detailed design consideration. Likewise, the foundation type for the offshore platforms will also be decided at the final design stage. A summary of the potential foundation structures for the offshore platforms is discussed below.

3.3.7.1 Offshore Platform Foundations: Piled Jacket

As described in section 3.3.5.2, piled jacket foundations are formed of a steel lattice construction (comprising tubular steel members and welded joints) secured to the seabed by driven pin piles attached to the jacket feet. The hollow steel pin piles are typically driven, drilled or vibrated into the seabed relying on the frictional and end bearing properties of the seabed for support. The TP and ancillary structure are fabricated as an integrated part of the jacket structure and is not installed separately offshore. Pin piles will typically be narrower than monopoles. The design envelope for jacket foundations with pin piles is shown in Table 3.9.

Table 3.9: Design Envelope: Jacket Foundation with Pin Piles for Offshore Platforms.

Parameter	Maximum Design Envelope
Number of piled jack foundations	10
Maximum number of legs	6
Maximum leg diameter (m)	2.5
Maximum number of piles per structure	12
Pin pile diameter (m)	3
Maximum hammer energy (kJ)	3000

3.3.7.2 Offshore Platform Foundations: Suction Bucket Jacket

As described in section 3.3.5.3, suction bucket jacket foundations are formed with a steel lattice construction (comprising tubular steel members and welded joints) fixed to the seabed by suction buckets installed below each leg of the jacket. The suction buckets are typically hollow steel cylinders, capped at the upper end, which are fitted underneath the legs of the jacket structure. They do not require a hammer or drill for installation. The TP and ancillary structure are fabricated as an integrated part of the jacket structure and is not installed separately offshore.

The design envelope for suction bucket jacket foundations is shown in Table 3.10.

Table 3.10: Design Envelope: Suction Bucket Jacket for Offshore Platforms.

Parameter	Maximum Design Envelope
Number of suction bucket foundations	10
Maximum number of legs using bucket foundation	6
Maximum bucket diameter (m)	20
Foundation footprint (m^2)	2880

3.3.8 INTER-ARRAY CABLES

Inter-array cables carry the electrical current produced by the wind turbines to an offshore substation. A small number of wind turbines will typically be grouped together on the same cable 'string' connecting those wind turbines to the substation, and multiple cable 'strings' will connect back to each offshore substation.

The inter-array cables will be buried where possible and protected with a hard-protective layer (such as rock or concrete mattresses) where burial is not achievable, for example where crossing pre-existing cables, pipelines or exposed bedrock. If cable protection is required, the protection measure will be dependent on several factors such as seabed conditions, seabed sedimentology and the physical processes.

Cable installation methodology and potential cable protection measures will be finalised at the final design stage. The design envelope for inter-array cables is presented in Table 3.11.

Table 3.11: Design Envelope: Inter-Array Cables.

Parameter	Maximum Design Envelope
Number of array cables	259
Cable diameter (mm)	200
Minimum cable burial depth (m)	3
Cable installation seabed preparation	Plough / jet / scar plough / grapnel
Width of cable trench (m)	2
Total length of inter-array cabling (km)	1036
Width of seabed affected by installation per cable (m)	10
Total seabed disturbed (km^2)	10.36

3.3.9 OFFSHORE TRANSMISSION INFRASTRUCTURE

Offshore export cables are used for the transfer of power from the offshore substations to the landfall point. The offshore export cables will have a maximum total length of 800 km, comprised of up to ten cables. Each of these export cables will be installed in a trench of up to 2 m wide with a burial depth of between 0 m and 3 m per cable. There is the potential for seabed preparation to be required prior to cable installation, with methods such as plough, jet, scar plough and grapnel currently being considered.

The exact locations of the offshore export cables are yet to be determined and will be based upon geophysical and geotechnical survey information, which will also support the decision on requirements for any additional cable protection. Flexibility is required in the location, depth of burial and protection measures for the export cables to ensure physical and technical constraints, changes in available technology and project economics can be accommodated within the final design.

The installation of the export cables through the intertidal zone at the landfall will depend on the ground conditions and intertidal constraints, such as extensive debris, steep gradients, highly mobile sediments, hard bedrock, and protected sites. There are currently several methods of installation at landfall being considered:

trenchless installation: installation of the offshore export cable via trenchless installation methods such as Horizontal Directional Drilling (HDD) or Direct Pipe®; or

- open cut trench: this method involves the excavation of a trench on the shore via earth moving equipment. The cable is then pulled ashore into the trench and the trench is backfilled and then re-instated.

The design envelope for the offshore transmission infrastructure is described in Table 3.12.

Table 3.12: Design Envelope: Offshore Transmission Infrastructure.

Parameter	Maximum Design Envelope
Number of cables	10
Total cable length (km)	800
Cable diameter (mm)	300
Cable installation seabed preparation	Plough / jet / scar plough / grapnel
Minimum cable burial depth (m)	3
Width of cable trench (m)	1
Width of seabed affected by installation per cable (m)	10
Total seabed disturbed (km^2)	8

3.4 OFFSHORE CONSTRUCTION PHASE

The Proposed Development is likely to be constructed over a period of three years in line with the general construction series outlined below:

1. pre-construction surveys (including UXO and geotechnical surveys);
2. foundation installation;
3. OSP installation/commissioning;
4. offshore export cable - landfall installation;
5. offshore export cable - offshore installation;
6. additional commissioning post-export cable installation if required;
7. inter-array cable installation; and
8. wind turbine installation/commissioning.

The offshore construction phase will be supported by various vessels including jack-up or floating Heavy Lift vessels (HLV), support vessels, cable lay vessels, pre-lay survey vessels, Remotely Operated underwater Vehicle (ROV) deployment vessel, rock installation vessel, service and commissioning support vessels, and guard vessels.

Wind turbines, foundation structures and offshore platform structures will be transported from the pre-assembly harbour where sub-assemblies (nacelle, rotor blades and towers) will be loaded onto an installation vessel or support vessel. At the installation location, the wind turbine tower will be erected first, followed by the nacelle and blades. The blades may be installed one at a time or may be pre-assembled. Following installation of the wind turbine and connection to the necessary cabling, a process of testing and commissioning will be undertaken.

3.5 OPERATION AND MAINTENANCE PHASE

Operations and maintenance works will be conducted from either a Service Operations Vessel (SOV), helicopter, drones or Crew Transfer Vessel (CTV). The details of estimated annual and total operations and maintenance activities will be detailed within the Design Envelope of the Offshore EIA Report.

3.6 DECOMMISSIONING PHASE

Under Section 105 of the Energy Act 2004 (as amended), developers of offshore renewable energy projects are required to prepare a decommissioning programme for approval by Scottish Ministers. A Section 105 notice is issued to developers by the regulator after consent or marine licence has been issued for the given development. Developers are then required to submit a detailed plan for the decommissioning works, including anticipated costs and financial securities. The plan will consider good industry practice, guidance and legislation relating to decommissioning at that time. The plan will be consulted on by an approved set of stakeholders and will be publicly available. Marine Scotland Licensing Operations Team (MS-LOT) will further consult on the plan, the costs and financial securities prior to seeking ministerial approval.

The Offshore EIA Report will provide an overview of the estimated decommissioning events and an assessment of the potential effects of this phase on receptors.

4 SITE SELECTION METHODOLOGY AND CONSIDERATION OF ALTERNATIVES

4.1 INTRODUCTION

A summary of the considerations for site selection and alternatives of the key Proposed Development components is outlined in this section The Offshore EIA Report will outline the stages of site selection that have been carried out in order to establish the array area, proposed export cable corridor and landfall. Furthermore, the Offshore EIA Report will set out any refinements to the Proposed Development that have taken place as a result of the EIA process and in response to consultation and stakeholder feedback and will describe the main alternatives that have been considered as part of this process.

Sections 4.2 and 4.3 outline the process behind the identification of the array area and the onshore grid connection point.

4.2 SITE SELECTION AND CONSIDERATION OF ALTERNATIVES

4.2.1 FIRTH OF FORTH ROUND 3 ZONE

The Proposed Development is located within the former Firth of Forth Zone (the Zone). Site selection for the Proposed Development comprised the following stages:

- initial zone selection in 2008, undertaken by TCE following their SEA and Round 3 zone identification process;
- followed by the subsequent stages undertaken by the Applicant:
  - identification of three development phases within the Firth of Forth Zone;
  - Zone Appraisal and Planning (ZAP): a discretionary, non-statutory process to aid developers in managing development risks within their zones; and
  - identification of the Proposed Development within the former Firth of Forth Zone.

The Round 3 offshore wind development programme instigated by TCE in 2008 was designed to facilitate delivery of a larger scale offshore wind farm development than had previously occurred in the UK. Suitable areas for the development of offshore wind were assessed through a statutory process of SEA undertaken by DECC, now BEIS.

In 2009, following a successful proposal application, Seagreen Wind Energy Limited was awarded development rights to R3 Zone 2 (named 'Firth of Forth Zone'), and subsequently Seagreen and TCE entered into a Zone Development Agreement (ZDA) with a target Zone generation capacity of circa 3.5 GW.

The ZDA granted Seagreen certain seabed rights within the Firth of Forth Zone, such as to identify specific areas for the development of offshore wind farms. Although the boundary of the Firth of Forth Zone was fixed, development phase and project boundaries remained flexible. The key considerations for the selection of the preferred offshore wind farm sites within the Firth of Forth Zone related to the environmental, engineering and economic constraints. For example, avoiding areas which are not economically viable due to insufficient wind resource, or unsuitable areas due to seabed geology.

Seagreen opted for a phased approach to the delivery of the projects within the Firth of Forth Zone to achieve the target capacity. This approach involved prioritising areas considered to have the least potential constraints and considering the practicalities of resourcing delivery of the target capacity for the

Firth of Forth Zone. To support the definition of phases and project boundaries rationally and strategically, Seagreen adopted the ZAP approach.

ZAP was a term advocated by TCE to describe the non-statutory strategic approach to zone design, project identification and consent. The ZAP process allowed developers to have greater control over the way a zone is developed and encourages a high-level strategic approach to planning and stakeholder engagement of the zone in terms of environmental, social and economic effects (particularly cumulative effects). The Seagreen ZAP followed an iterative process throughout the projects within the Firth of Forth Zone.

The initial ZAP report (Seagreen, 2010a) informed the Zone Consenting Strategy (Seagreen, 2010b) and ranked the sites on the level of constraint and ability to construct. The strategy was to construct seven offshore wind farms within three phases (Seagreen, 2011). An updated ZAP report in 2011 provided recommendations for the Phase 1 project boundaries and indicative Phase 2 and Phase 3 project boundaries, aided by identification of environmental constraint within the Zone (Seagreen, 2011). The Phase 1 project, consisting of Project Alpha and Project Bravo, were awarded consent in November 2017, and a 15-year CfD was awarded in September 2019 for 42% of the total project capacity (1.075 GW).

A second update of the ZAP report in 2014 provided further refined boundaries for Phase 2 projects, building on from increased understanding of constraints from the Seagreen 1 EIA (Seagreen, 2014). Phase 2 of the Firth of Forth Zone now consists of Berwick Bank Wind Farm (the Proposed Development) and Marr Bank Wind Farm.

The Proposed Development project boundaries were identified through consideration of several parameters within the Firth of Forth Zone, including:

- water depth and distance to shore;
- wind speed and metocean conditions;
- environmental designations (existing and proposed, onshore and offshore) including SPAs, Ramsar sites, Special Areas of Conservation (SACs), Sites of Special Scientific Interest (SSSIs) and Important Bird Areas (IBAs);
- ornithology;
- offshore habitats;
- marine ecology, including epifauna and infauna;
- marine mammals including cetaceans and seals;
- shipping and navigation;
- fishing effort;
- seascape and landscape;
- archaeology and cultural heritage;
- aviation and telecommunications issues, including civil and military aspects;
- oil and gas infrastructure;
- emergency services; and
- cables and pipelines.

A detailed consideration of ornithological constraints was also undertaken for the selection of Phase 2 project boundaries. The ornithology review sought to quantify the remaining biological capacity to absorb impacts (known as 'headroom') of species at specific SPAs. The key ornithological constraints to the development of Phase 2 are discussed further within section 7.4.

Subsequently in 2019, the Firth of Forth ZDA was terminated, with AfLs now agreed with CES for Seagreen 1 (consisting of Seagreen Alpha and Seagreen Bravo), Berwick Bank Wind Farm and Marr Bank Wind Farm.

The Offshore EIA Report will further describe the background to the former Firth of Forth Zone and the evolution of the Proposed Development within this boundary. In addition, the Offshore EIA Report will outline the process that the Applicant has followed to identify potential wind turbine layouts within the array area, the main alternatives that were considered and the rationale for the selection of the final layout considering any modifications identified during consultation.

4.2.2 TRANSMISSION CABLES AND ASSOCIATED INFRASTRUCTURE

To allow for connection between the array area and the onshore substation, the Applicant must install export cables between the array area and the onshore grid connection point. NPF3 recognises the importance of offshore renewable projects and aims to ensure planning facilitates the development of onshore elements which support offshore projects. Further, the NPF3 recognises that an "*enhanced High Voltage Energy transmission network is needed to facilitate renewable electricity development and its export*".

The NPS EN-5 (DECC, 2011c) provides guidance on the locating electricity networks by explaining that "it is not necessarily the case that a new connection should be via the most direct route, and this will be influenced by a number of factors, including environmental and engineering aspects".

As discussed within chapter 3, the generated electricity from the wind turbines will be transmitted onshore via buried high-voltage cables. These cables will be either High Voltage Alternating Current (HVAC) or High Voltage Direct Current (HVDC). The parameters of the export cable will be confirmed prior to EIA Report submission, and final design will be dependent on final wind turbine and electrical design, as well as a detailed analysis of the costs, technical aspects and available technology of the various options.

4.2.2.1 Proposed Export Cable Corridor

The proposed export cable corridor has been identified between the array area and the two proposed landfall locations on the East Lothian coast, Thorntonloch Landfall and Skateraw Landfall. Both cable landfalls may be utilised due to the capacity of the Proposed Development. A grid connection point has been confirmed at Branxton, south west of Torness Power station with an existing grid connection agreement.

The initial selection of the proposed export cable corridor was conducted by desktop and site-based study using the current best available information on constraints and publicly available information on the proximal Neart Na Gaoithe offshore wind farm, including site boundary, indicative proposed export cable corridor, and onshore cable route red line boundary. Geophysical surveys have been carried out on the part of the cable corridor from the array area to the proposed Thorntonloch Landfall at Thorntonloch Beach. The two proposed landfalls shown in Figure 4.1 were selected from an original selection of seven landfalls.

The indicative cable corridor shown in Figure 4.1 is a direct route from the onshore grid connection to the array area. The proposed export cable corridor then allows options in the nearshore area to route to the two landfall sites. Due to the potential number of cables and space required, two landfall locations may be required. The spatial difference between the proposed landfalls results in two indicative nearshore cable corridor options. These cable corridor options are defined as the nearshore options. Further survey work is planned to identify the preferred cable route to Skateraw.

Where possible the proposed export cable corridor route selection avoids known constraints and avoids conflict with known extant or planned assets, including the Marr Bank Wind Farm project, seabed rock outcrops, wrecks, and Neart na Gaoithe's landfall. However, the proposed cable corridor near to Skateraw is required to cross Neart na Gaoithe's export cable, this crossing is unavoidable; a crossing angle of 90 degrees has been maintained where possible.

4.3 LANDFALL LOCATION

The Project has a grid connection agreement with National Grid Electricity System Operator at a point close to the existing Branxton substation compound, approximately 8 km south of Dunbar.

From this, the Applicant considered a number of landfall options within the vicinity of Branxton. These have been evaluated from an engineering, consents (planning and environment), land use and cost perspective.

Two preferred landfall locations have been identified on the East Lothian coast, one at Thorntonloch and one at Skateraw. One or both may be required for the Project.

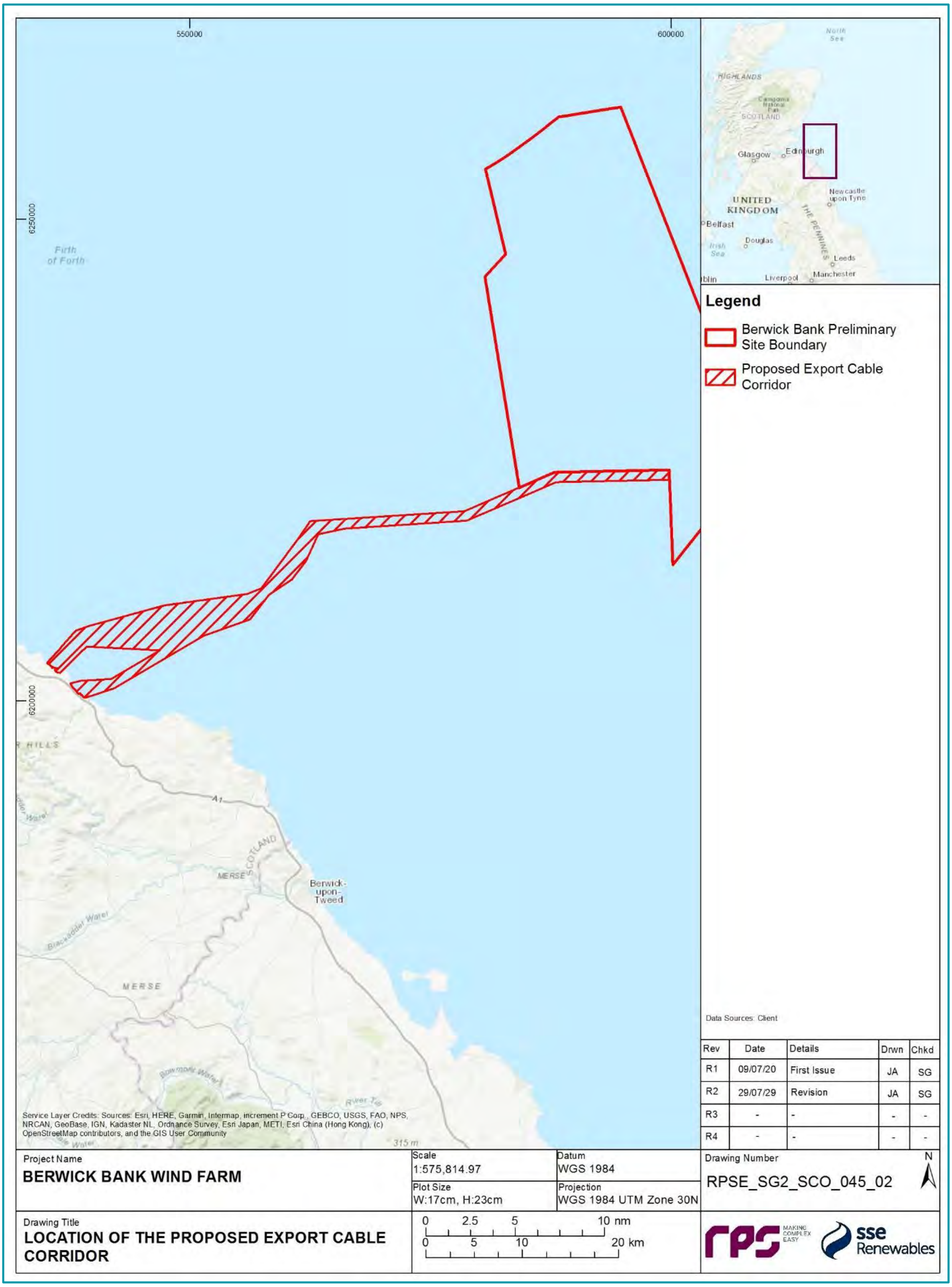

Figure 4.1: Location of the Proposed Export Cable Corridor.

5 ENVIRONMENTAL IMPACT ASSESSMENT METHODOLOGY

5.1 INTRODUCTION

This section describes the methodology that will be applied to the Proposed Development EIA. It outlines the methodology for the identification and evaluation of potential likely significant environmental effects (as defined in the EIA Regulations (see section 2.3)), and presents the proposed methodology for the identification and evaluation of potential cumulative and inter-related impacts, which includes due consideration of potential transboundary effects. A systematic and auditable evidence-based approach will be followed to evaluate and interpret the potential effects on physical, biological and human receptors.

5.2 BASIS OF ASSESSMENT

5.2.1 EIA LEGISLATIVE BASIS AND GUIDANCE DOCUMENTS

As explained in section 2.3.1 , in compliance with the EU Directive on the assessment of the effects of certain public and private projects on the environment (EIA Directive) (2011/92/EU, as amended by Directive 2014/52/EU), when applying for Section 36 consent, a marine licence or planning permission, an EIA Report is required to be prepared and submitted to support these applications if they are likely to have a significant effect on the environment due to factors such as their size nature or location.

The EIA is required to fulfil the requirements of the following regulations:

- in respect to a Section 36 consent application: The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017;
- in respect to a marine licence application: The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017 and Marine Licensing (Pre-application Consultation) (Scotland) Regulations 2013; and
- in respect to a planning application: The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017.

In addition, the following Regulations will also be considered in the production of the Offshore EIA Report:

- the Conservation (Natural Habitats &c.) Regulations 1994 (as amended);
- the Conservation of Habitats and Species Regulations 2017;
- the Conservation of Offshore Marine Habitats and Species Regulations 2017 (which apply to marine licences and Section 36 applications within the Scottish Offshore region; and
- the Wildlife and Countryside Act (1981)

Further information on the EIA Regulations is provided in chapter 2.

In addition to the legislative requirements, guidance and best practice documents have been developed to assist with the production of a ‘fit for purpose’ EIA. These include:

- Marine Scotland Consenting and Licensing Guidance: For Offshore Wind, Wave and Tidal Energy Applications (Marine Scotland, 2018a);
- Guidelines for Ecological Impact Assessment (EcIA) in the UK and Ireland – Terrestrial, Freshwater, Coastal and Marine (CIEEM, 2019);
- Environmental impact assessment for offshore renewable energy projects (British Standards Institute (BSI), 2015);

- Guidelines for data acquisition to support marine environmental assessments of offshore renewable energy projects (Centre for Environment, Fisheries and Aquaculture Science (Cefas), 2012);
- A Review of Assessment Methodologies for Offshore Wind Farms (Collaborative Offshore Wind Research Into The Environment (COWRIE) METH-08-08) (Maclean *et al.*, 2009);
- IEMA Environmental Impact Assessment Guide to Shaping Quality Development (IEMA, 2015); and
- Advice Note Seventeen: Cumulative effects assessment relevant to nationally significant infrastructure projects (The Planning Inspectorate, 2019).

5.2.2 THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

The EIA process can be broadly summarised as consisting of:

- Scoping: The Applicant produces an Offshore Scoping Report (this document) and requests a formal Scoping Opinion from Scottish Ministers;
- Consultation: The Applicant is required to conduct pre-application consultation;
- EIA Report Preparation: The Offshore EIA Report will be prepared, considering the responses to the consultation process and outcomes of the assessment of the LSE of the Proposed Development during the construction, operation and maintenance, and decommissioning stages of the project lifecycle;
- EIA Report Consultation: The Offshore EIA Report (and the application to which it relates) must be publicised, and the consultation bodies and the public must be given an opportunity to give their views about the Proposed Development and the Offshore EIA Report;
- Determination: The competent authority must examine all the environmental information, including the Offshore EIA Report and any comments and representations received, and must reach their reasoned conclusion on the significant effects of the development on the environment. The environmental information, and the conclusions reached, must be taken into account by the competent authority in deciding whether or not to give consent for the development. The competent authority must also consider whether any monitoring measures are appropriate; and
- Decision notice: The competent authority must inform the public and the consultation bodies of the decision and must publish a ‘decision notice’ which incorporates the authority’s reasoned conclusion on the significant effects of the development on the environment.

5.3 KEY PRINCIPALS OF THE EIA

5.3.1 OVERVIEW

Within the Offshore EIA Report, the assessment of each topic (e.g. physical processes, marine mammals, infrastructure and other users etc.) will be included in a separate chapter. A list of the topic chapters that will be included in the Offshore EIA Report is outlined in Table 1.2 . Within each of the topic chapters, the following matters will be considered:

- identification of the study area for the topic-specific assessments;
- description of the planning policy and guidance context;
- summary of consultation activity, including comments received in the Scoping Opinion and PAC;
- description of the environmental baseline conditions; and
- presentation of impact assessment, which includes:
  - identification of the maximum design scenario for each impact assessment;
  - a description of the measures adopted as part of the Proposed Development, including mitigation and design measures which seek to prevent, reduce or offset environmental effects;

- identification of likely impacts and assessment of the significance of identified effects, taking into account any mitigation measures adopted as part of the Proposed Development;
- identification of any further mitigation measures required in respect of LSE (in addition to those measures adopted as part of the Proposed Development), together with consideration of any residual effects;
- identification of any future monitoring required;
- assessment of any cumulative effects with other major developments, including those that are proposed, consented and under construction (including, where applicable, those projects, plans or activities that are currently operational that were not operational when baseline data was collected); and
- assessment of any transboundary effects (i.e. effects on other European Economic Area (EEA) states).

Inter-related effects (i.e. inter-relationships between environmental topic areas) will be assessed in a separate standalone chapter which will consider the impacts of the Proposed Development on each of the identified receptor groups.

Within each topic chapter a number of key principles will be applied, and these are detailed in sections 5.3.2 to 5.3.8.

5.3.2 PROPORTIONATE EIA

The importance of delivering EIAs which are proportionate and accessible to a wide range of stakeholders has been acknowledged by EIA practitioners, with a recent drive for improved quality of EIA reports from a number of organisations (e.g. IEMA, 2017). The topic of proportionate EIA has been a particular focus for the offshore wind industry with TCE's Industry Evidence Programme (IEP) (Crown Estate *et al*., 2018) making a series of strategic recommendations for the industry and stakeholders.

The aim of producing a proportionate EIA has been a key consideration in the development of this Offshore Scoping Report. A number of tools and processes have been used to aid the proportionality of the Proposed Development EIA, both within this Offshore Scoping Report, and that will be subsequently considered in the Offshore EIA Report. This includes:

- development of an Offshore Scoping Road Map;
- application of the existing evidence basis; and
- commitment to embedded mitigation measures.

5.3.2.1 Offshore Scoping Road Map

The Offshore Scoping Road Map (see Annex A) will be used as a tool to facilitate early engagement with stakeholders and subsequent engagement throughout the pre-application phase of the Proposed Development, including consultation on the developing baseline characterisation and development of the final application documentation. The Offshore Scoping Road Map is a 'live' document which will be used to reach and record further points of agreement on scoping impacts out of the assessment, and/or agreeing the level of assessment which will be presented for impacts, so that the focus in the EIA submission documents is on LSE.

For each topic section of the Offshore Scoping Report, the Offshore Scoping Road Map (Annex A) considers:

- expected receptors: Receptors expected to occur within the zone of influence (ZoI), based on an initial desktop review;

- sensitivity and evidence: Brief review of the sensitivity of the relevant receptors and evidence available on potential effects;
- baseline data sources: Description of data and information to be used to inform the baseline characterisation. See further information below;
- enhancement, mitigation and monitoring: Potential measures which could be applied to remove significant effects; and
- approach to EIA: Briefly describes whether impacts are scoped into the EIA, scoped out (with the relevant justification) or whether the impact has the potential to be scoped out at a later date.

5.3.2.2 Existing Evidence Basis

The Proposed Development is located in the outer Firth of Forth, for which there exists significant data and knowledge regarding the baseline environment. This data/knowledge has been acquired through the former Firth of Forth zonal studies, from the surveys and assessments undertaken for Seagreen 1 and from the surveys and assessment undertaken for the Inch Cape and Neart na Gaoithe offshore wind farms. Where possible in this Offshore Scoping Report, the Applicant has made use of these data to:

- provide an initial high-level overview of the baseline environment and the availability of existing data to support the Offshore EIA Report;
- support scoping out of impacts where there is clear evidence of lack of a receptor-impact pathway; and
- where impacts are proposed to be scoped in to further assessment in the Offshore EIA Report, to draw upon the pre-existing evidence base where appropriate.

Where this Offshore Scoping Report identifies that additional data is required to inform the Proposed Development EIA, the Offshore EIA Report will provide a description of the additional data.

5.3.2.3 Mitigation Measures

The EIA can influence the design of a project in many ways, including:

- amending the layout and extent of a development site to avoid key sensitive receptors;
- amending the design of a specific aspect of the development to manage impacts;
- specifying construction techniques to avoid effects on particular receptors; and
- changing materials to reduce volume and/or transport impacts (IEMA, 2016).

There are three distinct forms of mitigation which include:

- primary inherent mitigation: These include modifications to the location or design of the development made during the pre-application phase that are an inherent part of the Proposed Development and do not require additional action to be taken. This includes measures such as identifying an archaeological feature which should remain unaffected by the Proposed Development;
- secondary foreseeable mitigation: These include actions that will require further activity in order to achieve the anticipated outcome. These may be imposed as part of the consents and licences, or through inclusion in the Offshore EIA Report. This includes measures such as those required to restore a sensitive habitat; and
- tertiary inexorable mitigation: Actions that would occur with or without input from the EIA feeding into the design process. These include actions that will be undertaken to meet other existing legislative requirements, or actions that are considered to be standard practices used to manage commonly occurring environmental effects. This includes measures such as the Code of Construction Practice (CoCP) and Environmental Management Plans.

Both primary and tertiary measures can be embedded into the project design. The basis of the EIA can therefore be undertaken on the basis that these measures will definitely be delivered and therefore any effects which might arise without these mitigation measures do not need to be identified as potential effects as there is no potential for them to arise (IEMA, 2016).

Throughout this Offshore Scoping Report, a range of 'embedded design measures have been applied and are detailed in the technical assessments (see chapters 6 to 8). All mitigation measures considered in the Offshore Scoping Report are collated and presented in Annex B. Mitigation measures will evolve whilst the EIA progresses and in response to stakeholder engagement. Any additional measures will be fed iteratively into the assessment process and updated in the Offshore Scoping Road Map (Annex A).

5.3.3 DESIGN ENVELOPE APPROACH AND MAXIMUM DESIGN SCENARIO

The Design Envelope approach (also known as the Rochdale Envelope approach) will be adopted for the assessment of the Proposed Development, in accordance with current best practice and the "Rochdale Envelope Principle[3]". The Design Envelope concept allows for some flexibility in project design options, particularly for foundations and wind turbine type, where the full details of a project are not necessarily known at time of application submission.

Chapter 3 sets out the Design Envelope parameters and identifies the range of potential project design values for relevant components of the Proposed Development. For each of the topic chapters within the Offshore EIA Report and for each of the impacts assessed, the Design Envelope considered will be the scenario which would give rise to the greatest potential impact (hereafter referred to as the maximum design scenario).

An example of the Design Envelope approach would be where several types of wind turbine foundation are being considered. The assessment in this case would be based on the foundation known to have the greatest potential for impact on a given receptor. In this instance, the Design Envelope for the foundation with the greatest seabed disturbance potential would be the foundation with the largest footprint. If, after undertaking the impact assessment, it is shown that no significant effect is anticipated, it can be assumed that any project parameters equal to or less than those assessed will have environmental effects of the same level or less and will therefore also have no significant effect upon the receptors for the topic under consideration.

By employing the Design Envelope approach, the Applicant retains flexibility in design of the offshore wind farm and associated offshore and onshore infrastructure, within certain maximum scenarios, all of which are fully assessed in the Offshore EIA Report.

It is the Applicant's intention to refine the Design Envelope throughout the EIA process as further technical, environmental and design information becomes available so that the assessment presented in the final application is based on as refined and focussed Design Envelope as is practical whilst still retaining flexibility for new technology or design solutions in the post-consent phase.

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[3] Case law (i.e. R v Rochdale MBC ex parte Tew (1999) and R v Rochdale MBC ex parte Milne (2000)). In respect of S36 consent, whichever scheme is ultimately built must have been covered by the scope of the EIA.

5.3.4 CONSULTATION AND STAKEHOLDER ENGAGEMENT

5.3.4.1 Background

The legislative basis for undertaking pre-application consultation is described in section 2.3.2.

Section 5.3.4.2 provides an overview of consultation undertaken to date and section 5.3.4.3 outlines the proposed approach to stakeholder engagement that the Applicant proposes to follow during the pre-application period.

5.3.4.2 Engagement to Date

To support the development of this Offshore Scoping Report, pre-scoping engagement has been undertaken. An overview of this consultation is presented in Table 5.1. All pre-scoping engagement subsequent to March 2020 has been undertaken via conference calls reflecting the social distancing measures that have been in place for COVID-19.

5.3.4.3 Future Engagement

Scoping

In receipt of the Offshore Scoping Opinion request, the Scottish Ministers, in accordance with the EIA Regulations, will consult with statutory consultees. The purpose of the consultation is to obtain advice and guidance from each consultee or advisor as to which potential effects should be scoped in or out of the EIA. The Offshore Scoping Opinion will be a template for a gap analysis, which is to be used to record the environmental concerns identified during the scoping process and is to be completed and used to inform the preparation of the Offshore EIA Report.

Pre-Application Consultation Event

Where activity is planned within Scottish Territorial Waters, the PAC Regulations apply. The PAC Regulations require Applicants for a ‘prescribed class’ of activity to notify the MCA, NLB, SNH, SEPA, and any delegate for a relevant marine region.

Applicants must hold at least one pre-application event at which these bodies are notified, and members of the public may provide comments to the Applicant. The PAC event for the Proposed Development is envisaged to be held in spring of 2021. Further details on this PAC event will be published in Edinburgh Gazette and other local press.

Section 24(1) of the Marine (Scotland) Act 2010 requires that a PAC report must be prepared and submitted with the Marine Licence application.

Additional Stakeholder Engagement

The Applicant, along with their EIA consultants, intends to consult with key statutory and non-statutory stakeholders throughout the pre-application process. The Applicant will refine the Proposed Development Application, based upon the consultation undertaken during the pre-application phase. A summary of key consultation undertaken will be presented in the Offshore EIA Report.

Table 5.1: Pre-Scoping Engagement Undertaken to Date.

Topic	Stakeholder(s)	Date	Method of Engagement	Purpose of stakeholder engagement
Project introduction	SNH/MS-LOT	20 August 2019	Meeting	To provide an overview and introduction to the project.
Ornithology and marine mammals	SNH/MS-LOT	18 December 2019	Meeting	Overview of the marine mammal and ornithology aerial surveys.
Ornithology	SNH/MS-LOT	26 February 2020	Meeting	Update on baseline surveys.
Ornithology	SNH/MS-LOT	28 April 2020	Conference Call	Review of boat-based ornithology survey methodology.
Marine Archaeology	Historic Environment Scotland (HES)	16 July 2020	Conference Call	Outline proposed approach to scoping, data analysis and report.
Ornithology	RSPB	17 June 2020	Conference Call	Outline proposed approach to scoping, data reporting and analyses, and programme.
Ornithology	SNH/MS-LOT	02 June 2020	Conference Call	Outline proposed approach to scoping, data reporting and analyses, and programme.
Shipping and Navigation	MCA	09 June 2020	Conference Call	Outline proposed approach to scoping, approach to marine traffic surveys, data reporting and analyses, and programme.
Shipping and Navigation	NLB	10 June 2020	Conference Call	Outline proposed approach to scoping, approach to marine traffic surveys, data reporting and analyses, and programme.
Shipping and Navigation	Forth Ports	12 June 2020	Conference Call	Outline proposed approach to scoping, approach to marine traffic surveys, data reporting and analyses, and programme.
Marine Mammals, Benthic Subtidal and Intertidal Ecology, and Fish and Shellfish Ecology	SNH/MS-LOT	30 June 2020	Conference Call	Outline proposed approach to scoping, data reporting and analyses.

5.3.5 IMPACTS AND EFFECTS

The Proposed Development has the potential to create a range of impacts and effects with regard to the physical, biological and human environment, for both terrestrial and marine receptors. For the purposes of the offshore EIA, the term 'impact' is defined as a change that is caused by an action. For example, the laying of an inter-array cable (action) is likely to result in seabed disturbance (impact). Impacts can be defined as direct, indirect, temporary, irreversible, secondary, cumulative and inter-related. They can also be either positive or negative, although the relationship between them is not always straightforward.

The term 'effect' is defined as the consequence of an impact. Using the inter-array cable laying example again, the laying of an inter-array cable (action) results in seabed disturbance (impact), with the potential to disturb benthic habitats and species (effect). The significance of effects is determined by consideration of the magnitude of impact alongside the sensitivity of each receptor/receptor group.

The magnitude of an impact is the consideration of the extent, duration, frequency and reversibility of an impact. Receptors can be defined as the physical or biological resource or user group that could be affected by the potential impacts. In defining the sensitivity for each receptor/receptor group, the vulnerability, recoverability and value/importance of that receptor will be taken into consideration.

In order to ensure consistency in defining the significance of an effect, a matrix approach will be adopted in the Offshore EIA Report as presented in Table 5.2. In cases where a range is suggested for the significance of effect, there remains the possibility that this may span the significance threshold (i.e. the range is given as minor to moderate). In such cases the final significance is based upon the expert's professional judgement as to which outcome delineates the most likely effect, with an explanation as to why this is the case.

Table 5.2: Matrix Used for the Assessment of the Significance of the Effect.

		Magnitude of Impact			
		Negligible	**Low**	**Medium**	**High**
Sensitivity of Receptor	**Negligible**	Negligible	Negligible or Minor	Negligible or Minor	Minor
	Low	Negligible or Minor	Negligible or Minor	Minor	Minor or Moderate
	Medium	Negligible or Minor	Minor	Moderate	Moderate or Major
	High	Minor	Minor or Moderate	Moderate or Major	Major or Substantial
	Very High	Minor	Moderate or Major	Major or Substantial	Substantial

A level of effect of moderate or more will be considered a 'significant' effect for the purposes of the EIA. A level of effect of minor or less will be considered 'not significant'. Effects of moderate significance or above are therefore considered important in the decision-making process, whilst effects of minor significance or less warrant little, if any, weight in the decision-making process.

The matrix approach is consistent with the general approach described in the Design Manual for Roads and Bridges (DMRB) (Highways England *et al.*, 2019) and Environmental Impact Assessment for

Offshore Renewable Energy Projects – Guide (BSI, 2015). A number of modifications have however been made in the interest of proportionality, including:

- a magnitude of impact of 'no change' will not be assessed since it will always lead to a non-significant effect;
- a negligible magnitude impact will not be considered further because it will always lead to a non-significant effect; and
- receptors of negligible importance, value or sensitivity will not be considered further because it will always lead to a non-significant effect.

Where significant effects are initially identified, the EIA will follow a "feedback loop" methodology, as illustrated within Figure 5.1. Through this process, an impact is initially assessed to determine the significance of the potential environmental effect. If the effect of an impact presents a major or substantial significant adverse outcome, changes are typically made to the Proposed Development design (primary mitigation) in order to reduce or offset the magnitude of impact. If the effect of an impact presents a moderately significant adverse outcome, mitigation such as engineering controls or construction methods (secondary and tertiary mitigation) are employed in order to reduce or offset the magnitude of the impact.

This process is repeated, as illustrated within Figure 5.1 until the EIA practitioner is satisfied that:

- the effect is reduced to a level that is not significant in EIA terms; or
- no further changes can be made to the Proposed Development design to reduce the magnitude of impact and therefore the significance of the effect. In these cases, an overall effect that is still significant in EIA terms may be presented.

Following this iterative approach ensures that the significance of effect presented for each identified impact may be presumed to be representative of the maximum residual adverse effect the Proposed Development may have on the receiving environment.

All mitigation measures presented within the Offshore Scoping Report are collated and presented in Annex B. Mitigation measures will evolve whilst the EIA progresses and in response to stakeholder engagement, as described above and Annex B will be updated and included as part of the Offshore EIA Report.

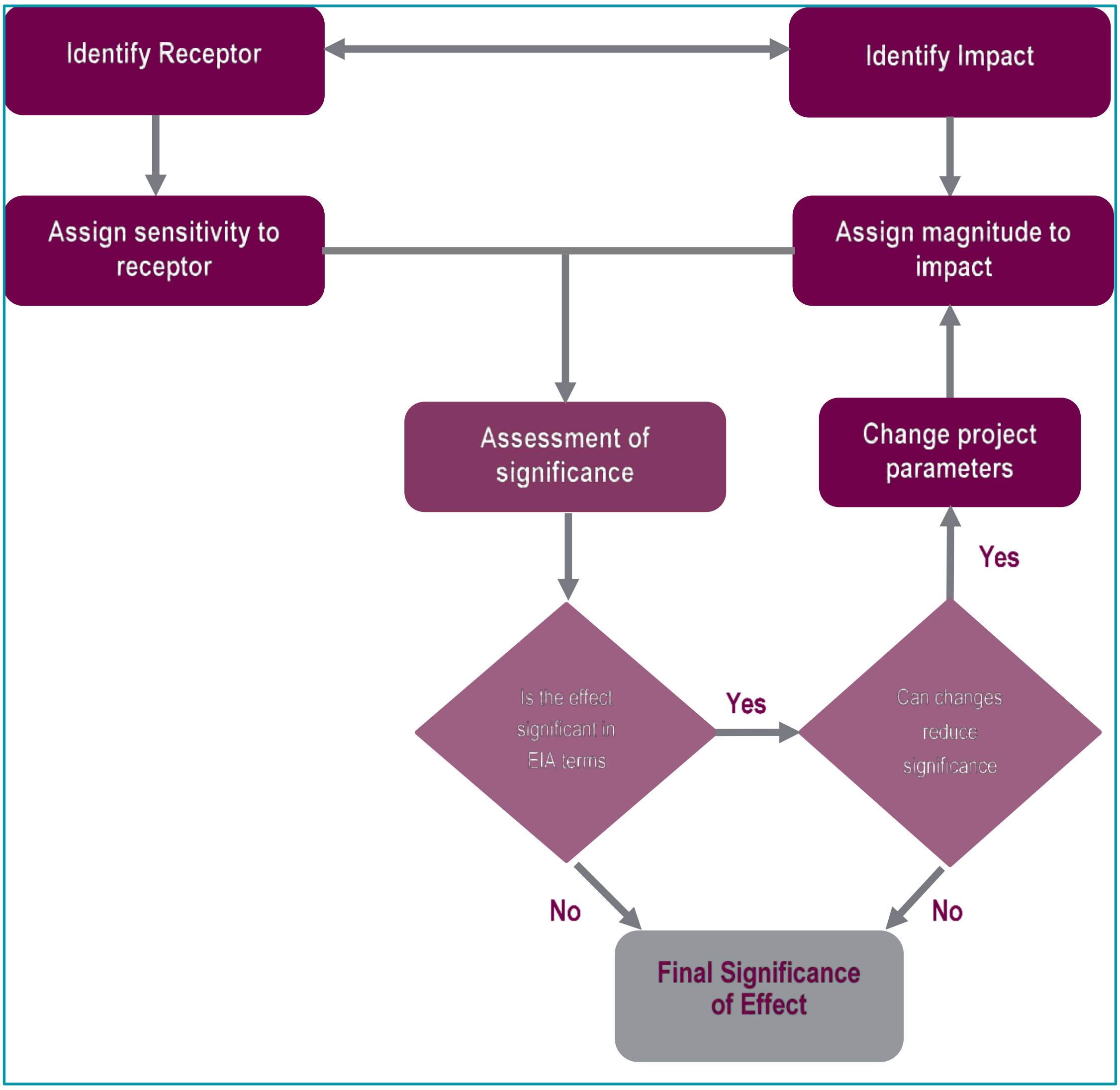

Figure 5.1: Proposed Iterative Approach to Mitigation Within the Proposed Development EIA.

5.3.6 INTER-RELATED EFFECTS

The EIA Regulations require consideration of inter-related effects. Inter-related effects refer to the inter-relationships between EIA topics that may lead to environmental effects. There are two categories of inter-related effects:

- project lifetime effects: effects that occur throughout more than one phase of the project (construction, operational and decommissioning) interacting to potentially create a more significant effect upon a receptor than if just assessed in isolation in a single phase; and
- receptor-led effects: effects that interact spatially and/or temporally resulting in inter-related effects upon a single receptor. For example, the effect upon subsea noise on marine mammals may be greater when multiple sources of impact interact or combine to produce a different or greater effect upon this receptor than when single sources of impact are considered in isolation. Receptor-led effects might be short term, temporary or transient effects, or incorporate longer term effects.

Within the EIA, assessment of inter-related effects will be undertaken with specific reference to the potential for such effects to arise in relation to receptor groups. The term 'receptor group' is used to highlight the fact that the proposed approach to inter-relationships assessment will, in the main, not assess every individual receptor assessed at the EIA stage, but rather, potentially sensitive groups of receptors.

Where the significance of an effect within the topic-specific assessment has been identified as 'no effect across all stages of the project', the assumption has been made that these effects can not contribute to any inter-related effects. These effects will therefore not be included in the inter-related effects assessment as there will be no effect from the Proposed Development over the lifetime of the project.

It is acknowledged that an ecosystem assessment for marine ecology receptors may be required. It is proposed that the Offshore EIA Report will present an ecosystem assessment as a section within each ecology topic and that the format and layout of this section will be determined following further discussion and guidance from SNH and MS-LOT.

The inter-related assessment will consider only effects from the Proposed Development and not those from other projects, which will be considered in the Cumulative Effect Assessment (CEA) (see section 5.3.7).

5.3.7 CUMULATIVE EFFECT ASSESSMENT

5.3.7.1 Overview

A CEA is a legal requirement under the EIA Regulations. A CEA provides consideration of the impacts arising from the Proposed Development alone and cumulatively with other relevant plans, projects and activities. Cumulative effects are therefore the combined effect of the Proposed Development in combination with the effects from a number of different projects, on the same receptor or resource.

A fundamental requirement of undertaking the CEA is to identify those foreseeable developments or activities with which the Project may interact to have the potential to result in a cumulative impact. All phases (construction, operation and maintenance, and decommissioning) of the Proposed Development may have the potential to lead to cumulative impact.

The Marine Scotland (2018) Consenting and Licensing Guidance: For Offshore Wind, Wave and Tidal energy Applications states that '*Engagement with MS-LOT is required to identify which plans/projects/on-going activities should be included in the in-combination element of the cumulative effects assessment (CEA)*'. The offshore wind projects in the Firth of Forth and Tay region will be considered, alongside other developments including those which are:

- already constructed;
- under construction;
- permitted application(s), but not yet implemented;
- submitted application(s) not yet determined; and
- plans and projects which are "reasonably foreseeable" (i.e. developments that are being planned, including, for example, offshore renewable energy projects which have a Crown Estate AfL, offshore renewable energy projects that have been scoped).

The CEA will consider all other relevant plans, projects and activities that are publicly available three months prior to the Proposed Development application.

5.3.7.2 Screening Stage

To ensure a thorough and comprehensive approach to identification of potential projects to be considered in the CEA, an initial 'long list' of projects within a defined ZOI will be developed based on the above listed criteria. The ZOI will be large enough to encompass all technical assessment regional study areas.

The initial long list will then be reduced following a consideration of potential for cumulative effects for each potential impact-receptor pathway staged process as set-out below:

- conceptual overlap – An impact has the potential to directly or indirectly affect the receptor(s) in question. In EIA terms this is described as an impact-receptor pathway and is defined here as a conceptual overlap;
- physical overlap – Ability for impacts arising from the Proposed Development to overlap with those from other projects/plans on a receptor basis. This means that an overlap of the physical extents of the impacts arising from the two (or more) projects/plans must be established for a cumulative effect to arise. Exceptions to this exist for certain mobile receptors that may move between, and subject to, two or more separate physical extents of impact from two or more projects; and
- temporal overlap – In order for a cumulative effect to arise from two or more projects, a temporal overlap of impacts arising from each must be established. It should be noted that some impacts are active only during certain phases of development, such as piling noise during construction. The absence of a strict overlap however may not necessarily preclude a cumulative effect, as receptors may become further affected by additional, non-temporally overlapping projects.

This screening stage will be based on the experience and knowledge of technical specialists, and the current guidance and regulations. The projects or plans that remain after review of the long list are taken forwards to the assessment stage.

5.3.7.3 Assessment Stage

Following the screening stage outlined in section 5.3.7.2, information is gathered on the projects, plans or activities to be taken forwards into the CEA. Where the potential significant effect for the proposed development alone is assessed as negligible, or where an impact is predicted to be highly localised, these will not be considered within the Proposed Project CEA, as there is not considered to be a potential for cumulative effects with other plans, projects or activities.

When undertaking the CEA of the Proposed Development, a tiered approach will be adopted. This provides a framework for placing relative weight upon the potential for each project/plan to be included in the CEA to ultimately be realised, based upon the project/plan's current stage of maturity and certainty in the projects' parameters. The tiered approach which will be utilised within the Proposed Development CEA employs the following tiers:

- tier 1 assessment – Proposed Development (Berwick Bank Wind Farm offshore) with Berwick Bank Wind Farm onshore;
- tier 2 assessment – All plans/projects assessed under Tier 1, plus projects which are operational, under construction, those with consent and submitted but not yet determined;
- tier 3 assessment – All plans/projects assessed under Tier 2, plus those projects with a Scoping Report; and
- tier 4 assessment – All plans/projects assessed under Tier 3, plus those projects likely to come forward where an Agreement for Lease (AfL) has been granted.

All projects/plans that have been screened into the CEA via the screening process will be allocated into one of the above Tiers and assessed in the CEA. It should be noted that the Offshore Scoping Report for Marr Bank Wind Farm is due to be published in Quarter 1 of 2021. If the Marr Bank Wind Farm consent and licence application is submitted before/at the same time as the Proposed Development, then it will be included in Tier 2 of the CEA. If the consent and licence application is submitted after the Proposed Development, then it will be included in Tier 3 of the CEA.

The CEA will consider all other relevant plans, projects and activities that are publicly available three months prior to the Proposed Development application.

Where practicable, the CEA methodology then follows the outline of the stand-alone assessment methodology as described in section 5.3.4. This approach allows consistency throughout the EIA.

5.3.8 TRANSBOUNDARY EFFECTS

Transboundary effects arise when impacts from the Proposed Development within one EEA state affects the environment of another EEA state(s). The need to consider such transboundary effects has been embodied by the United Nations Economic Commission for Europe Convention on EIA in a Transboundary Context (commonly referred to as the 'Espoo Convention'). The Convention requires that assessments are extended across borders between Parties of the Convention when a planned activity may cause significant adverse transboundary impacts.

Article 7 of the amended EIA Directive provides the basis for consultation between Member States in relation to the LSE of proposed development in one state on the environment in another Member State. The principal obligation is in respect of information and consultation and is imposed by Article 7(4) of the amended Directive:

"The Member States concerned shall enter into consultations regarding, inter alia, the potential transboundary effects of the project and the measures envisaged to reduce or eliminate such effects and shall agree on a reasonable timeframe for the duration of the consultation period. Such consultations may be conducted through an appropriate joint body."

Under Regulations 41 and 42 of the EIA Regulations, for any project that is likely to cause significant transboundary effects, Scottish Ministers must send information about the development to the government of the affected country and invite them to participate in the consultation procedures. To assist with this process, a screening exercise for potential transboundary impacts has been undertaken and is presented in Annex C. The transboundary screening exercise has identified that the following receptors may experience transboundary impacts from the Proposed Development:

- fish and shellfish ecology;
- commercial fisheries; and
- shipping and navigation.

6 OFFSHORE PHYSICAL ENVIRONMENT

6.1 PHYSICAL PROCESSES

6.1.1 INTRODUCTION

This section of the Offshore Scoping Report identifies the elements of the physical processes of relevance to the Proposed Development and considers the potential impacts from the construction, operation and maintenance, and decommissioning of the offshore and intertidal components (seaward of the MHWS mark) of the Proposed Development on physical processes.

For the purposes of this Offshore Scoping Report and subsequent Offshore EIA Report, physical processes are defined as encompassing the following elements:

- tidal elevations and currents;
- waves;
- bathymetry;
- geology and seabed sediments;
- suspended sediments; and
- sediment transport.

The parameters listed above are collectively referred to as 'physical processes' through the remainder of this Offshore Scoping Report.

6.1.2 STUDY AREA

The physical processes study area for the Proposed Development is illustrated in Figure 6.1 and defined as the:

- array area;
- proposed export cable corridor;
- landfall area; and
- seabed and coastal areas that may be influenced by changes to physical processes due to the Proposed Development, based on the outputs of the physical processes modelling.

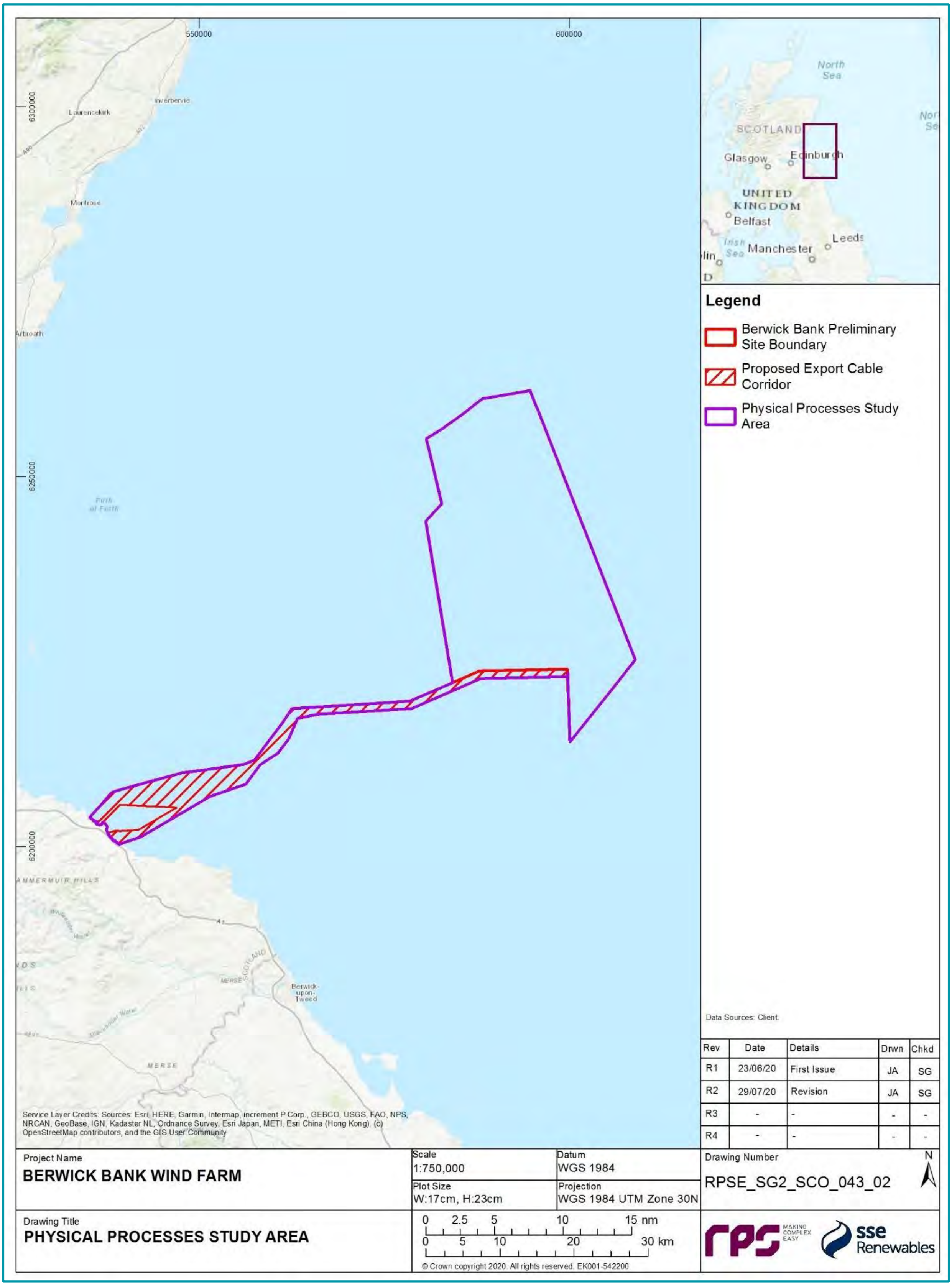

Figure 6.1: **Physical Processes Study Area.**

6.1.3 BASELINE ENVIRONMENT

6.1.3.1 Desktop Study

An initial desk-based review of literature and data sources to support this Offshore Scoping Report has identified a number of baseline datasets. This includes a number of surveys that were undertaken to characterise the former Firth of Forth Zone. These are summarised in Table 6.1.

Table 6.1: Summary of Key Desktop Reports and Datasets.

Source	Coverage	Data Provision
Marine Environmental Data Information Network (MEDIN)	UK Waters	Bathymetry data
European Centre for Medium-range Weather Forecast (ECMWF)	European Waters	Historic and contemporary pressure, wind speed and wave datasets.
European Marine Observation and Data Network (EMODnet)	European Waters	• Bathymetry; • Geology; and • Seabed substrate and classifications
Centre for Environment Fisheries and Aquaculture Science (Cefas) Offshore observation data	UK Waters	• Salinity; • Seawater temperature; and • Turbidity.
Cefas Climatology Report (Cefas, 2016)	UK Waters	Suspended sediment concentrations (SSC)
British Oceanographic Data Centre (BODC) UK tide gauge network. Database of current observation	UK Waters	• Tidal levels; • Current speed; and • Current direction.
United Kingdom Hydrographic Office (UKHO) - Published Charts and Tide tables	UK Waters	Charts such and 1409/7 1:200000 and 210 1:75000 include tidal diamonds with current stream data
Summary of Seagreen Firth of Forth Metocean Surveys to Date (Interek Metoc, 2012)	Former Firth of Forth Zone	• Wave data; • Current data; • Water level data; • Seawater temperature; and • Turbidity.
Firth of Forth Zone Development: Metocean survey (Fugro GEOS, 2011)	Former Firth of Forth Zone	Metocean data.
UK Round 3 Offshore Wind Farm Zone 2 Firth of Forth: Wave Height Spells for Survey Operability (Metoc, 2010)	Former Firth of Forth Zone	Metocean data.

6.1.3.2 Site-specific Survey Data

This section provides an overview of both the planned and existing project specific data sources of relevance to physical processes.

A recent geophysical survey campaign was completed across the array area and proposed export cable corridor (for the Thortonloch landfall only) in July to August 2019. This survey provides both geophysical and bathymetric data which will support the development of the physical processes EIA for the Proposed Development. The aims of the data collection, and a summary of the data collected during these surveys includes:

- bathymetric data in order to determine site topography, gradients and a baseline for a seabed mobility study that may influence foundation design and cable installation using multibeam echo sounder (MBES);
- high-resolution sidescan sonar (SSS) data to determine seabed features and the presence of boulders, seabed sediments and debris;
- high-resolution sub-bottom profiler (SBP) data to determine the shallow sub-surface soil conditions that may influence foundation design and cable installation such as boulders and shallow geology features;
- multichannel 2D ultra-high resolution seismic (UHRS) data to foundation depth to determine the deeper sub-surface soil conditions; and
- magnetometer data across the site (along the planned survey lines) to support unexploded ordnance (UXO) risk reduction.

To support the acquisition of physical processes data, there are several surveys planned for summer 2020:

- geotechnical borehole campaign (approximately five weeks duration) to measure physical properties of soils;
- geotechnical survey cone penetrometer test (CPT) campaign (approximately two weeks duration) to test the geotechnical engineering properties of soils and soil stratigraphy;
- deployment of wave buoys and lidar to gather data relating to the metocean parameters within the array area and proposed export cable corridor;
- subtidal benthic ecology surveys providing an overview of the seabed sediment composition to support the characterisation of the subtidal aspects of the Proposed Development; and
- landfall walkover site survey to provide an overview of the nature of the foreshore area, including a review of sediments; evidence of erosion/deposition or littoral sediment transport and any defence assets present. Photographs will be gathered to support the characterisation of the landfall area.

6.1.3.3 Baseline Characterisation Overview

The baseline has been established using data on bathymetry, tidal regime, meteorological information, wave climate and seabed sediments. The following sub-sections outlines an overview of the baseline conditions associated with the physical processes study area.

Bathymetry

Array Area

The bathymetry of the array area is influenced by the presence of large-scale morphological bank features, including the Marr Bank and the northern extent of the Berwick Bank. These two bank features are defined as Shelf Banks and Mounds and are part of the Firth of Forth Banks Complex.

Geophysical data collected in 2019 suggests the water depth within the array area varies between 39 m and 68 m relative to LAT, and average depths of generally 50 m to 60 m below LAT. Across all of the array area, there is approximately 80 km^2 of depths greater than 60 m. Minimum water depths of approximately 38 m below LAT are found on top of the western central part of the array area and maximum depth around 68 m below LAT in the east of the banks. Figure 6.2 illustrates the bathymetry recorded during the recent geophysical survey across the array area.

Proposed Export Cable Corridor

The bathymetry of the proposed export cable corridor is relatively variable, varying between 20 m and 69 m below LAT at the time of geophysical investigation. This variance in depth is influenced by the seafloor typography which slopes gently, reaching 60 m depth below LAT approximately 20 km from landfall (Kilometre Point (KP) 20), before decreasing to 44 m below LAT at KP 32 and varying between 40 and 30 m below LAT in the area of the cable corridor over the over the southern part of Marr Bank. The depth of the water in the far east extent of the route extends down to 64 m below LAT.

Figure 6.3 illustrates the bathymetry recorded during the recent geophysical survey across the proposed export cable corridor.

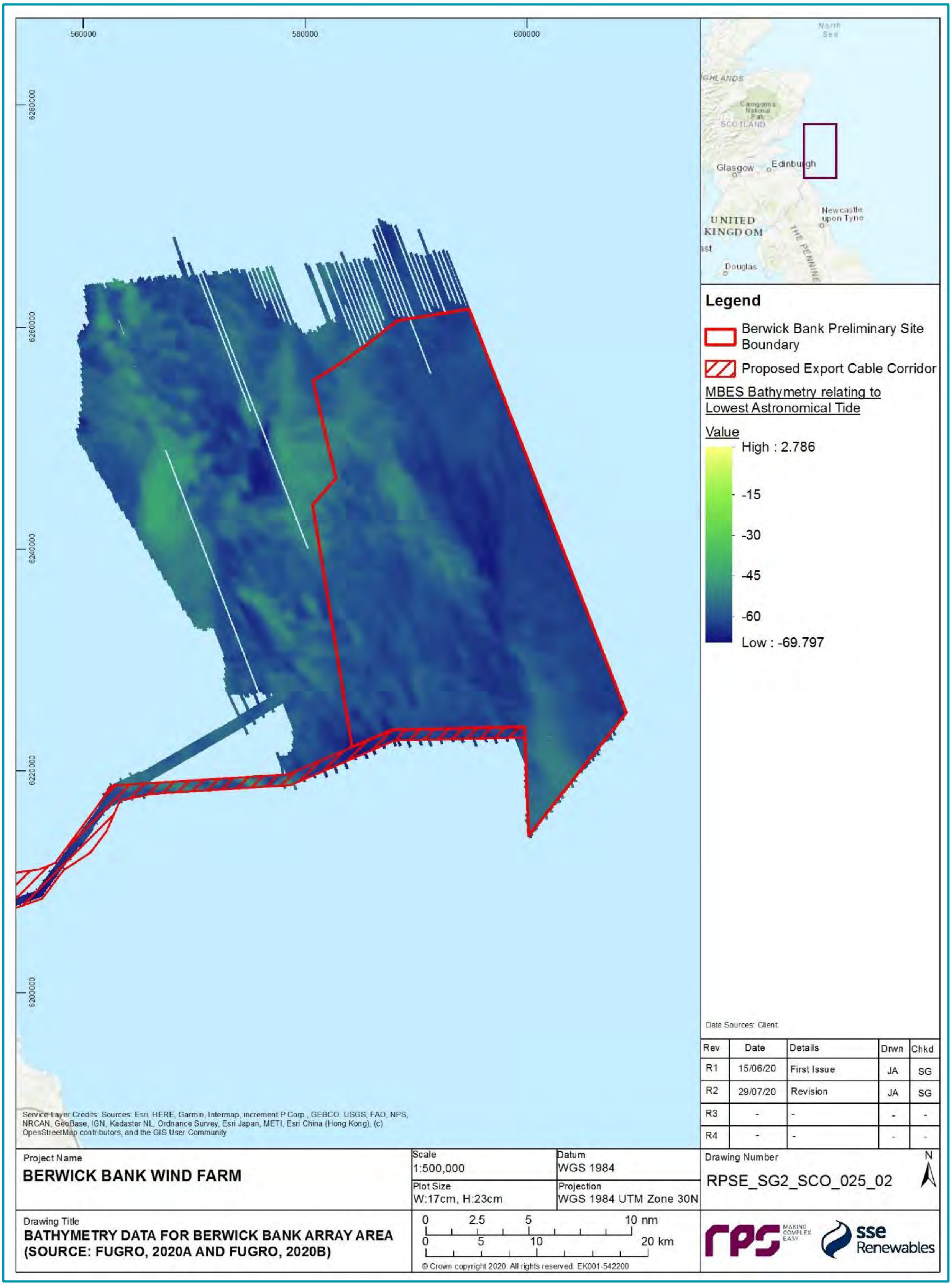

Figure 6.2: Array Area Bathymetry Data.

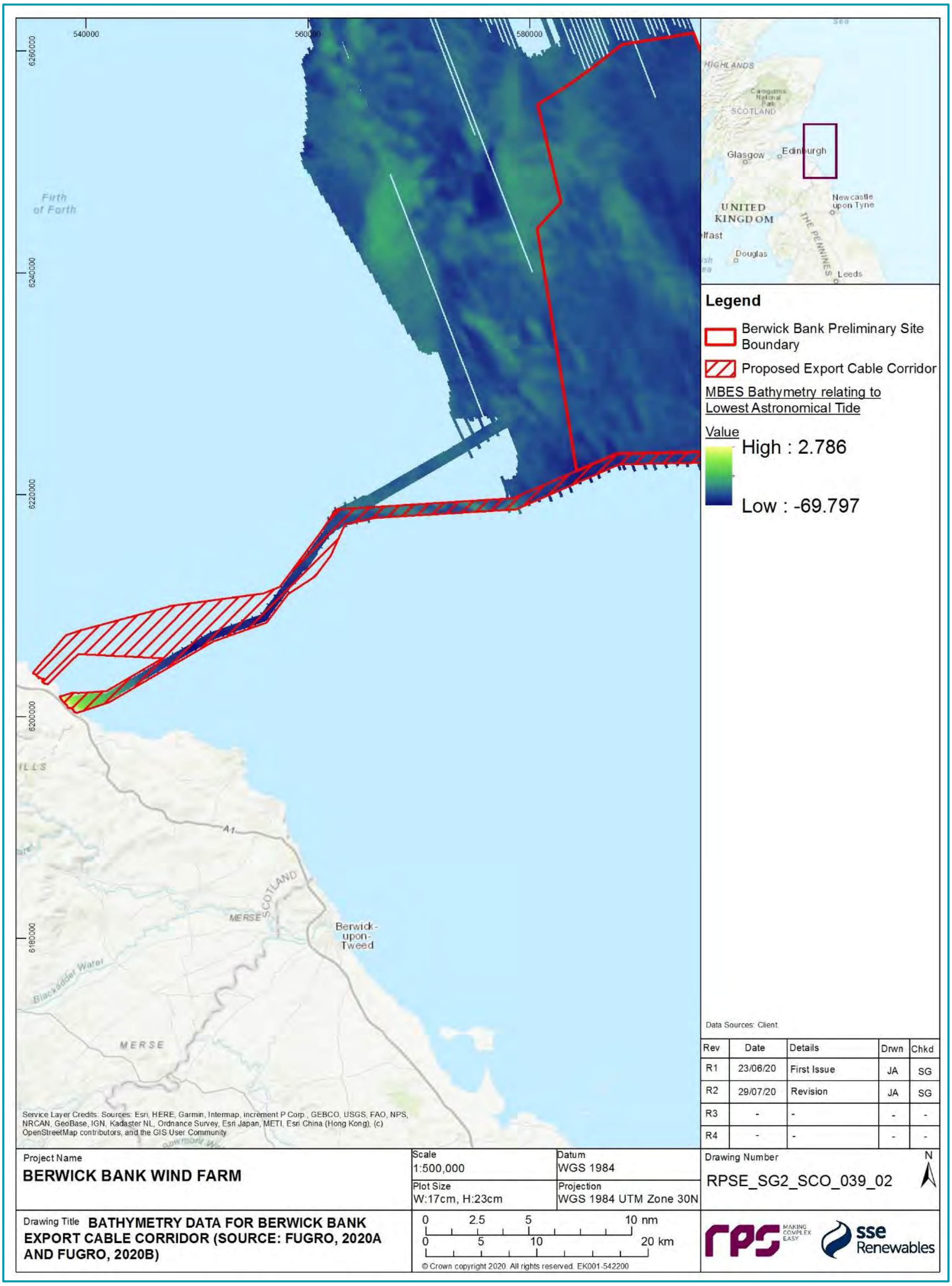

Figure 6.3: Proposed Export Cable Corridor Bathymetry Data.

Wind and Waves

Throughout the North Sea, strong winds can occur with wave heights varying greatly due to fetch limitations and water depth effects. Waves in the northern North Sea can be generated either by local winds or from remote wind systems (swell waves). East of the mouth of the River Tay, the dominant wave conditions approach from between 20^0N and 60^0N. However, extreme wave conditions (> 4 m) can be experienced from the entire eastern sector (0^0 to 180^0) (HR Wallingford, 2012).

Metocean surveys conducted across the former Firth of Forth Zone to characterise the zone provide an overview of the wave regime within the physical processes study area. During the stormiest event over the 18-month wave buoy deployment, a significant wave height of 6.7 m was recorded in January 2012, which correlated with a 1 in 1-year sea wave climate return period event (Fugro, 2012).

As offshore waves transfer from the deep offshore water to shallower coastal areas (e.g. proposed export cable corridor to landfall), a number of important modifications may result due to interactions of offshore deep-water waves with the seabed, with the resultant modifications producing shallow water waves. These physical 'wave transformation' interactions include:

- shoaling and refraction (due to both depth and current interactions with the wave);
- energy loss due to breaking;
- energy loss due to bottom friction; and
- momentum and mass transport effect.

Within the Offshore EIA Report physical processes baseline assessment, a detailed baseline will be presented which provides an overview of the wind and wave regime within the region and specific to the Proposed Development, utilising data collected from deployed wave buoys.

Tidal Currents and Elevation

An understanding of the tidal currents provides an insight into the patterns and rates of naturally occurring sediment transport. Currents are primarily driven by tides with a residual component generally dominated by storm driven currents (Ramsay and Brampton, 2000). Tidal elevations across the outer Firth of Forth are governed by a southerly directed flood tide which moves along the eastern coastline of Scotland into the Firth of Forth and around Fife Ness (HR Wallingford, 2009). Across the mouth of the Firth, the flood tidal stream has a general east-southeast pattern, whilst the ebb tidal stream runs in a west-north-west direction. The main peak flood tide occurs approximately two hours before high water (HW), with the main peak ebb tide occurring approximately four hours after HW (HR Wallingford, 2009). Tidal processes are often characterised by the natural tidal elevation of an area. The Firth of Forth Zone is characterised by a tidal regime which is semi-diurnal with variable mean spring tidal ranges, based on the metocean data collated within the 2011 survey campaign (HR Wallingford, 2012).

Metocean surveys conducted across the former Firth of Forth Zone to support the development of the characterisation of the Zone provided an overview of the tidal current flows. The locations of the mooring positions used for the collection of data during these surveys are illustrated in Figure 6.4. The strongest current flows during the survey period were recorded at the two most northerly sites (sites A and B) which correlates to the location of Seagreen 1. At these sites (A and B), a maximum current of 0.91 metres per second (m/s) in April 2011 during a period of spring tides that correlated with the maximum water level at most sites. Current speeds decreased slightly at the other sites with maxima ranging from 0.68 m/s to 0.77 m/s (Fugro, 2012).

Further, while sites C, D and G were characterised by a north to south tidal axis, site E and site H displayed axes parallel to their respective nearby coastlines, which were northeast to southwest at Site E and northwest to southeast at Site H (Fugro, 2012).

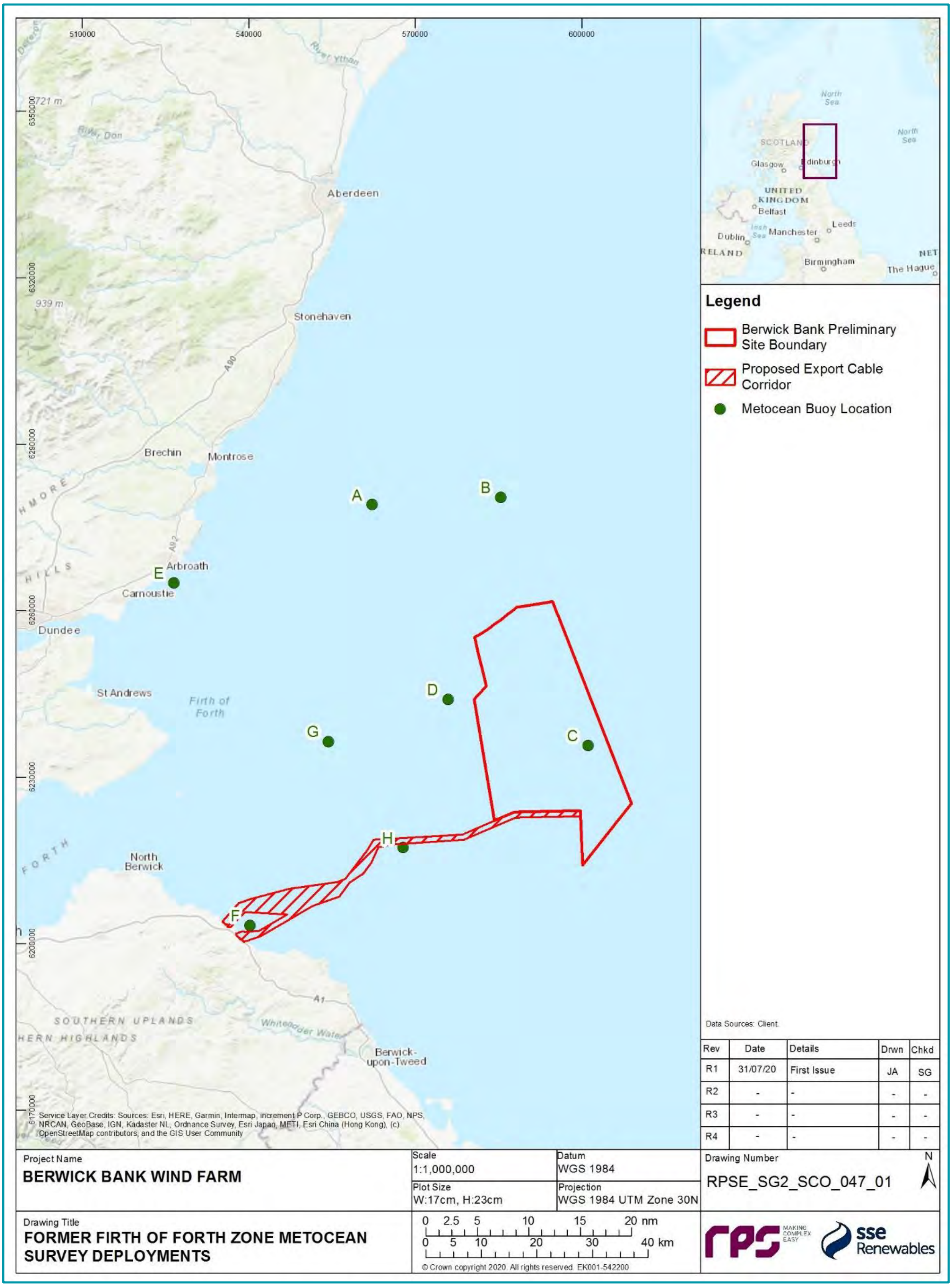

Figure 6.4: Former Firth of Forth Zone Metocean Survey Deployments.

Table 6.2: Summary of Tidal Current Statistics from the 2011 Metocean Survey Deployments.

Site	Depth (m) Below Mean Sea Level (bmsl)	Height (m) Above Seabed (asb)	Speed (m/s)		Direction at Max
			Max	Mean	
A – AWAC	10.50	43.00	0.91	0.35	029
A – ADCP	45.25	8.25	0.74	0.28	017
B	8.80	52.70	0.88	0.32	196
C	7.30	50.70	0.72	0.26	000
D	8.10	46.70	0.77	0.29	006
E	6.30	19.00	0.76	0.29	064
F	6.50	23.00	0.68	0.21	-
G	9.80	44.70	0.72	0.26	001
H	10.00	43.00	0.76	0.23	136

Geology

Information of the geology of the Proposed Development allows for an understanding of the origin and stability of the seabed, and the geology which will be encountered during the installation of wind turbines, offshore platform foundations, array cables and offshore export cables. Figure 6.5 to Figure 6.7 illustrate the seabed features, seabed sediments and boulders present across the array area and proposed export cable corridor.

Array Area

In general, the array area is part of a dynamic landscape where quaternary and pre-quaternary formations have been shaped as erosional surfaces by different geomorphic factors and continue to be shaped and modelled by the present day offshore marine conditions (Fugro, 2020a). The morphology features present due to advances and rapid retreats consistent with an oscillating and dynamic ice margin during British Ice Sheet (BIS) deglaciation (Graham *et al.*, 2009).

Subsequent sea level rise without new sediments led to the deepening and eroding of the sea mounds and banks present in the area. Seabed bottom currents have been actively mobilising and redistributing surficial sediments, developing bedforms and filling up both depressions and channels.

The seafloor morphology within the array area is very varied and can be classified into four types of morphological features:

- large scale banks (the Marr Bank and the Berwick Bank);
- arcuate ridges;
- incised valleys, relic glacial lakes and channels; and
- bedforms.

Proposed Export Cable Corridor

- The seabed within the proposed export cable corridor is variable with morphological features which are framed by relic pre-Holocenic landscape, and secondary morphological features characterised by bedforms and boulder fields formed by reworked and redeposition of available material in present-day shallow marine conditions.

The geophysical surveys observed that the bedforms in the proposed export cable corridor are comprised of principally flow-transverse structures (subaqueous dunes: ripples, megaripples); locally the bedforms can be linear, braided and lobe-shaped (bars and ribbons). The seabed within the proposed export cable corridor can be classified into several types of morphological features, which include:

- primary morphological features:
  - outcrops and erosional surfaces and platforms;
  - ridges; and
  - high topographic mounds and incised valleys and channels.
- secondary morphological features:
  - subaqueous dunes;
  - irregularity of the seafloor;
  - features related to anthropogenic activity; and
  - boulder fields.

Seabed Substrate

An overview of surficial sediment geology and the seabed features is presented in this section, based on interpretation undertaken of the SSS data collected during the recent geophysical surveys. An understanding of seabed substrate types is required to assess the potential impacts which may arise due to the installation of wind turbines, offshore platform foundations, array cables and offshore export cables.

Figure 6.5 to Figure 6.7 illustrate the seabed substrates present across the Proposed Development.

Array Area

The recent geophysical survey of the array area identified that it is comprised of several distinctive features:

- boulders and boulder fields;
- areas of ripples;
- areas of megaripples and sand waves; and
- areas of trawl marks.

The majority of the array area seabed is 'featureless' however the southern and north-western extent of the array area are dominated by megaripples, sandwaves, ribbons and bars. Boulders are also prevalent across the area and are either represented as isolated boulders or as clusters.

Seabed sediments present in the array area can be classified into several groups:

- coarse gravel, shelly gravelly sand with boulders;
- mixed sediment;
- mixed sediments with patchy coarse material or boulders; and
- muddy sand.

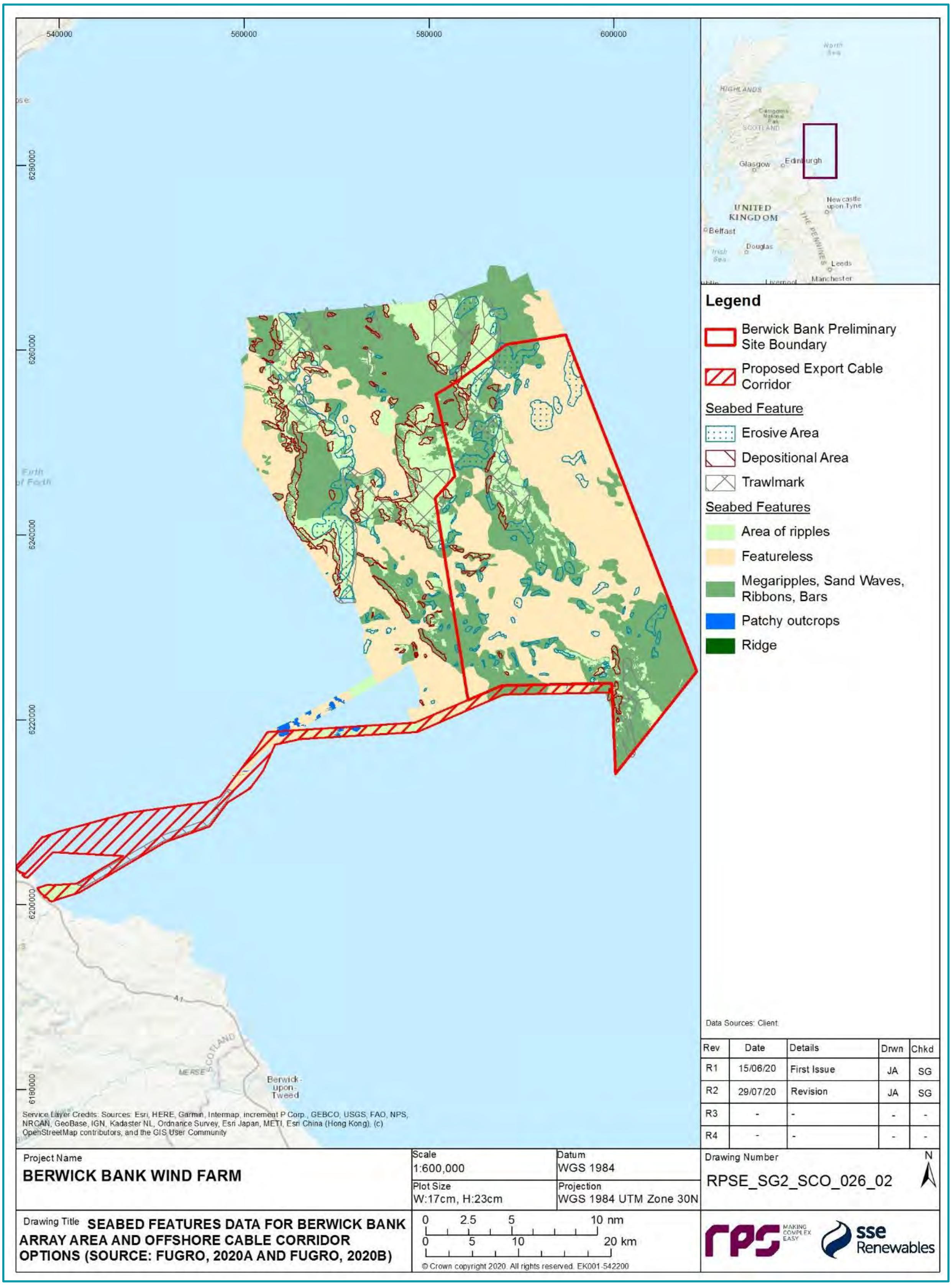

Figure 6.5: Array Area and Proposed Export Cable Corridor Seabed Features Data.

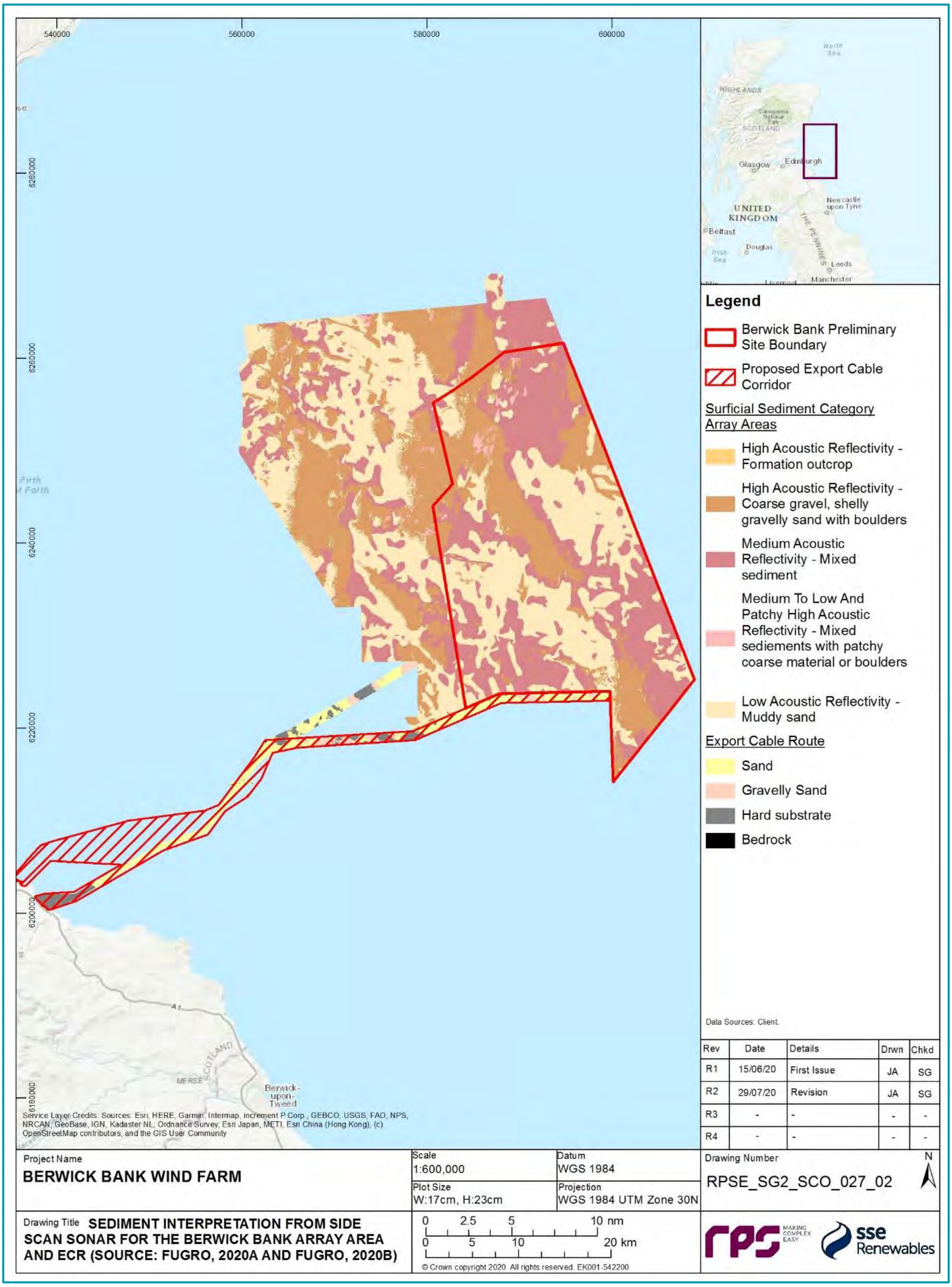

Figure 6.6: **Sediment Interpretation from SSS Data for the Array Area and Proposed Export Cable Corridor.**

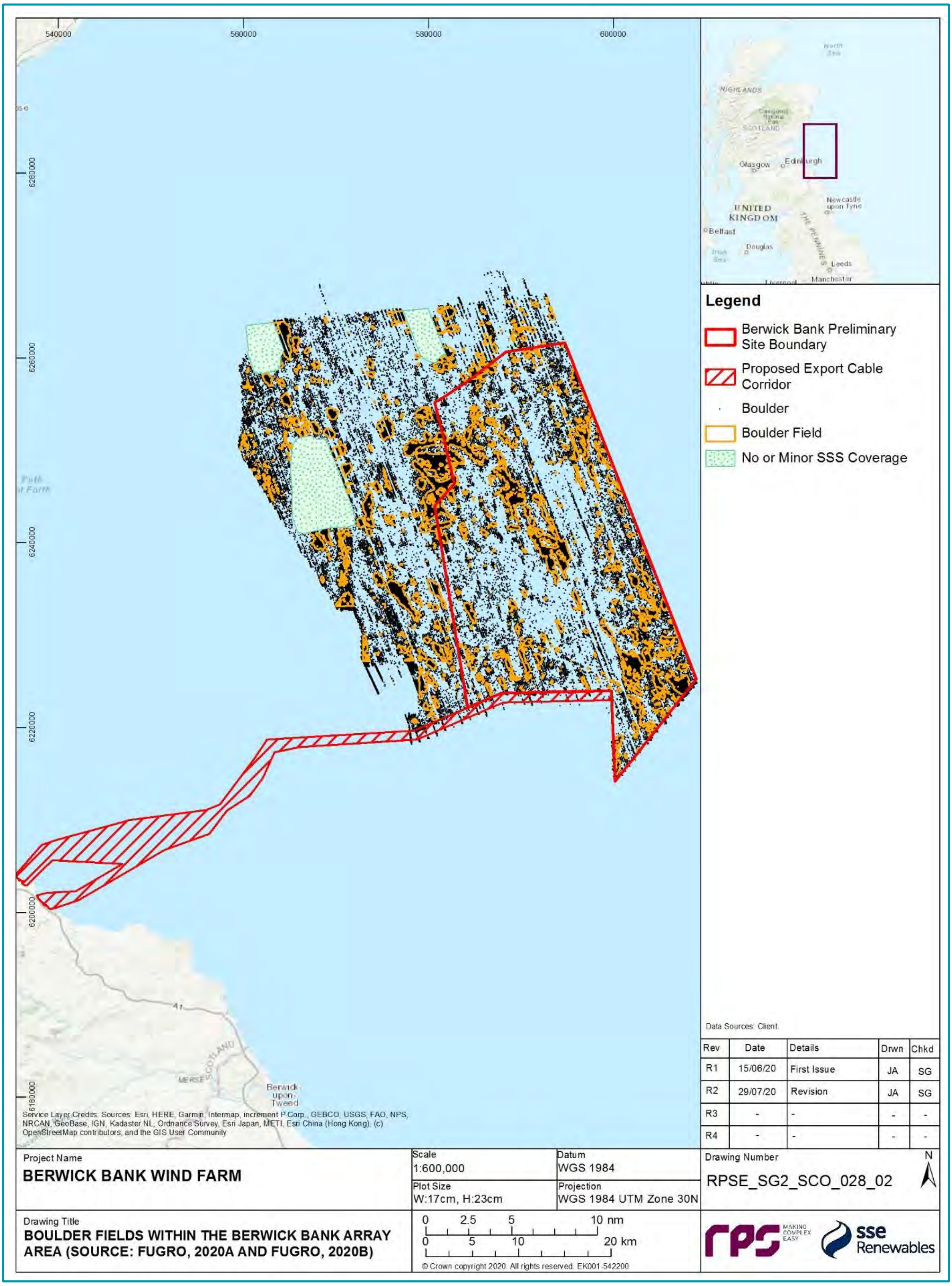

Figure 6.7: Array Area and Proposed Export Cable Corridor Boulder Fields Data.

Proposed Export Cable Corridor

The recent geophysical survey of the proposed export cable corridor identified that it is comprised of several distinctive features:

- boulders and boulder fields;
- area of ripples;
- area of megaripples and sand waves; and
- area of trawl marks.

The seabed within the proposed export cable corridor was recorded as smooth with very few observed primary morphological features (such as high reliefs or ridges), while secondary morphological features such as ripples and megaripples, sand bars and ribbons characterise the seabed morphology.

Seabed sediments present in the proposed export cable corridor can be classified into several groups:

- hard substrate: coarse sediment with cobbles, boulders and rock outcropping or sub outcropping characterised by high reflectivity signature in the sidescan data;
- gravelly sand and coarse sediments with medium reflectivity; and
- sandy sediments including fine sand and muddy sand with low reflectivity.

The nearshore area where the proposed export cable corridor makes landfall contains seabed features such as an area of ripples in the nearshore part and a prevalent featureless seabed with intense fishing trawl marks in the seabed area of the proposed export cable corridor moving offshore.

Landfall

The Applicant is currently assessing the feasibility of one or both landfall locations on the East Lothian coast, Thorntonloch Landfall and Skateraw Landfall. The geophysical surveys provided an overview of the Thorntonloch landfall area, identifying a band of approximately 2 km along the shore to be defined as the coastal area for the surveys. This coastal area is comprised of a sandy beach to the north, a rocky platform in the middle and a pebble and rocky beach in the south. The nearshore area of the proposed export cable corridor consists of a submerged beach and the rocky platform from the lowest tide until around 30 metres depth, approximately 2 miles from the shore.

Suspended Sediment

Sampling was conducted at an offshore station within Seagreen 1 in March and June 2011, suggesting total suspended solids (TSS) to be low. The samples collected illustrated a TSS of < 5 mg/l with a maximum reading of 10 mg/l during March 2011 (Fugro, 2012). Although all values are low, a slight increase in TSS was observed in March.

The principal mechanisms governing SSC in the water column are tidal currents, with fluctuations observed across the spring-neap cycle and across the different tidal stages (HW, peak ebb, low water, peak flood) observed throughout both datasets. It is key to note that SSCs can also be temporarily elevated by wave-driven currents during storm events. During high-energy storm events, levels of SSC can rise significantly, both nearbed and extending into the water column. Following storm events, SSC levels will gradually decrease to baseline conditions, regulated by the ambient regional tidal regimes. The seasonal nature and frequency of storm events supports a broadly seasonal pattern for SSC levels.

The Cefas Climatology Report 2016 (Cefas, 2016) provides the spatial distribution of average non-algal Suspended Particulate Matter (SPM) for the majority of the UK continental shelf (UKCS). Between 1998 and 2005, the greatest plumes are associated with large rivers such as the Thames Estuary, The Wash and Liverpool Bay, which show mean values of SPM above 30 mg/l. Based on the data provided within this study, the SPM associated with the Proposed Development has been estimated as approximately

0 mg/l to 1 mg/l over the 1998 to 2005 period. Higher levels of SPM are experienced more commonly in the winter months; however, due to the tidal influence, even during summer months the levels remain elevated. Figure 6.8 illustrates the average SPM within the Proposed Development based on the Cefas Climatology Report (Cefas, 2016).

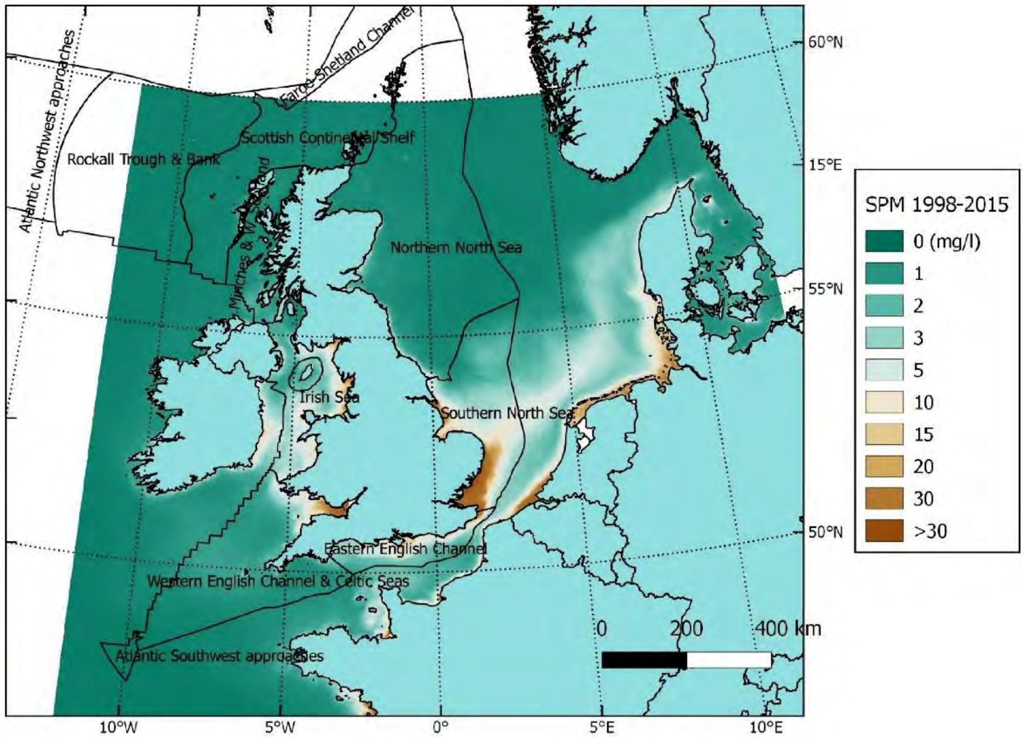

Figure 6.8: Average Suspended Sediment Between 1998 to 2015 Around the UK (Source: Cefas, 2016).

6.1.4 PROPOSED APPROACH TO THE ENVIRONMENTAL IMPACT ASSESSMENT

The offshore physical processes EIA will follow the methodology set out in chapter 5. Specific to the physical processes EIA, the following guidance documents will also be considered:

- Coastal Process Modelling for Offshore Wind farm Environmental Impact Assessment: Best Practice Guide. (COWRIE, 2009);
- Guidelines in the use of metocean data through the lifecycle of a marine renewable development (ABPmer *et al*., 2008); and
- Offshore wind, wave and tidal energy applications: consenting and licensing manual (Scottish Government, 2018).

6.1.5 EMBEDDED MITIGATION

At this stage, several additional mitigation or management measures are proposed:

- scour protection: The use of scour protection around offshore structures and foundations will be employed, as described in detail in chapter 3; and
- suitable implementation and monitoring of cable protection through the Development and adherence to a Cable Plan (CaP).

Any further mitigation requirements to be adopt for physical processes will be dependent on the significance of the effects and will be consulted upon with statutory consultees throughout the EIA process.

6.1.6 POTENTIAL PROPOSED DEVELOPMENT IMPACTS

A range of potential impacts on physical processes have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of the Proposed Development. The impacts that have been scoped into the Proposed Development assessment are outlined in Table 6.3 together with a description of any additional data collection (e.g. site-specific surveys) and/or supporting analyses (e.g. modelling) that will be required to enable a full assessment of the impacts.

At this stage, potential impacts to the seabed arising from sediment scour have been scoped out of the assessment, described in Table 6.4.

6.1.6.1 Modelling to Inform the Physical Processes Assessment

To support the development of the physical processes EIA, a numerical modelling study is planned. This model will be used to assess the magnitude and significance of changes to several processes, including:

- tidal currents;
- wave climate;
- littoral currents
- sediment transport; and
- SSCs.

This study will be undertaken using the MIKE software developed by DHI (www.dhigroup.com), which contains a suite of coastal and environmental modelling modules of global standard. The key to the MIKE suite of computational models is that each module may be applied to a single model mesh and then the modelling of combined (coupled) parameters may be undertaken.

The MIKE 21 Flexible Mess (fm) coupled modules would be used to model baseline wave climate, tidal flows and sediment transport, using a model which, whilst providing sufficient detail to simulate the necessary parameters, is also computationally efficient by utilising a flexible mesh comprised of the most up-to-date bathymetric data. The computational model applied in the baseline study will be amended to include the impact of the wind turbine and offshore platform structures to quantify the change in sediment transport and wave climate. Similarly, sediment will be released into the water column to replicate the construction phase works during the installation of the inter-array and offshore export cabling and the sediment dispersion and fate will be gauged. This also extends to the material released into the water column from the cable laying.

The computational modelling will quantify the potential impacts of the installation and ongoing operational effects on the tide, wave and sediment transport processes. It will also provide the transport and fate of any material released into the water column as part of the installation works.

The results of this numerical modelling will be used to support the impact assessments within the below topics:

- benthic subtidal and intertidal ecology (section 7.1);
- fish and shellfish ecology (section 7.1.7);
- marine mammals (section 7.3);
- marine archaeology and ordnance (section 8.4); and
- infrastructure and other users (section 8.6).

6.1.7 POTENTIAL CUMULATIVE EFFECTS

There is potential for the predicted impacts from the Proposed Development on physical processes to interact with impacts from other projects and activities in the physical processes study area and lead to a cumulative effect on receptors.

The cumulative assessment will consider the maximum adverse scenarios for each of the projects or activities across all phases of the Proposed Development. The following projects or activities will be considered within the physical processes study area:

- other offshore wind farms and associated cabling and infrastructure;
- oil and gas infrastructure/development (cables and pipelines);
- other forms of cabling (i.e. telecommunications and interlinks);
- beach replenishment schemes; and
- aggregate extraction and disposal of dredging spoil.

6.1.8 POTENTIAL TRANSBOUNDARY IMPACTS

A screening of transboundary impacts has been carried out and is presented in Annex C. This screening exercise identified that there is no potential for transboundary impacts with regard to physical processes as the predicted impacts will largely be focused within the footprint of the Proposed Development.

6.1.9 SCOPING QUESTIONS TO CONSULTEES

- Do you agree with the data sources which are suggested for the assessment of physical processes?
- Do you agree that all receptors and impacts have been identified for physical processes?
- Do you agree with the suggested embedded mitigation and is this mitigation appropriate?
- Do you agree with the proposed approach assessment?
- Do you agree that transboundary impacts of marine physical processes receptors should be scoped out of the Proposed Development EIA?

Table 6.3: Impacts Proposed to be Scoped into the Proposed Development Assessment for Physical Processes.

Impact	Justification	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Proposed Approach for the Undertaking of Proposed Development Specific Modelling to Inform the Assessment of Potential Impacts
Construction			
Increase in suspended sediments due construction related activities such as possible seabed preparation activities if required, wind turbine foundation installation or array cable installation and the potential impact to physical features within the array area.	There is potential for increased SSCs and associated deposition associated with seabed preparation activities, foundation installation and cable installation activities. This assessment will consider the potential impacts arisings due to changes in SSC and deposition, to physical coastal features and marine morphology. Elevations in SSC and subsequent deposition of disturbed sediments also have the potential to result in adverse and indirect impacts on a variety of receptor groups which lie in other Offshore EIA Report topics, such as benthic subtidal and intertidal ecology, fish and shellfish ecology, marine mammals, marine archaeology and infrastructure and other users. For these receptor groups, a significance of effect will not be assigned within the physical processes assessment.	Data collected during the 2019 geophysical survey campaign and to be collected during the 2020 geotechnical survey campaign will provide data to support the development of the physical processes numerical modelling. Data collected from previous metocean surveys may also be utilised.	Numerical modelling will be conducted to provide an overview of the potential impacts to physical processes relating to the construction / operation and maintenance and decommissioning of the Proposed Development. Further details of this modelling are presented in section 6.1.6.1.
Increase in suspended sediments due to construction related activities such as seabed preparation activities and export cable installation, and the potential impact to physical features within the proposed export cable corridor.	Sediment disturbance may arise from export cable installation. This assessment will consider the potential impacts arisings due to changes in SSC and deposition, to physical coastal features and marine morphology. Elevations in SSC and subsequent deposition of disturbed sediments have the potential to result in adverse and indirect impacts on a variety of receptor groups, which are listed above.	As above.	As above.

Impact	Justification	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Proposed Approach for the Undertaking of Proposed Development Specific Modelling to Inform the Assessment of Potential Impacts
Impacts to hydrodynamics, sediment transport and beach morphology due to cable installation activities and potential impact to physical features at landfall.	Cable installation activities at the landfall have the potential to impact on the physical environment at the shoreline.	As above.	As above.
Operation and Maintenance			
Impacts to the wave regime due to presence of infrastructure in the physical processes study area, and the associated potential impacts along adjacent shorelines.	The interaction of the wind turbine foundations and associated infrastructure and the wave regime will result in a reduction to wave energy. This in turn has the potential to impact upon adjacent physical coastal features and marine morphology.	As for construction phase.	As for construction phase.
Impacts to tidal regime due to presence of infrastructure in the physical processes study area and associated potential impacts to physical features and morphology (e.g. bank morphology).	The interaction of the wind turbine foundations and associated infrastructure and the tidal regime will result in a change to sediment transport regimes. This in turn has the potential to impact upon adjacent physical coastal features and marine morphology.	As for construction phase.	As for construction phase.
Impacts to sediment transport and sediment transport pathways due to presence of infrastructure in the physical processes study area and associated potential impacts to physical features and morphology (e.g. bank morphology).	Foundations within the array may interrupt sediment transport pathways. In addition, cable protection may result in localised secondary scour or pose an obstacle to sediment transport pathways.	As for construction phase.	As for construction phase.

Impact	Justification	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Proposed Approach for the Undertaking of Proposed Development Specific Modelling to Inform the Assessment of Potential Impacts
Impacts to beach morphology, hydrodynamics and sediment transport (littoral drift) due to operation and maintenance activities and potential impact to physical features at landfall.	Should the cable become exposed at the landfall, there is potential for impact on local coastal processes.	As for construction phase.	As for construction phase.
Increase in suspended sediments due to operation and maintenance related activities such as cable repairs, and the potential impact to physical features within the array area.	Sediment disturbance may arise from maintenance activities such as array cable repairs within the array area. This assessment will consider the potential impacts arisings due to changes in SSC and deposition, to physical coastal features and marine morphology. Elevations in SSC and subsequent deposition of disturbed sediments have the potential to result in adverse and indirect impacts on a variety of receptor groups, as listed for the construction phase.	As for construction phase.	As for construction phase.
Increase in suspended sediments due to operation and maintenance related activities such as cable repairs, and the potential impact to physical features within the proposed export cable corridor.	Sediment disturbance may arise from maintenance activities such as export cable repairs. This assessment will consider the potential impacts arisings due to changes in SSC and deposition, to physical coastal features and marine morphology. Elevations in SSC and subsequent deposition of disturbed sediments have the potential to result in adverse and indirect impacts on a variety of receptor groups, as listed for the construction phase.	As for construction phase.	As for construction phase.

Impact	Justification	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Proposed Approach for the Undertaking of Proposed Development Specific Modelling to Inform the Assessment of Potential Impacts
Decommissioning			
Increase in suspended sediments due to decommissioning related activities such as cable repairs, and the potential impact to physical features within the array area.	There is potential for increased SSCs and associated deposition associated with decommissioning activities. Effects are likely to be similar to those described during the construction phase.	As for construction phase.	As for construction phase.
Increase in suspended sediments due to decommissioning related activities such as cable repairs, and the potential impact to physical features within the proposed export cable corridor.	There is potential for increased SSCs and associated deposition associated with decommissioning activities. Effects are likely to be similar to those described during the construction phase.	As for construction phase.	As for construction phase.
Impacts to hydrodynamics, sediment transport and beach morphology due to decommissioning activities and potential impact to physical features at landfall	Decommissioning activities at the landfall have the potential to impact on the physical environment at the shoreline.	As above.	The potential for impacts relating to the decommissioning of cables at the landfall will be assessed as part of the cable landfall desktop analysis described in relation to the construction and operation phases.

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Table 6.4: Impacts Proposed to be Scoped Out of the Proposed Development Assessment for Physical Processes.

Impact	Justification
Operation and Maintenance	
Scour of seabed sediments.	There is the potential for scouring of seabed sediments to occur due to interactions between metocean regime (wave, sand and currents) and foundations or other seabed structures. This scouring can develop into depressions around the structure. However, the Applicant has proposed the use of scour protection which will reduce the risk of seabed sediment scour (further detail provided in section 6.1.5). Therefore, subject to consultation with the relevant stakeholders and feedback received on this Offshore Scoping Report, this impact has been scoped out of further consideration within the EIA.

6.2 SUBSEA NOISE

6.2.1 INTRODUCTION

This section of the Offshore Scoping Report considers the potential impacts from the construction, operation and maintenance, and decommissioning of the offshore and intertidal components (up to the MLWS mark) of the Proposed Development on subsea noise.

Sources of subsea noise and vibration during the construction phase may include piling (either impact piling or drilled piles) the use of barges and vessels, and heavy machinery and generators on the vessels. During the operational phase, the primary source of underwater sound is vibration of the wind turbine's gear box and generator, which is transmitted down the tower and radiated as underwater sound from the tower wall. Vessel activity during the operation phase for maintenance works will also be a source of underwater noise. Sources of subsea noise during the decommissioning phase may include those associated with the removal of subsea structures, the use of barges and vessels, and heavy machinery and generators on the vessels. This section also considers sources of noise which may originate in the intertidal area (between MLWS and MHWS), such as intertidal drilling associated with cable laying activities, which may impact offshore receptors.

A subsea noise technical appendix will be included in the Offshore EIA Report and will provide an assessment of the level of subsea noise generated from the Proposed Development, and will be used within the impact assessment of the following receptor chapters:

- fish and shellfish ecology (section 7.1.7);
- marine mammals (section 7.3);
- commercial fisheries (section 8.1); and
- infrastructure and other users (section 8.6).

Therefore, no study area has been outlined for subsea noise as this is defined by the receptors and discussed within those relevant sections listed above.

6.2.2 BASELINE ENVIRONMENT

6.2.2.1 Desktop Study

An initial desk-based review of literature and data sources to support this Offshore Scoping Report has identified a number of baseline datasets in the form of both pre-existing specific datasets. A subsea noise assessment was completed for the application of Seagreen 1, and these assessments shall be reviewed and used, where applicable, to inform the subsea noise assessment and modelling strategy for the Proposed Development. Key desktop data reports are summarised in Table 6.5.

6.2.2.2 Site-specific Survey Data

No site-specific surveys have been undertaken to inform the Offshore Scoping Report for subsea noise and no additional baseline surveys are required to inform the Offshore EIA Report.

Table 6.5: **Summary of Key Desktop Reports.**

Title	Source	Year	Author
Underwater Noise Modelling – Seagreen Offshore Wind Farm	Seagreen	2018	Cefas
Seagreen EIA Coordination - Underwater Noise Modelling Plan	Seagreen	2018	NIRAS
Appendix 10e Piling Noise Impact Assessment Using A 1% Acoustic Energy Conversion Factor and Use of ADD (Acoustic Deterrent Device)	Seagreen	2018	Seagreen

6.2.2.3 Baseline Characterisation

Background or “ambient” subsea noise is created by several natural sources, such as rain, breaking waves, wind at the surface, seismic noise, biological noise and thermal noise. Biological sources include marine mammals (using sound to communicate, build up an image of their environment and detect prey and predators) as well as certain fish and shrimp. Anthropogenic sources of noise in the marine environment include fishing boats, ships, industrial noise, seismic surveys and leisure activities, all of which add to ambient background noise.

Anthropogenic noise within the vicinity of the Proposed Development will arise primarily from shipping, which is discussed in section 8.2.

Research relating to both physiological effects and behavioural disturbance of noise on marine receptors is typically based on determining the absolute noise level for the onset of that effect. Consequently, the criteria for assessing the effects of noise on marine mammals and fish tend to be based on the absolute noise criteria, rather than the difference between the baseline noise level and the noise being assessed. The value of establishing the precise baseline noise level is somewhat diminished due to the lack of evidence-based studies on the effects of noise, relative to background on marine receptors.

It is important to understand that baseline noise levels will vary significantly depending on multiple factors, such as seasonal variations and different sea states. Therefore, there is very limited value in establishing such values. However, when undertaking an appraisal of underwater noise, it can be helpful to understand the range of noise levels likely to be prevailing within an area so any noise predictions can be placed in the context of the baseline.

Further, it is important to note the lack of scientific understanding with regard to how various species distinguish anthropogenic sound relative to masking noise. Therefore, it is necessary to exercise considerable caution if attempting any comparison between subsea noise from the Proposed Development and the baseline noise level.

6.2.3 PROPOSED APPROACH TO THE ENVIRONMENTAL IMPACT ASSESSMENT

The subsea noise assessment will consider the following legislation and guidance documents:

- Good practice guide to underwater noise measurement (National Physics Laboratory (NPL), 2014);
- National Oceanic and Atmospheric Administration (NOAA) Technical guidance for assessing the effects of anthropogenic sound on marine mammal hearing: Underwater acoustic thresholds for onset of permanent and temporary threshold shifts (NMFS, 2018);
- Marine mammal noise exposure criteria: Updated scientific recommendations for residual hearing effects (Southall *et al*., 2019);
- Sound exposure guidelines for Fishes and Sea Turtles (Popper *et al*., 2014);
- The EU Marine Strategy Framework Directive (Directive 2008/56/EC). This seeks to achieve good environmental status (GES) in Europe's seas by 2020. The qualitative descriptors for determining GES include "*Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment*." This Directive has been transposed into UK law by the Marine Strategy Regulations 2010; and
- NPS EN-1 Section 5.11, noise and vibration (DECC, 2011a).

The impact criteria will be based on the most recent and up-to-date scientific research and guidance, while utilising a precautionary approach. Potential impacts arising from subsea noise on marine mammals and fish will be assessed with respect to the potential for injury and behavioural disturbance.

Where possible, noise source data will be based on measured data from similar wind turbines. If this data is not available, source noise levels will be based on a combination of theoretical and empirical predictions and scaling of existing data where applicable. The associated source levels of other types of subsea noise associated with the Proposed Development will be based on published data and established prediction methodologies.

6.2.4 EMBEDDED MITIGATION

Measures adopted as part of the Proposed Development have been discussed within each of the relevant sections of the Offshore Scoping Report for which subsea noise is considered for relevant receptors: specifically section 7.1.7, section 7.3, section 8.1 and section 8.6. Within the Offshore EIA Report, each of the proposed mitigation measures relating to reducing potential impacts on receptors from subsea noise will be modelled to assess their efficacy in a quantitative way.

6.2.5 POTENTIAL PROPOSED DEVELOPMENT IMPACTS

During construction, there is the potential for subsea noise to impact sensitive ecological receptors due to, for example, impact piling, construction vessels and cable installation activities. During operation, there is potential for subsea noise to impact sensitive ecological receptors due to, for example, operational wind turbines and maintenance activities. Decommissioning effects associated with the removal of offshore infrastructure are envisaged to be the same or similar to those described for the construction phase, but with the exception that piling operations will not be required. The potential effects on these receptors will be assessed within the relevant technical chapters of the Offshore EIA Report (marine mammals, fish and shellfish, commercial fisheries and infrastructure and other users).

6.2.5.1 Subsea Noise Modelling

Subsea noise modelling is planned in order to assess the potential for construction and operational noise, using a robust, peer reviewed model. In accordance with National Physical Laboratory guidance (NPL, 2014), the choice of model will depend upon many factors which will be determined during the consultation period and will depend on site-specific circumstances (such as bathymetry etc.). However, the chosen model will be appropriate and peer reviewed, such as the energy flux model (Weston, 1976). Such models have been successfully benchmarked against other sound propagation models (e.g. Etter, 2018; Toso *et al*., 2014; Schulkin and Mercer, 1985) and have been used previously in underwater noise assessments for wind and tidal energy developments as well as for oil and gas and port developments.

The exact scope, specification and methodology of the noise propagation modelling will be discussed and agreed with Statutory Nature Conservation Bodies (SNCBs). However, on the basis of previous subsea noise modelling completed for Seagreen 1, the assessment will consider the bathymetry and other characteristics of the area, including the geo-acoustic properties of the seabed. The model will also estimate the unweighted and hearing group weighted Sound Exposure Level (SEL), rms (T90) sound pressure level and peak / peak-to-peak pressure level parameters as recommended by Southall *et al*., 2019, National Marine Fisheries Service (NMFS) 2018, Southall *et al*., 2007, Acoustical Society of America (ASA) Sound Exposure Guidelines for Fishes and Sea Turtles (Popper *et al*., 2014) and other guidance. The model will also incorporate swim speeds of marine mammals and fish to calculate cumulative SELs.

The cumulative effect of multiple events/operations will also be assessed/modelled and will consider the likely exposure times of species, allowing for safe distances and reaction ranges to be determined. Modelling scenarios will be undertaken for single pile installation as well as concurrent piling scenarios and will model piling at up to four locations including both typical (most likely) and maximum piling parameters within the PDE.

The results of the noise modelling will be presented in a Subsea Noise Technical Report appended to the Offshore EIA Report, which will inform the fish and shellfish ecology, marine mammal, commercial fisheries and infrastructure and other users EIAs.

6.2.6 POTENTIAL CUMULATIVE EFFECTS

Consideration shall be given to cumulative effects from subsea noise, in particular during construction related piling activities. The potential for cumulative effects with the Proposed Development, as well as other offshore wind farm developments, will be considered in the relevant topic receptors chapters of the Offshore EIA Report. The subsea noise modelling proposed, and as set out in section 6.2.5.1, will also assess cumulative effects from both the Proposed Development and Marr Bank Wind Farm and this will be used to inform the CEA. A detailed assessment of the wind farm developments within the area and their construction windows will be required for the Offshore EIA Report to identify which other offshore wind farm developments should be considered in terms of the cumulative underwater noise assessment.

Further, the CEA will be considered within the respective Offshore EIA Report chapters for marine mammals, fish and shellfish, commercial fishing and infrastructure and other users.

6.2.7 POTENTIAL TRANSBOUNDARY IMPACTS

Potential transboundary impacts of subsea noise are discussed within each of the relevant sections of the Offshore Scoping Report for which subsea noise is considered for relevant receptors: see section 7.1.7, section 7.3, section 8.1 and section 8.6.

6.2.8 SCOPING QUESTIONS TO CONSULTEES

- Do you agree with the proposed subsea noise modelling methodology?

6.3 AIRBORNE NOISE

6.3.1 INTRODUCTION

This section of the Offshore Scoping Report identifies the elements of offshore airborne noise (i.e. seaward of MHWS) of relevance to the Proposed Development and considers the potential impacts from the construction, operation and maintenance, and decommissioning of the offshore and intertidal components (seaward of MLWS) of the Proposed Development on airborne noise on all receptors, onshore and offshore..

Offshore airborne noise includes construction noise and vibration from sources such as piling, drilling, hammering, use of vessels, barges or other heavy machinery, and use of generators on vessels. Operational noise will include aerodynamic noise from wind turbine blades passing through the air and mechanical noise from the gearbox and generator of the wind turbines. The decommissioning phase also presents the potential for airborne noise through noise emitting during decommissioning activities.

6.3.2 STUDY AREA

The airborne noise study area associated with the potential effects resulting from construction and decommissioning activities on onshore receptors is a 2 km buffer around the landfall locations and 4 km buffer around the proposed offshore export cable corridor. Significant noise and vibration effects are not expected beyond this distance. For construction-related vibration, the study area is a buffer of up to 100 m from any vibration generating construction activity.

The airborne noise study areas have been developed to reflect receptors' increased sensitivity to noise at night, where night-time noise effects from construction and operation are possible.

The proposed airborne noise study areas are shown in Figure 6.9. The airborne noise study area will be reviewed and amended as the proposed offshore export cable corridor is refined through the EIA process.

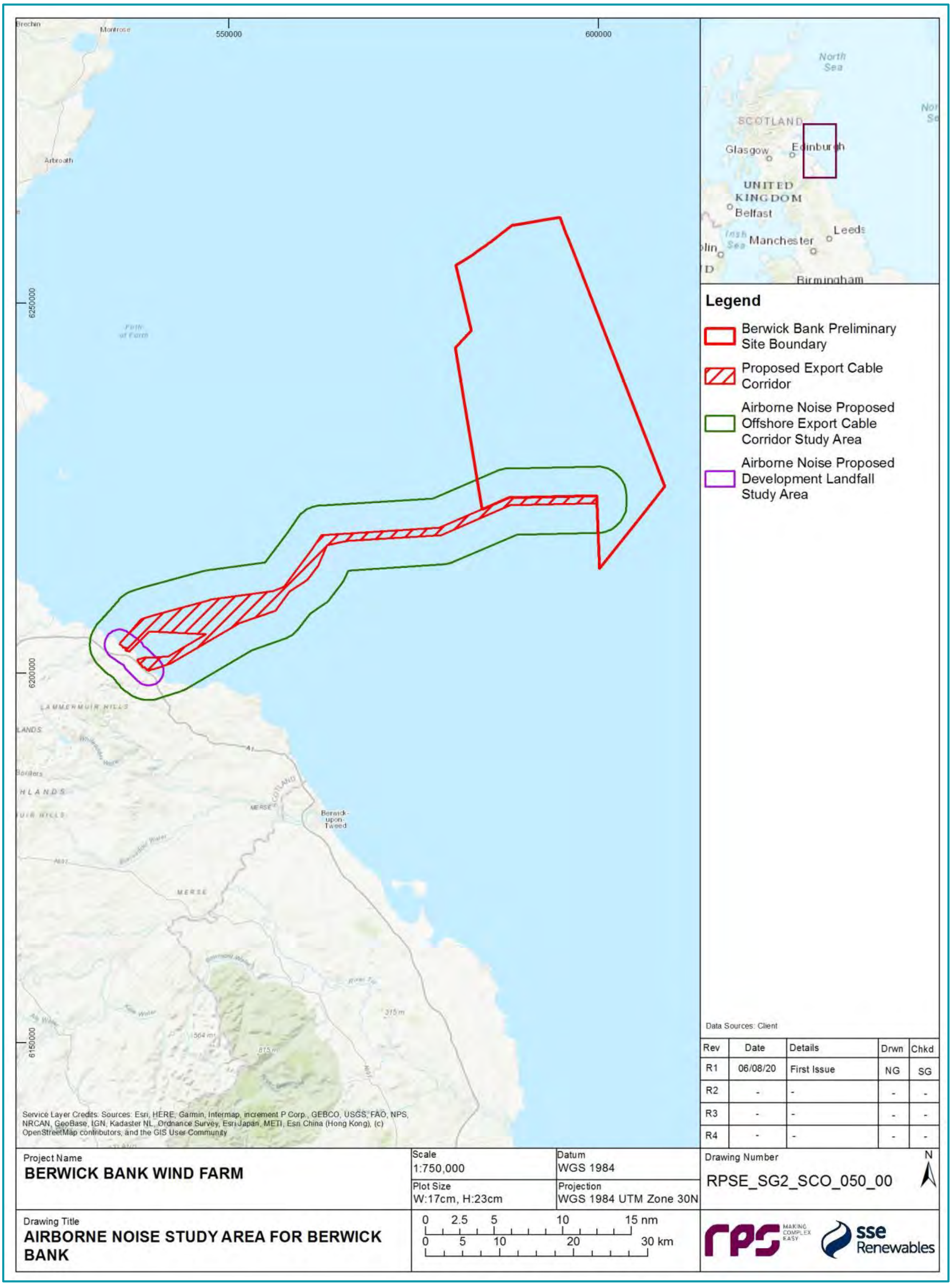


Figure 6.9: Airborne Noise Study Area.

6.3.3 BASELINE ENVIRONMENT

6.3.3.1 Desktop Study

An initial desk-based review of literature and data sources to support this Offshore Scoping Report has identified a desktop report which is summarised in Table 6.6 below.

Table 6.6: Summary of Key Desktop Reports to inform Offshore Airborne noise Scoping Assessment.

Title	Source	Year	Author
Appendix 5.2 Construction Noise and Vibration Technical Note	Neart na Gaoithe Wind Farm	2017	ITP Energised Ltd

6.3.3.2 Site-specific Survey Data

Seaward of MLWS

No site-specific surveys have been undertaken to inform the Offshore Scoping Report for ambient noise. This is because there is sufficient information on the baseline environment (described in section 6.3.3.3 below), to support the decision of scoping out offshore airborne noise from the EIA as described in Table 6.7.

Landward of MLWS

Baseline survey measurements will be conducted in accordance with current guidance including BS 4142:2014+A1:2019 Method for rating and assessing industrial and commercial sound, and BS 7445-2:1991 Description and measurement of environmental noise (BSI, 2003).

6.3.3.3 Baseline Characterisation

Seaward of MLWS

The array area is located approximately 39.2 km offshore, with proposed landfall locations at Thortonloch and Skateraw near Torness, on the East Lothian coast. The sensitive receptors to offshore airborne noise are likely to be:

- closest offshore oil and gas accommodation, and manned working platforms (> 65 km from the Proposed Development);
- closest commercial shipping route (overlaps with the Proposed Development);
- fishing vessels (50 m operation/500 m construction from each turbine); and
- nearshore leisure and recreational users including recreational fishing; motor cruising; water sports and scuba diving.

Landward of MLWS

The baseline environment within the airborne noise study area is mainly rural with occasional residential properties and industrial sites. Noise in this area is likely to be dominated by road traffic on the A1, rail traffic on the East Coast Main Line (ECML) with some noise from nearby industrial sites including Torness Nuclear Power Station, Dunbar Cement Works and the landfill site and opencast mine to the northwest of Skateraw.

A desk-based review and consultation will be undertaken to identify potentially sensitive receptors. Background noise monitoring will be undertaken at residential properties where the potential for significant noise effects from offshore activities is identified, and where needed to inform the construction assessment. Any surveys will be agreed in consultation with East Lothian Council (ELC) throughout the EIA process and will be carried out for a sufficient period to allow typical sound levels to be established, taking account of different types of noise sources and weather conditions that occur. Noise surveys may be accompanied by the acquisition of supplementary non-acoustic data (rainfall and wind records), as required.

6.3.4 EMBEDDED MITIGATION

As part of the Proposed Development design process, designed-in measures have been proposed to reduce the potential for impacts on noise and vibration (see section 6.3.4.1 and section 6.3.4.2 below). The embedded mitigation measures will evolve over the development process as the EIA progresses and in response to consultation.

6.3.4.1 Construction and Decommissioning Phases Mitigation

Core working hours for the construction of the onshore elements of the Proposed Development are Monday to Sunday 07.00 to 19.00 hour. Activities carried out during mobilisation and maintenance will not generate significant noise levels (such as piling, or other such noisy activities). In certain circumstances, specific works may have to be undertaken outside the normal working hours, such as:

- HDD or other trenchless construction technology which may require 24-hour machinery operation, dependent on the ground conditions;
- remedial works, for example in the event of severe weather;
- delivery of electrical infrastructure;
- jointing operations along the cable route; and
- security of sites and protection of open assets.

Based on noise modelling results, where noise has the potential to cause disturbance the use of mufflers, acoustic barriers and screening will be considered. The construction and decommissioning works would use Best Practicable Means (BPM) to limit the impacts of noise at sensitive receptors. Those measures would be set out in the CEMP. Monitoring of noise related complaints should also be undertaken.

6.3.4.2 Operation Phase Mitigation

Operational mitigation measures to be considered as part of the Proposed Development would involve:

- locating the onshore project substation and cable relay station away from noise sensitive receptors where possible;
- selection of quieter equipment where reasonably practicable;
- installation of acoustic enclosures;
- installation of acoustic barriers;
- screening substations further by the construction of a landform/embankment around the site may also provide up to 10 dB attenuation;
- silencing of exhausts/outlets for air handling/cooling units;

- locating equipment to take advantage of screening inherent in the design, i.e. from the substation hall(s) or control room buildings where reasonably practicable; and
- monitoring of noise related complaints.

6.3.5 PROPOSED APPROACH TO THE ENVIRONMENTAL IMPACT ASSESSMENT

Noise and vibration impacts associated with the construction and decommissioning of the offshore components of the Berwick Bank Wind Farm will be assessed using the guidance contained in BS 5228:2009+A1:2014, which defines the accepted prediction methods and source data for various construction plant and activities. Additional guidance would be sought in consultation with ELC for assessment of the particular impacts associated with offshore piling activities.

The following data sources will be used in the Offshore EIA Report:

- ordnance Survey mapping;
- topographical data;
- on-site noise monitoring data;
- construction data;
- DWG/DFX drawings;
- construction and O&M vessel numbers;
- noise modelling and propagation calculations, including the use of Parabolic Equations to predict noise from offshore piling operations at onshore receptors; and
- consultation with all relevant local authorities.

Construction noise impacts will be based on the likely construction programme and associated activities outlined in the Offshore EIA Report Project Description. This will include the type and nature of plant required for construction within the intertidal area, and the main sources of noise from offshore construction will be identified.

6.3.6 POTENTIAL PROPOSED DEVELOPMENT IMPACTS

6.3.6.1 Seaward of MLWS

Offshore piling of monopiles is likely to represent the greatest increase in offshore airborne noise therefore, the assessment of airborne noise effects on offshore noise sensitive receptors has focussed on offshore piling and will assume the following maximum design scenario:

- maximum of two concurrent piling events requiring approximately two to seven hours of piling each;
- 24-hours a day operation;
- maximum 15 m monopile diameter; and
- 6,000 kJ maximum hammer energy.

On the basis of the baseline information currently available for airborne noise and the Proposed Development description outlined in chapter 3, all airborne noise impacts are proposed to be scoped out of the assessment for the Proposed Development. These impacts are outlined, together with a justification for scoping them out, in Table 6.7.

6.3.6.2 Landward of MLWS

The potential impacts associated with construction noise are considered to be temporary, and may arise as a result of:

- activities carried out in the intertidal area below MHWL;
- piling associated with wind turbine and other offshore infrastructure installation;
- construction activities at nearshore locations (e.g. jack-up barges, drilling, dredging, cable laying vessels working close to the shore); and
- construction vessels.

An overview of the impacts scoped in for the assessment of airborne noise landward of MLWS is provided in Table 6.7.

6.3.7 POTENTIAL CUMULATIVE EFFECTS

6.3.7.1 Seaward of MLWS

Although there are several other offshore wind farm projects in development in the wider areas of the Proposed Development (including Neart na Gaoithe, Inch Cape and Seagreen Alpha and Bravo), all have been scoped out the assessment of airborne noise from their Environmental Statement (now termed EIA Report).

6.3.8 POTENTIAL TRANSBOUNDARY IMPACTS

A screening of transboundary impacts has been carried out and is presented in Annex C. This screening exercise identified that there is no potential for transboundary impacts with regard to airborne noise as the predicted impacts will largely be focused within the footprint of the Proposed Development.

6.3.9 SCOPING QUESTIONS TO CONSULTEES

- Do you agree that the assessment of airborne noise should be scoped out of the Proposed Development EIA?
- Do you agree that all potentially significant sources of noise and vibration from activities associated with the Proposed Development have been identified?
- Do you agree that appropriate standards and methods of assessment are proposed based on the potential for noise impact?
- Do you agree with the proposal to scope out the following:
    - operational noise from turbines and associated infrastructure;
    - vibration during the operational phase; and
    - noise and vibration from routine maintenance activities associated with the offshore infrastructure?

Table 6.7: Impacts Proposed to be Scoped into the Proposed Development Assessment for Airborne Noise (Landward of MLWS).

Impact	Justification	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Proposed Approach for the Undertaking of Proposed Development Specific Modelling to Inform the Assessment of Potential Impacts
Construction			
Change in Noise Level - Human Receptors	There is the potential for activities associated with the construction of the Proposed Development to temporarily increase the noise levels experienced at identified human receptors throughout the airborne noise study area during offshore and nearshore construction activities.	Baseline survey measurements will be conducted in accordance with current guidance including BS 4142:2014+A1:2019 Method for rating and assessing industrial and commercial sound, and BS 7445-2:1991 Description and measurement of environmental noise.	BS5228:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites (BSI, 2014) details the “ABC method”, which specifies a construction noise limit based on the existing ambient noise level and for different periods of the day. The predicted construction noise levels will be assessed against noise limits derived from advice within Annex E of BS 5228.

Impact	Justification	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Proposed Approach for the Undertaking of Proposed Development Specific Modelling to Inform the Assessment of Potential Impacts
Construction Vibration	Ground-borne vibration can result from construction works and may lead to perceptible levels of vibration at nearby receptors, which at higher levels can cause disturbance to residents. In extreme cases, cosmetic or structural building damage can occur, however vibration levels have to be very high for this effect to be manifested and such cases are rare (BSI, 1993). High vibration levels generally arise from 'heavy' construction works such as piling, deep excavation, or dynamic ground compaction. The use of piling during the construction of the Proposed Development may be required. Consideration will be given to potential sources of vibration associated with the offshore construction phase in proximity to residential and other sensitive receptors (i.e. nearshore vibration generating activities).	As above.	Guidance on the human response to vibration in buildings is found in BS 6472-1:2008 Guide to evaluation of human exposure to vibration in buildings, Part 1, Vibration sources other than blasting (BSI, 2008). For construction vibration from sources other than blasting, the vibration level and effects will be adopted based on Table B-1 of BS 5228-2. These levels and effects are based on human perception of vibration in residential environments.
Noise and vibration impacts to Ecological/Geological receptors	Noise and vibration during offshore and nearshore construction activities may cause disturbance to wildlife, including protected species and designated sites. Vibration impacts may cause disturbance to designated	As above.	Predictions of noise and vibration at identified ecological and geological receptors will be undertaken and provided to geologists and ecologists to undertake the assessment of noise and vibration impacts on such receptors.

Impact	Justification	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Proposed Approach for the Undertaking of Proposed Development Specific Modelling to Inform the Assessment of Potential Impacts
	geological sites such as the Barns Ness Coast SSSI.		

Table 6.8: Impacts Proposed to be Scoped Out of the Proposed Development Assessment for Airborne Noise.

Impact	Justification
Construction	
Piling activities will generate construction noise that may impact recreational and leisure receptors in the nearshore environment	Nearshore construction activities will include cable laying, which will be conducted via a cable lay vessel with support via a ROV. Therefore, it is unlikely that the construction activities associated with the Proposed Development will significantly affect these receptors. Construction activities within the offshore area are not predicted to affect these activities due to the offshore location of the project. Subject to consultation with the relevant stakeholders and feedback received on this Offshore Scoping Report, the Applicant intends to scope this impact out of further consideration within the EIA.
Piling activities will generate construction noise that may exceed guideline levels for commercial fishing vessels and commercial shipping traffic.	The maximum scenario distance of the receptors from the nearest turbine/project boundary is proposed as 500 m for commercial fishing vessel and 1 nm for commercial shipping traffic, based on navigational safety guidelines. The effect of airborne noise from piling on receptors onboard commercial fishing vessels and commercial ships will therefore be negligible. Subject to consultation with the relevant stakeholders and feedback received on this Offshore Scoping Report, the Applicant intends to scope this impact out of further consideration within the EIA.
Piling activities will generate construction noise that may exceed guideline levels for manned gas platforms.	The nearest gas platform with accommodation, to the Proposed Development, is located greater than 65 km away. Given this distance, the effect of operational noise on receptors onboard gas accommodation platforms has therefore been scoped out of this assessment. Subject to consultation with the relevant stakeholders and feedback received on this Offshore Scoping Report, the Applicant intends to scope this impact out of further consideration within the EIA.
Operation and Maintenance	
Airborne noise associated with the operation and maintenance	It is unlikely that there will be airborne noise effects from the operational wind turbines on nearshore recreational and leisure noise sensitive receptors due to the low level of noise associated within this phase of the project. Any maintenance activities (e.g. cable

Impact	Justification
of the Proposed Development may impact recreational and leisure receptors in the nearshore environment	inspection, repair or reburial) will be expected to be of low frequency along the intertidal sections of the Proposed Development export cable corridor. The noise associated with these activities will not exceed those of the construction phase. Subject to consultation with the relevant stakeholders and feedback received on this Offshore Scoping Report, the Applicant intends to scope this impact out of further consideration within the EIA.
Airborne noise may exceed guideline levels for commercial fishing vessels and commercial shipping traffic.	The maximum scenario distance of the receptors from the nearest turbine/project boundary is proposed as 500 m for commercial fishing vessel and 1 nm for commercial shipping traffic based on navigational safety guidelines. The effect of airborne noise from operation and maintenance activities receptors onboard commercial fishing vessels and commercial ships will therefore be negligible. Subject to consultation with the relevant stakeholders and feedback received on this Offshore Scoping Report, the Applicant intends to scope this impact out of further consideration within the EIA.
Airborne noise may exceed guideline values for offshore accommodation platforms.	The nearest gas platform with accommodation, to the Proposed Development, is located greater than 65 km away. Given this distance, the effect of operational noise for receptors onboard gas accommodation platforms has therefore been scoped out of this assessment. Subject to consultation with the relevant stakeholders and feedback received on this Offshore Scoping Report, the Applicant intends to scope this impact out of further consideration within the EIA.
Impacts on Receptors Landward of MLWS	There are unlikely to be any noise and vibration impacts relating to the operational phase of the wind turbines due to the very large distance between the nearest wind turbines and the shore (approximately 39.2 km). It is therefore proposed that noise impacts arising from operation of wind turbines and offshore infrastructure should be scoped out from further consideration within the Offshore EIA Report.
Decommissioning	
Piling activities will generate decommissioning noise that may impact recreational and leisure receptors in the nearshore environment	Nearshore decommissioning activities are unlikely to affect recreational and leisure receptors as non-high-level noise emitting activities are required in the near shore area. Subject to consultation with the relevant stakeholders and feedback received on this Offshore Scoping Report, the Applicant intends to scope this impact out of further consideration within the EIA.
Airborne noise may exceed guideline levels for commercial fishing vessels and commercial shipping traffic.	The maximum distance of the receptors from the nearest turbine/project boundary is proposed as 500 m for commercial fishing vessel and 1 nm for commercial shipping traffic based on navigational safety guidelines. The effect of airborne noise from decommissioning activities to receptors onboard commercial fishing vessels and commercial ships will therefore be negligible. Subject to consultation with the relevant stakeholders and feedback received on this Offshore Scoping Report, the Applicant intends to scope this impact out of further consideration within the EIA.

Impact	Justification
Airborne noise may exceed guideline values for offshore accommodation platforms.	Decommissioning activities will be similar to construction activities with the exception that piling operations will not be required. Given that the level of noise generated from the decommissioning will be less than the construction phase, the effect of airborne noise from piling for receptors onboard gas accommodation platforms has been scoped out of this assessment. Therefore, subject to consultation with the relevant stakeholders and feedback received on this Offshore Scoping Report, the Applicant intends to scope this impact out of further consideration within the EIA.
Impacts on Receptors Landward of MLWS	No decision has been made regarding the final decommissioning policy for the offshore project infrastructure, as it is recognised that industry best practice, rules and legislation change over time. The detail and scope of the decommissioning works would be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the regulator. A decommissioning plan would be provided. It is anticipated that the decommissioning impacts would be similar in nature to those of construction but would be more limited in geographical extent and timescale. Assessment of decommissioning works is therefore, scoped out of further assessment.

6.4 OFFSHORE AIR QUALITY

6.4.1 INTRODUCTION

This section of the Offshore Scoping Report considers the potential impacts from the construction, operation and maintenance, and decommissioning of the offshore components (up to MHWS) of the Proposed Development on offshore and onshore receptors

6.4.2 STUDY AREA

The onshore air quality study area includes the following in accordance with the Institute of Air Quality Management (IAQM) guidance:

- Designated ecological receptors within 50 m of potential landfall construction activities (Barns Ness SSSI); and
- Human Receptors (Residential Properties and public amenity areas) within 350 m of potential landfall construction activities.

6.4.3 BASELINE ENVIRONMENT

6.4.3.1 Desktop Study

An initial desk-based review of literature and data sources to support this Offshore Scoping Report has identified a number of baseline datasets. These are summarised at Table 6.9 below.

6.4.3.2 Site-specific Survey Data

No site-specific surveys have been undertaken to inform the Offshore Scoping Report for air quality. This is because sufficient secondary data is available to support the decision of scoping out offshore air quality from the EIA as outlined in Table 6.9.

6.4.3.3 Baseline Characterisation

Due to industrialisation of the coast and inshore area adjacent to the central North Sea there has been an increase in the levels of pollutants which decrease further offshore, though oil and gas platforms provide numerous point sources of atmospheric pollution (DECC, 2016).

The UK agreed to set emission ceilings through the National Emission Ceilings Directive (NECD), which was revised in 2016 (NECD 2016/2284/EU) to set emission reduction commitments for total emissions of NO_x, SO_x, non-methane volatile organic compounds (NMVOC), Ammonia (NH_3) and particulate matter ($PM_{2.5}$) in 2020 and 2030. The UK has met these reduction targets for all of these pollutants for each year since 2010 inclusive with the exception for NO_x for the year 2010 (NECD, 2020).

The Scottish Government suggest there have been long-term reductions in emissions for all pollutants due to various policies and strategies implemented within Scotland such as the CAFS – The Road to a Healthier Future (Scottish Government, 2015a and Scottish Government, 2020a), Climate Change (Emissions Reduction Targets) Act (2019) setting a 2045 target for net zero emissions (Climate Change (Emissions Reduction Targets) (Scotland) Act 2019), and establishment of Low Emission Zones (The Transport (Scotland) Act 2019).

Table 6.9: Summary of Key Desktop Reports to inform Offshore Air Quality Scoping Assessment.

Title	Source	Year	Author
Cleaner Air for Scotland (CAFS) The Road to a Healthier Future, 2018/2019 Progress Report	Scottish Government	2020	Scottish Government
Offshore Energy SEA 3, Appendix 1E: Air Quality	DECC	2016	DECC
Air Pollutant Inventories for England, Scotland, Wales, and Northern Ireland: 1990-2017	Department for Environment, Food and Rural Affairs (Defra), The Scottish Government, The Welsh Government and The Northern Ireland Department for Agriculture, Environment and Rural Affairs	2019	National Atmospheric Emissions Inventory
Scottish Government and Department for Environment Food and Rural Affairs (DEFRA) background concentrations maps for nitrogen dioxide (NO_2) and particulate matter (PM_{10}) and ($PM_{2.5}$).	Scottish Government and Department for Environment Food and Rural Affairs	2017	Scottish Government and Department for Environment Food and Rural Affairs
IAQM Guidance on the assessment of dust from demolition and construction V1.1	Institute of Air Quality Management	2014	Holman *et al.*

In 2017, the National Atmospheric Emissions Inventory undertook a review of the emissions in Scotland for the eight priority air pollutants: ammonia (NH_3), carbon monoxide (CO), NO_x, NMVOCs, PM_{10}, $PM_{2.5}$, SO_2, lead (Pb) and dioxins (PCDD/F) and benzo(a)pyrene B[a]p. Between 1990 and 2016, there were decreases of 12% for ammonia, 64% per cent for PM_{10}, 65% for NMVOCs, 72% for nitrogen oxides (NO_x), 84% for carbon monoxide, 94% for SO_2 and 98% for lead (National Atmospheric Emissions Inventory, 2019).

The annual mean concentrations in the vicinity of the potential landfall areas for 2020 are shown in Table 6.10. The baseline concentration of total oxides of nitrogen (NO_x) is relevant for sensitive ecological receptors. The baseline annual mean NO_x concentration at the Barns Ness SSSI is 5.1 micrograms per cubic meter of air (µg/m^3). The maximum baseline annual mean concentrations within the onshore air quality study area for NO_2, PM_{10} and for $PM_{2.5}$ are 4.4 µg/m^3, 10.6 µg/m^3 and 5.6 µg/m^3 respectively. All background concentrations within the onshore air quality study area are significantly below the annual mean Air Quality Standards (AQS$_s$) of 30 µg/m^3 for NO_x, 40 µg/m^3 for NO_2, 18 µg/m^3 for PM_{10} and 10 µg/m^3, for $PM^{2.5}$ which are applicable in Scotland.

Table 6.10: Baseline NO2, PM10 and PM2.5 Concentrations in the Onshore Air Quality Study Area 2020.

Centre of 1 km x 1 km OS Grid Square		Annual Mean Concentration (µg/m^3)		
Easting	**Northing**	**NO_2**	**PM_{10}**	**$PM_{2.5}$**
373500	676500	3.5	8.5	5.1
374500	675500	3.7	8.8	5.1
375500	674500	4.4	8.9	5.2
375500	673500	3.8	10.6	5.6
376500	673500	3.3	8.3	5.0
Average		**3.7**	**9.0**	**5.2**

6.4.4 EMBEDDED MITIGATION

A bespoke CoCP will be prepared for the construction phase of the Proposed Development. This will be customised depending on the choice of landfall and will include:

- detailed project description with figures illustrating location of proposed construction and operational activities, and main ports used for vessels to and from the offshore construction site;
- all legislative requirements;
- proposed programme of work;
- summary of Environmental Management Procedures including roles and responsibilities, sub-contractors and evidence of training, awareness and competence of on-site personnel;
- procedures for communication; and
- details of environmental management plans, including an air quality management plan to minimise the generation and potential impacts of dust emissions on receptors relevant for human health, amenity and ecology.

The dust and air quality management plan within the CoCP will include best practice measures in accordance with the Institute of Air Quality Management (IAQM) recommended guidance (Scottish Government and Defra, 2017; IAQM, 2018), proportionate to the potential impacts which notes that, even close to well-managed mineral extraction sites in the UK, impacts from release of dust on habitats, if they occur at all, are rare. If effects are rare close to large-scale, long-term mineral extraction sites then impacts from smaller-scale, well-managed temporary construction, operation and decommissioning activity can be concluded to be negligible.

6.4.5 POTENTIAL PROPOSED DEVELOPMENT IMPACTS

Atmospheric emissions from Proposed Development may arise from the combustion of fuel used to power both vessels and helicopters used in the construction, operation and maintenance, and decommissioning of the offshore wind farm. The pollutants from vessels and helicopters include sulphur dioxide (SO_2) and carbon dioxide (CO_2), oxides of nitrogen (NO_X) which represents the sum of nitrogen dioxide (NO_2) and nitrogen oxide (NO), and particulate matter (PM_{10} and $PM_{2.5}$).

Based on the baseline characterisation outlined in section 6.4.3.3 and the project description outlined in chapter 3, all potential offshore air quality impacts are proposed to be scoped out of further assessment. These impacts are outlined, together with a justification for scoping them out, in Table 6.11.

6.4.6 POTENTIAL CUMULATIVE EFFECTS

Although there are several other offshore wind farm projects in development (including Neart na Gaoithe, Inch Cape and Seagreen Alpha and Bravo) in the wider areas of the Proposed Development, all have been scoped out assessment of air quality from their Environmental Statements due to lack of receptor-impact pathway.

6.4.7 POTENTIAL TRANSBOUNDARY IMPACTS

A screening of transboundary impacts has been carried out and is presented in Annex C. This screening exercise identified that there is no potential for transboundary impacts with regard to air quality noise as the predicted impacts will largely be focused within the footprint of the Proposed Development.

6.4.8 SCOPING QUESTIONS TO CONSULTEES

- Do you agree that the assessment of air quality receptors should be scoped out of the Proposed Development EIA?
- Do you agree that further assessment of air quality impacts on onshore receptors can be scoped out of the offshore EIA?

Table 6.11: Impacts Proposed to be Scoped Out of the Proposed Development Assessment for Air Quality.

Impact	Justification
Construction	
Atmospheric emissions from vessel and helicopter movements.	Atmospheric emissions from the Proposed Development are likely to arise from fuel used to power vessels and helicopters used during the construction phase. Taking into account the dispersive nature of the offshore environment, the distance of Proposed Development from static sources of potential pollutants and the relatively small potential contribution to emissions when compared with the total vessel and helicopter movements in the northern North Sea, it is considered highly unlikely that concentrations of potential atmospheric pollutants will be at levels of environmental concern within Proposed Development. Therefore, the Applicant intends to scope this impact out of further consideration within the EIA, subject to consultation with the relevant stakeholders.
The generation of dust and particulates at the selected landfall site (e.g. from earth moving, directional drilling, open cut trenches)) have the potential to have an adverse (smothering) impact on ecological receptors	The only designated ecological receptor within 50 m of potential landfall construction activities is the Barns Ness SSSI. The SSSI is designated for saltmarsh, sand dunes and shingle. It is considered unlikely that areas of these habitats below MHWS where landfall connections could occur will be sensitive to dust deposition. The area of potential landfall construction activity within 50 m of the SSSI is small and the proposed construction methods are unlikely to generate significant amounts of airborne dust. In accordance with the IAQM guidance, the low sensitivity, and low magnitude of impact is likely to result in a low risk of impacts associated with dust generation. It is considered that the best-practice measures included in the dust and air quality management plan within the CoCP will provide the necessary prevention and mitigation of potential impacts such that the effects will be negligible. It is therefore proposed that further assessment of dust impacts on onshore ecological receptors due to construction in the intertidal area (seaward of MHWS) is scoped out of the Offshore EIA Report.
The generation of dust and particulates at the selected landfall site have the potential to affect human health and cause nuisance as a result of dust soiling of surfaces at residential properties	All residential properties are considered to have a high sensitivity to dust deposition. The number of residential properties within 350 m of the proposed landfall options is less than 10, resulting in an overall low sensitivity. In accordance with the IAQM guidance the low sensitivity and low magnitude of dust emissions during the offshore construction phase is likely to result in a negligible risk of dust soiling impacts as a result of dust generation. The annual mean PM_{10} concentration at any onshore receptor is significantly below the IAQM guidance threshold for Scotland of 14 µg/m^3. With less than 10 properties within 350 m of landfall options, the overall sensitivity to human health impacts considered to be low. The low sensitivity with the low magnitude of dust emissions during the offshore construction phase results in a negligible risk of dust impacts on human health. It is therefore proposed that further assessment of dust soiling impacts on human health at residential receptors due to construction in the intertidal area (seaward of MHWS) is scoped out of the Offshore EIA Report.
Exhaust emissions from offshore vessels used in the construction phase having the potential to increase local ambient concentrations of	The specific port locations where vessels will travel to and from to support the offshore construction has not yet been identified, however it is likely to be an established commercial/industrial port in the on the east coast of Scotland. Engine exhausts from offshore vessels associated with the construction, operation and maintenance, and decommissioning phases would contribute, at a small scale, to atmospheric emissions from existing shipping traffic in the area. It is considered that associated

Impact	Justification
Sulphur Dioxide (SO_2), NO_2, PM_{10} and $PM_{2.5}$ and impact human health	atmospheric emissions of infrequent vessel movements associated with the Proposed Development would be negligible in comparison to the total shipping activity in the area. Marine exhaust emissions are limited in line with the provisions of MARPOL Annex VI (MARPOL, 2016) and the recent decision taken by the International Maritime Organisation (IMO) to implement a global sulphur limit on vessel fuel of 0.50% percent by mass (m/m or mass/mass) by 2020 (IMO, 2016). The potential effects of increased emissions on onshore receptors is therefore considered to be negligible. It is therefore proposed that further assessment of the effects of emissions from offshore vessels during the construction phase on onshore receptors is scoped out of the Offshore EIA Report.
Operation and Maintenance	
Atmospheric emissions from vessel and helicopter movements.	As described for construction.
The generation of dust and particulates at the selected landfall site (e.g. from earth moving, directional drilling, open cut trenches)) have the potential to have an adverse (smothering) impact on ecological receptors	The generation of dust and particulates will not be an impact pathway during the operation of the Proposed Development. If works are required which may cause the generation of dust or particulates, these will be at levels which are significantly lower than the construction phase. It is therefore proposed that further assessment of dust impacts on onshore ecological receptors due to operation and maintenance in the intertidal area (below MHWS) is scoped out of the Offshore EIA Report.
The generation of dust and particulates at the selected landfall site have the potential to affect human health and cause a nuisance as a result of dust soiling of surfaces at residential properties	The generation of dust and particulates will not be an impact pathway during the operation of the Proposed Development. If works are required which may cause the generation of dust or particulates, these will be at levels which are significantly lower than the construction phase. It is therefore proposed that further assessment of dust soiling impacts on human health at residential receptors due to operation and maintenance in the intertidal area (below MHWS) is scoped out of the Offshore EIA Report.

Impact	Justification
Exhaust emissions from offshore vessels used in the construction phase have the potential to increase local ambient concentrations of Sulphur Dioxide (SO_2), NO_2, PM_{10} and $PM_{2.5}$ and impact human health	The potential impacts on onshore air quality from operation and maintenance activities associated with the Proposed Development will be limited to potential effects from emissions due to a small increase in vessel movements, are considered to be negligible. It is therefore proposed that further assessment of the effects of emissions from offshore vessels during the operation and maintenance phase on onshore receptors is scoped out of the Offshore EIA Report.
Decommissioning	
Atmospheric emissions from vessel and helicopter movements.	As described for construction.
The generation of dust and particulates at the selected landfall site (e.g. from earth moving, directional drilling, open cut trenches)) have the potential to have an adverse (smothering) impact on ecological receptors	It is recognised that industry best practice and legislation change over time and it is therefore not possible to confirm a decommissioning strategy at this time. It is likely that the subsea cabling equipment would be reused or recycled and there could therefore be decommissioning activity at the landfall site. A decommissioning plan will be developed and agreed with the regulator prior to commencement of decommissioning works. It is anticipated that the potential decommissioning impacts and mitigation would be similar in scale and nature to those of the construction phase.
The generation of dust and particulates at the selected landfall site have the potential to affect human health and cause a nuisance as a result of dust soiling of surfaces at residential properties	It is recognised that industry best practice and legislation change over time and it is therefore not possible to confirm a decommissioning strategy at this time. It is likely that the subsea cabling equipment would be reused or recycled and there could therefore be decommissioning activity at the landfall site. A decommissioning plan will be developed and agreed with the regulator prior to commencement of decommissioning works. It is anticipated that the potential decommissioning impacts and mitigation would be similar in scale and nature to those of the construction phase.

Impact	Justification
Exhaust emissions from offshore vessels used in the construction phase have the potential to increase local ambient concentrations of Sulphur Dioxide (SO_2), NO_2, PM_{10} and $PM_{2.5}$ and impact human health	The potential impacts on onshore air quality from decommissioning activities associated with the Proposed Development will be similar to those identified during the construction phase, which were considered to be negligible. It is therefore proposed that further assessment of the effects of emissions from offshore vessels during the decommissioning phase on onshore receptors is scoped out of the Offshore EIA Report.

7 OFFSHORE BIOLOGICAL ENVIRONMENT

7.1 BENTHIC ECOLOGY

7.1.1 INTRODUCTION

This section of the Offshore Scoping Report identifies the elements of the benthic subtidal and intertidal ecology resources of relevance to the Proposed Development and considers the potential impacts from the construction, operation and maintenance, and decommissioning of the offshore and intertidal components (seaward of the MHWS mark) of the Proposed Development on benthic subtidal and intertidal ecology.

7.1.2 STUDY AREA

To support the development of the benthic subtidal and intertidal ecology EIA chapter, two study areas are defined:

- Proposed Development benthic subtidal and intertidal ecology study area: this is defined as the area encompassing the Proposed Development (see Figure 7.1). This is the area within which site-specific benthic surveys will be undertaken, the results of which will inform the baseline characterisation and identification of benthic receptors against which potential impacts associated with the Proposed Development will be assessed; and
- regional benthic subtidal and intertidal ecology study area: this is defined as the area encompassing the northern North Sea region as defined by the UK Regional Reporting Areas (see Figure 7.1). It will be characterised by desktop data and will provide a wider context to the site-specific data collected within the Proposed Development benthic subtidal and intertidal ecology study area.

7.1.3 BASELINE ENVIRONMENT

7.1.3.1 Desktop Study

An initial desk based review of literature and data sources to support this Offshore Scoping Report has identified a number of data sources which provide coverage of the Proposed Development, and which will provide context to the site-specific benthic ecology survey data which will be collected (see section 7.1.3.2). These are summarised in Table 7.1 .

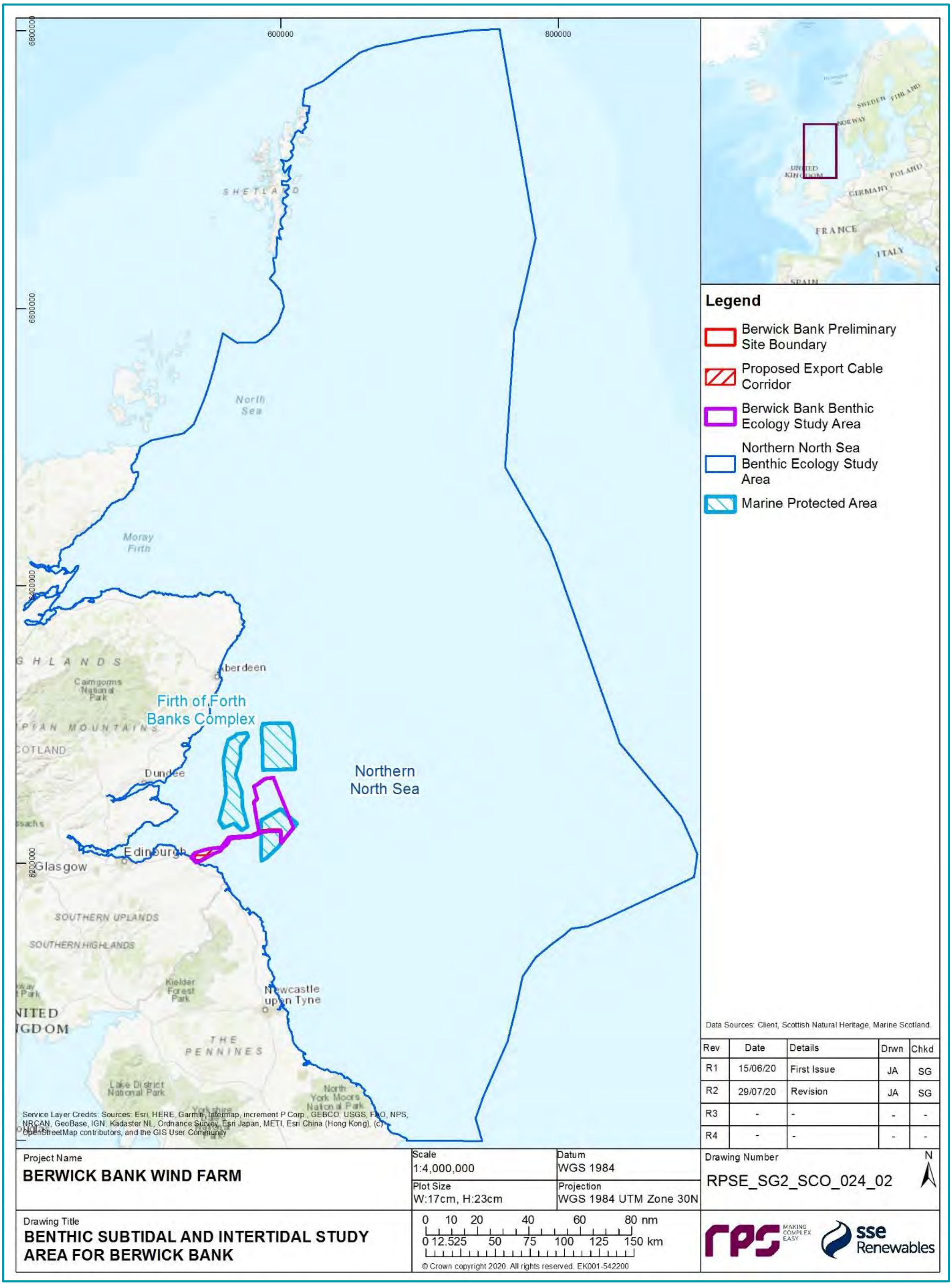


Figure 7.1: Benthic Subtidal and Intertidal Ecology Study Areas.

Table 7.1: Summary of Key Desktop Datasets and Reports.

Title	Source	Year	Author
The Marine Scotland National Marine Plan Interactive (NMPi) maps	Marine Scotland	2019	Marine Scotland for the Scottish Government
EMODnet broad-scale seabed habitat map for Europe (EUSeaMap)	EMODnet – Seabed Habitats	2014	EMODnet – Seabed Habitats
A big data approach to macrofaunal baseline assessment, monitoring and sustainable exploitation of the seabed	Centre for Environment, Fisheries and Aquaculture Science (Cefas)	2017	Cooper and Barry
Descriptions of Scottish Priority Marine Features (PMFs)	SNH	2016	SNH
Firth of Forth Banks Complex MPA: Assessment against MPA Selection Guidelines	Joint Nature Conservation Committee (JNCC)	2014	JNCC
Biotope Assignment of Grab Samples from Four Surveys Undertaken in 2011 Across Scotland's Seas (2012)	JNCC	2014	JNCC
Analysis of seabed imagery from the 2011 survey of the Firth of Forth Banks Complex, the 2011 IBTS Quarter 4 (Q4) survey and additional deep-water sites from Marine Scotland Science surveys	JNCC	2014	JNCC
Mapping habitats and biotopes from acoustic datasets to strengthen the information base of Marine Protected Areas (MPA) in Scottish waters	JNCC	2014	JNCC
Mapping habitats and biotopes from acoustic datasets to strengthen the information base of MPAs in Scottish waters – Phase 2	JNCC	2014	JNCC
Characterising Scotland's marine environment to define search locations for new MPA s. Part 2: The identification of key geodiversity areas in Scottish waters	SNH	2013	SNH
EIA baseline characterisation data for Seagreen Phase 1 (Alpha and Bravo)	Seagreen	2012	Seagreen
Barns Ness Coast Site of Special Scientific Interest (SSSI) citation	SNH	2011	SNH

Title	Source	Year	Author
The Marine Nature Conservation Review (MNCR) Area Summary for south-east Scotland and north-east England	JNCC	1998	Brazier *et al.*

7.1.3.2 Site-Specific Survey Data

Details of both planned and existing Proposed Development specific data sources are provided below:

Existing data:

- acoustic geophysical survey data covering the array area and proposed export cable corridor. Data includes high resolution side scan sonar and multibeam bathymetry. These data were collected in July - August 2019 (Fugro, 2020a and Fugro 2020b); and
- existing data: Habitat data and maps generated by the benthic baseline characterisation surveys (grab, video and epibenthic trawl surveys) for Seagreen 1 in 2011 (Seagreen, 2012a).

Planned surveys:

- benthic subtidal surveys across the Proposed Development benthic ecology study area in summer 2020; and
- intertidal surveys of the landfall locations in summer 2020.

Other reference sites will also support the development and assessment of benthic subtidal and interidal ecology in the Offshore EIA Report, such as:

- The Marine Life Information Network (MarLIN);
- Marine Environmental Data and Information Network (MEDIN);
- The National Biodiversity Network Gateway (NBN);
- Scottish Environment Protection Agency (SEPA) for sediment contaminant data; and
- SeaSearch database.

Benthic Subtidal Surveys

A benthic subtidal survey has been proposed in order to characterise the Proposed Development benthic subtidal and intertidal ecology study area, the details of which are currently being finalised in consultation with the SNCBs. It is proposed that the survey will comprise:

- combined Drop-Down Video (DDV) and 0.1 m^2 Hamon grab sampling at 100 sampling locations to ensure adequate data coverage for both infaunal and epifaunal communities at each location, with grab samples to be analysed for benthic infauna (abundance and biomass) and particle size analysis (PSA). 27 of these sampling locations will be located within the Firth of Forth Banks MPA;
- 11 DDV transects within the proposed export cable corridor targeting areas of hard substrate where grab sampling is unlikely to be successful and where there is the potential for habitats of conservation importance to be present;
- day grab samples for sediment chemistry at 10 sampling locations, of which four sampling locations will be located within the Firth of Forth Banks MPA; and

- epibenthic 2 m beam trawling at 18 sampling locations distributed across representative sediment types to characterise epifaunal communities. Six of these sampling locations will be within the Firth of Forth Banks MPA.

The proposed sampling locations are illustrated within Figure 7.2.

Intertidal Survey

Phase 1 intertidal surveys are proposed for each of the landfall locations. The surveys will be undertaken according to standard intertidal survey methodologies as outlined in the JNCC Marine Monitoring Handbook (Davies *et al*., 2001) within Procedural Guidance No. 3-1 In situ intertidal biotope recording (Wyn and Brazier, 2001; Hiscock, 2001) and The Handbook for Marine Intertidal Phase 1 Biotope Mapping Survey (Wyn *et al*., 2006). The Phase 1 walkover survey method is a standardised system of surveying and mapping littoral habitats which is designed to produce illustrative maps of biotope distribution.

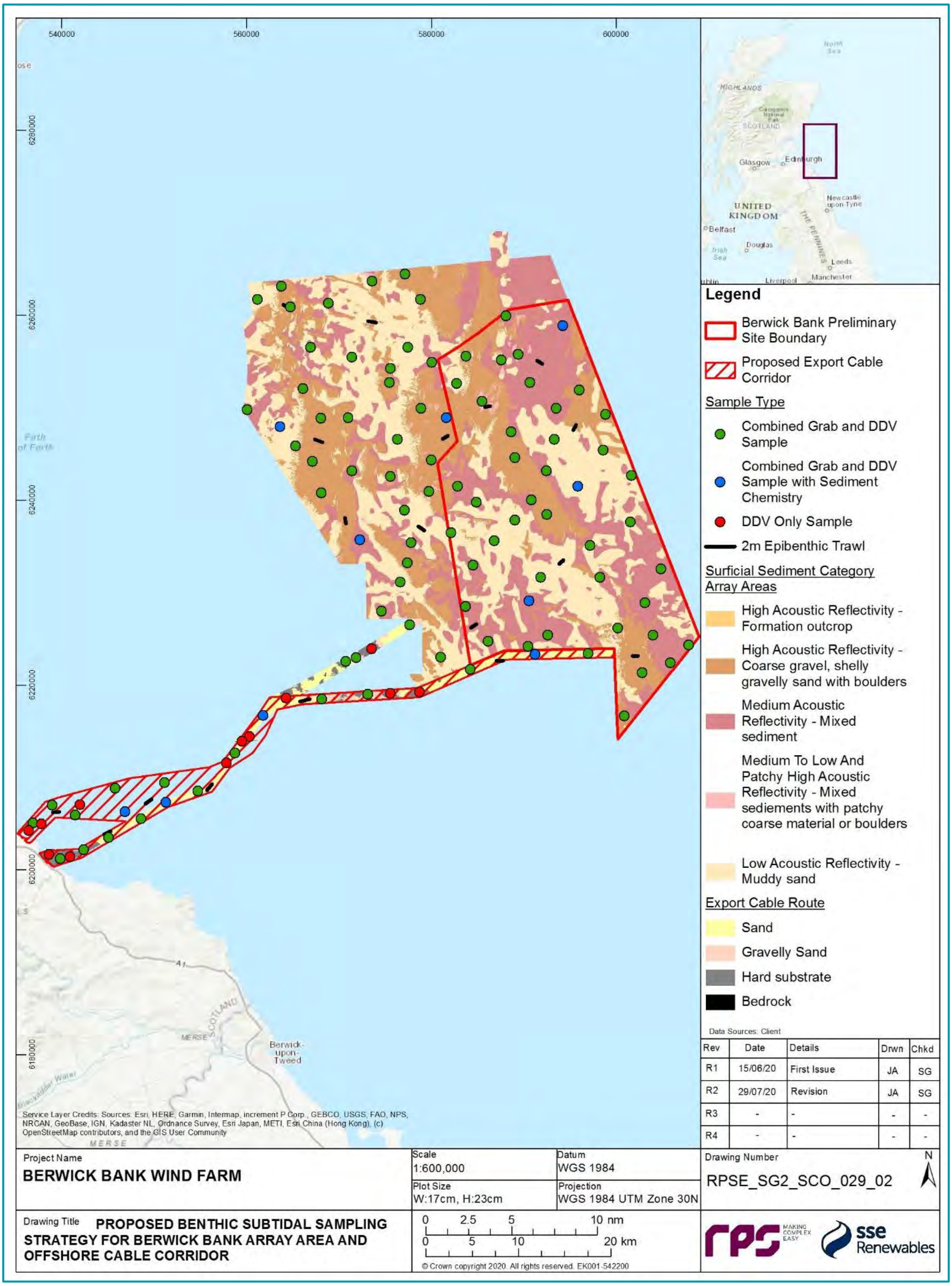


Figure 7.2: **Proposed Benthic Subtidal Sampling Strategy for the Array Area and Proposed Export Cable Corridor.**

7.1.3.3 Baseline Characterisation

Subtidal Sediments

Based on the EUSeaMap data, regions of higher topography and those associated with the Banks complexes within the array area are dominated by deep circalittoral coarse sediments whereas those in deeper water and in the flanks of the banks are dominated by deep circalittoral sands (illustrated in Figure 7.3). These two broad habitat types are also predicted across the majority of the proposed export cable corridor, with discrete areas of faunal communities on deep low energy circalittoral rock. As the proposed export cable corridors moves into shallower waters and approaches landfall, sandy sediments grade into deep circalittoral muds, deep circalittoral mixed sediments and deep circalittoral coarse sediments (Figure 7.3).

The array area overlaps with the Firth of Forth Banks Complex MPA, designated for offshore subtidal sands and gravels, shelf banks and mounds, and moraines representative of the Wee Bankie Key Geodiversity Area (JNCC, 2020a). The MPA is comprised of the large-scale morphological bank features Berwick, Scalp and Montrose Banks and the Wee Bankie, and the Proposed Development overlaps the Berwick Bank aspect of the MPA. The area is described as strongly influenced by water currents with a mosaic of different types of sand and gravels present which create a unique range of habitats (JNCC, 2020a). Although these sediments are relatively common around Scotland, the dynamic currents in the Firth of Forth Banks area influence the distribution of the sands and gravels (JNCC, 2014a). A large proportion of the Wee Bankie moraine formation is located within the Wee Bankie (including Scalp Bank) part of the MPA and is considered to be a key geodiversity area in Scotland's seas. This formation is a series of prominent (20 m high) submarine glacial ridges, composed of poorly sorted sediments (boulders, gravels, sands and clays) (JNCC, 2020a).

The surveys conducted in 2011 to support the EIA benthic baseline characterisation for Seagreen 1 (located immediately to the north of the array area) also provide an overview of the sedimentary habitats present within the immediate vicinity of the Proposed Development. The sediments present across the Seagreen Project Alpha array area ranged from cobbles with sand and gravelly sand in the west, to sandy gravel in the east. There was a greater predominance of fine sediments recorded across the Seagreen Project Bravo array compared with Seagreen Project Alpha array area, with sediments ranging from slightly gravelly sand in the west, sandy gravel in the central section and gravelly sand in the east of the Seagreen Bravo offshore wind farm (Seagreen, 2012a).

In 2019, a site-specific geophysical survey campaign was conducted across the Proposed Development (Fugro, 2020a and Fugro 2020b). The SSS data collected has been correlated to the European University Information Systems (EUNIS) Classification data available from EMODnet, as illustrated within Figure 7.4. The data indicates a heterogenous sediment across the array area with coarse and cobbly sediments on topographic highs, and sand to gravelly sand in the topographic lows and in the flanks of the banks. There are also extensive boulder fields present across the broad topographic highs and the banks. Hard substrates are present in the nearshore area of the proposed export cable corridor for the Thortonloch landfall, with sand sediments in the central section grading into more gravelly sands and areas of hard substrate.

This geophysical data also show that the majority of the seabed is 'featureless', however the southern and north-western extent of the array area are dominated by megaripples, sandwaves, ribbons and bars. Boulders are also prevalent across the area and are either represented as isolated boulders or as clusters (Figure 7.5).

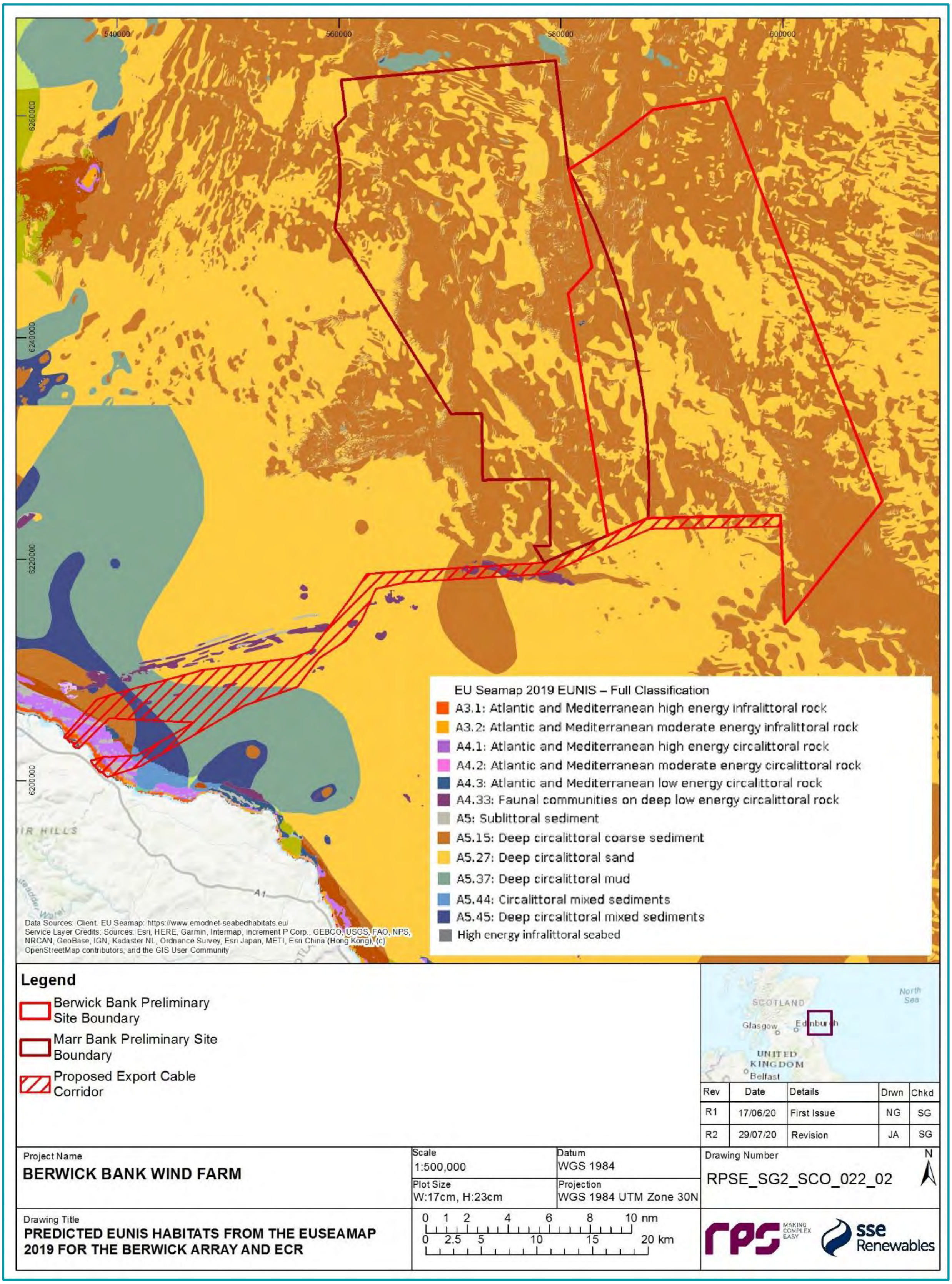


Figure 7.3: Predicted EUNIS Habitats from the EUSeaMap for the Array Area and Proposed Export Cable Corridor (Source: EMODnet, 2014).

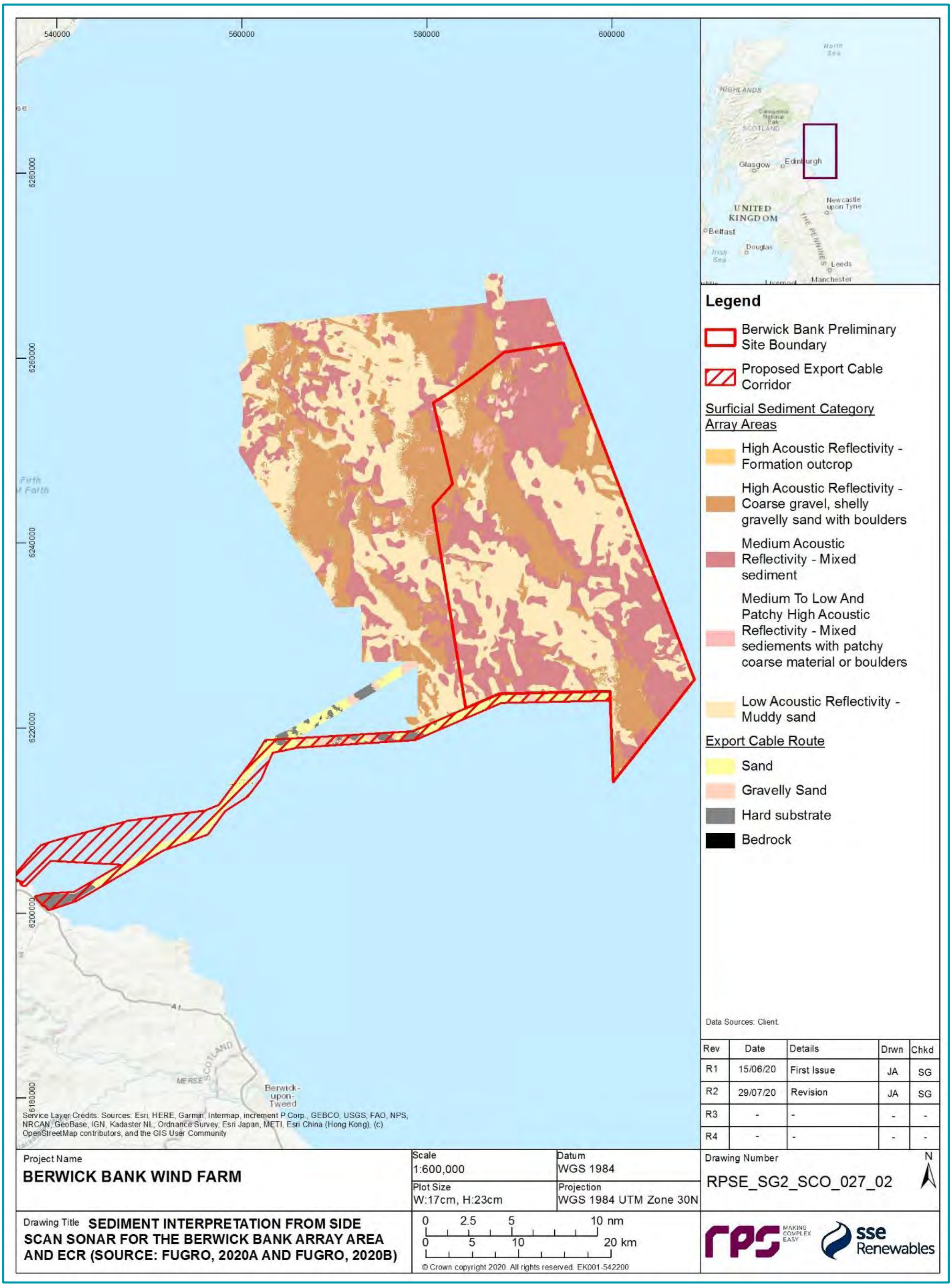
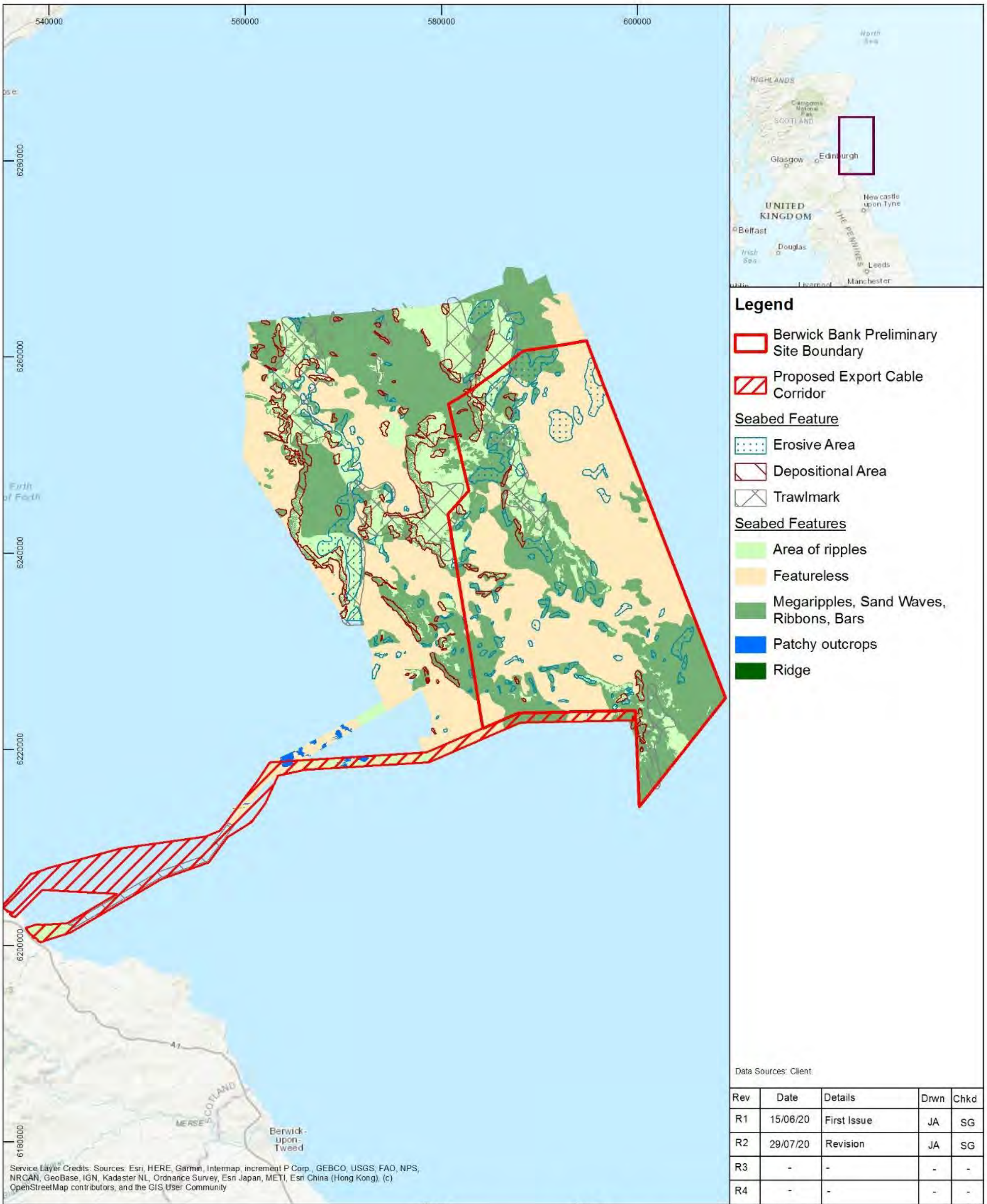


Figure 7.4: Sediment Interpretation from Side Scan Sonar for the Array Area and Proposed Export Cable Corridor (Source: Fugro, 2020a and Fugro 2020b).



Rev	Date	Details	Drwn	Chkd
R1	15/06/20	First Issue	JA	SG
R2	29/07/20	Revision	JA	SG
R3	-	-	-	-
R4	-	-	-	-

Project Name BERWICK BANK WIND FARM	Scale 1:600,000 Plot Size W:17cm, H:23cm	Datum WGS 1984 Projection WGS 1984 UTM Zone 30N	Drawing Number RPSE_SG2_SCO_026_02
Drawing Title SEABED FEATURES DATA FOR BERWICK BANK ARRAY AREA AND OFFSHORE CABLE CORRIDOR OPTIONS (SOURCE: FUGRO, 2020A AND FUGRO, 2020B)	0 2.5 5 10 nm 0 5 10 20 km © Crown copyright 2020. All rights reserved. EK001-542200		

Figure 7.5: Seabed Features Data for Array Area and Proposed Export Cable Corridor (Source: Fugro, 2020a and Fugro 2020b).

Subtidal Benthic Communities

The marine ecology surveys conducted for Seagreen 1 found that the benthic habitats were characterised by patchy communities of polychaete worms and shellfish (Seagreen, 2012a). The benthic communities identified for each site are described in Table 7.2.

The distribution of the epifauna from these surveys was related to the sediment type with the sandy gravels and gravelly sands supporting a rich epifauna, while the slightly gravelly sands were generally low in epifauna. The majority of species recorded were opportunistic species, with bryozoans / hydroid turfs, tube worm *Hydroides norvegica*, pea urchin *Echinocyamus pusillus* and sea squirt *Ascidiella scabra.* High species richness was recorded in association with areas of the *Sabellaria* habitat, although no evidence from the DDV surveys suggests extensive or well-developed aggregations of *Sabellaria* in the Seagreen 1 array area. The benthic communities present were considered typical of the outer Firth of Forth and northwest North Sea (Seagreen, 2012a).

Table 7.2: Benthic Ecology Community Overview from Seagreen Project Alpha and Seagreen Project Bravo Survey Data (Seagreen, 2012a).

Project	Community Overview
Seagreen Project Alpha	• Western area: '*Sabellaria*', 'sparse polychaetes and bivalves' and 'faunal turf'; • Central and eastern areas: dominated by the sabellid polychaete classes 'dense *Chone*' and 'sparse *Chone*'.
Seagreen Project Beta	• Western area: '*Sabellaria*', 'rich polychaetes and bivalves' and 'epifauna with polychaetes'; • Eastern area: 'dense *Chone*' and 'rich polychaetes'

As discussed in the previous sub-section 'Subtidal Sediments', the array area overlaps with the Firth of Forth Banks Complex MPA. The MPA is described as strongly influenced by water currents with a mosaic of different types of sand and gravels present which create a unique range of habitats and species such as the common brittlestar *Ophiothrix fragilis*, soft coral Dead man's fingers *Alcyonium digitatum*, hornwrack (colonial bryozoan) *Flustra foliacea* and ocean quahog *Arctica islandica* (JNCC, 2020).

Still image survey data collected to support the designation of the MPA around Berwick Bank (the area of the MPA which the Proposed Development overlaps) indicate the presence of the SS.SMx.CMx.FluHyd (*Flustra foliacea* and *Hydrallmania falcata* on tide-swept circalittoral mixed sediment) biotope to the east and north of the area, with areas of circalittoral mixed sediments and circalittoral muddy sand (JNCC, 2014b). However, the infaunal communities recorded from grab samples in the Berwick Bank area of the MPA did not fit within the standard Marine Habitat Classification of Britain & Ireland and were allocated new biotope proposals (Pearce *et al.*, 2014):

- SS.SSa.OSa.[Sbom] - *Spiophanes bombyx* aggregations in offshore sands.

This proposed biotope falls under the EUNIS Level 4 habitats offshore coarse (JNCC, 2014b).

The biotopes identified around the Wee Bankie area (including Scalp Bank) and Montrose Bank also indicated the presence of SS.SMx.CMx.FluHyd (*Flustra foliacea* and *Hydrallmania falcata* on tide-swept circalittoral mixed sediment). The infaunal communities sampled at these two areas of the MPA also did not fit within the standard Marine Habitat Classification of Britain and Ireland and were allocated new biotope proposals (Pearce *et al.*, 2014):

Wee Bankie:

- SS.SSa.OSa.[Sbom] - *Spiophanes bombyx* aggregations in offshore sands; and
- SS.SMx.OMx.[PoGintBy] - Polychaete-rich Galathea community with encrusting bryozoans and other epifauna on offshore circalittoral mixed sediment.

Montrose Bank:

- SS.SCS.OCS.[PoGintBy] - Polychaete-rich Galathea community with encrusting bryozoans and other epifauna on offshore coarse sediment;
- SS.SCS.OCS.[Sbom] - *Spiophanes bombyx* aggregations in offshore coarse sands;
- SS.SSa.OSa.[Sbom] - *Spiophanes bombyx* aggregations in offshore sands; and
- SS.SMx.OMx.[PoGintBy] - Polychaete-rich Galathea community with encrusting bryozoans and other epifauna on offshore circalittoral mixed sediment.

As part of the Regional Seabed Monitoring Programme (RSMP), Cooper and Barry (2017) describe the results of a baseline assessment of the UK's macrobenthic infauna. Although the aggregates industry was the focus of the study, a "big data" approach was taken which collated data from across UK waters, including in proximity to the Proposed Development (see Figure 7.6), from various industries including offshore wind farms, oil and gas, nuclear and port and harbour sectors.

Data points coinciding with array area were predominantly characterised by slightly muddy sands with a small gravel component, and associated benthic infaunal communities of polychaetes (*Spionidae*, *Nephtyidae*, *Lumbrineridae*, *Oweniidae*, *Cirratulidae*, *Capitellidae* and *Ampharetidae*), echinoderms (*Amphiuridae*) and nemerteans (Cooper and Barry, 2017). There were also records of gravelly sands with a small mud fraction characterised by communities of polychaetes (*Spionidae*, *Glyceridae*, *Terebellidae*, *Capitellidae* and *Phyllodocidae*) and nemerteans. The only samples coinciding with the proposed export cable corridor are located in the inshore part of Skateraw Landfall and correlate with slightly gravelly slightly muddy sand and species rich communities of polychaetes (*Spionidae*, *Nephtyidae*, *Capitellidae*, *Cirratulidae*, *Oweniidae* and *Pholoidae*), bivalve molluscs (*Montacutidae*, *Semelidae* and *Nuculidae*) and nemerteans (Cooper and Barry, 2017).

The baseline benthic communities within the Proposed Development benthic subtidal and intertidal ecology study area will be described in depth following the completion of site-specific surveys, and the results of these surveys will be presented within a Benthic Subtidal and Intertidal Ecology Technical Report.

Intertidal Ecology

The proposed landfall locations are located at Thortonloch and Skateraw near to Torness, on the East Lothian coast. The EUNIS medium-scale habitat maps on EMODnet and the MNCR data both indicate that the communities which dominate the lower intertidal area at both potential landfall survey areas are characterised by the following biotopes:

- barnacles and *Patella* spp. on exposed or moderately exposed, or vertical sheltered, eulittoral rock (BPat);
- *Fucus vesiculosus* and barnacle mosaics on moderately exposed mid eulittoral rock (FVesB); and
- *Laminaria digitata* on moderately exposed sublittoral fringe bedrock (Ldig.Ldig).

The baseline intertidal communities relating to the landfall area will be described in depth following the completion of site-specific intertidal surveys, and the results of these surveys will be presented within a Benthic Subtidal and Intertidal Ecology Technical Report.

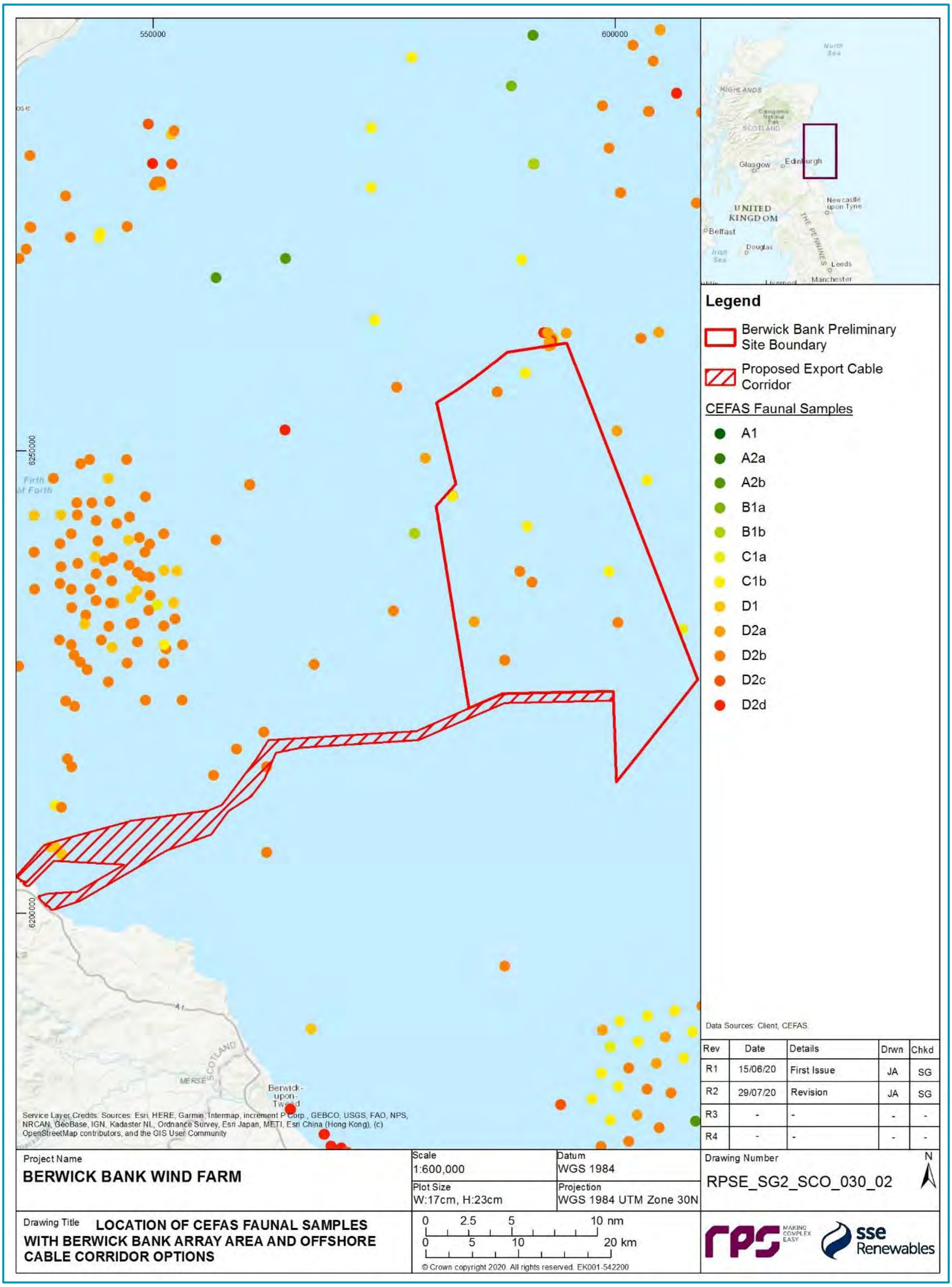


Figure 7.6: Location of Faunal Samples from Cooper and Barry (2017) within the Array Area and Proposed Export Cable Corridor.

Designated Sites

A number of sites of nature conservation importance, which are designated for benthic subtidal and/or intertidal features, have been identified as overlapping with, or occurring in close proximity to, the Proposed Development. These are listed in Table 7.3 and provide an early indication of designated sites which will be considered within the EIA and HRA. This list will be refined in the EIA to also include sites that fall within the potential ZOI of the Proposed Development, which will be determined as part of the EIA process.

A full screening of Natura 2000 sites with qualifying benthic interest features will be undertaken in the LSE Screening Report for the Proposed Development. Relevant Annex I habitats of Natura 2000 sites screened into the benthic subtidal and intertidal ecology assessment will be fully considered and assessed in the benthic subtidal and intertidal ecology Offshore EIA Report chapter, with the assessment on the Natura 2000 site itself deferred to the Report to Inform Appropriate Assessment (RIAA).

The screening to be undertaken in the benthic subtidal and intertidal ecology Offshore EIA Report chapter will also include national designations (i.e. SSSIs, MPAs and Marine Conservation Zones (MCZs)). Nationally designated sites and the relevant qualifying benthic features screened into the assessment will also be fully considered and assessed in the benthic subtidal and intertidal ecology Offshore EIA Report chapter.

Table 7.3: Summary of Designated Sites with Relevant Benthic Ecology Features in Proximity to the Proposed Development.

Designated Site	Distance to the Proposed Development (km)	Features
Firth of Forth Banks Complex MPA	0.0	• Ocean quahog (*Arctica islandica*); • Offshore subtidal sands and gravels; • Shelf Banks and Mounds; and • Moraines representative of the Wee Bankie Key Geodiversity Area.
Barns Ness Coast SSSI	0.0	• Lower Carboniferous [Dinantian-Namurian (part)]; • Saltmarsh; • Shingle; and • Sand dune.
Pease Bay Coast SSSI	0.2	• Maritime cliff.
Berwickshire and North Northumberland Coast Special Area of Conservation (SAC)	3.0	• Mudflats and sandflats not covered by seawater at low tide (1140); • Large shallow inlets and bays (1160); • Reefs (1170); and • Submerged or partially submerged sea caves (8330).

7.1.4 PROPOSED APPROACH TO THE ENVIRONMENTAL IMPACT ASSESSMENT

The benthic subtidal and intertidal ecology EIA will follow the methodology set out in chapter 5. Specific to the benthic subtidal and intertidal ecology Offshore EIA Report chapter, the following guidance documents will also be considered:

- Guidelines for EcIA in the UK and Ireland. Terrestrial, Freshwater and Coastal (CIEEM, 2019);
- Guidance on Environmental Considerations for Offshore Wind Farm Development (OSPAR, 2008);
- Best methods for identifying and evaluating *Sabellaria spinulosa* and cobble reef (Limpenny *et al*., 2010);
- Defining and Managing *Sabellaria spinulosa* Reefs (Gubbay, 2007);
- Identification of the Main Characteristics of Stony Reef Habitats under the Habitats Directive (Irving, 2009);
- SNH guidance: Guidance on Survey and Monitoring in Relation to Marine Renewables Deployments in Scotland – Volume 5: Benthic Habitats (SNH, 2011); and
- Guidelines for data acquisition to support marine environmental assessments of offshore renewable energy projects (Judd, 2012).

In addition, and specific to marine ecology topics, important ecological features (IEFs) will be identified and assessments will be presented for appropriate ecological receptor groups in the baseline characterisation of each relevant technical chapter. Criteria defining the value of each IEF will be defined to reflect topic-specific interests.

7.1.5 EMBEDDED MITIGATION

Measures likely adopted as part of the Proposed Development will include:

- the development of, and adherence to, an appropriate CoCP;
- the development of, and adherence to, an Environmental Management Plan, including Marine Pollution Contingency Plan and Invasive Non-Indigenous Species (INIS) Management Plan; and
- development of, and adherence to, a Decommissioning Plan.

The requirement and feasibility of additional measures will be dependent on the significance of the effects on benthic subtidal and intertidal ecology and will be consulted upon with statutory consultees throughout the EIA process.

7.1.6 POTENTIAL PROPOSED DEVELOPMENT IMPACTS

A range of potential impacts on benthic subtidal and intertidal ecology receptors have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of the Proposed Development. The impacts that have been scoped into the Proposed Development assessment are outlined in Table 7.4 together with a description of any additional data collection (e.g. site-specific surveys) and/or supporting analyses (e.g. modelling) that will be required to enable a full assessment of the impacts.

On the basis of the baseline benthic subtidal and intertidal ecology information currently available and the Proposed Development description outlined in chapter 3, a number of impacts are proposed to be scoped out of the assessment for benthic subtidal and intertidal ecology. These impacts are outlined, together with a justification for scoping them out, in Table 7.5.

Table 7.4: Impacts Proposed to be Scoped into the Proposed Development Assessment for Benthic Subtidal and Intertidal Ecology.

Impact	Embedded Mitigation	Justification	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Proposed Approach for the Undertaking of Proposed Development Specific Modelling to Inform the Assessment of Potential Impacts
Construction				
Temporary habitat loss / disturbance	Not Applicable (N/A)	There is potential for temporary, direct habitat loss and disturbance as a result of site preparation activities in advance of installation activities, cable installation activities (including pre-cabling seabed clearance and anchor placements), and placement of spud-can legs from jack-up operations.	Benthic subtidal and intertidal surveys are planned to collect site-specific data in order to characterisation the baseline of the benthic subtidal and intertidal ecology study area. Details of the scope of these surveys are presented in section 7.1.3.2.	No specific modelling is required to inform this impact assessment.
Increased suspended sediment concentrations and associated deposition	N/A	Sediment disturbance arising from construction activities (e.g. foundation and cable installation, and seabed preparation works) may result in indirect impacts on benthic communities as a result of temporary increases in SSCs and associated sediment deposition (i.e. smothering effects). Changes in SSCs can impact benthic receptors through water clarity due to change in suspended solids, and light due to smothering and siltation rate changes.	As per above.	The outputs of numerical modelling undertaken for the physical processes assessment will inform this impact assessment. Further details of this modelling are presented within section 6.1.

Impact	Embedded Mitigation	Justification	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Proposed Approach for the Undertaking of Proposed Development Specific Modelling to Inform the Assessment of Potential Impacts
Operation and Maintenance				
Long-term subtidal habitat loss	N/A	There is the potential for long-term habitat loss to occur directly under all foundation structures and associated scour protection, and under any cable protection required along the inter-array and offshore export cables.	As per temporary habitat loss / disturbance during construction phase.	No specific modelling is required to inform this impact assessment.
Temporary subtidal habitat loss / disturbance	N/A	Temporary habitat loss/disturbance may occur during the operational and maintenance phase as a result of maintenance operations (e.g. cable repair/reburial, use of jack-up vessels to facilitate wind turbine component repairs etc.). The impacts associated with these operations are likely to be similar in nature to those associated with the construction phase although of reduced magnitude.	As per temporary habitat loss / disturbance during construction phase.	No specific modelling is required to inform this impact assessment.
Colonisation of hard structures	Designed-in measures including an INIS Management Plan, which will include measures to ensure that the risk of potential introduction and spread of INIS are minimised.	Artificial structures placed on the seabed (i.e. foundations and scour/cable protection) in the offshore environment are expected to be colonised by a range of marine organisms leading to localised increases in biodiversity. These structures may also facilitate the spread of marine invasive and non-native species.	As per temporary habitat loss / disturbance during construction phase.	No specific modelling is required to inform this impact assessment.

Impact	Embedded Mitigation	Justification	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Proposed Approach for the Undertaking of Proposed Development Specific Modelling to Inform the Assessment of Potential Impacts
Changes in physical processes	N/A	The presence of foundation structures, associated scour protection and cable protection may introduce localised changes to the tidal flow and wave climate, resulting in potential changes to the sediment transport pathways and associated effects on benthic ecology.	As per temporary habitat loss / disturbance during construction phase.	The outputs of numerical modelling undertaken for physical processes will inform this impact assessment. Further details of this modelling are presented within section 6.1.
Decommissioning				
Temporary habitat loss / disturbance	N/A	There is potential for temporary, direct habitat loss and disturbance due to operations to remove array and export cables, and jack-up operations to remove foundations, resulting in potential effects on benthic ecology.	As per temporary habitat loss / disturbance during construction phase.	No specific modelling is required to inform this impact assessment.
Increased suspended sediment concentrations and associated deposition	N/A	Sediment disturbance arising from decommissioning activities (e.g. cable and foundation removal) may result in adverse and indirect impacts on benthic communities as a result of temporary increases in SSCs and associated sediment deposition.	As per temporary habitat loss / disturbance during construction phase.	The outputs of numerical modelling undertaken for physical processes will inform this impact assessment. Further details of this modelling are presented within section 6.1.
Removal of hard substrates	N/A	The removal of foundations and any scour/cable protection during decommissioning has the potential to lead to loss of species/habitats colonising these structures.	As per temporary habitat loss / disturbance during construction phase.	No specific modelling is required to inform this impact assessment.

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Table 7.5: Impacts Proposed to be Scoped Out of the Proposed Development Assessment for Benthic Subtidal and Intertidal Ecology.

Impact	Justification
Construction / Operation and Maintenance / Decommissioning	
Accidental pollution during construction, operation and maintenance and decommissioning	There is a risk of pollution being accidentally released during the construction, operational and maintenance and decommissioning phases from sources including vessels/vehicles and equipment/machinery. However, the risk of such events is managed by the implementation of measures set out in standard post consent plans (e.g. Environmental Management Plans, including Marine Pollution Contingency Plans). These plans include planning for accidental spills, address all potential contaminant releases and include key emergency contact details. It will also set out industry good practice and OSPAR (Oslo-Paris), IMO and MARPOL (International Convention for the Prevention of Pollution from Ships) guidelines for preventing pollution at sea. Therefore, the likelihood of an accidental spill occurring is very low and in the unlikely event that such events occur, the magnitude of these will be minimised through measures such as marine pollution contingency planning. As such, it is intended that this impact is scoped out of further consideration within the Benthic Subtidal and Intertidal Ecology Offshore EIA Report chapter.
Impacts from release of sediment bound contaminants	Seabed disturbance associated with construction, maintenance and decommissioning activities (e.g. foundation and cable installation) could lead to the remobilisation of sediment-bound contaminants that may result in harmful and adverse effects on benthic communities. Due to the limited historic oil and gas activities in the vicinity of the Proposed Development, the nature of the sediments present (i.e. low levels of fines) and the large distance from shore which suggests a limited input from terrestrial sources, the risk of sediment bound contaminants being present in concentrations likely to be harmful to benthic receptors is considered to be low. Site specific sediment chemistry sampling will, however, be undertaken across the array area and export cable corridor during subtidal sampling to provide evidence in support of this proposal and, subject to consultation with the SNCBs, it is intended that this impact is scoped out of further consideration within the Benthic Subtidal and Intertidal Ecology Offshore EIA Report chapter.

7.1.7 POTENTIAL CUMULATIVE EFFECTS

Although the predicted effects from the Proposed Development on benthic subtidal and intertidal ecology are considered to be localised to within the footprint of the project , there is potential for the predicted impacts to interact with impacts from other projects and activities in the regional benthic subtidal and intertidal ecology study area and lead to a cumulative effect on receptors. To ensure cumulative effects are appropriately assessed, the maximum adverse scenarios for each of the projects or activities across all phases of the Proposed Development will be considered.

An overview of the projects or activities which will be considered for cumulative effects include:

- other offshore wind farms and associated cabling and infrastructure;
- oil and gas infrastructure/development (cables and pipelines);
- other forms of cabling (i.e. telecommunications and interlinks);
- commercial fishing activity;
- beach replenishment schemes;
- navigation and shipping; and
- aggregate extraction and disposal of dredging spoil.

An overview of the methodology relating to the cumulative effect assessment is presented within section 5.3.7.

7.1.8 POTENTIAL TRANSBOUNDARY IMPACTS

A screening of transboundary impacts has been carried out and is presented in Annex C. This screening exercise identified that there is no potential for transboundary impacts with regard to benthic subtidal and intertidal ecology, as the predicted impacts on the benthic and epibenthic communities will largely be focused within the footprint of the Proposed Development.

The potential for the Proposed Development to impact benthic subtidal and intertidal features of nature conservation designations outside of the UK European Economic Zone (EEZ) will be considered within the HRA process, including the interaction between physical processes and benthic ecology.

7.1.9 SCOPING QUESTIONS TO CONSULTEES

- Do you agree with the study areas defined for benthic subtidal and intertidal ecology?
- Do you agree that the proposed site-specific surveys, together with the existing desktop data sets identified, are sufficient to adequately characterise the benthic subtidal and intertidal baseline for the Proposed Development?
- Do you agree that all potential impacts (Table 7.4) have been identified for benthic subtidal and intertidal ecology?
- Do you agree that the impacts described in Table 7.5 can be scoped out of the benthic subtidal and intertidal ecology EIA chapter?

7.2 FISH AND SHELLFISH ECOLOGY

7.2.1 INTRODUCTION

This section of the Offshore Scoping Report identifies the fish and shellfish receptors of relevance to the Proposed Development and considers the potential impacts from the construction, operation and maintenance, and decommissioning of the offshore and intertidal components (seaward of the MHWS mark) of the Proposed Development.

7.2.2 STUDY AREA

Fish and shellfish are spatially and temporally variable, therefore for the purposes of the fish and shellfish ecology characterisation, two study areas are defined. These are shown in Figure 7.7 and described here:

- Proposed Development fish and shellfish study area encompasses the array area, proposed export cable corridor and intertidal zone seaward of MHWS; and
- northern North Sea fish and shellfish study area encompasses the Proposed Development fish and shellfish study area and a surrounding area defined by the boundary of the northern North Sea as defined by the biogeographic region identified as part of the Review of Marine Nature Conservation (RMNC) (2004). This is the regional study area and also encompasses waters of the Forth and Tay Scottish Marine Region (SMR). The northern North Sea fish and shellfish study area provides a wider context for the fish species and populations identified within the Proposed Development fish and shellfish study area and will inform assessments of those impacts affecting fish and shellfish receptors over a larger scale (e.g. underwater noise).

7.2.3 BASELINE ENVIRONMENT

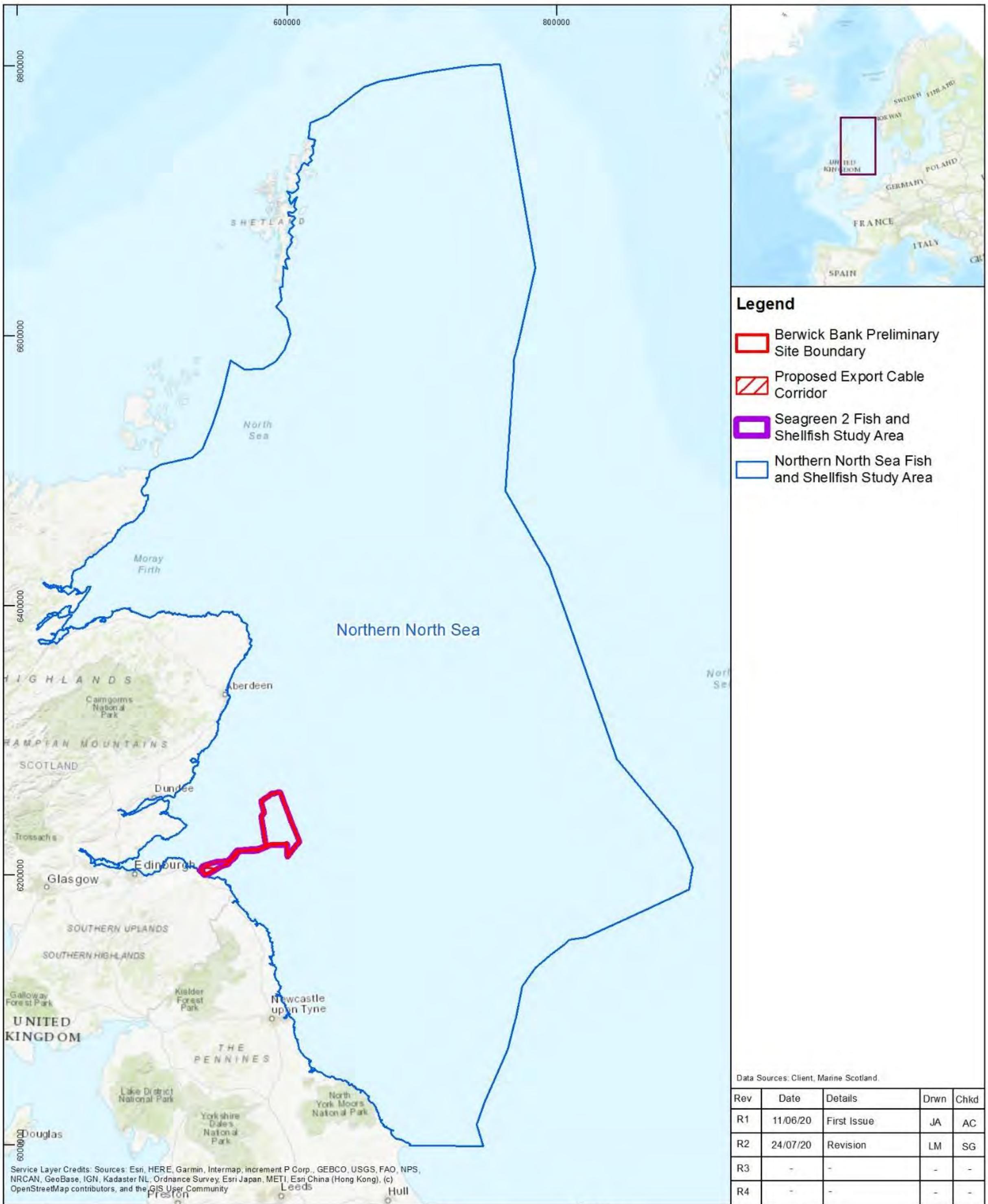
7.2.3.1 Desktop Study

An initial desk-based review of literature and data sources to support this Offshore Scoping Report has identified a number of data sources which provide coverage of the array area and proposed export cable corridor. These are summarised in Table 7.6.

7.2.3.2 Site-specific Survey Data

Given the wide-ranging and comprehensive desktop information and data sources available to characterise the fish and shellfish baseline, no further site-specific fish ecology surveys to inform the EIA for the Proposed Development are proposed. As discussed in section 7.1.37.1, however, epibenthic 2 m beam trawling at 18 sampling locations distributed across representative sediment types will be undertaken to characterise epifaunal communities and inform the benthic subtidal and intertidal ecology baseline characterisation. It is intended that the results of the epibenthic beam trawl survey, which are likely to include records of small demersal fish species present in the Proposed Development fish and shellfish study area, are used to enhance the existing data for fish and shellfish. Epibenthic sampling will be undertaken using a standard 2 m scientific beam trawl (Lowestoft design) fitted with a knotless 5 mm cod end liner.

Other various papers on fish migration are also referenced as key reports such as Newton *et al*., 2017; Gardiner *et al*., 2018, Godfrey *et al*., 2015; Malcolm *et al*., 2015; Lothian *et al*., 2017; Malcolm *et al*. 2010.



Rev	Date	Details	Drwn	Chkd
R1	11/06/20	First Issue	JA	AC
R2	24/07/20	Revision	LM	SG
R3	-	-	-	-
R4	-	-	-	-

Project Name	Scale	Datum	Drawing Number
BERWICK BANK WIND FARM	1:4,367,620.88	WGS 1984	RPSE_SG2_SCO_004_02
	Plot Size: W:17cm, H:23cm	Projection: WGS 1984 UTM Zone 30N	

Drawing Title
FISH AND SHELLFISH STUDY AREA

0 10 20 40 60 80 nm
0 12.5 25 50 75 100 125 150 175 km

Figure 7.7: Fish and Shellfish Study Areas.

Table 7.6: Summary of Key Desktop Reports for Fish and Shellfish Ecology.

Title	Source	Year	Author
Seagreen Phase 1 (Seagreen Alpha and Seagreen Bravo): Natural Fish and Shellfish Resource Environmental Statement chapter for the original project.	Chapter 12, Seagreen Environmental Statement Volume 1	2012	Seagreen
Sandeel Surveys in the East Coast	Marine Scotland	2019	Marine Scotland
Seagreen Phase 1 (Seagreen Alpha and Seagreen Bravo): Natural Fish and Shellfish Resource Environmental Statement chapter for the optimised project.	Chapter 9, Seagreen Environmental Statement Volume 1	2018	Seagreen
International Bottom Trawl Surveys	International Council for the Exploration of the Sea (ICES)	2018	Boyle and New
Scallop Stock Assessment	Marine Scotland	2018b	Marine Scotland
Neart na Gaoithe Proposed Offshore Wind Farm Fish and Shellfish Ecology	Chapter 7, *Neart na Gaoithe* EIA Fish and Shellfish Ecology	2018	GoBe Consultants Ltd.
2018 landings data by ICES rectangle.	Marine Scotland	2018	Marine Scotland
International Herring Larvae Survey	Wageningen Marine Research, IJmuiden	2015	Wageningen Marine Research, IJmuiden
Mapping the spawning and nursery grounds of selected fish for spatial planning.	Centre for Environment, Fisheries and Aquaculture Science (CEFAS)	2012	Ellis et al.
Review of migratory routes and behaviour of Atlantic salmon, sea trout and European eel in Scotland's coastal environment: implications for the development of marine renewables.	Scottish Marine and Freshwater Science	2010	Malcolm et al.
Marine renewables SEA environmental report. Section C7 Fish and shellfish.	Scottish Government	2007	Faber Maunsell
British sea fishes.	Underwater World Publications Ltd.	2001	Dipper
Fisheries sensitivity maps in British Waters.	United Kingdom Offshore Operators Association (UKOOA) Ltd.	1998	Coull et al.
Fish and shellfish sensitivity reports.	https://www.marlin.ac.uk/activity/pressures_report	n/a	Various

Title	Source	Year	Author
Salmon fishery statistics, including rod catch data	Marine Scotland	2019 (latest dataset)	Marine Scotland
Salmon smolt trawl surveys in Moray Firth and Firths of Forth and Tay	Marine Scotland	2018c	Marine Scotland

7.2.3.3 Baseline Characterisation

Fish and Shellfish Designated Sites

The Proposed Development does not overlap with any Natura 2000 sites but there are several protected areas for fish in East Scotland. Table 7.7 provides an early indication of the designated sites (international and national) that may be considered within the EIA and HRA. This list will be refined in the EIA to also include sites that fall within the potential ZOI of the Proposed Development, which will be determined as part of the EIA process to include consideration of migratory fish species.

Table 7.7: Summary of designated Sites for fish and shellfish in proximity to the Proposed Development.

Protected Area	Distance from the Proposed Development (array area)	Relevant Qualifying Features
River Tweed SAC	52.9 km	• Atlantic salmon (Salmo salar) • Sea lamprey (Petromyzon marinus) • River lamprey (*Lampetra fluviatilis)*
River South Esk SAC	61.2 km	• Freshwater pearl mussel (Margaritifera margaritifera) • Atlantic salmon
River Tay SAC	75.2 km	• Atlantic salmon • Sea lamprey • River lamprey
River Dee SAC	78.8 km	• Atlantic salmon • Freshwater pearl mussel
Turbot Bank MPA	96.2 km	• Sandeels (Ammodytes americanus)
River Spey SAC	126.9 km	• Freshwater pearl mussel • Atlantic salmon • Sea lamprey
River Teith SAC	143.1 km	• Sea lamprey • River lamprey

A full screening of Natura 2000 sites with qualifying fish features will be undertaken in the LSE Screening Report for the Proposed Development. Relevant Annex II fish species of Natura 2000 sites screened into the fish and shellfish ecology assessment will be fully considered and assessed in the fish and shellfish Offshore EIA Report chapter with the assessment on the Natura 2000 site itself deferred to the RIAA.

The screening to be undertaken in the benthic subtidal and intertidal ecology Offshore EIA Report chapter will also include nationally designated sites (i.e. SSSIs, MPAs, recommended and designated MCZs). Nationally designated sites and the relevant qualifying features screened into the assessment will also be fully considered and assessed in the fish and shellfish ecology Offshore EIA Report chapter.

Fish Assemblage

Distribution of fish is determined by a range of factors including abiotic parameters such as water temperature, salinity, depth, local-scale habitat features and substrate type, and biotic parameters such as predator-prey interactions, competition and anthropogenic factors such as infrastructure and commercial fishing intensity.

The fish assemblage of the northern North Sea fish and shellfish study area includes demersal, pelagic, migratory and elasmobranchs fish species. Demersal species include sandeel *Ammodytidae*, whiting *Merlangius merlangus*, lemon sole *Microstomus kitt,* ling *Molva molva*, plaice *Pleuronectes platessa*, with pelagic species including herring *Clupea harengus*, sprat *Sprattus sprattus* and saithe *Pollachius virens* likely to be found in the vicinity of the Proposed Development.

To inform the fish and shellfish baseline characterisation for the Seagreen 1 EIA (Seagreen, 2012b), a total of 53 epibenthic trawls were conducted during the benthic surveys in 2011. Several species were observed including pogge *Agonus cataphractus*, dab *Limanda limanda*, goby *Pomatoschistus norvegicus/lozanoi*, lesser sandeel *Ammodytes marinus*, butterfish *Pholis gunnellus*, plaice, whiting and cod. Of these species, dab, goby, and lesser sandeel were generally the most abundant and with up to 588 individuals recorded in a single trawl. Commercial species such as plaice, whiting and cod were also observed.

Migratory Fish Species

There is the potential for migratory fish species to migrate to and from Scottish rivers in the vicinity of the Proposed Development and, therefore, they may migrate through the Proposed Development fish and shellfish study area to rivers during certain periods of the year (SNH, 2017a and National Biodiversity Network (NBN) Atlas, 2019).

The fish and shellfish ecology assessment for Seagreen 1 (SSE Renewables, 2012) observed seven migratory species of relevance. These species include Atlantic salmon *Salmo salar*, sea trout *Salmo trutta*, sea lamprey *Petromyzon marinus*, river lamprey *Lampetra fluviatilis,* European eel *Anguilla anguilla,* Allis and twaite shad *Allosa fallax* and *Allosa allosa* and sparling (European smelt) *Osmerus eperlanus.* The species which were considered as having the greatest potential to be present within the vicinity of the Seagreen 1 were Atlantic salmon, sea trout, eels and the lampreys.

In addition, elasmobranchs (sharks and rays) have been found distributed throughout the east coast of Scotland (Coull *et al.*, 1998; Ellis *et al.*, 2012; Baxter *et al.*, 2011).

No site-specific surveys are proposed to inform the impact assessment on migratory fish species. For the purposes of the impact assessment, it will be assumed that the aforementioned species are likely to be present within the array area and/or proposed export cable corridor, during key migration periods (e.g. adult migration to spawning rivers and smolt migration from natal rivers in the vicinity of the development). With respect to migratory fish species, the aim of the impact assessment will be to determine whether construction, operation and maintenance or decommissioning activities have the potential to lead to disruption to migration, e.g. construction noise potentially creating an effective barrier to fish migration. The timing of fish migration will therefore be an important element of the baseline characterisation and this will be collected through desktop data sources, including rod catch data from rivers on the east coast of Scotland (e.g. Tweed, Forth, Tay, Esk and Dee), recent papers (e.g. Newton *et al*., 2017; Gardiner *et al*., 2018, Godfrey *et al*., 2015; Malcolm *et al*., 2015) and Marine Scotland smolt survey data from the east coast of Scotland (Marine Scotland, 2018c). Further site-specific survey data are therefore not considered necessary to inform the baseline characterisation, as it will not provide further detail which could be applied to the impact assessment.

Shellfish Assemblage

Commercial landing data provides an overview of species present within the northern North Sea fish and shellfish study area. Species most caught include the brown crab *Cancer pagarus*, European lobster *Homarus gammarus*, great scallop *Pecten maximus*, velvet swimming crab *Necora puber* and squid *Loligo* spp. Other species caught in the area include green crab *Carcinus maenas* and whelks *Buccinum undatum* (ICES, 2018).

The River South Esk, River Dee and River Spey SACs, 61.2 km north west and, 78.8 km and 126.9 km north of the Proposed Development respectively, have primarily been designated as SACs due to the presence of the freshwater pearl mussel *Margaritifera margaritifera*. The freshwater pearl mussel, whilst not present in the marine environment, is dependent on the Atlantic salmon smolting population (JNCC, undated). Should the Atlantic salmon population be adversely affected by the Proposed Development, this may have an indirect effect on freshwater pearl mussel populations.

During the epibenthic trawls conducted for Seagreen 1, several shellfish species were observed including great scallop and queen scallop *Aequipecten opercularis* (Seagreen, 2012b). *Nephrops* was not recorded in any of the site-specific surveys, although underwater video survey data provided by Marine Scotland showed that *Nephrops* abundance was high in the inshore waters of the southern parts of the spawning and nursery grounds (Seagreen, 2012b). Other species such as brown crab, lobster, velvet swimming crab, whelk and squid were either recorded in very low abundances or not observed at all in the in the benthic surveys, but are all recognised as important commercial shellfish species within the northern North Sea fish and shellfish study area (Seagreen, 2018).

Spawning and/or Nursery Grounds

Potential nursery and spawning areas in the North Sea for a range of species were identified by Coull *et al*. (1998), based on larvae, egg and benthic habitat survey data. Ellis *et al*. (2012) reviewed this data for several fin fish species in the North Sea, including herring, providing an updated understanding of areas of low and high intensity nursery and spawning grounds.

Based on this data, spawning areas for several species overlap the Proposed Development fish and shellfish study area, including low-intensity spawning for cod and plaice, non-specified spawning for *Nephrops*, sprat, whiting, lemon sole and herring, and high-intensity for sandeel. Species with known spawning periods and nursery habitats identified within the Proposed Development fish and shellfish study area have been summarised in Table 7.8, and illustrated in Figure 7.8 to Figure 7.10.

Table 7.8: **Key Species with geographic Spawning and Nursery Grounds Overlap with the Proposed Development (Coull *et al.*, 1998 and Ellis *et al.*, 2012).**

Common Name	Species	Array Area		Proposed Export Cable Corridor	
		Spawning	Nursery	Spawning	Nursery
Anglerfish	*Lophius piscatorius*		✓		✓
Blue Whiting	*Micromesistius poutassou*		✓		✓
Cod	*Gadus morhua*	✓	✓	✓ (partial)	✓
European hake	*Merluccius merluccius*		✓		✓ (partial)
Herring	*Clupea harengus*		✓	✓ (partial)	✓
Ling	*Molva molva*		✓		✓
Mackerel	*Trachurus trachurus*		✓		✓
Plaice	*Pleuronectes platessa*	✓	✓	✓	✓
Sandeel	*Ammodytidae*	✓	✓	✓ (partial)	✓
Spotted ray	*Raja montagui*		✓		✓
Spurdog	*Squalus sp.*		✓		✓ (partial)
Tope shark	*Galeorhinus galeus*		✓		✓ (partial)
Whiting	*Merlangius merlangus*	✓	✓	✓	✓
Haddock	*Melanogrammus aeglefinus*		✓		
Nephrops	*Nephrops norvegicus*	✓ (partial)	✓ (partial)	✓	✓
Sprat	*Sprattus sprattus*	✓	✓	✓ (partial)	✓
Lemon sole	*Microstomus kitt*	✓	✓	✓	✓

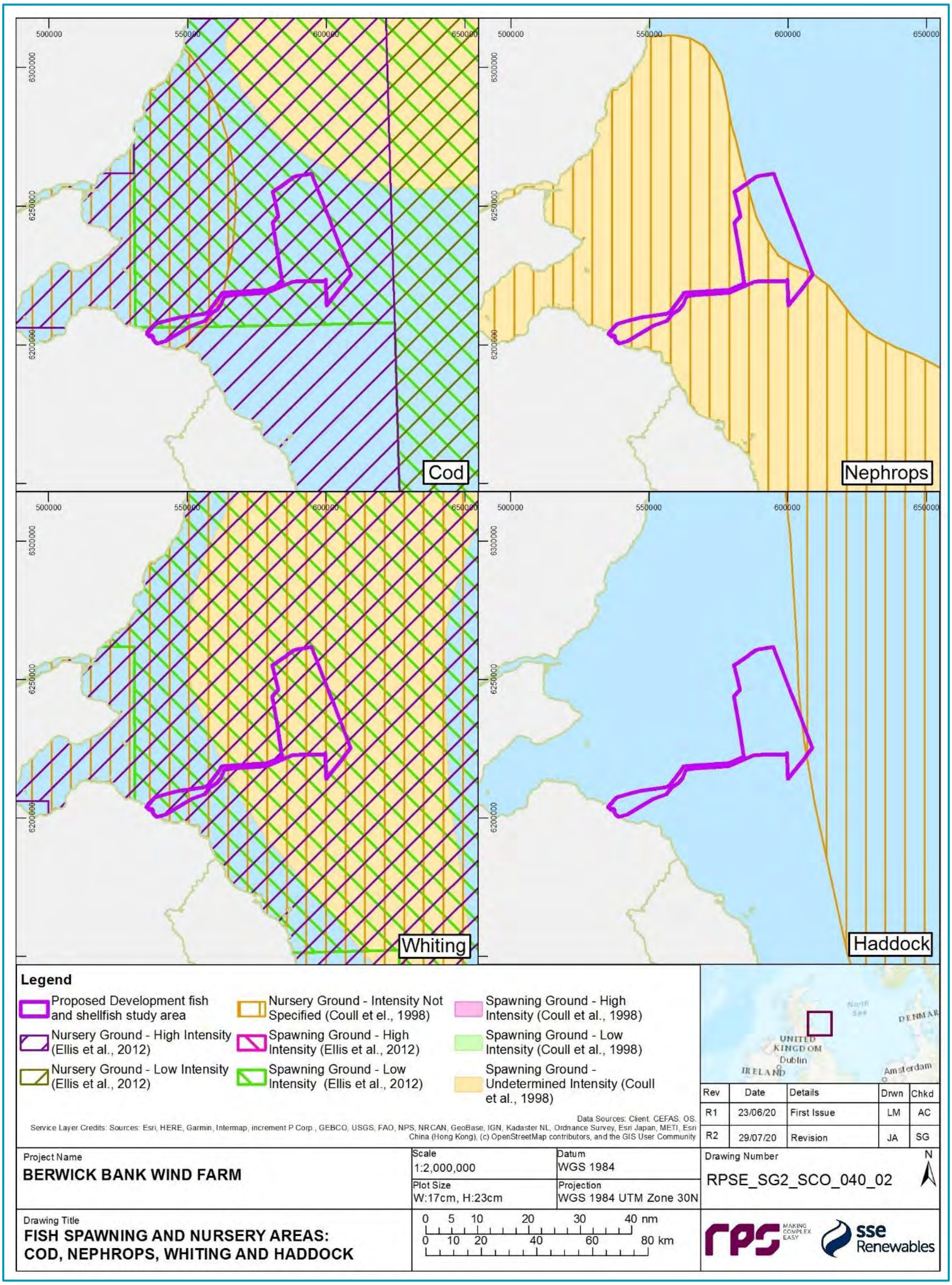


Figure 7.8: **Cod, Nephrops, Whiting and Haddock Spawning and Nursery Grounds and Overlaps with the Proposed Development.**

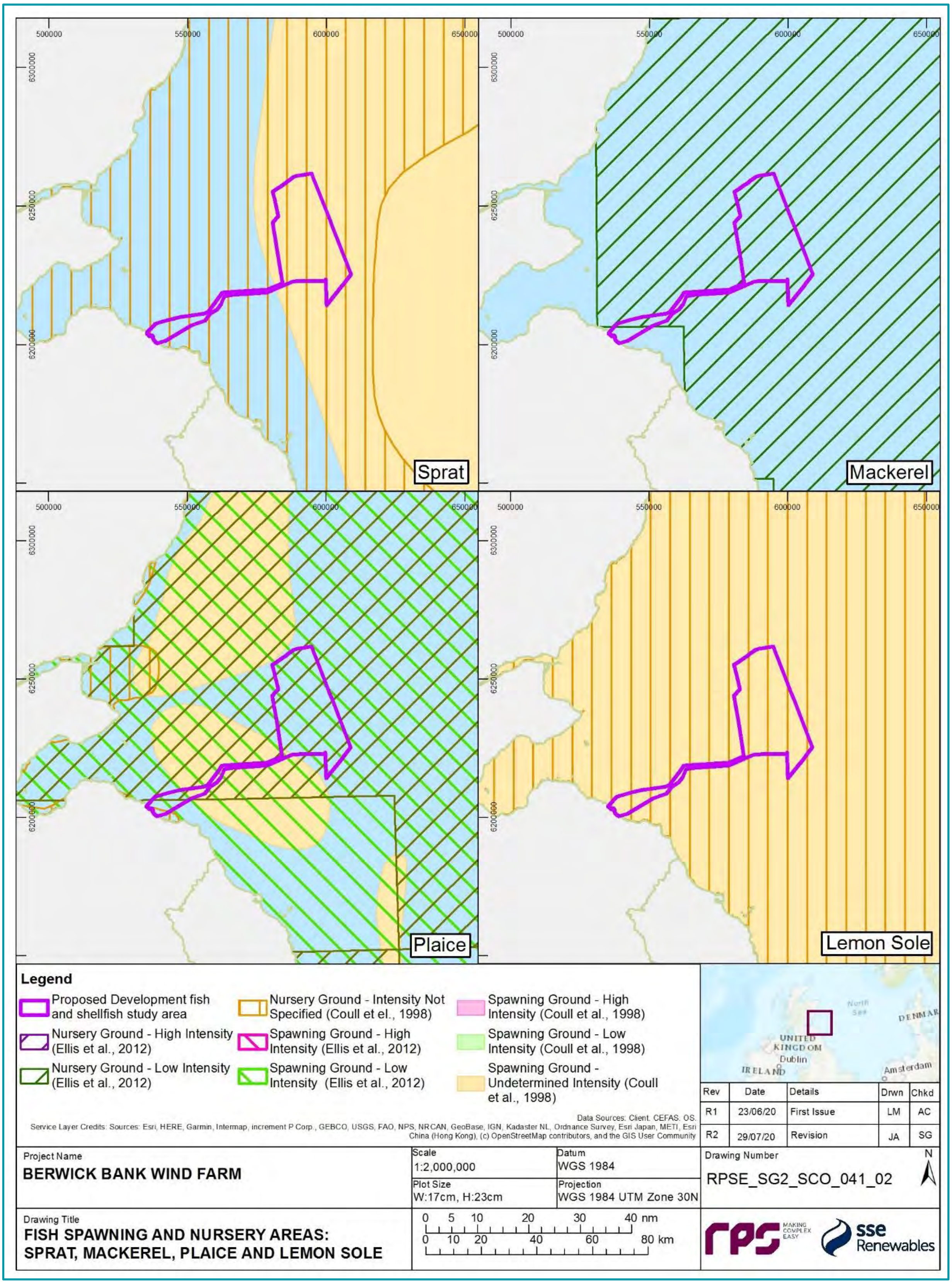


Figure 7.9: **Sprat, Mackerel, Plaice and Lemon Sole Spawning and Nursery Grounds and Overlaps with the Proposed Development.**

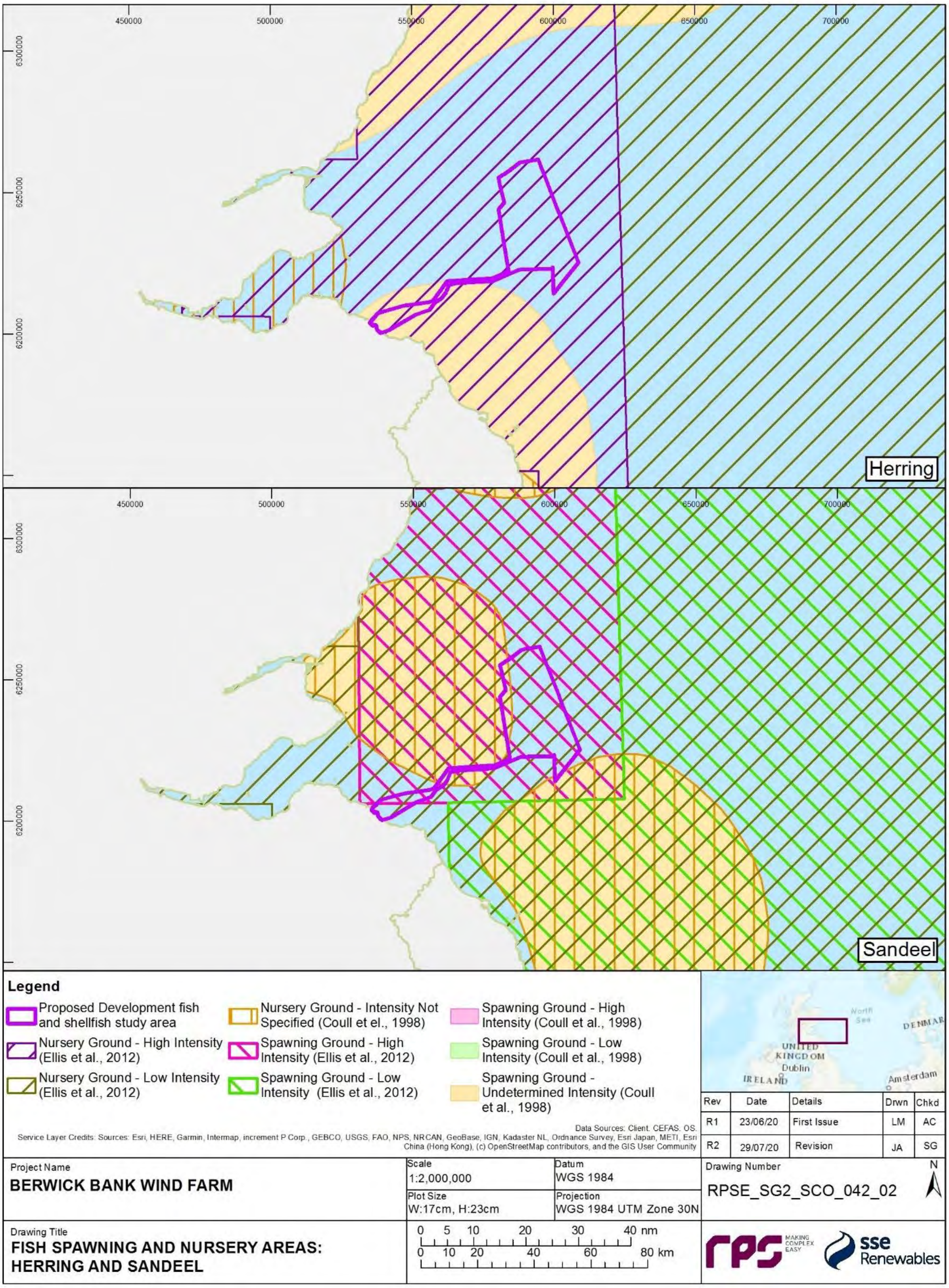


Figure 7.10: **Herring and Sandeel Spawning and Nursery Grounds and Overlaps with the Proposed Development.**

Herring nursery grounds are widespread along the Scottish and Northumberland coastlines (Ellis *et al.*, 2012), with post-larvae juveniles up to sub-adults that are yet to reach sexual maturity feeding here until migrating to feeding grounds further offshore where they remain until reaching sexual maturity (ICES, 2016). Herring are a commercially and ecologically important pelagic fish species and are common across much of the North Sea and is listed as a Scottish Priority Marine Feature (PMF) (Fauchald *et al.*, 2011 and Casini *et al.*, 2004). Herring utilise specific benthic habitats during spawning, which increases their vulnerability to activities impacting the seabed. Further, as a hearing specialist, herring are vulnerable to impacts arising from subsea noise.

A review of spawning grounds suggests there is an overlap of the Proposed Development fish and shellfish study area with herring nursey grounds. This overlap occurs along the Proposed Development export cable corridor towards landfall and is non-specified in intensity. A further review of the herring spawning and nursery grounds will be undertaken to support the fish and shellfish ecology assessment.

7.2.4 PROPOSED APPROACH TO THE ENVIRONMENTAL IMPACT ASSESSMENT

The fish and shellfish EIA will follow the methodology set out in chapter 5. Specific to the fish and shellfish EIA, the following guidance documents will also be considered:

- Guidelines for EcIA in the UK and Ireland. Terrestrial, Freshwater, Coastal and Marine (CIEEM, 2019);
- Consenting, EIA and HRA Guidance for Marine Renewable Energy Developments in Scotland (European Marine Energy Centre (EMEC) and Xodus, 2010) and
- Guidance on Environmental Considerations for Offshore Wind Farm Development (OSPAR, 2008).

In addition, and specific to marine ecology topics, IEFs will be identified and assessments will be presented for appropriate ecological receptor groups in the baseline characterisation of each relevant technical chapter. Criteria defining the value of each IEF will be defined to reflect topic-specific interests.

7.2.5 EMBEDDED MITIGATION

Measures adopted as part of the Proposed Development will follow best practice and may include:

- implementation of piling soft-start and ramp-up measures;
- development of, and adherence to, an appropriate CoCP;
- development of, and adherence to, an Environmental Management Plan, including Marine Pollution Contingency Plans; and
- development of, and adherence to, a Decommissioning Plan.

The requirement for additional mitigation measures will be dependent on the significance of the effects on fish and shellfish ecology and will be consulted upon with statutory consultees throughout the EIA process.

7.2.6 POTENTIAL PROPOSED DEVELOPMENT IMPACTS

A range of potential impacts on fish and shellfish have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of the Proposed Development. The impacts that have been scoped into the Proposed Development assessment are outlined in Table 7.9 together with a description of any additional data collection (e.g. site-specific surveys) and/or supporting analyses (e.g. modelling) that will be required to enable a full assessment of the impacts.

Taking into account the baseline fish and shellfish information currently available and the Proposed Development description outlined in chapter 3, a number of impacts are proposed to be scoped out of the assessment for fish and shellfish. These impacts are outlined, together with a justification for scoping them out, in Table 7.10.

7.2.7 POTENTIAL CUMULATIVE EFFECTS

The majority of predicted effects of construction, operation and maintenance, and decommissioning from the Proposed Development on fish and shellfish ecology are considered to be localised to within the footprint of the project. However, there is potential for some predicted impacts from the Proposed Development on fish and shellfish ecology (e.g. underwater noise) to interact with impacts from other projects and activities and lead to a cumulative effect on receptors. The key cumulative effect is likely to result from increased underwater noise during pile driving.

The cumulative assessment will consider the maximum adverse scenarios for each of the projects or activities across all phases of the Proposed Development. The following projects or activities will be considered for cumulative effects:

- other offshore wind farms and associated cabling and infrastructure;
- oil and gas infrastructure/development (cables and pipelines);
- other forms of cabling (i.e. telecommunications and interlinks);
- commercial fishing activity;
- beach replenishment schemes;
- navigation and shipping; and
- aggregate extraction and disposal of dredging spoil.

7.2.8 POTENTIAL TRANSBOUNDARY IMPACTS

A screening of transboundary impacts has been carried out and is presented in Annex C. This screening exercise identified that there is the potential for transboundary impacts upon fish and shellfish due to construction, operational and maintenance, and decommissioning impacts of the Proposed Development. These include:

- injury and/or disturbance to fish from underwater noise during construction; and
- increased noised during construction also has the potential to affect Annex II migratory fish species, or species that have commercial value.

The potential for the Proposed Development to impact fish and shellfish features of nature conservation designations outside of the UK EEZ will be considered within the HRA process, including the interaction between physical processes and fish and shellfish ecology.

7.2.9 SCOPING QUESTIONS TO CONSULTEES

- Do you agree with the study areas defined for fish and shellfish ecology?
- Do you agree that the existing desktop data on fish and shellfish resources in the fish and shellfish study area is sufficient to characterise the describe the ecology in the fish and shellfish baseline?
- Do you agree that all potential impacts (Table 7.9) have been identified for fish and shellfish ecology?
- Do you agree that the impacts described in Table 7.10 can be scoped out of the fish and shellfish ecology Offshore EIA Report chapter?

Table 7.9: Impacts Proposed to be Scoped into the Proposed Development Assessment for Fish and Shellfish.

Impact	Embedded Mitigation	Justification	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Proposed Approach for the Undertaking of Proposed Development Specific Modelling to Inform the Assessment of Potential Impacts
Construction				
Temporary habitat loss and disturbance	N/A	There is potential for temporary, direct habitat loss and disturbance due to cable laying operations (including anchor placements), spud-can leg impacts from jack-up operations and seabed preparation works for gravity base foundations.	Given the wide-ranging and comprehensive desktop information and data sources available to characterise the fish and shellfish baseline, no further site-specific fish ecology surveys to inform the Proposed Development EIA are proposed. However, it is intended that the results of the epibenthic beam trawl survey, which is proposed to characterise the benthic subtidal baseline (see section 7.1), can be used to enhance the existing data for fish and shellfish.	No modelling is required for this impact.
Underwater noise	Piling ramp-up and soft-start measures	There is potential for mortality, injury and/or distance to sensitive fish and shellfish species as a result of construction activities such as pile-driving and vessel noise.	As above.	Modelling undertaken for section 6.2 will be used to inform the assessment of underwater noise impacts to fish and shellfish.
Increased suspended sediment concentrations and associated sediment deposition	N/A	There is potential for an increase in suspended sediments and associated deposition during construction activities such as cable installation and seabed preparation.	As above.	The outputs of numerical modelling undertaken for the physical processes assessment will inform this impact assessment. Further details of this modelling are presented within section 6.1.

Impact	Embedded Mitigation	Justification	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Proposed Approach for the Undertaking of Proposed Development Specific Modelling to Inform the Assessment of Potential Impacts
Operation and Maintenance				
Long-term habitat loss	N/A	The presence of wind turbines and scour/cable protection will result in the loss of habitat.	As above.	No modelling is required for this impact.
Temporary habitat loss	N/A	Temporary habitat loss/disturbance may occur during the operational and maintenance phase as a result of maintenance operations (e.g. cable repair/reburial, use of jack-up vessels to facilitate wind turbine component repairs etc.). The impacts associated with these operations are likely to be similar in nature to those associated with the construction phase although of reduced magnitude.	As above	No modelling is required for this impact.
Electromagnetic Fields (EMF) from subsea electrical cabling	N/A	EMF generated through the subsea electrical cabling may affect fish and shellfish prey/predator relationship by inhibiting/interfering with the detection of EMF behaviours.	As above.	No modelling is required for this impact.

Impact	Embedded Mitigation	Justification	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Proposed Approach for the Undertaking of Proposed Development Specific Modelling to Inform the Assessment of Potential Impacts
Decommissioning				
Temporary habitat loss and disturbance	N/A	Impacts are expected to be similar to those during the construction phase.	As above.	No modelling is required for this impact.
Underwater noise.	N/A		As above.	No modelling is required for this impact.
Increased suspended sediment concentrations and associated sediment deposition	N/A		As above.	No modelling is required for this impact.

Table 7.10: Impacts Proposed to be Scoped Out of the Proposed Development Assessment for Fish and Shellfish.

Impact	Justification
Construction	
Accidental release of pollutants	There is a risk of pollution being accidentally released during the construction phases from sources including vessels/vehicles and equipment/machinery. However, the risk of such events is managed by the implementation of measures set out in standard post consent plans, e.g. Environmental Management Plans, including Marine Pollution Contingency Plans. These plans include planning for accidental spills, address all potential contaminant releases and include key emergency contact details. It will also set out industry good practice and OSPAR, International Maritime Organisation (IMO), MARPOL (International Convention for the Prevention of Pollution from Ships) guidelines for preventing pollution at sea. Therefore, the likelihood of an accidental spill occurring is very low and in the unlikely event that such events occur, the magnitude of these will be minimised through measures such as marine pollution contingency planning. On this basis, and subject to consultation with the SNCBs and feedback received on this Offshore Scoping Report, it is proposed to scope this impact out of further consideration within the EIA for fish and shellfish.
Operation and Maintenance	
Accidental release of pollutants	As above for construction phase.
Underwater noise from wind turbine operation	Noise generated by operational wind wind turbines is of a very low frequency and low sound pressure level (Andersson et al., 2011). Studies have found that sound levels are only high enough to possibly cause a behavioural reaction within metres from a wind turbine (Sigray and Andersson 2011, and therefore such levels are not considered to have potentially effects on fish and shellfish receptors. Therefore, subject to consultation with the SNCBs and feedback received on this Offshore Scoping Report, it is proposed to scope this impact out of further consideration within the EIA for fish and shellfish.
Underwater noise from vessels	Operational underwater noise generated from vessels is likely to be low and effects would only occur if fish species remained within immediate vicinity of the vessel (i.e. within metres) for a number of hours which is highly unlikely. Therefore, subject to consultation with the SNCBs and feedback received on this Offshore Scoping Report, it is proposed to scope this impact out of further consideration within the EIA for fish and shellfish.

Impact	Justification
Colonisation of hard structures	There is the potential for the introduction of subsurface structures to provide suitable substrate for colonisation by marine species which may lead to effects on fish and shellfish receptors by creating reef habitat. However, the increase in surface area suitable for colonisation would be extremely small in the context of hard and soft sediment habitats in the fish and shellfish study area and therefore this would not have a potentially significant effect on the diversity or population levels. Therefore, subject to consultation with the SNCBs and feedback received on this Offshore Scoping Report, it is proposed to scope this impact out of further consideration within the EIA for fish and shellfish.
Decommissioning	
Accidental release of pollutants	As above for the construction phase.

7.3 MARINE MAMMALS

7.3.1 INTRODUCTION

This section of the Offshore Scoping Report identifies the marine mammals of relevance to the Proposed Development and considers the potential impacts from the construction, operation and maintenance, and decommissioning of the offshore and intertidal components (seaward of the MHWS mark) of the Proposed Development on marine mammals.

7.3.2 STUDY AREA

The marine mammal study area proposed for the purpose of EIA varies depending on the species, considering individual species ecology and behaviour. The marine mammal study area has been defined at two spatial scales:

- regional marine mammal study area: this provides a wider geographic context in terms of the species present. The regional marine mammal study area will be the northern North Sea Region extended to the European coastline (see Figure 7.11). This area will be used to identify potential cumulative projects and will inform consideration of designated sites for marine mammals. The marine mammal management units (MMMUs) defined in Inter-Agency Marine Mammal Working Group (IAMMWG (2015)) and the Seal Management Areas (SMAs) will be used as context for the assessment for example reference population for each key species and % reference population potentially affected; and
- Proposed Development marine mammal study area: this includes the area covered by site-specific marine mammal surveys which are currently underway for the Proposed Development and is illustrated in Figure 7.11. These will provide an indication of the marine mammals present across potential impact footprints. In addition, data will be collated from existing data sets extending over the Proposed Development proposed export cable corridor plus a 10 km buffer, and to the north and south of the potential landfall location. The Proposed Development marine mammal study area is shown in Figure 7.11.

7.3.3 BASELINE ENVIRONMENT

7.3.3.1 Desktop Study

An initial desk-based review of literature and data sources to support this Offshore Scoping Report has identified a number of baseline datasets. These are summarised at Table 7.11.

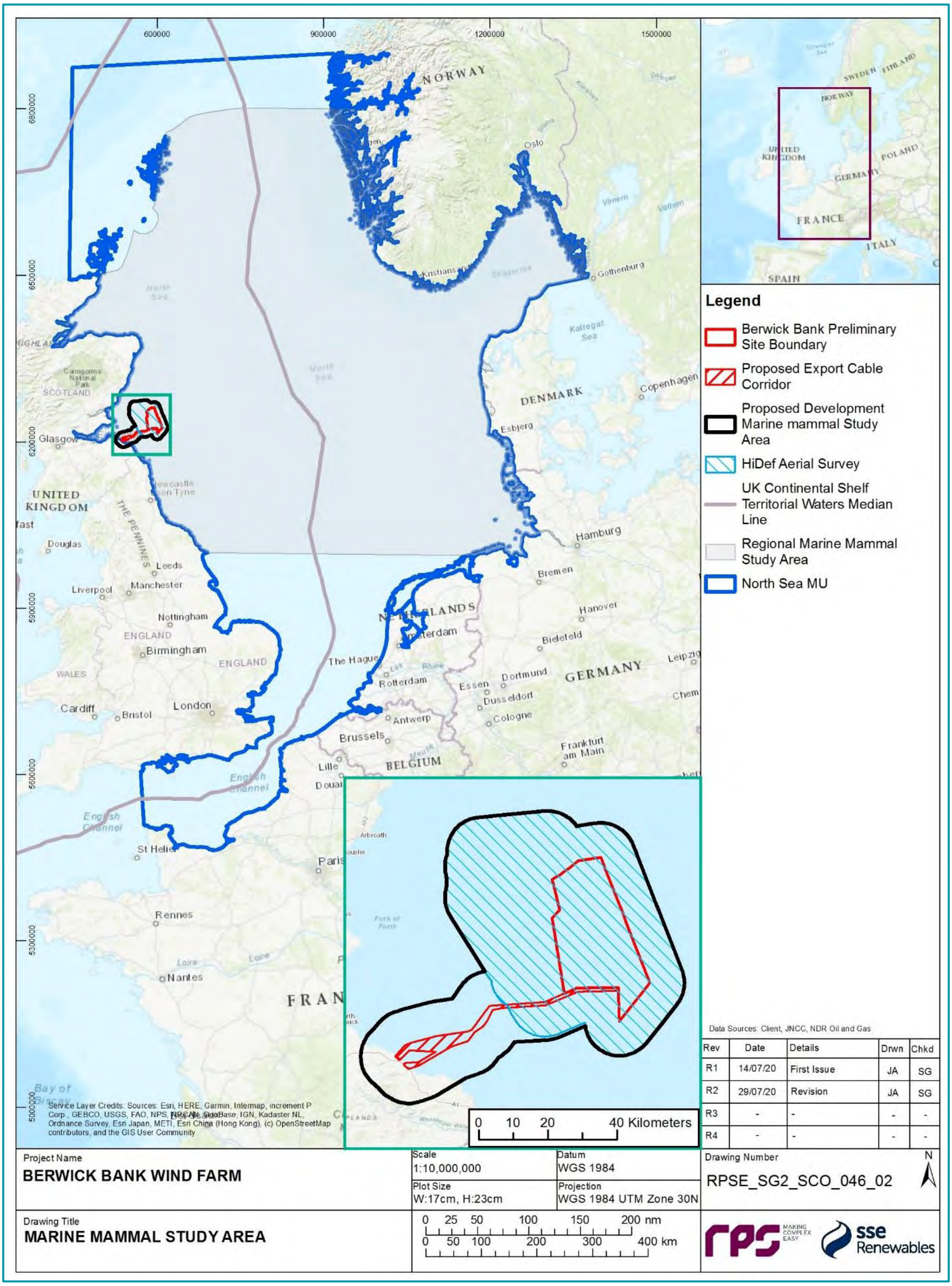


Figure 7.11: Marine Mammal Study Areas.

Table 7.11: Summary of Key Desktop Reports for Marine Mammals.

Title	Survey/Data Years	Author
Bottlenose dolphin PhotoID surveys	May-Sept 2009 to present	Quick *et al.* (2014) Cheney *et al.* (2013) Arso Civil *et al.* (2019)
East Coast Marine Mammal Acoustic Study (ECOMMAS) PAM data	2013 to present	Marine Scotland Science
Marine Ecosystems Research Program cetacean density surfaces	1980 to 2018	Waggitt *et al.* (2020)
Seal haul-out counts	2018	Data provided by SMRU
Seal telemetry	1990 to 2018	Data provided by SMRU
Seagreen Phase 1 boat-based surveys	May to Aug 2017	
Small Cetaceans in European Atlantic Waters (SCANS) III	Jul 2016	Hammond *et al.* (2017)
Seal at-sea usage	Telemetry: 1991 to 2016 Count: 1996 to 2015	Russell *et al.* (2017)
Forth and Tay Offshore Wind Developers Group cetacean survey data analysis report	2009 to 2011	Mackenzie *et al.* (2012) King and Sparling (2012)
Seagreen Firth of Forth Round 3 Zone Marine Mammal Surveys	May 2010 to Nov 2011	Sparling (2012)
JNCC Report 544: Harbour Porpoise Density	1994 to 2011	Heinänen and Skov (2015)
Analysis of The Crown Estate aerial survey data for marine mammals for the Forth and Tay Offshore Wind Developers Group	May 2009 to Mar 2010	Grellier and Lacey (2012)
Joint Cetacean Protocol Phase III	1994 to 2010	Paxton *et al.* (2016)
Cetacean Baseline Characterisation for the Firth of Tay: Bottlenose dolphins	PhotoID: 2009 and 2010 PAM: 2006 to 2009	Quick and Cheney (2011)
SCANS II	Jul 2005	Hammond *et al.* (2006)
SCANS I	Jul 1994	Hammond *et al.* (2002)

7.3.3.2 Site-specific Survey Data

As outlined in Table 7.11, there have been several surveys undertaken in the former Firth of Forth Zone and in relation to Seagreen Phase 1. In addition to these previous surveys, digital aerial surveys are currently being undertaken by HiDef to inform the marine mammal baseline for the Proposed Development and Marr Bank Wind Farm (Figure 7.12). These surveys commenced in March 2019 and will continue for 24 months. To date, one year of surveys has been completed. The marine mammal species recorded during these surveys, and therefore those which will form the focus of the marine mammal assessment, include:

- Harbour porpoise *Phocoena phocoena*;
- Minke whale *Balaenoptera acutorostrata*;
- White-beaked dolphin *Lagenorhynchus albirostris*;
- Bottlenose dolphin *Tursiops truncatus*;
- Grey seals *Halichoerus grypus*; and
- Unknown seal and cetacean species.

Work is currently undergoing to determine the best correction factors that should be applied to these sightings data to correct for availability bias and thus provide density estimates for each species.

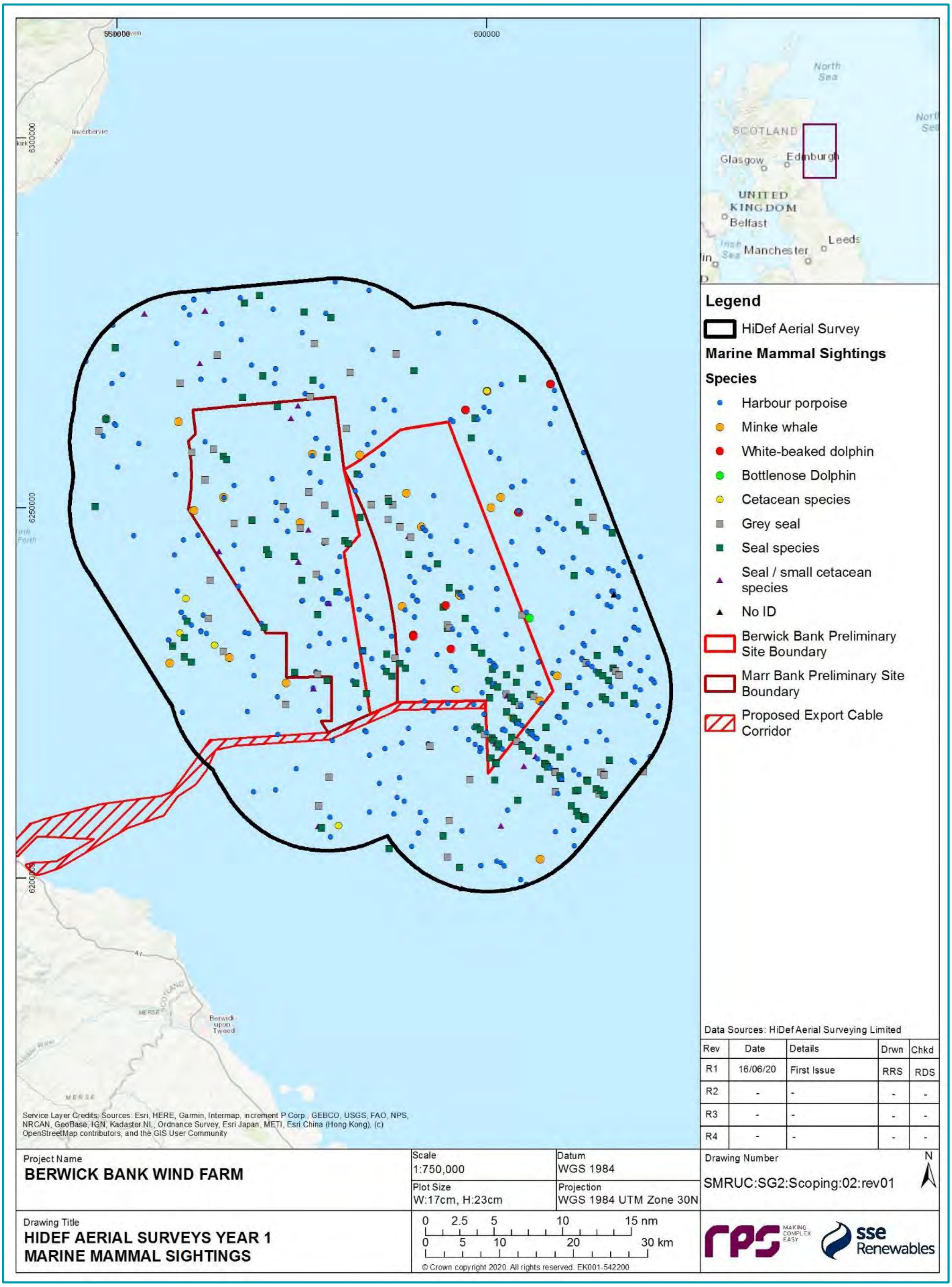


Figure 7.12: Marine Mammal Sightings During Year 1 of the HiDef Aerial Surveys.

7.3.3.3 Baseline Characterisation

Protected Areas

There are several protected areas for marine mammals in east Scotland. Table 7.12 provides an early indication of key designated sites that may occur in proximity to the Proposed Development and which may require consideration within the EIA and HRA. This list will be refined in the EIA to also include sites that fall within the potential ZOI of the Proposed Development, which will be determined as part of the EIA process. A full screening of Natura 2000 sites with qualifying marine mammal interest features will be undertaken in the LSE Screening Report for the Proposed Development. Relevant marine mammal notified interest features of Natura 2000 sites screened into the marine mammal assessment will be fully considered and assessed in the marine mammal Offshore EIA Report chapter, with the assessment on the Natura 2000 site itself deferred to the RIAA.

The screening to be undertaken in the marine mammal Offshore EIA Report chapter will also include national designations, including designated seal haul out sites, SSSIs and MPAs.

Table 7.12: Summary of Marine Mammal Protected Areas in Proximity to the Proposed Development.

Site	Type	Species	Minimum Distance from the Array Area (km)	Minimum Distance from the Proposed Export Cable Corridor (km)
Moray Firth	SAC	Bottlenose dolphin	>200	>200
Isle of May	SAC	Grey seals	~59	~21
Berwickshire and North Northumberland Coast	SAC	Grey seals	~40	~3
Firth of Tay and Eden Estuary	SAC	Harbour seals	~62	~49

Harbour Porpoise

The most recent assessment of harbour porpoise in UK waters concluded that the overall trend in Conservation Status was Unknown, highlighting that there was insufficient data to establish a trend for the population size nor potential future prospects for the population (JNCC, 2019d). The Proposed Development is located within the ICES North Sea Assessment Unit for harbour porpoise, which is estimated to have an abundance of 345,373 porpoise (95% Confidence Interval (CI): 246,526 to 495,752) based on estimates from SCANS III Hammond et al. (2017). Given the sightings recorded thus far during the ongoing site-specific aerial surveys, and from previous surveys in the Firth of Forth Round 3 Zone (e.g. Figure 7.13), harbour porpoise are considered likely to occur year round within the Proposed Development zone of potential impact.

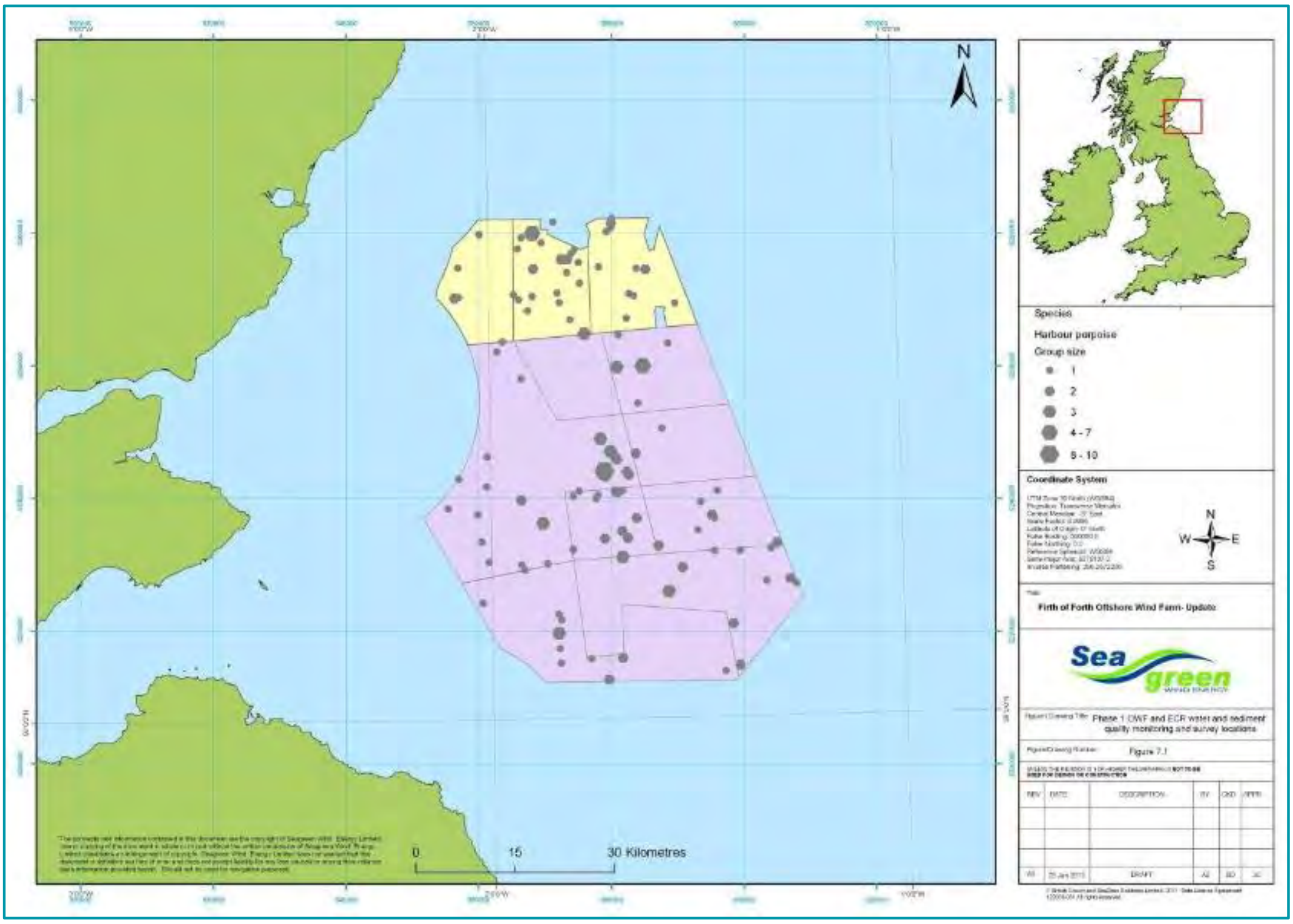


Figure 7.13: Harbour Porpoise Sightings from the Former Firth of Forth Zone Vessel Surveys, May 2010 to November 2011 (Sparling 2012).

Note – Yellow denotes the original Phase 1 area and pink denotes the original Phase 2 and 3 areas within the former Firth of Forth Zone

Minke Whale

The most recent assessment of minke whales in UK waters concluded that the overall trend in Conservation Status was Unknown, highlighting that there was insufficient data to establish a trend for the population size nor potential future prospects for the population (JNCC, 2019e). All minke whales in UK waters are considered to be part of the Celtic and Greater North Seas MU (IAMMWG, 2015). Given the sightings recorded thus far during the ongoing site-specific aerial surveys, and from previous surveys in the former Firth of Forth Zone (Figure 7.14), minke whales are considered likely to occur in the summer months within the Proposed Development zone of potential impact.

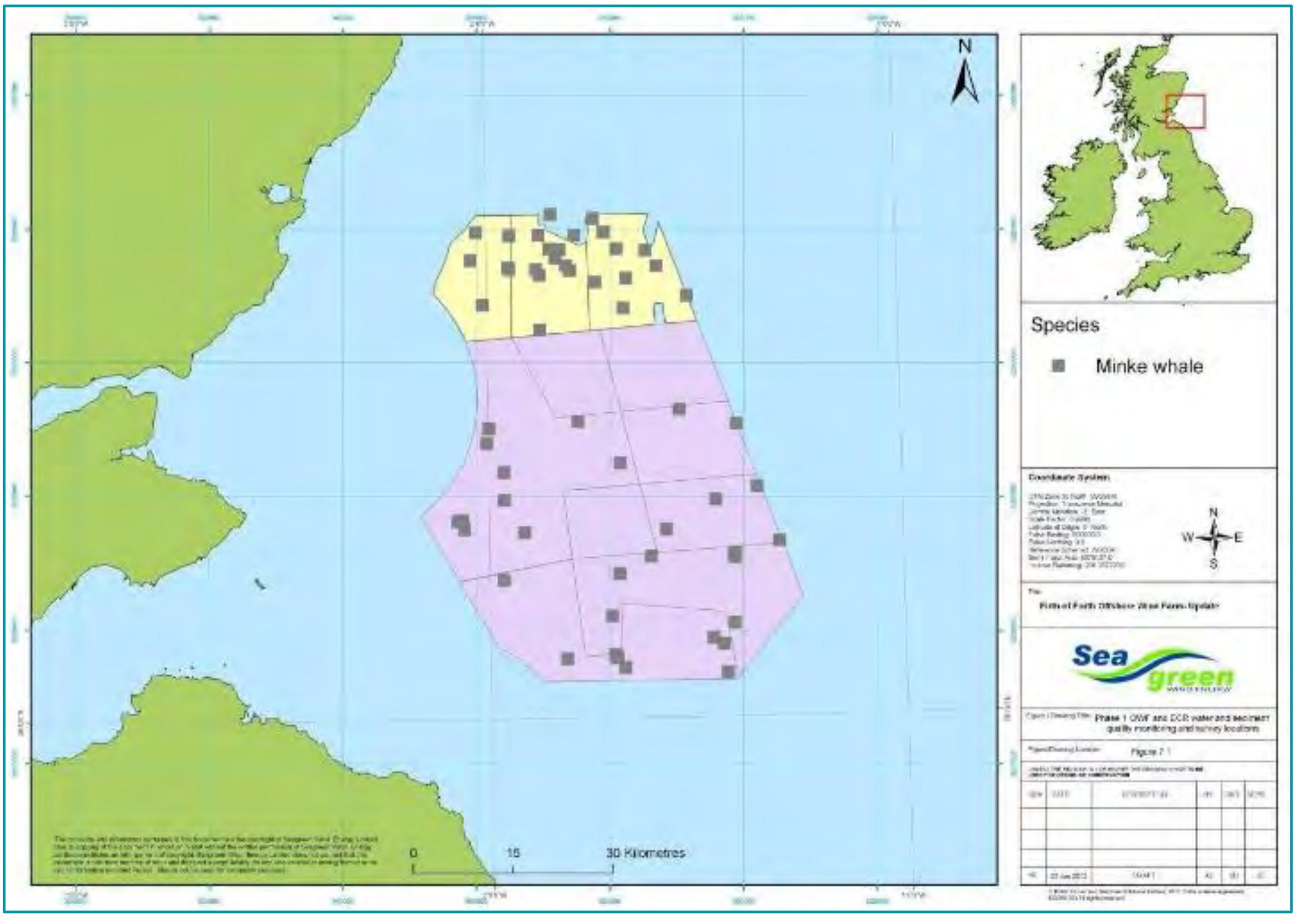


Figure 7.14: Minke Whale Sightings from the Former Firth of Forth Zone Vessel Surveys, May 2010 to November 2011 (Sparling 2012).

Note – Yellow denotes the original Phase 1 area and pink denotes the original Phase 2 and 3 areas within the former Firth of Forth Zone

White-beaked Dolphin

The most recent assessment of white-beaked dolphins in UK waters concluded that the overall trend in Conservation Status was Unknown, highlighting that there was insufficient data to establish a trend for the population size nor potential future prospects for the population (JNCC, 2019d).The relevant MU for white-beaked dolphins is the Celtic and Greater North Seas MU which has an estimated population size of 15,895 animals (95% CI 9,107-27,743) based on data from SCANS II. However, the SCANS III surveys suggest a higher abundance than the SCANS II surveys which produced a white-beaked dolphin abundance estimate of 36,287 across all surveyed blocks (95% CI 18,694 –61,869) (Hammond *et al.*, 2017). Given the sightings recorded thus far during the ongoing site-specific aerial surveys, and from previous surveys in the former Firth of Forth Zone (Figure 7.15), white-beaked dolphins are considered likely to occur year round (with increased numbers in the summer months) within the Proposed Development zone of potential impact.

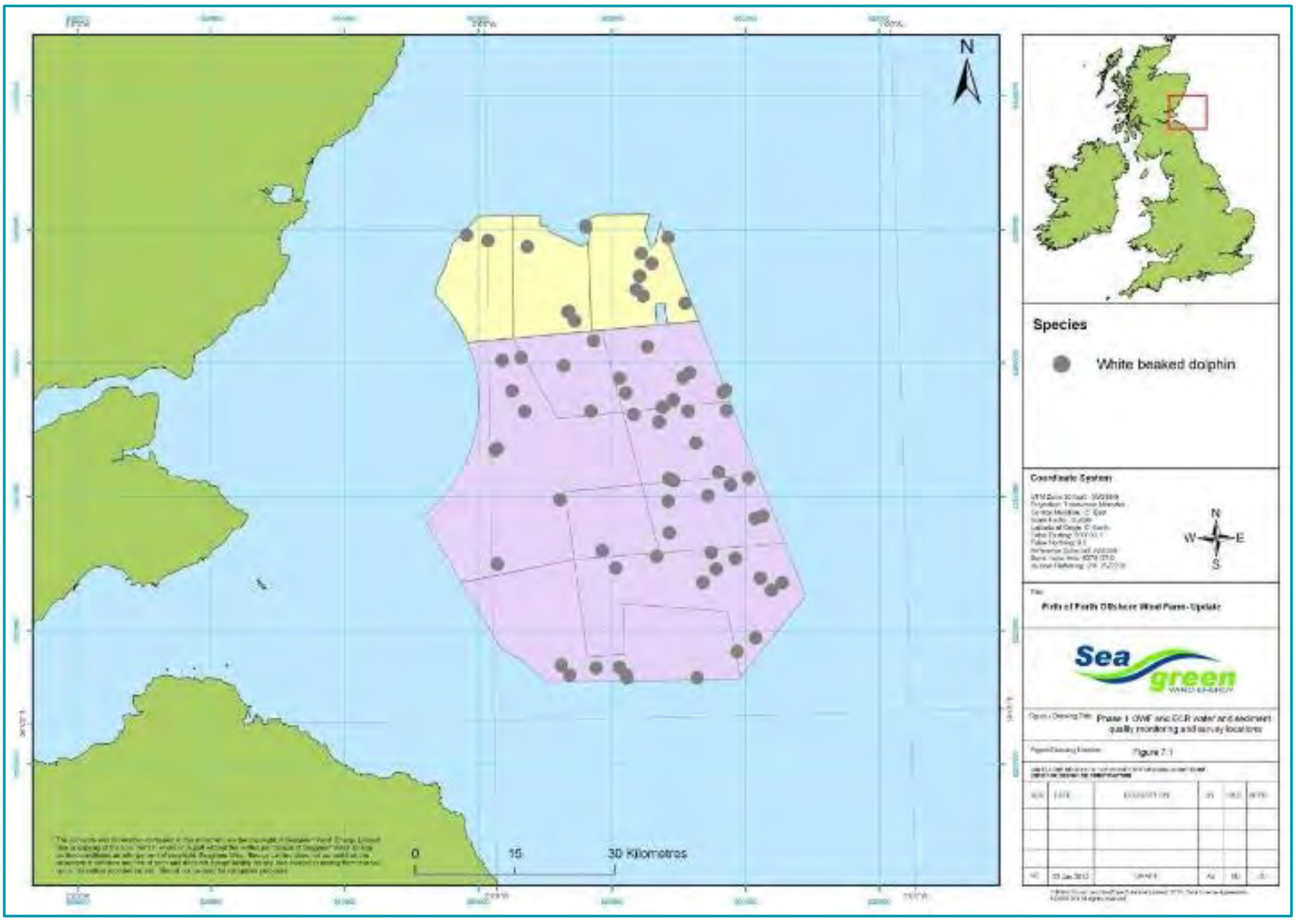


Figure 7.15: White-beaked Dolphin Sightings from the Former Firth of Forth Zone Vessel Surveys, May 2010 to November 2011 (Sparling 2012).

Note – Yellow denotes the original Phase 1 area and pink denotes the original Phase 2 and 3 areas within the former Firth of Forth Zone

Bottlenose Dolphin

The most recent assessment of bottlenose dolphins in UK waters concluded that the overall trend in Conservation Status was Unknown, highlighting that although the population size appears to be stable, there were too few datapoints to confidently conclude on the current and future population trends (JNCC, 2019a).

The Moray Firth population of bottlenose dolphins is the only known remaining resident population in the North Sea and it was for this reason that the Moray Firth SAC was established in order to protect this population. The current population estimate of bottlenose dolphin abundance for the Coastal East Scotland MU population is 195 individuals (95% Highest Posterior Density Intervals (HPDI): 162 to 253) based on photo-ID counts between 2006 and 2007 (Cheney *et al*., 2013). The results of further surveys suggest that the east coast Scotland population has continued to increase in size since 2007, (Cheney *et al*., 2018). Given the presence of bottlenose dolphins within coastal waters in east Scotland, they are considered likely to occur year-round within the Proposed Development zone of potential impact.

Grey Seal

The most recent assessment of grey seals in UK waters concluded that the overall trend in Conservation Status was Favourable, with an overall trend in Conservation Status assessed as Improving (JNCC, 2019b).

The most recent UK wide grey seal pup production count was in 2016, which resulted in a modelled UK adult population size in 2017 of 150,000 grey seals (95% CI 131,000 – 171,600) (SCOS, 2019). Pup production in the North Sea region (which includes the Firth of Forth breeding colonies) continues to increase rapidly with an average annual increase of 8% p.a. between 2014 and 2016 (SCOS, 2019). The Proposed Development is located within the east Scotland SMA, where the most recent August moult count (960) can be corrected for the proportion of seals hauled-out (0.34; 95% CI 0.30-0.37) (Lonergan *et al.*, 2011) to produce a population estimate of 2,824 grey seals (95% CI: 2,595 – 3,200). Given the sightings recorded thus far during the ongoing site-specific aerial surveys, from previous surveys in the former Firth of Forth Zone (Figure 7.16), and from the seal at-sea usage estimates (Figure 7.17), grey seals are considered likely to occur year round within the Proposed Development zone of potential impact.

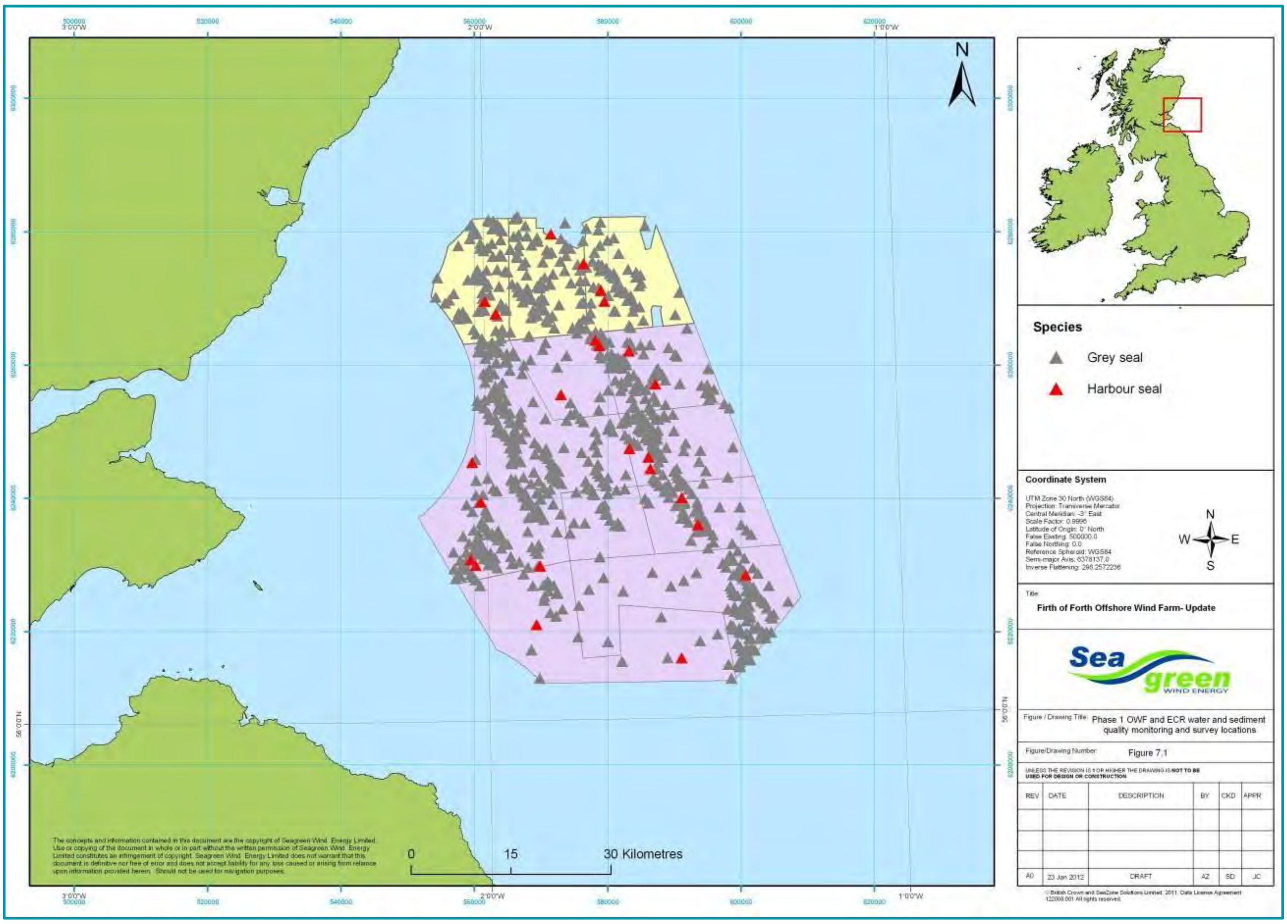


Figure 7.16: Harbour and Grey Seal Sightings from the Former Firth of Forth Zone Vessel Surveys, May 2010 to November 2011 (Sparling 2012).

Note – Yellow denotes the original Phase 1 area and pink denotes the original Phase 2 and 3 areas within the former Firth of Forth Zone

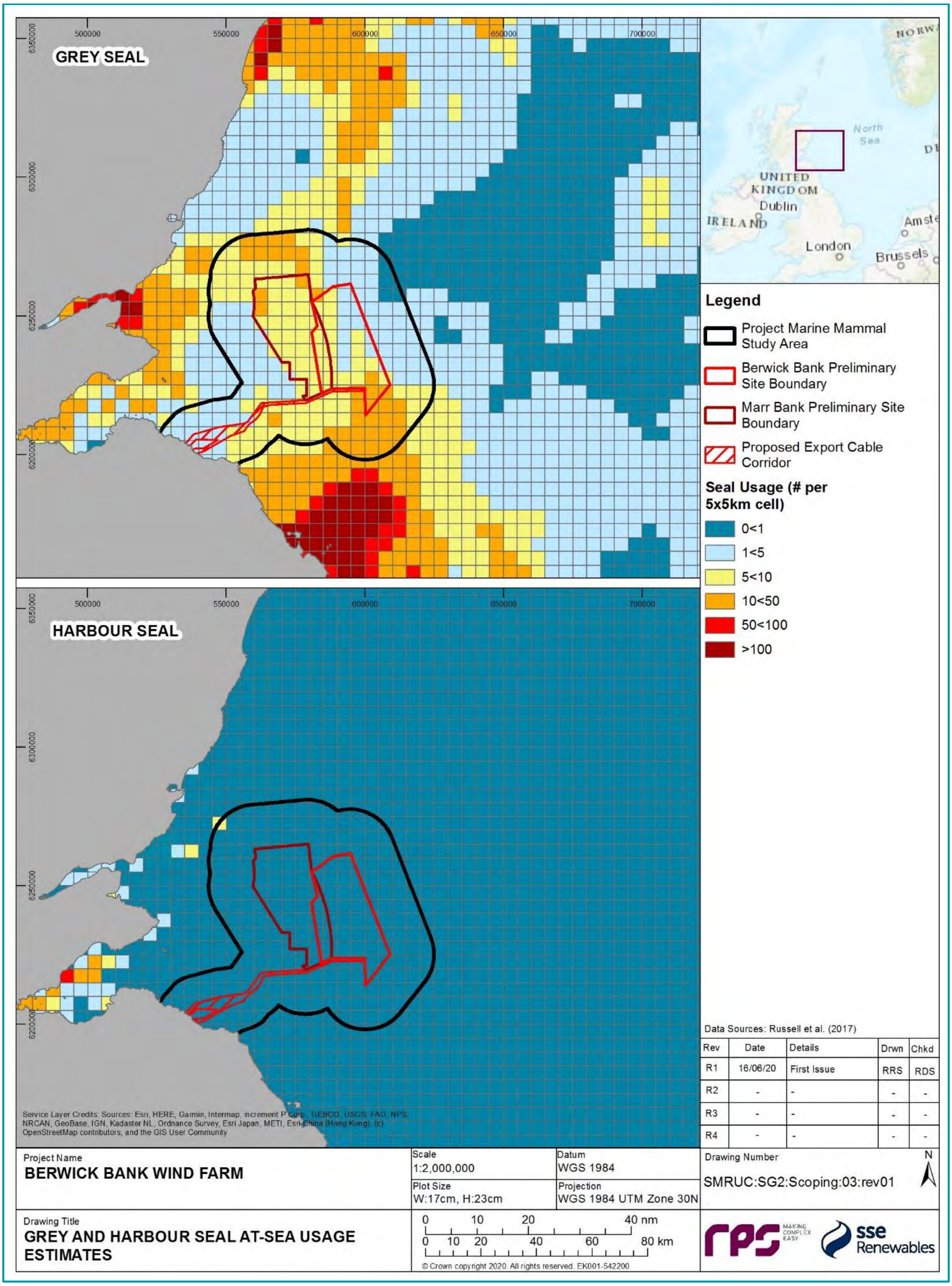


Figure 7.17: Grey and Harbour Seal at-Sea Usage Estimates.

Harbour Seal

In the UK, harbour seals have been assessed as having an Unfavourable – Inadequate conservation status (JNCC, 2019c). The assessment concluded Unfavourable – Inadequate for population size as the short-term trend is unknown and the current population size is below the Favourable Reference Range. In addition, the future prospects were assessed as Unfavourable – Inadequate because the future prospects of the population are poor.

The Proposed Development is located within the east Scotland SMA. The most recent harbour seal August moult count presented for this SMA is 346 (2015-2017 count period) (SCOS, 2019). Accounting for the proportion of the population at sea during the survey, this scales to a population estimate of 511 harbour seals (95% CI: 418 to 681). While the SMA has shown a large decline in numbers since the 1996 to 1997 count period, the most recent haul-out count in the 2015-2017 period (346) was considerably higher than that in the 2007 to 2009 count period (283). However, counts in the Firth of Forth have been sporadic and as such, trends are only fitted to the Firth of Tay and Eden Estuary SAC, which has shown a rapid and monotonic decline since 2002 (Thompson *et al.*, 2019). Given the sightings recorded thus far during the ongoing site-specific aerial surveys, from previous surveys in the former Firth of Forth Zone (Figure 7.16), and from the seal at-sea usage estimates (Figure 7.17), harbour seals are considered likely to occur year round (primarily in coastal waters) within the Proposed Development zone of potential impact.

The only marine mammal receptors that are at risk of impacts landward of MLWS are seals at hauled-out sites. Data sources characterising seal haul-outs are listed in Table 7.11. Seal haul-out sites will be important to consider in terms of the potential impacts from landfall activities.

There are three grey seal haul-out sites that are located within 10 km from proposed export cable corridor landfall locations: Long Craigs (~7 km), Scart Rock (~6 km), and Black Bull (~7 km). In the east Scotland SMA there are three designated seasonal haul-out sites for grey seals: Fast Castle, Inchkeith and Craigleith. The closest of these designated seasonal haul-outs is Fast Castle, which is located within 2 km of Thorntonloch Landfall, and ~5.5 km from Skateraw Landfall.

There are no harbour seal haul-out sites near the landfall locations, the nearest harbour seal haul-out site is Eastern Craigs, Black Rocks, Leith, which is located ~50 km swimming distance from the nearest proposed landfall location There are also two designated haul-out sites for harbour seals: Kinghorn Rocks and Inchmickery and Cow and Calves, both of which are located >40 km from proposed export cable corridor landfall location.

7.3.4 PROPOSED APPROACH TO THE ENVIRONMENTAL IMPACT ASSESSMENT

The marine mammal EIA will follow the methodology set out in chapter 5. Specific to the marine mammal EIA, the following guidance documents will also be considered. This is not considered to be an exhaustive list and the Proposed Development marine mammal Offshore EIA Report chapter will detail all guidance considered in the preparation of the marine mammal assessment:

- Guidelines for Marine and Coastal EcIA in Britain and Ireland (IEEM, 2010; CIEEM, 2019);
- Guidance on Wind Energy Developments and Natura 2000 legislation (EC, 2011);
- Oslo Paris Convention (OSPAR) Guidance on Environmental Considerations for Offshore Wind Farm Development (OSPAR, 2008); and
- marine mammal injury noise exposure-onset noise exposure criteria recommended in (Southall *et al.*, 2019).

In addition, and specific to marine ecology topics, IEFs will be identified and assessments will be presented for appropriate ecological receptor groups in the baseline characterisation of each relevant technical chapter. Criteria defining the value of each IEF will be defined to reflect topic-specific interests.

7.3.5 EMBEDDED MITIGATION

Measures adopted as part of the Proposed Development will follow best practice and may include:

- development of, and adherence to, a Vessel Management Plan (VMP);
- development of, and adherence to, a Pollution Prevention Plan;
- development of, and adherence to, a Decommissioning Plan; and
- implementation of piling soft-start and ramp-up measures.

The requirement and feasibility of additional measures will be dependent on the significance of the effects on marine mammals and will be consulted upon with statutory consultees throughout the EIA process.

7.3.6 POTENTIAL PROPOSED DEVELOPMENT IMPACTS

A range of potential impacts on marine mammals have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of the Proposed Development. The impacts that have been scoped into the Proposed Development assessment are outlined in Table 7.13 together with a description of any additional data collection (e.g. site-specific surveys) and/or supporting analyses (e.g. modelling) that will be required to enable a full assessment of the impacts.

Taking into account the baseline marine mammal information currently available and the Proposed Development description outlined in chapter 3, a number of impacts are proposed to be scoped out of the assessment for marine mammals. These impacts are outlined, together with a justification for scoping them out, in Table 7.14.

The only potential impact on marine mammals landward of MLWS is the impact of landfall activities on seal haul-outs during the construction phase of the Proposed Development.

Table 7.13: Impacts Proposed to be Scoped into the Proposed Development Assessment for Marine Mammals.

Impact	Embedded Mitigation	Justification	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Proposed Approach for the Undertaking of Proposed Development Specific Modelling to Inform the Assessment of Potential Impacts
Construction				
Injury and disturbance from piling	Piling ramp-up and soft-start measures	Impact piling during construction may result in hearing damage/auditory injury Permanent Threshold Shift (PTS) or behavioural disturbance/displacement of marine mammals	Ongoing aerial surveys to obtain density estimates, where data allows, for each species within the relevant impact footprint.	Noise modelling will be required to quantitatively assess the risk of PTS. Unless any new guidance is published prior to the impact assessment, the Southall *et al*. (2019) thresholds will be used to assess the risk of PTS. The risk of injury will be based on both of the dual criteria: cumulative SEL (SEL_{cum}) and peak sound pressure level (SPL_{peak}). The assessment of disturbance will be based on the best practice methodology at the time of assessment, making use of the best available scientific evidence. Species-specific dose-response approach will be applied. Noise contours at appropriate intervals will likely be generated by noise modelling and overlain on species density surfaces to predict the number of animals potentially affected.

Impact	Embedded Mitigation	Justification	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Proposed Approach for the Undertaking of Proposed Development Specific Modelling to Inform the Assessment of Potential Impacts
Disturbance of marine mammals from vessel use and other construction activities	VMP	The impact of other construction related activities (e.g. dredging, trenching, rock placement) and associated vessel use may result in behavioural disturbance/ displacement of marine mammals including the potential for landfall activities to result in disturbance to seals at nearby haul-out sites.	Ongoing aerial surveys to obtain density estimates, where data allows, for each species within the relevant impact footprint.	No modelling required for this impact.
Increased vessel may result in collision with marine mammals	VMP	Increased vessel traffic during construction activities may result in collisions with marine mammals.	Ongoing aerial surveys to obtain density estimates, where data allows, for each species within the relevant impact footprint.	No modelling required for this impact.
Changes in prey availability	N/A	Changes in prey abundance and distribution resulting from construction activities may impact on the ability of marine mammals to forage in the area.	Review of section 7.1.7 Fish and Shellfish Ecology	No modelling required for this impact.

Impact	Embedded Mitigation	Justification	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Proposed Approach for the Undertaking of Proposed Development Specific Modelling to Inform the Assessment of Potential Impacts
Operation and Maintenance				
Injury and disturbance from operation and maintenance activities	VMP	Increased vessel traffic and associated activities during operation and maintenance activities may result in disturbance of marine mammals.	Ongoing aerial surveys to obtain density estimates, where data allows, for each species within the relevant impact footprint.	No modelling required for this impact.
Increased vessel may result in collision with marine mammals	VMP	Increased vessel traffic during operation and maintenance activities may result in collisions with marine mammals.	Ongoing aerial surveys to obtain density estimates, where data allows, for each species within the relevant impact footprint.	No modelling required for this impact.
Changes in prey	N/A	Changes in prey abundance and distribution resulting from operation and maintenance activities may impact on the ability of marine mammals to forage in the area.	Review of section 7.1.7 Fish and Shellfish Ecology	No modelling required for this impact.

Impact	Embedded Mitigation	Justification	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Proposed Approach for the Undertaking of Proposed Development Specific Modelling to Inform the Assessment of Potential Impacts
Decommissioning				
Injury and disturbance from decommissioning activities	N/A	Underwater noise generated during decommissioning activities may result in hearing damage/auditory injury or disturbance of marine mammals.	Ongoing aerial surveys to obtain density estimates, where data allows, for each species within the relevant impact footprint.	No modelling required for this impact.
Increased vessel use may result in collision with marine mammals	VMP	Increased vessel traffic during decommissioning activities may result in collisions with marine mammals.	Ongoing aerial surveys to obtain density estimates, where data allows, for each species within the relevant impact footprint.	No modelling required for this impact.
Changes in prey availability	None	Changes in prey abundance and distribution resulting from decommissioning activities may impact on the ability of marine mammals to forage in the area.	Review of section 7.1.7.	No modelling required for this impact.

Table 7.14: Impacts Proposed to be Scoped Out of the Proposed Development Assessment for Marine Mammals.

Impact	Justification
Construction/Decommissioning	
Accidental pollution	The impact of pollution including accidental spills and contaminant releases associated with the construction of infrastructure and use of supply/service vessels may lead to direct mortality of marine mammals or a reduction in prey availability, either of which may affect species' survival rates. With implementation of an appropriate pollution prevention plan, and based on evidence from other consented offshore wind farms and consent applications, that significant impact within the equivalent extent of a wind farm's array plus buffer area is considered very unlikely to occur, and a major incident that may impact any species at a population level is considered very unlikely. It was predicted that any impact would be of local spatial extent, short-term duration, intermittent and medium reversibility within the context of the regional populations and therefore not significant in EIA terms. This is considered to be equally applicable to the Proposed Development for which construction will be comparable in scale and operation within the same environment, whilst implementing an appropriate pollution prevention plan. Therefore, subject to consultation with the SNCBs and feedback received on this Offshore Scoping Report, the Proposed Development intends to scope this impact out of further consideration within the EIA.
Changes in water clarity	Disturbance to water quality as a result of construction operations can have both direct and indirect impacts on marine mammals. Indirect impacts would include effects on prey species (which is scoped in and is listed in Table 7.13). Direct impacts include the impairment of visibility and therefore foraging ability which might be expected to reduce foraging success. Marine mammals are well known to forage in tidal areas where water conditions are turbid and visibility conditions poor. For example, harbour porpoise and harbour seals in the UK have been documented foraging in areas with high tidal flows (e.g. Pierpoint 2008, Marubini *et al.* 2009, Hastie *et al.* 2016); therefore, low light levels, turbid waters and suspended sediments are unlikely to negatively impact marine mammal foraging success. When the visual sensory systems of marine mammals are compromised, they are able to sense the environment in other ways, for example, seals can detect water movements and hydrodynamic trails with their mystacial vibrissae; while odontocetes primarily use echolocation to navigate and find food in darkness. Whilst elevated levels of SSC arising during construction of the offshore wind farm may decrease light availability in the water column and produce turbid conditions, the maximum impact range is expected to be localised with sediments rapidly dissipating over one tidal excursion. In addition, there is likely to be large natural variability in the SSC within the Proposed Development Marine Mammal Study Area due the proximity to the Firth of Forth estuary, so marine mammals living here will be tolerant of any small scale increases, such as those associated with the construction activities. In summary, the ZOI of increased SSC will be small, particularly in the context of the wider available habitat, and the duration of effects will be short (one tidal excursion). Marine mammal receptors in the Marine Mammal Study Area are not considered to be sensitive to increases in SSC as they are likely to be adapted to high natural variation in sediment levels. Therefore, it is proposed that this impact is scoped out of the EIA.

Impact	Justification
Operation and Maintenance	
Operational noise	The MMO (2014) review of post-consent monitoring at Offshore Wind Farms found that available data on the operational wind turbine noise, from the UK and abroad, in general showed that noise levels from operational wind turbines are low and the spatial extent of the potential impact of the operational wind turbine noise on marine receptors is generally estimated to be small, with behavioural response only likely at ranges close to wind turbines. This is supported by several published studies which provide evidence that marine mammals are not displaced from operational wind farms. At the Horns Rev and Nysted offshore wind farms in Denmark, long-term monitoring showed that both harbour porpoise and harbour seals were sighted regularly within the operational Offshore Wind Farms, and within two years of operation, the populations had returned to levels that were comparable with the wider area (Diederichs *et al.* 2008). Similarly, a monitoring programme at the Egmond aan Zee Offshore Wind Farm in the Netherlands reported that significantly more porpoise activity was recorded within the Offshore Wind Farm compared to the reference area during the operational phase (Scheidat *et al.* 2011). Other studies at Dutch and Danish offshore wind farms (Lindeboom *et al.* 2011) also suggest that harbour porpoise may be attracted to increased foraging opportunities within operating offshore wind farms. In addition, recent tagging work by Russell *et al.* (2014) found that some tagged harbour and grey seals demonstrated grid-like movement patterns as these animals moved between individual wind turbines, strongly suggestive of these structures being used for foraging. Other reviews have also concluded that operational wind farm noise will have negligible effects (Madsen *et al.* 2006, Teilmann *et al.* 2006a, Teilmann *et al.* 2006b, Cefas, 2010, Brasseur *et al.* 2012). In addition, previous modelling by Subacoustech (e.g. Hornsea Project Three EIA) concluded that underwater noise during the operational phase is expected to have a negligible range of influence on any marine receptors. Therefore, subject to consultation with the SNCBs and feedback received on this Offshore Scoping Report, it is proposed to scope this impact out of further consideration within the EIA.
EMF	Based on the data available to date, there is no evidence of EMF related to marine renewable devices having any impact (either positive or negative) on marine mammals (Copping 2018). There is no evidence that seals can detect or respond to EMF, however, some species of cetaceans may be able to detect variations in magnetic fields (Normandeau *et al.* 2011). To date, the only marine mammal known to show any response to EMF is the Guiana dolphin (*Sotalia guianensis*) which has been shown to possess an electroreceptive system, which uses the vibrissal crypts on their rostrum to detect electrical stimuli similar to those generated by small to medium sized fish (Czech-Damal *et al.* 2013). However, this has not been shown in any other species of marine mammal and this species does not occur within the Proposed Development marine mammal study area of Regional marine mammal study area Therefore, subject to consultation with the SNCBs and feedback received on this Offshore Scoping Report, it is proposed to scope this impact out of further consideration within the EIA.

7.3.7 POTENTIAL CUMULATIVE EFFECTS

The marine mammal cumulative effect assessment will follow the approach set-out in chapter 5. The identification of cumulative effects on marine mammals will follow receptor-specific approach to determine receptor-impact pathways from the cumulative screening matrix.

The key cumulative effect is likely to result from increased underwater noise from pile driving.

7.3.8 POTENTIAL TRANSBOUNDARY IMPACTS

A screening of transboundary impacts has been carried out and is presented in Annex C. This screening exercise identified that there is the potential for transboundary impacts upon marine mammals due to construction, operational and maintenance, and decommissioning impacts of the Proposed Development. It is not expected that any impact from the Proposed Development will have a direct impact on the environment of any another EEA State. However, the scale of the Mus for harbour porpoise, white-beaked dolphin and minke whale mean that there is the potential for impacts on populations whose MU and range extends beyond UK waters.

7.3.9 SCOPING QUESTIONS TO CONSULTEES

- Do you agree that the data sources identified are sufficient to inform the marine mammal baseline chapter?
- Do you agree that all potential impacts (Table 7.13) been identified for marine mammal receptors?
- For those impacts scoped in (Table 7.13), do you agree that the methods described are sufficient to inform a robust impact assessment?
- Do you agree that the impacts described in Table 7.14 can be scoped out?

7.4 OFFSHORE AND INTERTIDAL ORNITHOLOGY

7.4.1 INTRODUCTION

This Offshore Scoping Report considers the potential impacts on birds from construction, operation and maintenance, and decommissioning of the offshore and intertidal components of the Proposed Development (seaward of the MHWS mark).

7.4.2 OFFSHORE ORNITHOLOGY STUDY AREA

Three study areas inform the Offshore Scoping Report (and subsequently the Offshore EIA Report). These are listed below, with further detail is provided in the following sections:

- offshore ornithology regional study area;
- offshore ornithology study area; and
- intertidal ornithology study area.

7.4.2.1 Offshore Ornithology Regional Study Area

Many seabirds have large foraging ranges which extend several hundred kilometres from their breeding colonies. Birds may therefore overlap (i.e. have connectivity with) the Proposed Development, even when the colonies they originate from are a significant distance away. The offshore ornithology regional study area therefore identifies the SPA breeding colonies with potential connectivity to the Proposed Development (Figure 7.18).

Published mean-maximum foraging ranges (plus one standard deviation (+1 S.D.)) in Woodward *et al*. (2019) were used to define the offshore ornithology regional study area. Northern gannet *Morus bassanus* has the largest foraging range (315.2 km ± 194.2 km) of the key species considered in the ornithology assessment (see section 7.4.1.3). The offshore ornithology regional study area therefore extends 509.4 km from the Proposed Development along a marine pathway (Figure 7.18). Search areas for SPA breeding colonies and regional search areas for other key species in the assessment will fall within the mean-maximum foraging range of gannet. Therefore, the application of this search area defines the maximum extent of the offshore ornithology regional study area.

A seabird breeding colony that is affected by the potential impacts of the Proposed Development could also be affected by the potential impacts at other developments within the foraging range of seabirds from that colony. The offshore ornithology cumulative study area for each species will therefore be defined by implementing a search area equivalent to the species-specific mean-maximum foraging range (+ 1 S.D.) along a marine pathway from those potentially affected breeding colonies of that species.

In the non-breeding season, seabirds are not constrained by colony location and can, depending on individual species, range widely within UK seas and beyond. The ZoI for seabird species in the non-breeding season (where an assessment is deemed to be required) is based on Furness (2015) which presents Biologically Defined Minimum Population Scales (BDMPS). It is not possible to represent these scales on a figure.

7.4.2.2 Offshore Ornithology Study Area

The baseline digital aerial survey extends to 12 km from the Berwick Bank Wind Farm and Marr Bank Wind Farm array areas. This survey buffer and a 2 km buffer of the proposed export cable corridor, form the offshore ornithology study area (Figure 7.18).

This study area encompasses the Proposed Development's 2 km direct ZOI on birds and provides the wider ornithological context for the Proposed Development. It is also of sufficient size to provide a potential control area for monitoring change in seabird abundance and distribution pre and post construction of the Proposed Development.

The proposed export cable corridor has not been covered by the current digital aerial surveys because potential impacts from that part of the Proposed Development are proposed to be scoped out (Table 7.17).

The offshore ornithology assessment will include consideration of the potential impacts on migratory species such as bean geese or pink-footed geese, which may be associated with the Slamannan Plateau SPA or Firth of Forth SPA respectively.

7.4.2.3 Intertidal Ornithology Study Area

The study area for the assessment of effects on birds in the intertidal zone covers the coastal area between MHWS and MLWS at the landfall locations within which wintering intertidal bird surveys will be conducted. This study area will extend 250 m either side of the landfall locations and up to 300 m seaward from MHWS (Figure 7.18).

7.4.1 BASELINE ENVIRONMENT

There is a considerable amount of information on seabirds and other bird interests in the outer Firth of Forth. These data are available following surveys and data collection programmes associated with the existing Forth and Tay offshore wind farm developments including: Seagreen 1 (Seagreen Alpha and Bravo), Neart na Gaoithe and Inch Cape offshore wind farms. However, guidelines and best practice applicable to the assessment of potential impacts of offshore wind farms on bird receptors are continually developing. Therefore, further site-specific baseline ornithological data collection has been undertaken since spring 2019 and will continue until spring 2021. Ongoing consultation with Marine Scotland, SNH and the RSPB has informed the range of data collection to date and will continue to help to inform the scope of the proposed baseline survey, analysis and assessment of the Proposed Development in the Offshore EIA Report.

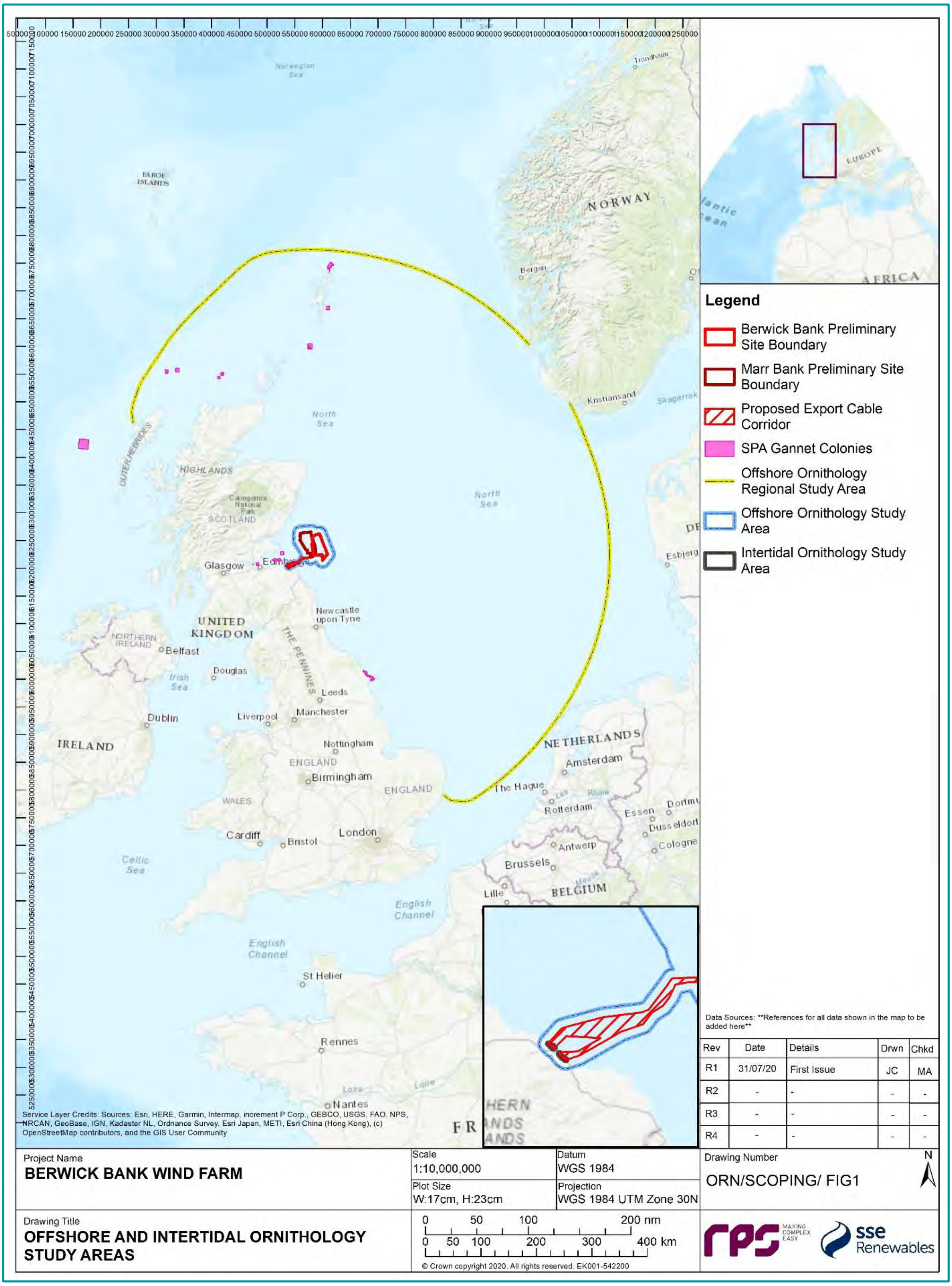


Figure 7.18: Offshore Ornithology and Intertidal Ornithology Study Areas.

7.4.1.1 Desktop Study

An initial desk-based review of literature and data sources to support this Offshore Scoping Report has identified baseline datasets in the form of pre-existing, non-Proposed Development specific, and Proposed Development specific datasets. These are summarised at Table 7.15 below. Other sources of data will be sought as the assessment progresses and all such sources of information will be referenced appropriately in the Offshore EIA Report.

Table 7.15: Summary of Key Desktop Reports.

Title	Source	Year	Author
Special Protection Areas, proposed marine Special Protection Areas, and Sites of Special Scientific Interest	SNH SiteLink	Accessed 2020	SNH: https://sitelink.nature.scot
Seabird colony data	Seabirds Count and the Seabird Monitoring Programme	2020b	JNCC: https://jncc.gov.uk/our-work/seabird-monitoring-programme/#smp-results-data
2018 Seagreen 1 (Alpha and Bravo) Environmental Statement and Addendum and associated technical reports	Seagreen online library	2018, 2019	Seagreen: https://www.seagreenwindenergy.com/library
Visual aerial surveys of Firth of Forth	Wildfowl and Wetlands Trust (WWT); Kober et al., 2010	2009-10	JNCC
Non-estuarine Coastal Waterbird Survey	British trust for Ornithology (BTO)	2015/16	BTO: https://app.bto.org/webs-reporting/?tab=news

7.4.1.2 Site-specific Survey Data

Details are provided below of planned and existing Proposed Development specific data sources/surveys of relevance to marine and coastal ornithology:

- boat-based transect surveys of the Firth of Forth Round 3 Zone, December 2009 to November 2011;
- digital aerial transect surveys of the Proposed Development and Marr Bank Wind Farm array areas plus 12 km buffer, March 2019 to April 2021;
- boat-based transect surveys within the Proposed Development and Marr Bank Wind Farm array areas targeted at recording flight height and behaviour and collecting associated environmental variable data, July and August 2020 and April and May 2021;
- tracking, colour-ringing and breeding colony data 2020 to 2021, if available; and
- winter intertidal bird surveys at the landfall locations on the north Berwick coast from September 2020 to March 2021.

The original 2009 to 2011 boat-based surveys were carried out for the first phase of baseline data collection for the former Firth of Forth Zone. Changes in seabird populations since then will be accounted for when assessing the magnitude of potential predicted impacts using these data. This will be considered in detail and discussed with consultees following presentation of an interim baseline report in Quarter 4 2020. It is also recognised that baseline data to characterise the site's seabird population will be derived from two different survey platforms (boat and aerial), each with their own particular benefits. This will also be considered and discussed with consultees following presentation of the interim baseline report in Quarter 4 2020.

Boat-based Transect Surveys 2009 to 2011

A total of 23 monthly boat-based transect surveys were undertaken between December 2009 and November 2011, covering the former Firth of Forth Zone (Figure 7.19), which includes the boundary of the Proposed Development. Transects were spaced 3 km apart and oriented northwest to southeast to intercept the likely predominant flight lines from major breeding colonies in the Firth of Forth. Due to weather constraints, five of the 23 surveys were incomplete (January 2010 (89% complete), March 2010 (26%), November 2010 (58%), February 2011 (84%) and October 2011 (80%)) but all other survey months attained 100% coverage.

The survey followed a modified method based on COWRIE recommendations (Camphuysen *et al.* 2004) for ornithological survey at offshore wind farms (which is based on the standard European Seabirds at Sea (ESAS) protocol). Birds were recorded in distance bands perpendicular to each side of the boat (A: 0 m – 50 m, B: 50 m – 100 m, C: 100 m – 200 m, D: 200 m – 300 m and E: >300 m). The survey therefore achieves approximately 20% coverage of the survey area. The direction of travel and height of flying birds was recorded in three bands (1: <20 m, 2: 20 m to 120 m and 3: >120 m). Snapshot counts were undertaken at 500 m intervals in radial distance bands (A to D) resulting in a 180° arc extending 300 m from each side of the vessel. Sea state and other variables (glare, cloud cover and precipitation and general visibility score) were also recorded.

The data will be used to generate combined density estimates of birds sitting on the water and birds in flight. In order to provide consistency for comparison with the Seagreen 1 Application, density will be calculated in two ways: (i) using standard ESAS density estimation; and (ii) using Distance sampling for birds on the water where sample size permits, combined with standard ESAS density estimates for birds in flight.

Digital Aerial Transect Surveys 2019 to 2021

A monthly programme of digital aerial transect surveys has been carried out since March 2019 and is planned to continue until April 2021. The survey area encompasses the array area and Marr Bank Wind Farm array areas, plus a 12 km buffer. This survey area incorporates a large area of open sea extending over nearly 5,000 km^2 (Figure 7.20). The survey is carried out using multiple aircraft in a single day to reduce potential variation associated with movement of birds between different days.

The surveys follow the standard HiDef digital video aerial survey method for recording birds, conforming with guidance of Thaxter and Burton (2009) and updated in Thaxter *et al.* (2016). Transects across the survey area are spaced 2 km apart. The aircraft carries four cameras recording continuously across the survey area transects, each surveying a strip width of 125 m. Data from two of the cameras are analysed, with the other two providing back up data in case of failure, or to provide additional spatial coverage where necessary. The survey therefore achieves 12.5% coverage of the survey area.

For each bird detected, a record is made of the observation time and location, species group, species (where identification can be made to species level), number of individuals, age class, behaviour, flight direction and association (e.g. with fishing vessels).

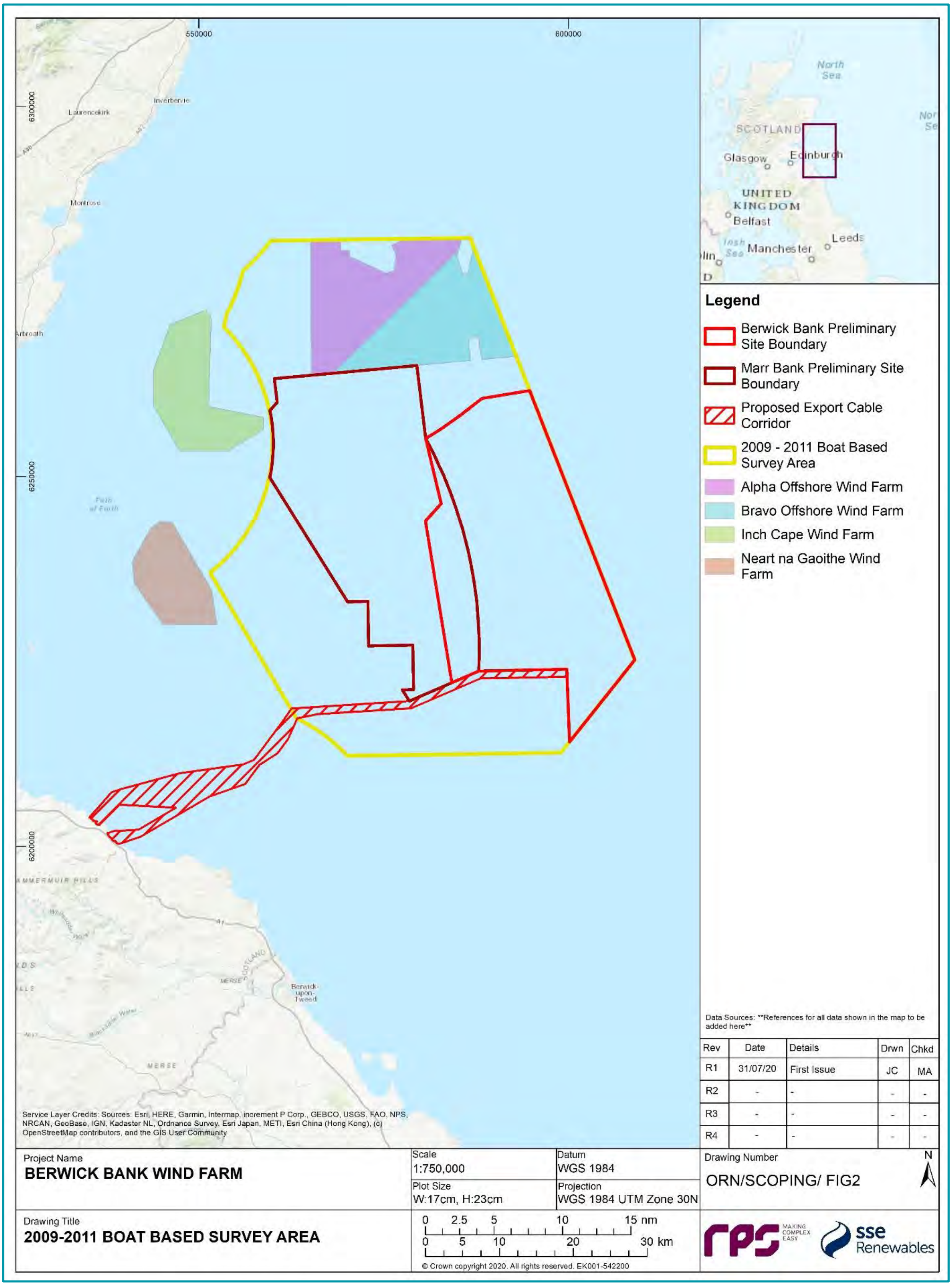


Figure 7.19: **Boat-based Transect Survey Area 2009 to 2011.**

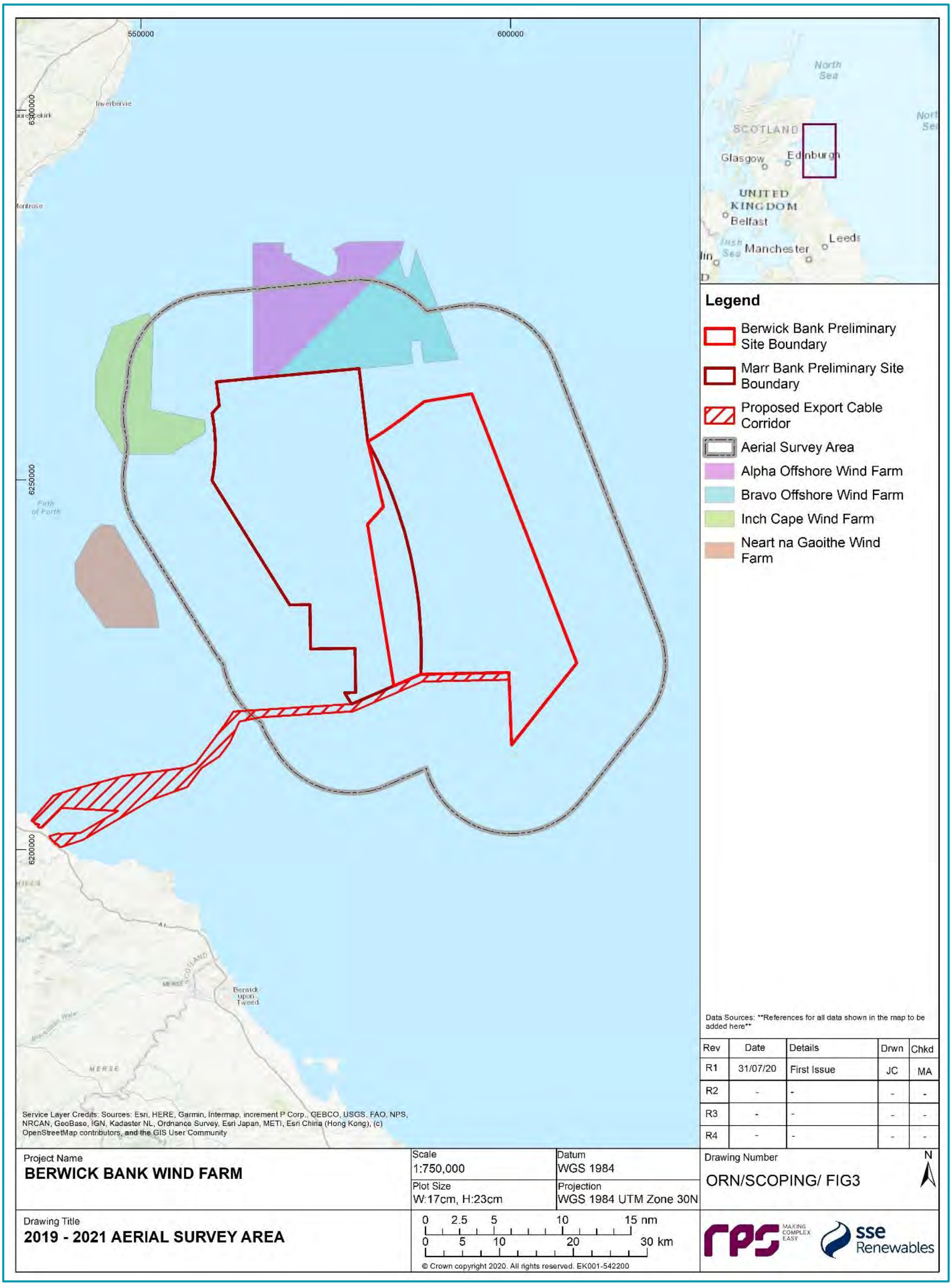


Figure 7.20: Digital Aerial Transect Survey Area 2019 to 2021.

Industrial action at airfields, weather and in April 2020 the Covid-19 lockdown, prevented surveys being flown in three months to date, (January 2020, April 2019 and April 2020). However, for two out of the three missed months (January and April 2020), two surveys were subsequently completed in the following month (spaced 14 and 11 days apart respectively). Two surveys will also be flown in April 2021 to ensure contemporary coverage for that part of the season. For a small proportion of the other monthly surveys, not all 37 transects were flown, but data from the third and fourth cameras enabled the 12.5% coverage to be maintained. Consideration is being given to appropriate modelling and statistical analyses to help take account of these aerial survey data gaps, and the approaches being considered will be the subject of on-going consultations with Marine Scotland, SNH and the RSPB.

The expansive aerial survey data, extending out to 12 km from the array area, will be used to generate density estimates of bird species within the survey area using the MRSea modelling application.

Boat-based Seabird Surveys 2020 to 2021

The previous boat-based surveys (2009 to 2011) recorded flight heights of birds in three height bands (<20 m, 20 m to 100 m and >120 m). These bands were informed by the approximation of wind turbine dimensions at that time. Whilst useful to determine the overall proportion of flight activity below 20 m, these bands do not however, directly reflect the potential rotor swept heights of modern or future wind turbine technology. Further boat-based surveys are therefore being undertaken to collect site-specific flight height (and behavioural) data to inform the Proposed Development and Marr Bank Wind Farm collision risk modelling (CRM). This programme of surveys was planned for 2020, however commencement was delayed due to the COVID-19 pandemic. As a result, a revised programme of surveys will take place across two breeding seasons, in July and August 2020 and April and May 2021.

The proposed survey broadly follows Embling *et al.* (2012). This includes repeatedly sampling locations along a continuous transect route to assess the effect of variable factors (e.g. tidal state) on bird density, or utilisation of a specific area. In a deviation from Embling *et al.* (2012), the proposed approach will survey four spatially independent sites (two in the array area and two in the Marr Bank Wind Farm array area, each separated by at least 5 km) using two parallel 15 km line transects separated by a 3 km gap. Each of the four sites will be surveyed over a day during suitable weather conditions, once per month (in July and August 2020 and April and May 2021). During each one-day survey, the transect routes will be repeatedly surveyed between sunrise and sunset to cover the daytime component of the diel cycle when birds can be surveyed visually. It is anticipated that each transect will be repeated four times during each survey, with repeats being spread throughout the day at dawn, mid-morning, mid-day, mid-afternoon and ending at dusk. Time between runs will be used to collect additional flight height data using a rangefinder.

The survey will follow the same modified observation method as used for the previous boat-based surveys (2009 to 2011), recording detailed information about species, age and plumage of each bird encountered, flight direction, behaviour, interaction with other birds, incidental marine mammals sightings, vessels, and association with other features of interest such as tidal fronts, upwellings, current, detritus or flotsam etc. Flight height recording will follow the previous boat-based survey method used for Seagreen 1 in 2017 (Harwood *et al.* 2018), with flight heights estimated in 5 m bands. Flight height distributions will be generated by use of a laser rangefinder. The detailed methodology is subject to a separate consultation with ornithological advisors at Marine Scotland, SNH and RSPB.

Tracking, Colour-ringing and Breeding Colony Data

A series of tracking, ringing and colony studies are ongoing or have been proposed as part of the monitoring proposals for the combined Forth and Tay developments: Seagreen 1, Neart na Gaoithe and Inch Cape, under advice from the Forth and Tay Regional Advisory Group Ornithology subcommittee. It is anticipated that data from those studies will be made available to inform the Proposed Development ornithology EIA.

A programme of tracking of breeding seabirds using GPS tags has been proposed to provide breeding colony-specific data on bird movements from the Isle of May, St Abb's Head to Fast Castle and Fowlsheugh colonies. Due to the impact of the COVID-19 pandemic however, tagging is not likely to happen in 2020 for St Abb's or Fowlsheugh, and tag deployment on the Isle of May might be reduced. As a result, inclusion of results from new tagging studies in the Proposed Development assessment will be determined in 2021.

Other existing tracking data are available (from Centre for Ecology and Hydrology (CEH) and University of Leeds) covering several years and for multiple seabird species, from the Isle of May and Bass Rock, and (for 2010 and 2011) from Fowlsheugh and St Abb's Head to Fast Castle. These data span the last decade. Further tagging data will be sought from the RPSB-led Future of the Atlantic Marine Environment fameproject.eu (FAME) and Seabird Tracking and Research (STAR) projects. If available for the offshore ornithological assessment, it is intended that these data will be used to inform colony provenance and breeding colony connectivity of seabirds within the Proposed Development site, as part of the assessment process.

Similarly, a programme of colour-ringing and re-sighting of gannets at Bass Rock, Grassholm and potentially one other colony is proposed to provide information on demographic rates for population modelling and monitoring of future change. Fieldwork was however, limited in the 2020 season because of the Covid-19 pandemic, with fieldwork limited to re-sighting rather than ringing birds. As a result of the Covid-19 adjustments that have had to be made, the extent to which new gannet ring reading data will available for the Proposed Development ornithology assessment is yet to be determined.

On behalf of the Applicant, RSPB has collated all existing colony monitoring data from the Fowlsheugh and St Abb's Head breeding colonies. These include demographic as well as population abundance data. These data will be used to inform the population viability analysis where appropriate.

Winter Intertidal Surveys 2020 to 2021

Monthly surveys within the intertidal ornithology study area at the landfall locations (Figure 7.18) are planned for the period between September 2020 and March 2021. Each survey will comprise a six hour 'through-the-tide' count, during which time the distribution, numbers and activity of bird species present will be recorded at appropriate intervals. Contextual data on weather conditions, sources of potential disturbance (dog walkers, predators etc.) will also be noted, and all resulting data compiled on Microsoft Access data and ArcGIS.

Accompanying the inter-tidal survey effort data, there will also be recording of birds in the nearshore in the intertidal ornithology study area from an appropriate shore-based vantage point, up to 300 m from the shoreline.

7.4.1.3 Baseline Characterisation

The Proposed Development lies within the Forth and Tay region, recognised as one of the most important for birds in the North Sea (Heath *et al*. 2000). It supports internationally important populations of gannet, auk and gull species, and as a result, has been the focus of extensive seabird research. This has demonstrated the importance of the shallow sandbanks of the Wee Bankie and Marr Bank as feeding areas for seabirds from local colonies (e.g. Daunt *et al.* 2011; Wanless *et al.* 1998), and demonstrated that, in general, seabird numbers and species diversity decline with distance from shore.

As a result of this research, the ornithology of the Proposed Development and surrounding area is known in part from previous surveys, reports and scientific studies (e.g. Kober *et al.*, 2010). However, since that phase of earlier studies, considerable new information has also become available through a combination of site-specific and regional research projects, as detailed above. A detailed interim baseline report is being produced for consultation in Quarter 4 2020, which will bring this combination of information together, up-dating and describing the current baseline knowledge on key species and trends in their population and distribution. The following provides a brief summary of general baseline characteristics, divided into breeding, wintering and passage periods.

Breeding Species

Survey data to date indicate that the most numerous species in the Proposed Development area are common guillemot *Uria aalge*, black legged kittiwake *Rissa tridactyla*, gannet, Atlantic puffin *Fratercula arctica* and razorbill *Alca torda*. For these species, numbers are typically highest during the pre-breeding period when birds forage further from their breeding colonies and during post-breeding dispersal.

Although there is considerable spatial variation in abundance and distribution within and between breeding seasons, data suggest greater auk densities occur in the shallower waters of the Wee Bankie / Marr Bank sandbank complex in the west of the Proposed Development. Higher kittiwake densities have ranged further east (Daunt *et al.*, 2011a, 2011b) but boat and aerial surveys show other foraging hotspots, for example in the south west of the area.

The Proposed Development lies within the core foraging range of gannets from the Bass Rock breeding colony. Numbers of gannet at the Bass Rock breeding colony have increased significantly in recent years, and this internationally important gannetry is now the largest in the world, with approximately 75,000 pairs (Murray *et al*., 2015).

Other breeding species which are distributed fairly uniformly across the region at low densities include fulmar *Fulmarus glacialis* and gulls including herring *Larus argentatus*, lesser black-backed *L. fuscus* and great black backed *L. marinus* gulls. Species such as terns and skuas have not been recorded in notable numbers.

The abundance of the key species above (gannet, kittiwake and auks) is consistent with the presence of internationally important breeding seabird colonies around the coast and islands of the Firths of Forth and Tay, in particular the Forth Islands SPA, which includes the Isle of May and Bass Rock, and the sea cliffs of St Abb's Head to Fastcastle SPA and Fowlsheugh SPA. The breeding success of some species at these colonies is in decline reflecting what appear to be general trends for seabirds in the North Sea (Mavor *et al*., 2008; Parsons *et al*., 2008; JNCC, 2020b). For prey specialists such as kittiwake, this may be linked to a decline in the abundance of sandeels *Ammodytes marinus*.

Wintering Species

Surveys indicate that in winter, auks remain the dominant species group with puffins present in lower numbers than during the breeding period. Greater numbers of wintering little auk *Alle alle* have been recorded at this time. Kittiwakes are also widespread together with wintering herring and great black-backed gulls, including birds of Scandinavian origin. Gannet remain present but in reduced numbers as birds from the Bass Rock tend to winter in waters south of the North Sea, predominantly off West Africa (Deakin *et al*. 2019). By contrast, fulmars may be present in greater densities than in summer in the Firth of Forth area (Kober *et al*., 2010).

Seaducks, divers, grebes and waders which winter in the inner Firths of Forth and Tay in nationally important numbers appear to be present only in very low numbers.

Passage Species

Passage movements have traditionally been difficult to assess comparatively, using boat-based or aerial survey methods, as they are time-limited to relatively short periods and migration may also take place at high altitudes and under cover of darkness, when detection is difficult. This has been resolved to a degree for some species through satellite tagging individuals (notably bean geese, for example see Wildfowl and Wetlands Trust (2017) although sample sizes for other species remain relatively small, and therefore only provide a partial indication of these populations' movements.

Migrating species were, nonetheless, still recorded during boat-based surveys, particularly pink footed geese *Anser brachyrhynchus* and a smaller number of barnacle geese *Branta leucopsis*. Overall, the relatively low numbers seen and evidence from tracking projects suggest that goose migration tends to occur predominantly inshore of the Zone (Griffin *et al.*, 2011).

Other passage species occurring in relatively high numbers during boat-based surveys include little gull *Hydrocoelus minutus* and Arctic tern *Sterna paradisea* with common *S. hirundo* and Sandwich tern *S. sandvicensis* present in smaller numbers. Shearwaters and petrels which may have been anticipated on passage have been seen in relatively low numbers, as have skuas and gulls (Langston, 2010).

The SPAs of the inner Firths of Forth and Tay support large populations of wintering migrants including, sea ducks, divers, grebes and waders, but these have not been recorded in the Proposed Development area other than as isolated individuals. Passerine species are known to cross the North Sea in large numbers moving to and from continental Europe. However, they too have generally been scarce with the exception of redwing *Turdus iliacius* which was recorded in good numbers during autumn passage.

The aerial and boat-based data collected to date broadly confirm the distribution of key species predicted for the Firth of Forth region using ESAS data (Kober *et al*., 2010) and in the area in general as described by Stone *et al*. (1995) and the RSPB (Langston, 2010).

Between MLWS and MHWS

The intertidal and near shore bird populations also vary seasonally, across the same breeding, wintering and passage periods. In the absence of any concentrations of breeding seabirds or other species of conservation concern however, the key feature of these habitats occur during winter and passage. The inner Firth of Forth is internationally and nationally important for its wader and wildfowl assemblages over these periods, reflected in the designation of the Firth of Forth SPA.

The preferred landfalls (Skateraw and Throtonloch) is yet to be finalised, but options do not fall within any sites designated primarily for ornithology features. The Skateraw landfall location overlaps Barns Ness Coast SSSI which is designated for geological feature and biological features (saltmarsh, sand dune and shingle); the citation also notes that a good diversity of birds adds to the interest of the site. It is therefore anticipated that the specific intertidal locations in the immediate vicinity of the landfall comprise over-wintering and passage assemblages of local importance only, comprising small numbers of species such as ruddy turnstone *Arenaria interpres*, oystercatcher *Haematopus ostralegus* and redshank *Tringa totanus*.

Designated Sites

There are many protected areas for ornithology receptors in the east of Scotland. A full screening of Natura 2000 sites with qualifying ornithology interest features will be undertaken in the LSE Screening Report for the Proposed Development. Relevant ornithology notified interest features of Natura 2000 sites screened into the ornithology assessment will be fully considered and assessed in the Offshore EIA Report chapter with the assessment on the Natura 2000 site itself deferred to the RIAA. Designated sites for ornithological interest, including SPAs and proposed SPAs (pSPA), will be identified through the process described for identification of the offshore ornithology study area and offshore ornithology cumulative study areas.

This will generate a 'long-list' of designated sites with potential connectivity derived from seabirds' large foraging ranges (mean-maximum + 1 S.D.). Due to their proximity to the site and based on the experience of the Seagreen 1 and other Forth and Tay offshore wind farm developments, the assessment is likely to focus on the potential effects on:

- Forth Islands SPA;
- Fowlsheugh SPA;
- St Abb's Head to Fast Castle SPA; and
- Outer Firth of Forth and St Andrew's Bay Complex pSPA.

The screening to be undertaken in the ornithology Offshore EIA Report chapter will also include national designations, including SSSIs and MPAs.

7.4.2 PROPOSED APPROACH TO THE ENVIRONMENTAL IMPACT ASSESSMENT

The offshore and intertidal ornithology EIA will follow the methodology set out in chapter 5. Specific to the offshore and intertidal ornithology EIA, the following guidance documents will also be considered:

- Chartered Institute of Ecology and Environmental Management (CIEEM) Guidelines for EcIA in the UK and Ireland, Including the Coastal and Marine Environments (CIEEM, 2019);
- Guidance on Ornithological CEA (King *et al.*, 2009);
- Vulnerability of Seabirds to Offshore Wind Farms (Furness *et al.*, 2013; Wade *et al.*, 2016); and
- Mapping Seabird Sensitivity to Offshore Wind Farms (Bradbury *et al.*, 2014).

Additional sources of guidance and information to inform the ornithological assessment will be identified, and the offshore and intertidal ornithology Offshore EIA Report chapter will detail all guidance considered in the preparation of the assessment. For example, during the course of the assessment, it is expected that new guidance will emerge for specific aspects of assessing the potential impacts of offshore wind farms on seabirds, including for example, the Marine Scotland project '*Study to examine how seabird collision risk, displacement and barrier effect could be integrated for assessment of offshore wind developments*'. Emerging guidance will be monitored and applied as appropriate to the assessment, in discussion with consultees.

In addition, and specific to marine ecology topics, IEFs will be identified and assessments will be presented for appropriate ecological receptor groups in the baseline characterisation of each relevant technical chapter. Criteria defining the value of each IEF will be defined to reflect topic-specific interests.

7.4.3 EMBEDDED MITIGATION

Measures adopted as part of the Proposed Development will include:

- the landfall (below MHWS) avoids designated sites for birds;
- development of, and adherence to, a Vessel Management Plan (VMP);
- development of, and adherence to, an Environmental Management Plan, including Marine Pollution Contingency Plan;
- development of, and adherence to, a Pollution Prevention Plan; and
- the baseline data being prepared for the interim baseline report will be used to help inform the final design of the Project (e.g. the selected wind turbine design may be influenced by the differences in

scale of potential collision risk of the different wind turbine specifications, or it may be possible to identify areas of consistently and significantly high sensitivity with respect to seabirds and avoid wind turbine development in those areas in order to reduce potential effects).

The requirement and feasibility of additional measures will be dependent on the significance of the effects on offshore and intertidal birds and will be consulted upon with statutory consultees throughout the EIA process.

7.4.4 POTENTIAL PROPOSED DEVELOPMENT IMPACTS

A range of potential impacts on marine and coastal birds have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of the Proposed Development. These include:

- construction:
  - disturbance and displacement; and
  - indirect impacts, for example as a result of changes in prey distribution, availability or abundance.
- Operation and maintenance:
  - collision with operating wind turbines;
  - disturbance and displacement;
  - barrier to flight lines, such as along migratory pathways or interruptions to frequent movements between breeding/roosting sites and foraging areas; and
  - indirect impacts.
- decommissioning (similar to construction effects):
  - disturbance and displacement; and
  - indirect impacts.

The impacts that have been scoped into the Proposed Development assessment are outlined in Table 7.16 together with a description of any additional data collection (e.g. site-specific surveys) and/or supporting analyses (e.g. modelling) that will be required to enable a full assessment of the impacts.

On the basis of the baseline ornithological information currently available and the Proposed Development description outlined in chapter 3, a number of impacts are proposed to be scoped out of the assessment for marine and coastal ornithology. These impacts are outlined, together with a justification for scoping them out, in Table 7.17.

Preliminary analysis of the boat-based transect survey data (2009 to 2011) and the ongoing digital aerial transect survey data (2019 to 2021), as well as the key species identified by the Forth and Tay Regional Advisory Group ornithology subcommittee, suggest that seabird species on which assessment should focus on for the Proposed Development are:

- gannet;
- kittiwake;
- guillemot;
- razorbill; and
- puffin.

Table 7.16: Impacts Proposed to be Scoped into the Proposed Development Assessment for Offshore and Intertidal Ornithology.

Impact	Embedded Mitigation	Justification	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Proposed Approach for the Undertaking of Proposed Development Specific Modelling to Inform the Assessment of Potential Impacts
Construction				
Temporary habitat loss/ disturbance	Cable landfall avoids designated sites.	Presence of vessels and construction works may disturb birds from foraging areas in the short-term.	Baseline surveys and data analysis described in section 7.4.1.	No specific modelling required for this impact.
Indirect impacts	As described in section 7.1.7.	Reduction or disruption to prey availability may cause displacement from the area or reduced energy intake, affecting productivity or survival in the short-term.	Section 7.1.7 for assessment of effects on fish and shellfish ecology.	No specific modelling required for this impact.
Operation and Maintenance				
Collision	Final design may avoid areas of consistently and significantly high seabird sensitivity.	Additional mortality may cause a decrease in seabird populations.	Baseline surveys and data analysis described in section 7.4.1.	CRM and population viability analysis described in section 7.4.2 may be required for some species.
Disturbance/displacement	Final design may avoid areas of consistently and significantly high seabird sensitivity.	Presence of operational wind turbines and associated maintenance activities may disturb birds and displace them from foraging/ resting areas over the long-term.	Baseline surveys and data analysis described in section 7.4.1.	Displacement matrices and population viability analysis described in section 7.4.2 may be required for some species.

Impact	Embedded Mitigation	Justification	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Proposed Approach for the Undertaking of Proposed Development Specific Modelling to Inform the Assessment of Potential Impacts
Barrier to movement	N/A	Presence of operational wind turbines may result in additional energy expenditure as migrating or commuting birds are forced to fly longer distances around the wind farm over the long-term.	Baseline surveys and data analysis described in section 7.4.1.	No specific modelling required for this impact, although quantification of impact may be integrated with disturbance/displacement.
Indirect impacts	As described in section 7.1.7.	Reduction or disruption to prey availability may cause displacement from the area or reduced energy intake, affecting productivity or survival in the long-term.	Reference section 7.1.7 for assessment of effects on fish and shellfish ecology	No specific modelling required for this impact.
Decommissioning				
Temporary habitat loss/ disturbance	As per construction phase.	As per construction phase.	As per construction phase.	As per construction phase.
Indirect impacts	As per construction phase.	As per construction phase.	As per construction phase.	As per construction phase.

Table 7.17: Impacts Proposed to be Scoped Out of the Proposed Development Assessment for Offshore and Intertidal Ornithology.

Impact	Justification
Construction	
Pollution impacts	Embedded and applied mitigation implemented during construction (e.g. implementation of an agreed construction pollution prevention plan) will avoid the risk of significant pollution incidence and as a result seabirds and shorebirds are extremely unlikely to be adversely affected by any such incident. On this basis, and subject to consultation with the SNCBs and feedback received on this Offshore Scoping Report, it is proposed to scope this impact out of further consideration within the EIA for offshore and intertidal ornithology.
Disturbance from offshore export cable construction	It is extremely unlikely that there would be any significant disturbance to seabirds as a result of the construction process for the offshore proposed export cable corridor. Installation is likely to be of short duration, temporary in any location at a time and therefore disturbance will be localised around the source. A Vessel Management Plan may be implemented to avoid distrubance to rafting auks. On this basis, and subject to consultation with the SNCBs and feedback received on this Offshore Scoping Report, it is proposed to scope this impact out of further consideration within the EIA for offshore and intertidal ornithology.
Operation and Maintenance	
Pollution impacts	Embedded and applied mitigation implemented during operation (e.g. implementation of an agreed operational pollution prevention plan) will avoid the risk of significant pollution incidence and as a result seabirds and shorebirds are extremely unlikely to be adversely affected by any such incident. On this basis, and subject to consultation with the SNCBs and feedback received on this Offshore Scoping Report, it is proposed to scope this impact out of further consideration within the EIA for offshore and intertidal ornithology.
Decommissioning	
Pollution impacts	Embedded and applied mitigation implemented during decommissioning (e.g. Development of, and adherence to, a Decommissioning Plan and a Pollution Prevention Plan) will avoid the risk of significant pollution incidence and as a result seabirds and shorebirds are extremely unlikely to be adversely affected by any such incident. On this basis, and subject to consultation with the SNCBs and feedback received on this Offshore Scoping Report, it is proposed to scope this impact out of further consideration within the EIA for offshore and intertidal ornithology.

All other species occur very infrequently or at very low density within the survey area and are not likely to feature in detail in the assessment, although the inclusion of other species will be considered and discussed in the interim baseline report for consultation in Quarter 4 2020.

It is proposed that collision risk will be considered for gannet and kittiwake, whilst displacement impacts would be considered for kittiwake, guillemot, razorbill and puffin. This will be kept under review however, as further evidence emerges on the potential effects of offshore wind farm developments on these species.

The EIA approach will also consider the wider ecosystem characteristics of the Proposed Development area by drawing together information on environmental and biological drivers of seabird abundance and distribution. This will include particular consideration of the relationships between seabird distribution and prey availability and distribution, as well as the physical influences of bathymetry, tidal conditions and distance from colonies. Integrated into this analysis will be consideration of the effects of climate change on the food chains on which the key seabird species depend, and the potential implications of climate change for their populations in the Firth of Forth and wider North Sea. Where information is available on changes to prey abundance following wind farm construction, this will also be incorporated into the ecosystem assessment.

7.4.4.1 Data Analysis

Breeding and Non-Breeding Seasons

Different seabird species have different phenologies relating to the breeding and non-breeding seasons. The analyses described below will identify the seasons for each species according to SNH guidance (Tyler, 2017). Table 7.18 shows the seasonal definitions for five key species in the assessment.

Displacement

Displacement will be assessed using the SNCB recommended matrix methods (JNCC; Natural England, 2017), based on estimated seabird densities derived from the boat-based survey data and the digital aerial survey data from areas within up to 2 km of the array area. The boat-based survey in 2009 to 2011 did not cover a complete 2 km buffer around the array area, therefore displacement analyses based on those data may require correction factors to be applied based on the variation in density within and outside the array as derived from the digital aerial surveys.

The use of SeaBORD (Searle *et al.*, 2018) as a tool for assessing displacement during the breeding season will also be investigated and new techniques emerging from the SNH-led Marine Impact Assessment Guidance Workshop (20 February 2020) will be considered and discussed with consultees during the development of the assessment.

Barrier Effects

Barrier effects will be considered in a qualitative way with reference to published literature. Emerging guidance and techniques may consider the integration of displacement and barrier effects together.

Collision Risk

The predicted collision risk to birds will be analysed using two CRM techniques. The monthly densities of flying birds derived from both the baseline boat-based surveys and digital aerial surveys will be used to populate the offshore Band model (2012) presented alongside outputs using the stochastic collision risk model (sCRM) developed by Masden (2015) to incorporate variation and uncertainty in input parameters.

CRM modelling will be based on the spreadsheets accompanying Band (2012), using the appropriate Options (1 to 4) for the data and species-specific parameters available. Where Band CRM Options 2 and 3 are applied, the proportion of birds at risk height will be derived from the Johnston *et al.* (2014) Corrigendum. The 2020 to 2021 boat-based surveys will be used to provide site-specific flight height distributions applicable to the Band model Option 4.

Biological parameters of birds used in the CRM will be discussed in consultation with stakeholders and will apply the best available evidence: bird size, flight speed, nocturnal activity factor, seasonality, age class and avoidance rates. CRM will be completed in accordance with published guidance. It may also take a modified approach, or use different parameters, where evidence justifies (in which case the evidence and reasoning will be provided).

Potential collision risk to migratory species will be assessed qualitatively with reference to the survey results and the Marine Scotland commissioned strategic level report (Marine Scotland, 2014).

Apportioning

For the assessment of impacts on different breeding colonies, particularly in relation to the HRA for SPA breeding colonies, it is necessary to apportion the entire potential impact described for the development (e.g. the additional mortality as a result of collision risk, or number of birds displaced) between breeding colonies. Apportioning of effects will be based on emerging Marine Scotland guidance (due to be published imminently) for guillemot, razorbill and kittiwake (and shag, although detailed assessment is not likely to be required for this species because of lack of connectivity) and on SNH (2018) interim guidance for all other species considered in detail in the assessment.

Colony data will be accessed through the new Seabird monitoring Plan (SMP) portal, including recent data collected for Seabirds Count.

The approach to apportioning impacts during the non-breeding season will be the subject of further discussion with consultees. Effects will be assessed against wider regional populations as defined in Furness (2015) for BDMPS.

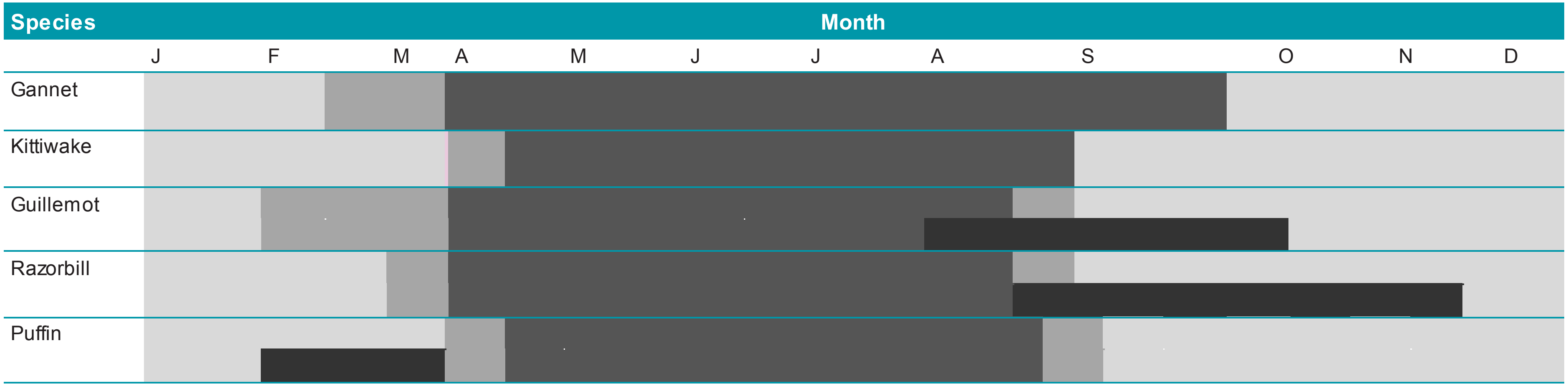
Population Assessment

Where thresholds for significant effects may be approached for any particular species, population models will be developed to examine the potential change in populations over time.

7.4.5 POTENTIAL CUMULATIVE EFFECTS

The ornithology CEA will follow the approach set-out in chapter 5. The identification of cumulative effects on birds will follow a receptor-specific approach to determine receptor-impact pathways from the cumulative screening matrix. The offshore and intertidal ornithology cumulative assessment will also take into account the principles set out in COWRIE guidance (King *et al.*, 2009). Where necessary, effects related to operational collision and displacement will be summed across cumulative developments and subject to population assessment at relevant breeding colonies. When considering the predicted collision rates from other developments, the most recent CRM results will be used (notably as presented in the optimised layout applications that have been submitted by Seagreen 1, NNG and ICOL, rather than the consented wind farms).

Table 7.18: Seasonal Periods for Key Seabird Species.



Colour Code	
Winter (non-breeding) period	
Breeding site attendance (not closely associated with nest site)	
Breeding period (strongly associated with nest site)	
Flightless moult period	

7.4.6 POTENTIAL TRANSBOUNDARY IMPACTS

A screening of transboundary impacts has been carried out and is presented in Annex C. This screening exercise identified that transboundary impacts upon seabirds are unlikely to occur because there are no non-UK seabird breeding colonies within mean-maximum (+ 1 S.D.) foraging range (of gannet, which has the largest range of the key species) of the Proposed Development along a marine pathway.

In the non-breeding season, it is considered very unlikely that the scale of impacts would adversely affect significant numbers of a species from non-UK colonies.

7.4.7 SCOPING QUESTIONS TO CONSULTEES

- Do you agree with the identification of the offshore and intertidal ornithology study areas, offshore ornithology regional study area and approach to offshore ornithology cumulative study areas?
- Do you agree that the baseline surveys currently completed and proposed provide a suitable data set for the assessment? Are there further baseline surveys or variations to the proposed programme of surveys that you feel are necessary for the assessment?
- Do you agree with the proposed analytical approaches for displacement, collision risk, apportioning and population assessment? Are there alternatives that you recommend alongside or instead of the proposed methods?
- Are there additional data sources not referenced within this chapter that you feel would be valuable for the assessment?
- Do you agree with the list of impacts scoped into and out of the assessment?

8 OFFSHORE HUMAN AND SOCIO-ECONOMIC ENVIRONMENT

8.1 COMMERCIAL FISHERIES

8.1.1 INTRODUCTION

This section of the Offshore Scoping Report identifies the elements of commercial fisheries of relevance to the Proposed Development and considers the potential impacts from the construction, operation and maintenance, and decommissioning of the offshore and intertidal components (seaward of the MHWS mark) of the Proposed Development on commercial fisheries receptors.

8.1.2 STUDY AREA

The Proposed Development is located in ICES Division IVc (Central North Sea). Fisheries data are recorded and collated by statistical rectangles within each ICES Division. The commercial fisheries study area has therefore been defined with reference to the ICES rectangles within which the Proposed Development is located. As shown in Figure 8.1, these are as follows:

- ICES rectangle 41E8: where the array area and part of the proposed export cable corridor are located; and
- ICES rectangles 41E7 and 40E7: where the inshore section of the proposed export cable corridor is located.

The commercial fisheries study area defined above will be used to identify fisheries active in areas relevant to the Proposed Development. Where relevant however, data and information will be analysed for wider areas to provide context and describe the full extent of activity of the fisheries included in the assessment.

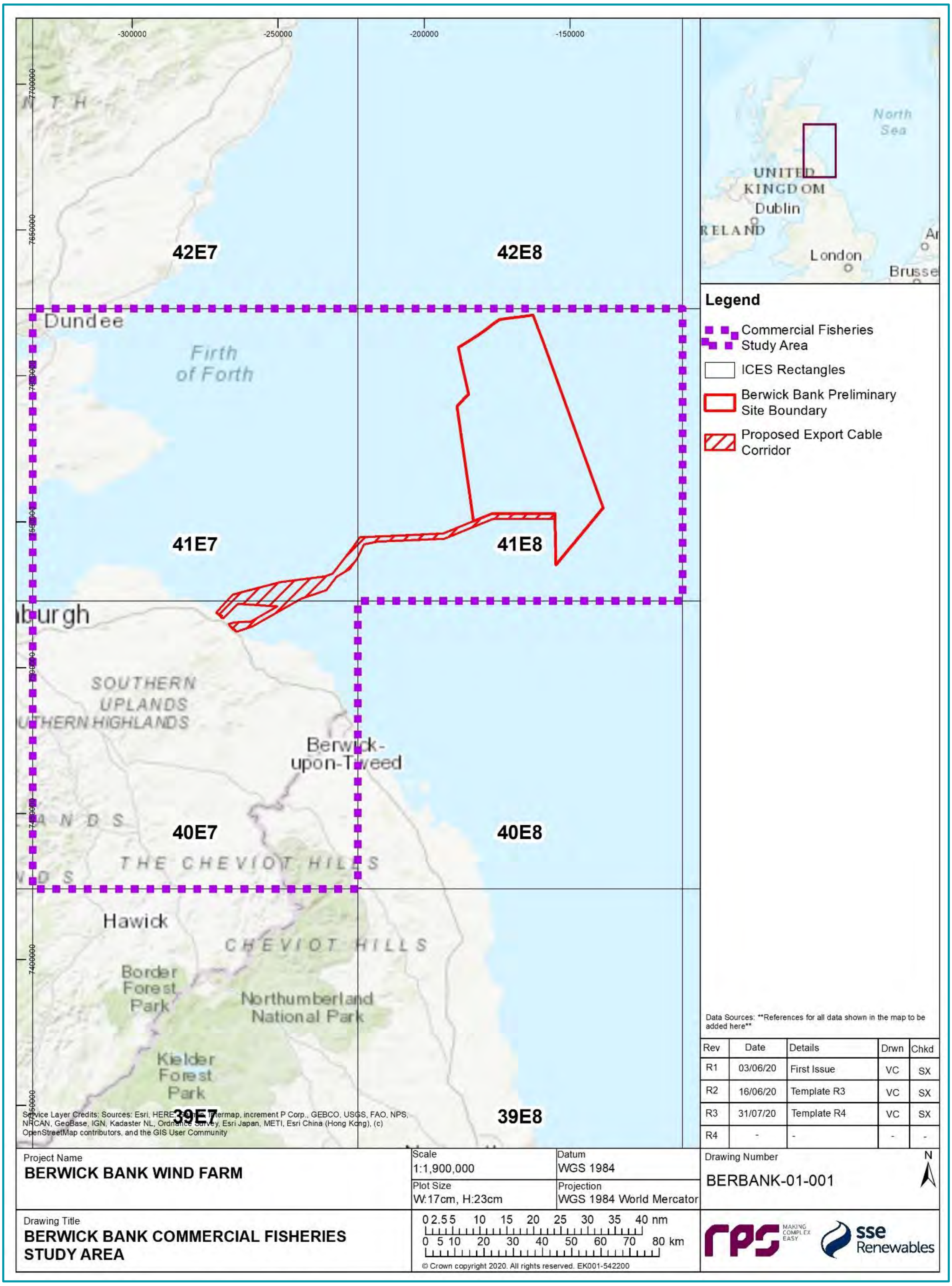


Figure 8.1: Commercial Fisheries Study Area.

8.1.3 BASELINE ENVIRONMENT

8.1.3.1 Desktop Study

An initial desk-based review of literature and data sources to support this commercial fisheries section of the Offshore Scoping Report has identified a number of baseline datasets. These are summarised in Table 8.1.

Table 8.1: Summary of Key Desktop Reports.

Title	Source	Year	Author
Fisheries landings and effort data by ICES rectangle	Marine Management Organisation (MMO)	2014 - 2018	n/a
Vessel Monitoring System (VMS) data	MMO	2014 - 2018	n/a
Fisheries datasets available from the Marine Scotland MAPS NMPi (including ScotMap data)	Marine Scotland https://marinescotland.atkinsgeospatial.com/nmpi/	Various	n/a

8.1.3.2 Site-specific Survey Data

No site-specific surveys have been undertaken to inform the Offshore Scoping Report for commercial fisheries. However, extensive consultation with fisheries stakeholders is planned to be undertaken to help inform the commercial fisheries baseline within the Offshore EIA Report.

In addition, where relevant, the findings of site-specific surveys which may be undertaken for other topics (e.g. benthic subtidal and intertidal ecology (section 7.1) and shipping and navigation (section 8.2)) will be reviewed and integrated in the characterisation of the commercial fisheries baseline, as appropriate.

8.1.3.3 Baseline Characterisation

An indication of the principal fishing activities undertaken within the commercial fisheries study areas is provided below, based on analysis of landings values (£) by species and fishing method for UK vessels (annual average 2014 to 2018).

Scallop dredging makes up the majority of the landings in ICES rectangle 41E8 (where the array area and a section of the proposed export cable corridor are located). Other activities of importance in this rectangle include potting for lobster and crabs, and to a much lesser extent, demersal trawling for *Nephrops* (Figure 8.2 and Figure 8.3).

In inshore rectangles 41E7 and 40E7 (where the nearshore section of the proposed export cable corridor is located) demersal trawling for *Nephrops* represents the main fishing activity, followed by potting for lobster and crabs and, to a lesser extent, scallop dredging. In addition, in rectangle 41E7, razor clams contribute significantly to landings values (Figure 8.2 and Figure 8.3).

As it is apparent from Figure 8.2 and Figure 8.3, overall, within the commercial fisheries study area, landings values are considerably higher in rectangle 41E7 than in the rest of rectangles.

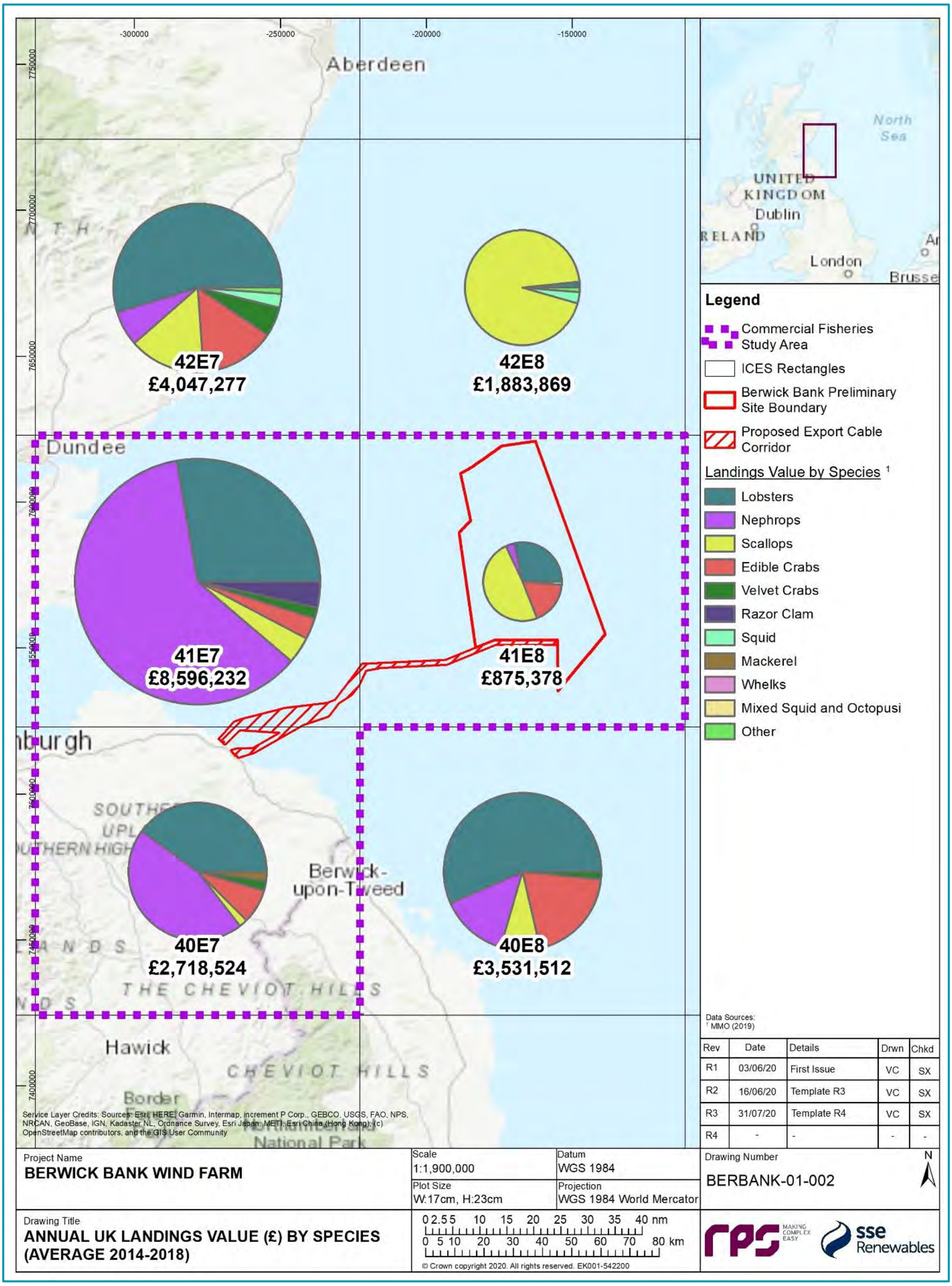
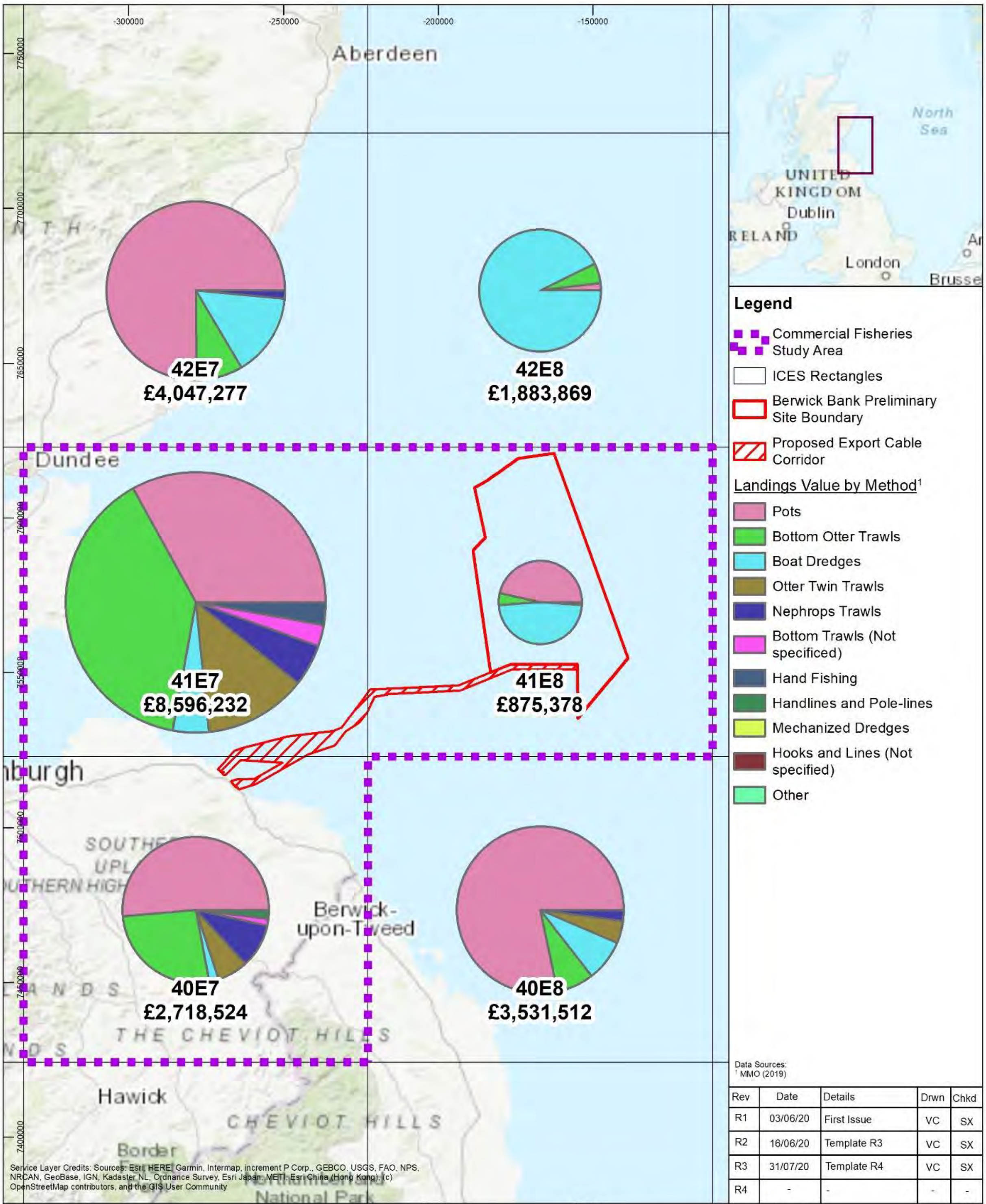


Figure 8.2: Annual Landings Values (£) by Species (Average 2014 to 2018).



Rev	Date	Details	Drwn	Chkd
R1	03/06/20	First Issue	VC	SX
R2	16/06/20	Template R3	VC	SX
R3	31/07/20	Template R4	VC	SX
R4	-	-	-	-

Project Name: BERWICK BANK WIND FARM

Scale: 1:1,900,000 | Datum: WGS 1984

Plot Size: W:17cm, H:23cm | Projection: WGS 1984 World Mercator

Drawing Number: BERBANK-01-003

Drawing Title: ANNUAL UK LANDINGS VALUE (£) BY METHOD (AVERAGE 2014-2018)

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Figure 8.3: Annual Landings Values (£) by Method (Average 2014 to 2018).

8.1.4 PROPOSED APPROACH TO THE ENVIRONMENTAL IMPACT ASSESSMENT

The commercial fisheries EIA will follow the methodology set out in chapter 5. Specific to the commercial fisheries EIA, the following guidance documents will also be considered:

- FLOWW Best Practice Guidance for Offshore Renewables Developments: Recommendations for Fisheries Liaison: FLOWW (Fishing Liaison with Offshore Wind and Wet Renewables Group) (FLOWW, 2014);
- FLOWW Best Practice Guidance for Offshore Renewables Developments: Recommendations for Fisheries Disruption Settlements and Community Funds (FLOWW, 2015);
- Best practice guidance for fishing industry financial and economic impact assessments (UK Fisheries Economics Network (UKFEN), 2012);
- Options and opportunities for marine fisheries mitigation associated with wind farms (Blyth-Skyrme, 2010); and
- Fishing and Submarine Cables - Working Together (*International Cable Protection Committee* (ICPC), 2009).

8.1.5 EMBEDDED MITIGATION

Measures adopted as part of the Proposed Development will include:

- ongoing consultation with the fishing industry and appointment of a Fisheries Liaison Officer (FLO);
- development of a Fisheries Management and Mitigation Strategy (FMMS);
- adherence to best practice guidance with regards to fisheries liaison (e.g. FLOWW, 2014; 2015);
- timely and efficient distribution of Notice to Mariners (NtM), Kingfisher notifications and other navigational warnings of the position and nature of works associated with the Proposed Development;
- use of guard vessels, where required;
- appointment of an Offshore Fisheries Liaison Officers (OFLOs), as appropriate;
- development of, and adherence to, a VMP;
- notification to the UK Hydrographic Office (UKHO) of the proposed works to facilitate the promulgation of maritime safety information and updating of nautical/admiralty charts and publications; and
- undertaking of post-lay and cable burial inspection surveys.

The requirement and feasibility of additional measures will be dependent on the significance of the effects on commercial fisheries and will be consulted upon with statutory consultees throughout the EIA process.

8.1.6 POTENTIAL PROPOSED DEVELOPMENT IMPACTS

A range of potential impacts on commercial fisheries have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of the Proposed Development. The impacts that have been scoped into the Proposed Development assessment are outlined in Table 8.2 together with a description of any additional data collection (e.g. site-specific surveys) and/or supporting analyses (e.g. modelling) that will be required to enable a full assessment of the impacts.

On the basis of the baseline commercial fisheries information currently available and the Proposed Development description outlined in chapter 3, no impacts are proposed to be scoped out of the assessment for commercial fisheries.

Table 8.2: Impacts Proposed to be Scoped into the Proposed Development Assessment for Commercial Fisheries.

Impact	Embedded Mitigation	Justification	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Proposed Approach for the Undertaking of Proposed Development Specific Modelling to Inform the Assessment of Potential Impacts
Construction				
Temporary loss or restricted access to fishing grounds	• On-going consultation with the fishing industry. • Appointment of a FLO. • Use of guard vessels and OFLOS, where appropriate. • Timely and efficient distribution of information. • Development of a FMMS. • Adherence to best practice guidance with regards to fisheries liaison. • VMP.	The implementation of safety zones around construction works may result in temporary loss/restricted access to fishing grounds.	• Analysis of fisheries data and information. • Consultation with fisheries stakeholders.	No modelling required for this impact.
Displacement of fishing activity into other areas		Fishing activity may be temporarily displaced to other areas as a result of loss of grounds/restricted access to fishing grounds during construction works.	• Analysis of fisheries data and information. • Consultation with fisheries stakeholders.	No modelling required for this impact.
Interference with fishing activity		There may be potential for transiting construction vessels to cause interference (conflict) with fishing activities/fishing gears.	• Analysis of fisheries data and information. • Consultation with fisheries stakeholders.	No modelling required for this impact.
Increased steaming times		The presence of safety zones around construction works may result in temporary increases in steaming time/routes to/from fishing grounds.	• Analysis of fisheries data and information. • Consultation with fisheries stakeholders. • Outcomes of the shipping and navigation impact assessment.	No modelling required for this impact.

Impact	Embedded Mitigation	Justification	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Proposed Approach for the Undertaking of Proposed Development Specific Modelling to Inform the Assessment of Potential Impacts
Safety issues for fishing vessels		Navigational safety risks (e.g. collision/allision) may arise as a result of increased vessel traffic associated with construction works and the presence of pre-commissioned infrastructure (see section 8.2). In addition to navigational safety risks, in the specific case of vessels engaged in fishing, there may be additional risks such as the potential for snagging with project infrastructure and the presence of objects/obstacles on the seabed.	• Analysis of fisheries data and information. • Consultation with fisheries stakeholders. • Outcomes of the shipping and navigation impact assessment.	The outputs of the Shipping and Navigation assessment outlined in section 8.2 will be reviewed to inform this assessment.
Potential impacts on commercially exploited species	As described in section 7.1.7.			

Impact	Embedded Mitigation	Justification	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Proposed Approach for the Undertaking of Proposed Development Specific Modelling to Inform the Assessment of Potential Impacts
Operation and Maintenance				
Loss or restricted access to fishing grounds	• On-going consultation with the fishing industry. • Appointment of an FLO. • Use of guard vessels and OFLOS, where appropriate. • Timely and efficient distribution of information. • Development of a FMMS. • Adherence to best practice guidance with regards to fisheries liaison. • VMP. • Post-lay and cable burial inspection surveys; • Appropriate marking on Admiralty charts.	The presence of project infrastructure may result in a loss or restricted access to fishing grounds during the operation and maintenance phase. The implementation of safety zones around major maintenance activities may also result in temporary localised loss or restricted access to grounds.	• Analysis of fisheries data and information. • Consultation with fisheries stakeholders.	No modelling required for this impact.
Displacement of fishing activity into other areas		Fishing activity may be displaced to other areas as a result of loss of grounds/restricted access to fishing grounds during the operation and maintenance phase.	• Analysis of fisheries data and information. • Consultation with fisheries stakeholders.	No modelling required for this impact.
Interference with fishing activity		There may be potential for transiting maintenance vessels to cause interference (conflict) with fishing activities/fishing gears.	• Analysis of fisheries data and information. • Consultation with fisheries stakeholders.	No modelling required for this impact.

Impact	Embedded Mitigation	Justification	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Proposed Approach for the Undertaking of Proposed Development Specific Modelling to Inform the Assessment of Potential Impacts
Increased steaming times		The presence of project infrastructure and the implementation of safety zones around major maintenance activities may result in increases in steaming times/routes to/from fishing grounds.	• Analysis of fisheries data and information. • Consultation with fisheries stakeholders. • Outcomes of the shipping and navigation impact assessment.	No modelling required for this impact.
Safety issues for fishing vessels		Navigational safety risks (e.g. collision/allision) may arise as a result of increased vessel traffic associated with maintenance works and the presence of project infrastructure (see section 8.2). In addition to navigational safety risks, in the specific case of vessels engaged in fishing, there may be additional risks such as the potential for snagging with project infrastructure and the presence of objects/obstacles on the seabed.	• Analysis of fisheries data and information. • Consultation with fisheries stakeholders. • Outcomes of the shipping and navigation impact assessment.	The outputs of the Shipping and Navigation assessment outlined in section 8.2 will be reviewed to inform this assessment.
Potential impacts on commercially exploited species	As described in section 7.1.7.			

Impact	Embedded Mitigation	Justification	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Proposed Approach for the Undertaking of Proposed Development Specific Modelling to Inform the Assessment of Potential Impacts
Decommissioning				
As above for the construction phase.				

8.1.7 POTENTIAL CUMULATIVE EFFECTS

There is potential for cumulative effects to occur on commercial fisheries as a result of other projects or activities.

The CEA will consider the maximum adverse scenarios for each of the projects or activities. The following types of projects/activities will be considered in the cumulative assessment:

- other offshore wind farm projects;
- oil and gas pipelines; and
- subsea cables.

The projects or activities included in the cumulative assessment may vary depending on the fishery under consideration (e.g. depending on the extent of grounds and operational range of the vessels involved).

8.1.8 POTENTIAL TRANSBOUNDARY IMPACTS

A screening of transboundary impacts has been carried out and is presented in Annex C. This screening exercise identified that because the array area is located beyond the 12 nm limit, where EU member states currently have access to fishing, there is potential for transboundary impacts upon commercial fisheries due to the construction, operation and maintenance, and decommissioning phase of the Proposed Development. These include:

- loss or restricted access to fishing grounds;
- displacement of fishing activities into other areas;
- interference with fishing activity;
- increased steaming times;
- safety issues for fishing vessels; and
- potential impacts on commercially exploited species.

Where significant fishing activity is identified for non-UK fleets within the commercial fisheries study area, these will be included as a receptor throughout the impact assessment.

8.1.9 SCOPING QUESTIONS TO CONSULTEES

- Are there any additional datasets to those included in Table 8.1 that you feel should be reviewed to characterise the commercial fisheries baseline?
- Do you agree that all potential impacts have been identified for commercial fisheries receptors?

8.2 SHIPPING AND NAVIGATION

8.2.1 INTRODUCTION

This section of the Offshore Scoping Report identifies the elements of shipping and navigation of relevance to the Proposed Development and considers the potential impacts from the construction, operation and maintenance, and decommissioning of the offshore and intertidal components (seaward of the MHWS mark) of the Proposed Development on shipping and navigation receptors.

8.2.2 STUDY AREA

Data was originally considered within a 10 nm buffer of the array area (the “shipping and navigation study area”)[4], as shown in Figure 8.4. Following an alteration to the Proposed Development array boundary, this buffer is only 7 nm to the west. This is considered adequate at the Scoping stage and will be increased to 10 nm within the Navigational Risk Assessment (NRA).

The defined study area is large enough to encompass vessel routeing which has the potential to be impacted, while remaining site-specific to the Proposed Development.

Where necessary, the standard 10 nm buffer has been extended to consider features that may impact vessel routeing (e.g. other offshore wind farms outside of the shipping and navigation study area that dictate the behaviour of the traffic within the shipping and navigation study area).

Relevant features in vicinity to the proposed export cable corridor have also been considered.

A regional shipping and navigation study area of 50 nm from the array area has also been considered (see section 8.2.7), to assess the effects from the Proposed Development when considered together with other projects or activities.

8.2.3 BASELINE ENVIRONMENT

8.2.3.1 Desktop Study

An initial desk-based review of literature and data sources to support this Offshore Scoping Report has identified a number of baseline datasets. These are summarised in Table 8.3.

It should be noted that AIS carriage is not compulsory for fishing vessels less than 15 m in length, or vessels of less than 300 Gross Tonnage (GT) (notably this includes most recreational vessels). It is therefore considered that such traffic may be underrepresented within the assessment undertaken for this Offshore Scoping Report; however, it is noted that smaller vessels are increasingly observed to utilise AIS voluntarily given the associated safety benefits. It is also noted that the site is some distance offshore which will mean AIS tracking from shore is not comprehensive for the entire shipping and navigation study area. Taking into account these limitations, AIS data, supported by the other data sets, is considered suitable for the high-level baseline assessment provided in this Offshore Scoping Report.

[4] The 10 nm study area was defined around the original Proposed Development array area site boundary. Due to the Proposed Development array area site boundary subsequently being extended to the west, the study area now covers a minimum of 7 nm to the west of the revised boundary and 10 nm in all other directions. This is considered adequate for scoping and the study area will be redrawn within the Navigational Risk Assessment to provide 10 nm on all sides. This approach has been discussed and agreed with the Maritime and Coastguard Agency (MCA).

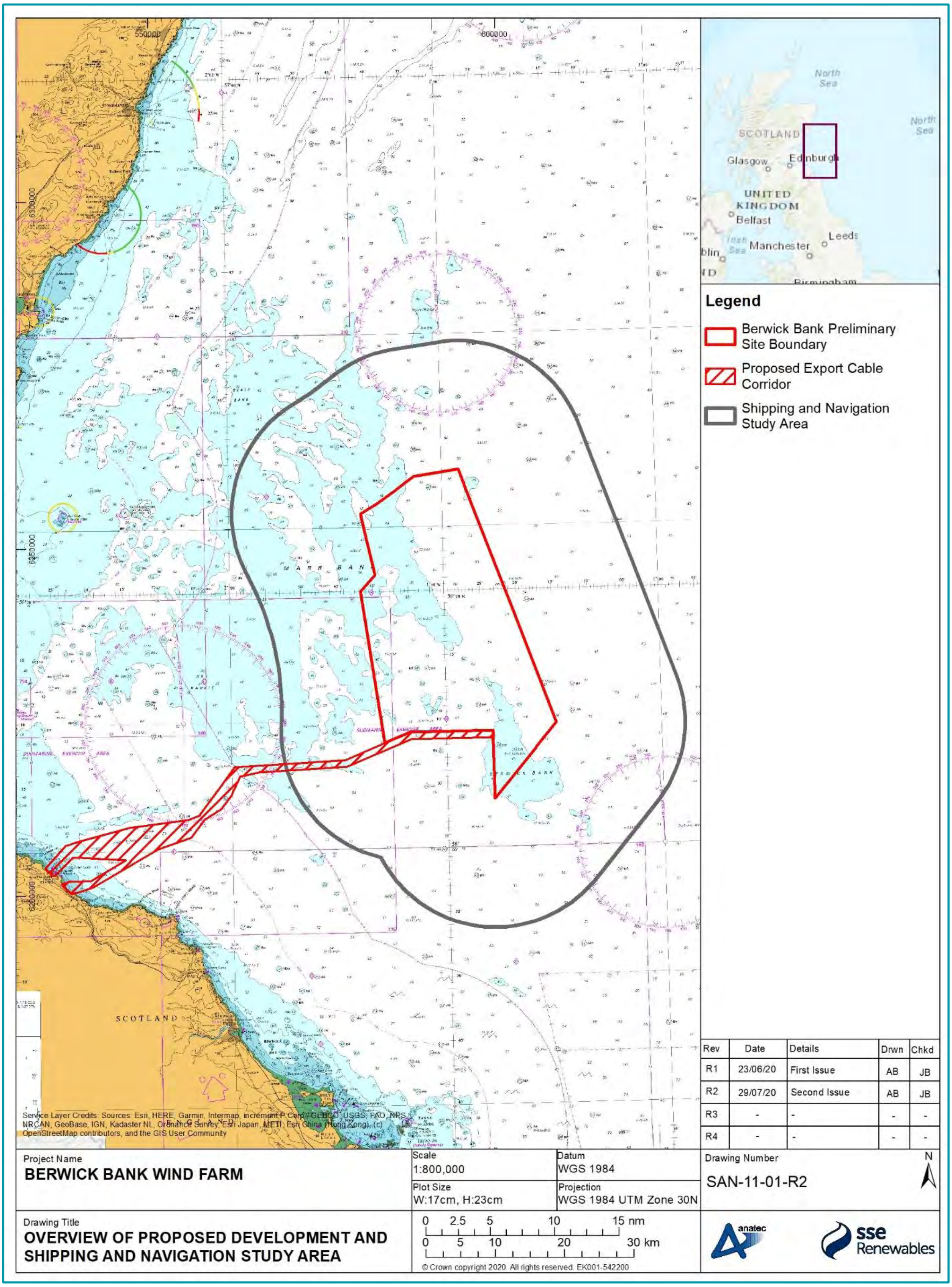


Figure 8.4: Overview of Proposed Development and Shipping and Navigation Study Area.

Table 8.3: Summary of Key Desktop Data Sources.

Title	Source	Year	Author
14 Days (summer) Automatic Identification (AIS) Data.	Anatec in-house data from shore-based receivers	2019	Anatec
14 Days (winter) AIS Data	Anatec in-house data from shore-based receivers	2019	Anatec
Admiralty Charts: 160, 175, 190, 210, 734, 1407, 1409, 1481	United Kingdom Hydrographic Office (UKHO)	2019/2020	UKHO
Marine Accident Investigation Branch (MAIB) Incident Data	MAIB	2008 to 2017	MAIB
Royal National Lifeboat Institution (RNLI) Incident Data	RNLI	2008 to 2017	RNLI
Royal Yachting Association (RYA) Coastal Atlas	RYA	2019	RYA
NP54 Admiralty Sailing Directions North Sea (West) Pilot Book 10th Edition	UKHO	2016	UKHO

8.2.3.2 Site-specific Survey Data

No site-specific surveys have been undertaken to inform the Offshore Scoping Report for shipping and navigation. This is because this section of the Offshore Scoping Report is intended to provide a broad overview of shipping and navigation both in terms of vessel traffic and navigational features before site-specific surveys are undertaken at a later stage of the project. Further, data collected to inform the shipping and navigation assessment must be current data (generally within the 12 months prior to EIA Report submission) and therefore could not be collected pre-scoping.

In line with MGN 543 (MCA, 2016), it will be necessary to undertake a vessel traffic survey covering both AIS and non-AIS traffic within the array area and surrounding area. The vessel-based surveys will involve a single vessel positioned centrally to provide optimal coverage of the Proposed Development and Marr Bank Wind Farm array areas (see section 8.2.7).

A requirement of MGN 543 is for a minimum of 28 days of seasonally varied data which is usually collected during two, 14-day surveys, in summer and winter. However, it has been noted during consultation that vessel traffic for summer 2020 may not be considered representative of the year on year traffic numbers and patterns, due to COVID-19 restrictions put in place by both the UK and Scottish Governments. The implication of this potential concern on proposed marine traffic surveys is currently being discussed with key stakeholders including the MCA, the Northern Lighthouse Board (NLB), and Forth Ports.

The most recent iteration of the RYA Coastal Atlas (RYA, 2019) will be considered in line with the RYA's preference, for both the Proposed Development array area and proposed offshore export cable corridor.

8.2.3.3 Baseline Characterisation

Navigational Features

This section presents the baseline environment for navigational features, which have been identified via a review of Admiralty Charts and the local UKHO Admiralty Sailing Directions (UKHO, 2016) as per section 8.2.3. An overview of the navigational features that were deemed relevant to the shipping and navigation assessment is shown in Figure 8.5, with key navigational features discussed further below.

The array area is located approximately 21 nm northeast of St Abb's Head, with charted water depths between approx. 39 m and 60 m. There are two landfall options located at Thortonloch and Skateraw.

The key navigational features in proximity to the Proposed Development are a number of other offshore wind farms, Ministry of Defence (MoD) practice areas, ammunition dumping grounds, spoil grounds and anchorage areas. Numerous charted wrecks and Aids to Navigation (AtoN) are also present within the shipping and navigation study area.

There is one other consented offshore wind farm located partially within the shipping and navigation study area. Seagreen 1 is within the northern section of the shipping and navigation study area. Seagreen 1 has been consented and construction is expected to commence in 2022. A further two consented offshore wind farms are located outside and to the west of the shipping and navigation study area but within the regional shipping and navigation study area; Inch Cape is located 12 nm west of the array area, and Neart na Gaoithe (NnG) is located 19 nm west of the array area.

Two MoD practice areas are located in proximity to the Proposed Development, but not within the shipping and navigation study area. The D513 practice firing area is located 14 nm south – southeast of the array area. The D604 practice firing range is located 32 nm west of the array area. Both firing practice areas are operated using a clear range procedure.

A number of anchorage areas are located to the west of the Proposed Development towards the coast with a number of these located within the Firth of Forth. Two disused ammunition dumping ground are located 29 nm west of the array area. Nine charted wrecks are located within the array area, with seven located in the southern section, one in the north, and one on the eastern boundary. Four buoys are also located within the array area, two are located centrally and two are on the south eastern corner.

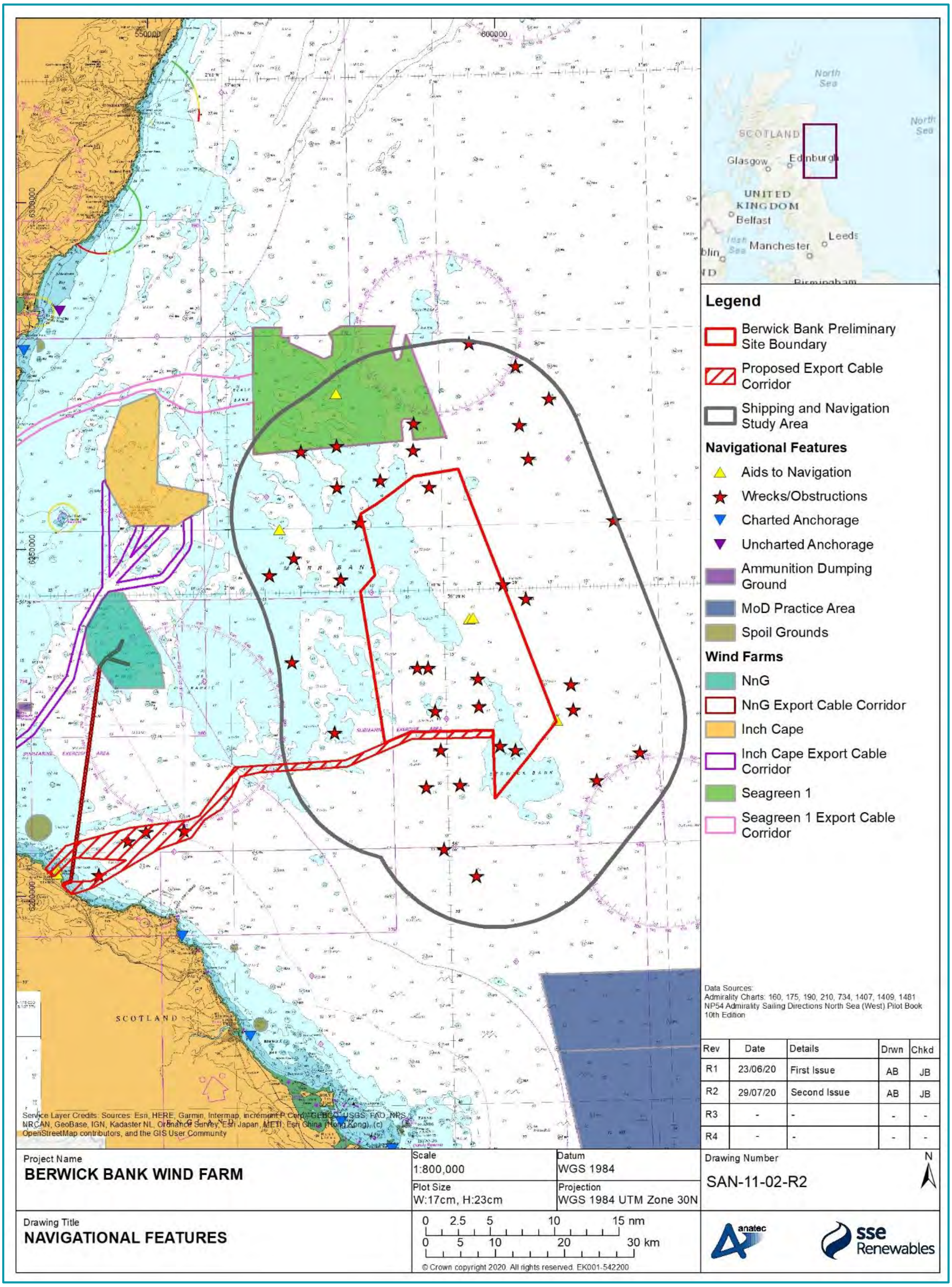


Figure 8.5: **Navigational Features.**

Vessel Traffic

Baseline characterisations of the AIS vessel traffic data within the shipping and navigation study area, collected during the winter and summer periods, 2019, are shown in Figure 8.6 and Figure 8.7, respectively. It is noted that vessels involved in temporary, non-routine activities (e.g. vessels engaged in surveys) have been removed. Vessels visiting planned nearby offshore wind farm sites have also been treated as temporary traffic, as these projects were not operational at the time of the surveys and this traffic is not considered representative of future operational traffic associated with these offshore wind farms.

An average of 11 unique vessels were recorded per day within the shipping and navigation study area during summer 2019, with an average of approximately five unique vessels per day intersecting the array area. The daily averages were identical in winter 2019, with 11 per day within the shipping and navigation study area and five per day intersecting the array area.

The main vessel types recorded during the summer 2019 study period were tankers (33%), cargo vessels (29%); fishing vessels (17%) and recreational vessels (9%). The main vessel types recorded during the winter 2019 study period were cargo vessels (32%), fishing vessels (27%) and tankers (26%). No recreational vessels were recorded during the winter 2019 study period. It is again noted that these data are derived from shore-based receivers, and that smaller vessels are not required to carry AIS (see section 8.2.3.3).

The most regular destinations for vessels within the study area were Aberdeen (10%), Grangemouth (8%) and Immingham (4%).

The variation in traffic density within the shipping and navigation study area over the combined 28 days of summer and winter data is presented in Figure 8.8. A relatively high density of traffic was observed in the western section of the shipping and navigation study area, with routeing occurring primarily within and inshore of the array area.

Anchoring was also assessed for the summer and winter 2019 study periods within the array area and proposed offshore export cable corridor; anchoring associated with vessels working at other offshore wind farms have been categorised as temporary and hence not assessed. No anchoring was observed during either of the summer and winter 2019 study periods within the array area or the proposed export cable corridor.

Marine Incidents

Marine Accident Investigation Branch

An analysis of the Marine Accident Investigation Branch (MAIB) incident data from 2008 to 2017, indicated that a total of two incidents were recorded within the shipping and navigation study area, but both outside the array area; a summary of each incident is provided below:

- in July 2011 approximately 7 nm west of the array area, a fishing vessel experienced a machinery failure, no damage or injury to person was reported; and
- in March 2013 approximately 10 nm south of the array area, a cargo vessel was involved in a contact incident during poor visibility, minor damage was reported with no injuries to persons.

A further five incidents involving fishing vessels were reported by MAIB within the proposed export cable corridor; all within the Skateraw Landfall export cable corridor area. Four were machinery failures and one was a hazardous incident involving a trawler that had to stop to avoid collision with a tanker. No damage or injuries were reported.

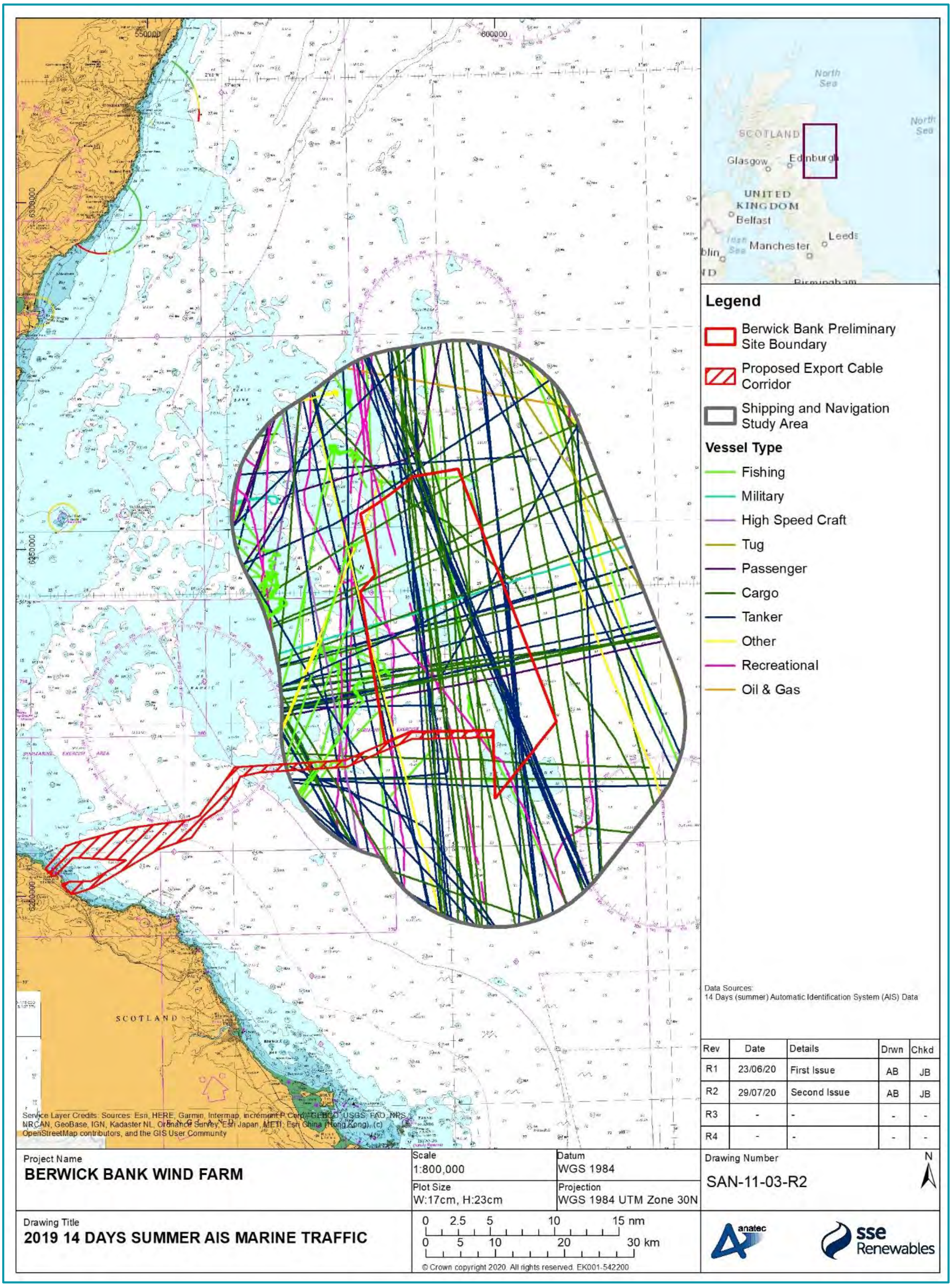


Figure 8.6: **2019 14 Days Summer AIS Marine Traffic.**

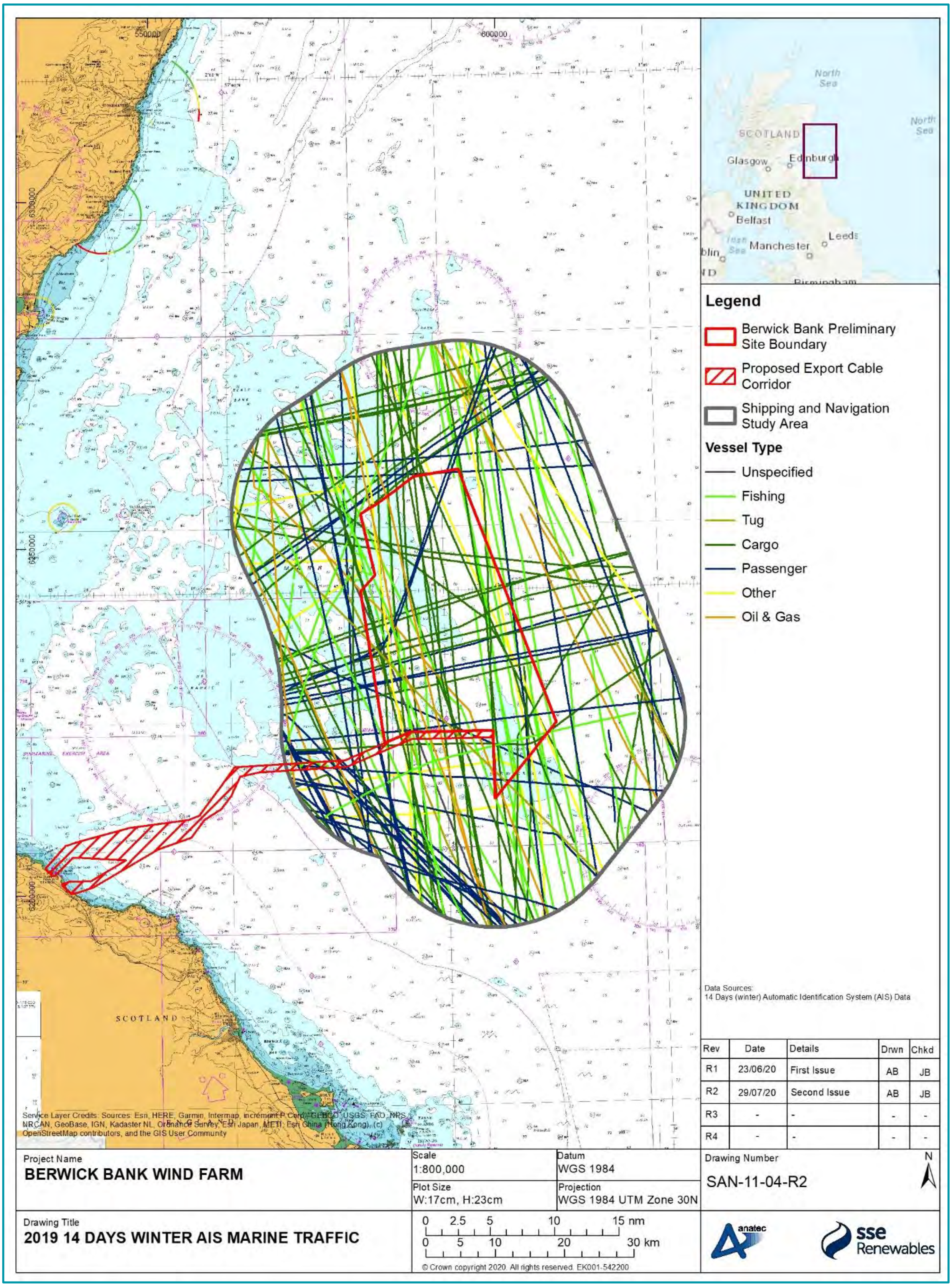


Figure 8.7: **2019 14 Days Winter AIS Marine Traffic.**

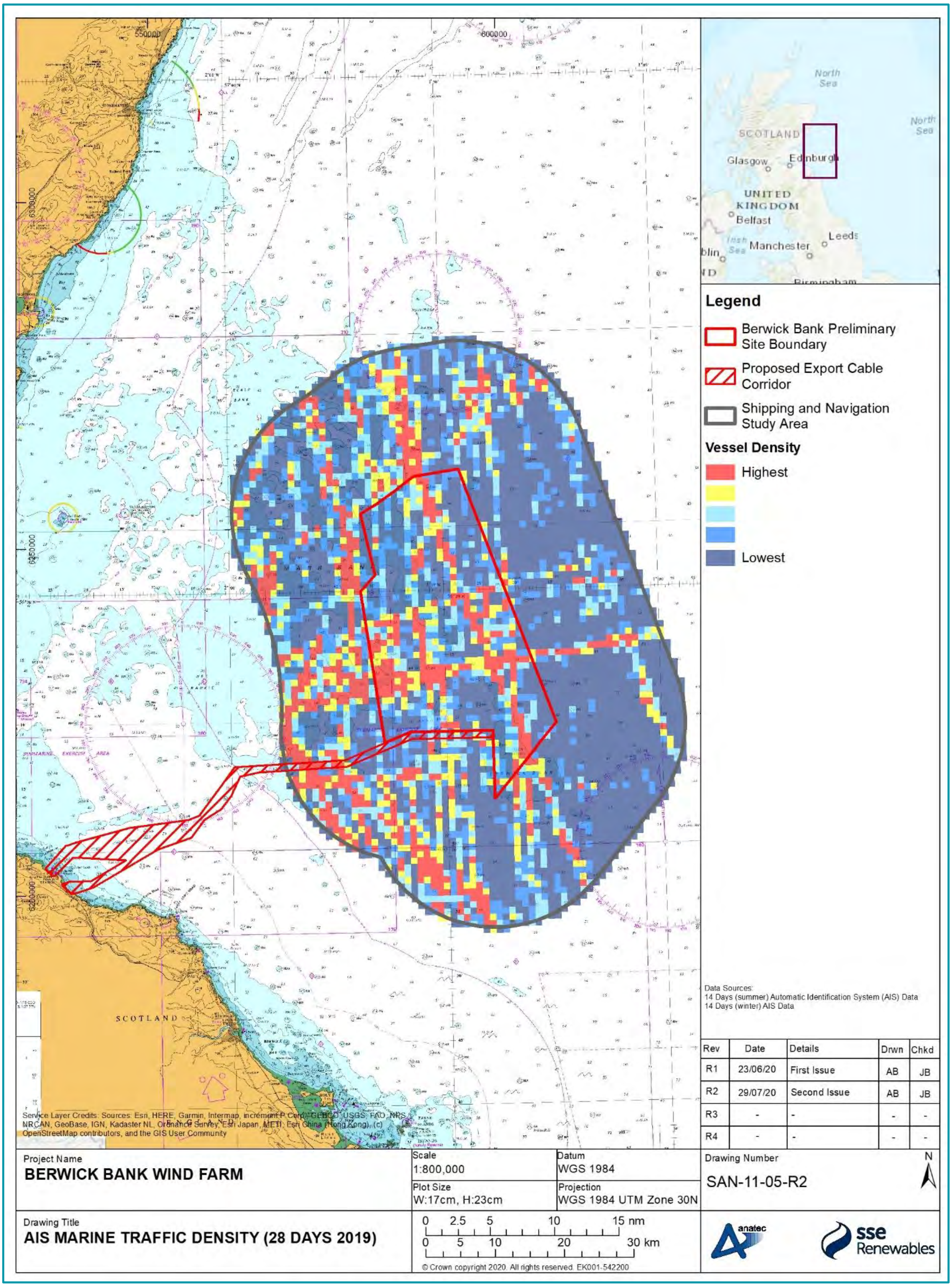


Figure 8.8: AIS Marine Traffic Density (28 Days 2019).

Royal National Lifeboat Institute

An analysis of the Royal National Lifeboat Institute (RNLI) data from 2008 to 2017 indicated that a total of 11 incidents were recorded within the shipping and navigation study area, with two of these occurring within the array area. These incidents either involved recreational vessels (seven) or fishing vessels (four); none of the incidents resulted in loss of life. More detailed descriptions of the two incidents within the array area are given below:

- in May 2009, a recreational vessel was flooding/foundering, assistance was rendered from Dunbar and two people rescued; and
- in August 2016, a recreational vessel with two people onboard was considered to be in trouble and assistance was rendered from Eyemouth.

A total of 17 incidents were recorded within the proposed export cable corridor; five of these incidents were recorded within the Skateraw Landfall proposed export cable corridor area, and 12 within the Thorntonloch Landfall proposed export cable corridor area. The main incidents recorded within the proposed export cable corridor were "vessel may be in trouble" (41%), "person in danger" (18%) and "machinery failure" (18%). None of the incidents resulted in loss of life.

8.2.4 PROPOSED APPROACH TO THE ENVIRONMENTAL IMPACT ASSESSMENT

The shipping and navigation Offshore EIA Report will follow the methodology set out in the following guidance documents:

- Marine Guidance Note (MGN) 543[5] Offshore Renewable Energy Installations (OREIs) – Guidance on UK Navigational Practice, Safety and Emergency Response and its annexes (Maritime and Coastguard Agency (MCA), 2016);
- International Maritime Organization (IMO) guidelines for Formal Safety Assessment (FSA) (IMO, 2018);
- International Association of Lighthouse Authorities (IALA) Recommendation O-139 on the Marking of Man-Made Offshore Structures (IALA, 2013);
- MGN 372 Offshore Renewable Energy Installations (OREIs) – Guidance to Mariners Operating in the Vicinity of United Kingdom (UK) OREIs (MCA, 2008)[6];
- MCA Methodology for Assessing the Marine Navigational Safety Risks of Offshore Renewable Energy Installations (MCA, 2013)[7]; and
- The RYA's Position on Offshore Energy Developments: Paper 1 – Wind Energy (RYA, 2015).

As per the MCA methodology (MCA, 2013), a Navigational Risk Assessment (NRA) will be undertaken, the output of which will form the primary input into the Offshore EIA Report. Given that the NRA includes a set of criteria under MGN 543 (MCA, 2016) which must be considered, no impacts will be scoped out of the NRA process.

[5] Or any subsequent updates to MGN 543 at the time of commencing the NRA.
[6] Or any subsequent updates to MGN 372 at the time of commencing the NRA.
[7] Or any subsequent updates to the MCA methodology at the time of commencing the NRA.

The IMO FSA methodology (IMO, 2018) is the internationally recognised approach for assessing the impacts to shipping and navigation receptors, and is the approach required under the MCA methodology (MCA, 2013). This methodology is centred on risk control and assesses each impact in terms of its frequency and consequence so that its significance can be determined as:

- "broadly acceptable";
- "tolerable"; or
- "unacceptable".

Any impacts assessed as "unacceptable" will require additional measures implemented beyond those considered embedded measures, so that the significance of the impact is reduced to within "tolerable" or "broadly acceptable" parameters.

The significance of potential impact for each impact assessed will be determined via a risk ranking matrix (Table 8.4) based on the frequency and consequence of the impact. The frequency and consequence of each impact will be related to parameters within the IMO FSA guidance and agreed at the Hazard Workshop. The risk ranking matrix is presented in Table 8.4. The frequency and consequence rankings of each impact will be determined using a number of inputs, including:

- quantitative modelling undertaken in the NRA;
- output of the baseline assessment;
- consideration of embedded measures;
- lessons learnt from other offshore wind farm projects;
- level of stakeholder concern;
- consultation output; and
- expert opinion.

Table 8.4: Risk Ranking Matrix.

		Frequency				
		Negligible	**Extremely unlikely**	**Remote**	**Reasonably Probable**	**Frequent**
Consequence	**Negligible**	Broadly Acceptable	Broadly Acceptable	Broadly Acceptable	Broadly Acceptable	Tolerable
	Minor	Broadly Acceptable	Broadly Acceptable	Broadly Acceptable	Tolerable	Tolerable
	Moderate	Broadly Acceptable	Broadly Acceptable	Tolerable	Tolerable	Unacceptable
	Serious	Broadly Acceptable	Tolerable	Tolerable	Unacceptable	Unacceptable
	Major	Tolerable	Tolerable	Unacceptable	Unacceptable	Unacceptable

In order to inform the shipping and navigation EIA, consultation during the pre-application phase is planned with the following statutory and non-statutory organisations:

- MCA;
- NLB;
- Chamber of Shipping (CoS);
- RYA;

- Cruising Association;
- Scottish Fishermen's Federation (SFF);
- regular vessel operators; and
- local port operators (including Forth Ports and relevant municipal ports).

Consultation undertaken to date with stakeholders is presented in Table 5.1.

8.2.5 EMBEDDED MITIGATION

Measures adopted as part of the Proposed Development will include:

- compliance with MGN 543 (MCA, 2016) and its annexes (in particular Search and Rescue (SAR) annex 5 (MCA, 2018)) where applicable;
- appropriate marking on Admiralty charts;
- promulgation of information as required (e.g. NtM, Kingfisher Bulletin);
- buoyed construction area in agreement with NLB;
- application for safety zones of up to 500 m during construction and periods of major maintenance[8];
- marine coordination and communication to manage project vessel movements;
- suitable implementation and monitoring of cable protection (via burial, or external protection where adequate burial depth as identified via risk assessment is not feasible);
- marking and lighting of the site in agreement with NLB and in line with IALA Recommendation O-139 (IALA, 2013)[9];
- compliance of all project vessels with international marine regulations as adopted by the Flag State, notably the International Regulations for Preventing Collisions at Sea (COLREGs) (IMO, 1974) and the International Convention for the Safety of Life at Sea (SOLAS) (IMO, 1974);
- production of a Marine Pollution Contingency Plan;
- blade clearance of at least 22 m above MHWS (in line with RYA policy (RYA, 2015)); and
- guard vessel(s) as required by risk assessment.
- The requirement and feasibility of additional measures will be dependent on the significance of the effects on shipping and navigation and will be consulted upon with statutory consultees throughout the EIA process (see section 8.2.4).

8.2.6 POTENTIAL PROPOSED DEVELOPMENT IMPACTS

A range of potential impacts on shipping and navigation have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of the Proposed Development. The impacts that have been scoped into the Proposed Development assessment are outlined in Table 8.5 together with a description of any additional data collection (e.g. site-specific surveys) and/or supporting analyses (e.g. modelling) that will be required to enable a full assessment of the impacts.

On the basis of the baseline shipping and navigation information currently available, and the Proposed Development description outlined in chapter 3, no impacts are proposed to be scoped out.

[8] Safety zones may also be required for the decommissioning phase; however, this will be assessed during the decommissioning stage separately if identified as necessary once the decommissioning plans are confirmed.
[9] Or any subsequent updates to IALA O-139 at the time of application.

Table 8.5: Impacts Proposed to be Scoped Into the Proposed Development Assessment for Shipping and Navigation.

Impact	Embedded Mitigation	Justification	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Proposed Approach for the Undertaking of Proposed Development Specific Modelling to Inform the Assessment of Potential Impacts
Construction				
Vessel displacement due to construction activities.	• Promulgation of information as required (e.g. NtM, Kingfisher Bulletin); and • Buoyed construction area in agreement with NLB.	Vessels may be displaced from their existing routes due to construction activities associated with the Proposed Development.	A dedicated vessel traffic survey will be undertaken to characterise vessel movements in the area.	Future traffic pattern will be modelled.
Increased vessel to vessel collision risk between a third-party vessel and a project vessel due to the presence of project related vessels.	• Promulgation of information as required (e.g. NtM, Kingfisher Bulletin); • Marine coordination and communication to manage project vessel movements; • Compliance of all project vessels with international marine regulations as adopted by the Flag State, notably COLREGs (IMO, 1974) and SOLAS (IMO, 1974); and • Application for safety zones during construction of up to 500 m.	The presence of project vessels during construction may increase the likelihood of vessel to vessel encounters and subsequently increase the collision risk between third-party and project vessels.	A dedicated vessel traffic survey will be undertaken to characterise vessel movements in the area.	Qualitative assessment.

Impact	Embedded Mitigation	Justification	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Proposed Approach for the Undertaking of Proposed Development Specific Modelling to Inform the Assessment of Potential Impacts
Increased vessel to vessel collision risk between third party vessels due to vessel displacement.	• Promulgation of information as required (e.g. NtM, Kingfisher Bulletin).	Displaced vessels may lead to increased traffic densities in certain areas and a subsequent increase in collision risk between third party vessels.	A dedicated vessel traffic survey will be undertaken to characterise vessel movements in the area.	Modelling of collision risk will be carried out for the operation and maintenance phase. Any differences during construction will be discussed.
Vessel to structure allision risk due to the presence of new structures associated with the Proposed Development.	• Appropriate marking on Admiralty charts; • Promulgation of information as required (e.g. NtM, Kingfisher Bulletin); • Buoyed construction area in agreement with NLB; • Application for safety zones during construction of up to 500 m; • Marking and lighting of the site in agreement with NLB and in line with IALA Recommendation O-139 (IALA, 2013); and • Guard vessel(s) as required by risk assessment.	Partially complete and completed structures within the Proposed Development array area could create an allision risk (powered or drifting) to passing traffic.	A dedicated vessel traffic survey will be undertaken to characterise vessel movements in the area.	Modelling of allision risk will be carried out for the operation and maintenance phase. Any differences during construction will be discussed.

Impact	Embedded Mitigation	Justification	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Proposed Approach for the Undertaking of Proposed Development Specific Modelling to Inform the Assessment of Potential Impacts
Reduced access to local ports due to construction activities associated with the Proposed Development.	• Marine coordination and communication to manage project vessel movements; and • Compliance of all project vessels with international marine regulations as adopted by the Flag State, notably COLREGs (IMO, 1974) and SOLAS (IMO, 1974).	Access to local ports may be impacted due to construction activities associated with the Proposed Development.	A dedicated vessel traffic survey will be undertaken to characterise vessel movements in the area.	Qualitative assessment.
Operation and Maintenance				
Commercial traffic displacement due to the presence of the Proposed Development.	• Promulgation of information as required (e.g. NtM, Kingfisher Bulletin).	Commercial vessels may be displaced from their existing routes due to the presence of the Proposed Development.	A dedicated vessel traffic survey will be undertaken to characterise vessel movements in the area.	Worst case deviated routes shall be presented, with input of operators and consideration of other offshore structures, to show how the routes will be affected by the Proposed Development.
Fishing vessel and recreational vessel displacement due to the presence of the Proposed Development	• Promulgation of information as required (e.g. NtM, Kingfisher Bulletin).	Fishing vessels and recreational vessels may be displaced from their existing routes due to the presence of the Proposed Development.	A dedicated vessel traffic survey will be undertaken to characterise vessel movements in the area.	Qualitative assessment.
Increased vessel to vessel collision risk between a third-party vessel and a	• Promulgation of information as required (e.g. NtM, Kingfisher Bulletin);	The presence of project vessels during operation may increase the likelihood of vessel to vessel	A dedicated vessel traffic survey will be undertaken to characterise vessel movements in the area.	Qualitative assessment.

Impact	Embedded Mitigation	Justification	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Proposed Approach for the Undertaking of Proposed Development Specific Modelling to Inform the Assessment of Potential Impacts
project vessel due to the presence of project vessels.	• Marine coordination and communication to manage project vessel movements; and • Compliance of all project vessels with international marine regulations as adopted by the Flag State, notably COLREGs (IMO, 1974) and SOLAS (IMO, 1974).	encounters and subsequently increase the collision risk between third-party and project vessels.		
Increased vessel to vessel collision risk between third-party vessels (route-based) due to the displacement of vessels from their usual routes.	• Promulgation of information as required (e.g. NtM, Kingfisher Bulletin); and • Application for safety zones during major maintenance of up to 500 m.	Displaced vessels may lead to increased traffic densities in certain areas and a subsequent increase in collision risk between third party commercial vessels.	A dedicated vessel traffic survey will be undertaken to characterise vessel movements in the area.	Collision risk modelling will be undertaken to assess the change in collision risk for third party vessels between pre and post offshore wind farm cases.
Increased vessel to vessel collision risk involving fishing vessels and/or recreational vessels due to the displacement of fishing and/or recreational vessels.	• Promulgation of information as required (e.g. NtM, Kingfisher Bulletin); and • Application for safety zones during major maintenance of up to 500 m.	Displaced vessels may lead to increased traffic densities in certain areas and a subsequent increase in encounters.	A dedicated vessel traffic survey will be undertaken to characterise vessel movements in the area.	Change in collision rate will be estimated based on encounters assessment.

Impact	Embedded Mitigation	Justification	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Proposed Approach for the Undertaking of Proposed Development Specific Modelling to Inform the Assessment of Potential Impacts
Vessel to structure allision risk for commercial vessels due to the presence of new structures associated with the Proposed Development.	• Appropriate marking on Admiralty charts; • Promulgation of information as required (e.g. NtM, Kingfisher Bulletin); • Application for safety zones during periods of major maintenance of up to 500 m; • Marking and lighting of the site in agreement with NLB and in line with IALA Recommendation O-139 (IALA, 2013); and • Guard vessel(s) as required by risk assessment.	Structures within the Proposed Development array area could create an allision risk (powered or drifting) to passing commercial vessels.	A dedicated vessel traffic survey will be undertaken to characterise vessel movements in the area.	Powered and drifting allision risk modelling will be undertaken.
Vessel to structure allision risk for fishing vessels in transit due to the presence of new structures associated with the proposed development.	• Appropriate marking on Admiralty charts; • Promulgation of information as required (e.g. NtM, Kingfisher Bulletin); • Application for safety zones during periods of major maintenance of up to 500 m; • Marking and lighting of the site in agreement with NLB and in line with IALA Recommendation O-139 (IALA, 2013); and • Guard vessel(s) as required by risk assessment.	Structures within the Proposed Development array area could create an allision risk (powered or drifting) to passing fishing vessels.	A dedicated vessel traffic survey will be undertaken to characterise vessel movements in the area.	Powered and drifting allision risk modelling will be undertaken.

Impact	Embedded Mitigation	Justification	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Proposed Approach for the Undertaking of Proposed Development Specific Modelling to Inform the Assessment of Potential Impacts
Vessel to structure allision risk for recreational vessels due to the presence of new structures associated with the proposed development.	• Appropriate marking on Admiralty charts; • Promulgation of information as required (e.g. NtM, Kingfisher Bulletin); • Application for safety zones during periods of major maintenance of up to 500 m; • Marking and lighting of the site in agreement with NLB and in line with IALA Recommendation O-139 (IALA, 2013); • Guard vessel(s) as required by risk assessment; and • Minimum blade clearance of at least 22 m above MHWS.	Structures within the Proposed Development array area could create an allision risk (powered or drifting) to passing recreational vessels.	A dedicated vessel traffic survey will be undertaken to characterise vessel movements in the area.	Qualitative assessment.
Reduced access to local ports due to maintenance activities associated with the Proposed Development.	• Promulgation of information as required (e.g. NtM, Kingfisher Bulletin).	Access to local ports may be impacted due to maintenance activities associated with the Proposed Development.	A dedicated vessel traffic survey will be undertaken to characterise vessel movements in the area.	Qualitative assessment.
Reduction of under keel clearance due to the presence of cables / cable protection	• Appropriate marking on Admiralty charts;	The implementation of cable protection to cables associated with the Proposed Development may reduce water depths	An assessment of the vessel traffic in proximity to the proposed export cable corridor will be undertaken (AIS only) and assessed against water depths within the corridor to	Qualitative assessment.

Impact	Embedded Mitigation	Justification	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Proposed Approach for the Undertaking of Proposed Development Specific Modelling to Inform the Assessment of Potential Impacts
associated with the Proposed Development.	• Promulgation of information as required (e.g. NtM, Kingfisher bulletin); and • Suitable implementation and monitoring of cable protection (via burial, or external protection where adequate burial depth as identified by risk assessment is not feasible).	in proximity and therefore reduce the under keel clearance for third-party traffic.	identify any areas where under keel clearance may be of concern.	
Anchor interaction with subsea cables due to the presence of subsea cables associated with the Proposed Development.	• Appropriate marking on Admiralty charts; • Promulgation of information as required (e.g. NtM, Kingfisher bulletin); and • Suitable implementation and monitoring of cable protection (via burial, or external protection where adequate burial depth as identified by risk assessment is not feasible).	The presence of subsea cables associated with the Proposed Development may increase the likelihood of anchor interaction for third-party vessels including a snagging risk.	An assessment of the vessel traffic in proximity to the proposed export cable corridor will be undertaken (AIS only) including identification of areas where anchoring activity occurs frequently.	Qualitative assessment.
Interference with marine navigation, communications and position fixing equipment due to the presence of new structures associated with the	-	Communication and position fixing equipment may be affected by the presence of installations within the array area, or proposed export cable corridor.	A dedicated marine traffic survey will be undertaken to determine traffic levels and routeing in the area.	Qualitative assessment.

Impact	Embedded Mitigation	Justification	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Proposed Approach for the Undertaking of Proposed Development Specific Modelling to Inform the Assessment of Potential Impacts
Proposed Development.				
Reduction of emergency response capability due to increased incident rates and reduced access for SAR responders due to an increase in the number of vessels in the area and a reduction of freely navigable sea room and airspace.	• Compliance with MGN 543 (MCA, 2016) and its annexes (in particular SAR annex 5 (MCA, 2018)) were applicable; • Marking and lighting of the site in agreement with NLB and in line with the IALA O-139 (IALA, 2013); and • Production of a Marine Pollution Contingency Plan.	The presence of the Proposed Development will increase the number of vessels in the area which may result in an increased number of incidents requiring emergency response and may reduce access for SAR responders.	MAIB and RNLI incident data assessment will be assessed to characterise baseline incident rates.	Qualitative assessment.
Decommissioning				
The impacts for the decommissioning phase will be similar to the impacts for the construction phase noting that from a shipping and navigation perspective the activities during both of these phases will be similar.				

8.2.7 POTENTIAL CUMULATIVE EFFECTS

There is potential for cumulative effects to occur on shipping and navigation receptors as a result of other projects or activities. The cumulative assessment will consider the maximum adverse scenarios for each of the projects or activities. Offshore wind farms and any other relevant marine activity within the 50 nm regional shipping and navigation study area will be considered in the cumulative assessment.

Where relevant, impacts assessed within the NRA process for the Proposed Development in isolation (see Table 8.5) will also be assessed for a cumulative impact. In line with the approach for the isolation case, no cumulative impacts will be scoped out for the NRA, noting the assessment criteria required under MGN 543 (MCA, 2016).

8.2.8 POTENTIAL TRANSBOUNDARY IMPACTS

A screening of transboundary impacts has been carried out and is presented in Annex C. This screening exercise identified that there is the potential for transboundary impact upon shipping and navigation due to the Proposed Development. Specifically, transits to/from other countries including effects on shipping routes to/from transboundary ports may lead to impacts.

8.2.9 SCOPING QUESTIONS TO CONSULTEES

Based on the findings of the Offshore Scoping Report, the following questions should be considered by stakeholders seeking to respond:

- Do you agree that the existing data relating to navigation features available to describe the shipping and navigation baseline is sufficient to inform the assessment of shipping and navigation impacts?
- Do you agree that the embedded measures described provide a suitable means for managing and mitigating the potential effects of the Proposed Development on shipping and navigation receptors?
- Do you agree that all necessary organisations have been considered within the consultees listed in section 8.2.4?

8.3 AVIATION, MILITARY AND COMMUNICATIONS

8.3.1 INTRODUCTION

This section of the Offshore Scoping Report identifies the aviation, military and communications receptors of relevance to the Proposed Development and considers the potential impacts from the construction, operation and maintenance, and decommissioning of the offshore and intertidal components (seaward of the MHWS mark) of the Proposed Development on aviation, military and communication receptors.

The potential effects of wind turbines on aviation are widely publicised, but the primary concern is one of safety. Despite innumerable subtleties in the actual effects, there are two dominant scenarios that lead to potential impacts:

- physical obstruction. Wind turbines can present a physical obstruction to aircraft; and
- impacts on aviation radar systems and the provision of radar-based Air Traffic Services (ATS). Wind turbines can create unwanted radar clutter which appears on radar displays and can affect the provision of ATS to pilots. Radar clutter (or false radar returns) can confuse air traffic controllers making it difficult to differentiate between aircraft and those radar returns resulting from the detection of wind turbines. Furthermore, the appearance of multiple false targets in close proximity can generate false aircraft tracks and seduce those returns from 'real' aircraft away from the true aircraft position.

8.3.2 STUDY AREA

The aviation, military and communications study area has been determined by the range of the affected aviation receptors; in particular, Air Traffic Control (ATC) and Air Defence (AD) radar systems. The operating range of these radars can be up to 200 nm (370 km), however it is only the likely radar coverage over the Proposed Development that has been taken into account and assisted in identifying the relevant radars, and stakeholders, that may be affected. The aviation, military and communications study area is illustrated in Figure 8.9, together with the locations of the relevant aviation receptors.

The construction, operation and maintenance, and decommissioning of the proposed export cable corridor will not affect aviation and therefore no infrastructure relating to the proposed export cable corridor will be considered and as such this has not been considered when defining the aviation, military and communications study area.

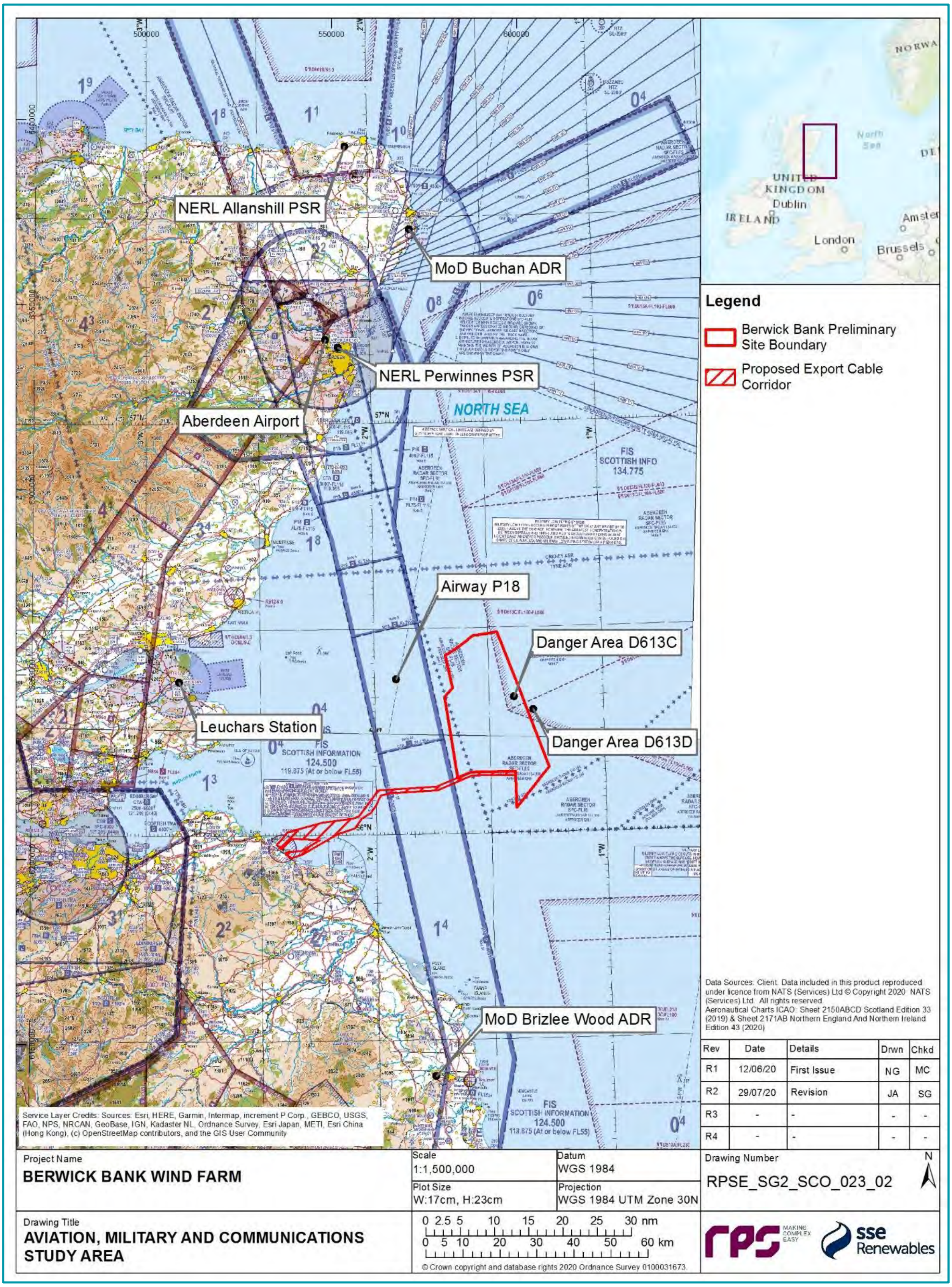


Figure 8.9: Aviation, Military and Communications Study Area and Associated Identified Receptors.

8.3.3 BASELINE ENVIRONMENT

8.3.3.1 Desktop Study

An initial desk-based review of literature and data sources to support this Offshore Scoping Report has identified a number of baseline datasets. These are summarised at Table 8.6 below.

Table 8.6: Summary of Key Desktop Reports.

Title	Source	Year	Author
Seagreen 1 Environmental Statement	Seagreen Wind Energy	2012	Seagreen Wind Energy
Seagreen 1 Scoping Report	Seagreen Wind Energy	2017	Seagreen Wind Energy
Seagreen 1 Environmental Statement	Seagreen Wind Energy	2018	Seagreen Wind Energy
Inch Cape Offshore Wind Farm Environmental Statement	Inch Cape Offshore Limited	*2013*	Inch Cape Offshore Limited
Neart na Gaoithe Offshore Wind Farm Environmental Statement	Neart na Gaoithe Offshore Wind Limited	*2018*	Neart na Gaoithe Offshore Wind Limited
Seagreen 1 Airspace Change Proposal Regulatory Decision	Seagreen Wind Energy	2020	Civil Aviation Authority (CAA)

8.3.3.2 Site-specific Survey Data

Pre-planning radar-line-of-sight (RLOS) assessments by the Ministry of Defence (MoD) and National Air Traffic Services En-Route PLC (NERL) will be undertaken to inform the Offshore EIA Report. To inform this Offshore Scoping Report an assessment of the likely impacts, backed-up by an 'in-house' database of civilian and military radar coverage, has been carried out.

8.3.3.3 Baseline Characterisation

The Proposed Development is located in close proximity, and to the south, of the consented Seagreen 1 project. As such, the potential impact on aviation, in particular aviation radar systems, will be similar to those assessed for Seagreen 1; therefore, data collected to inform the Seagreen 1 Environmental Statement (Seagreen Wind Energy, 2012), Scoping Report (Seagreen Wind Energy, 2017) and Environmental Statement (Seagreen Wind Energy, 2018) are appropriate sources of information to inform the assessment of impacts for the Proposed Development. An initial desk-based review has been undertaken to consider the aviation aspects likely to be affected by the Proposed Development utilising these, as well as other available, datasets.

There are a number of civilian and military aviation interests which the Proposed Development could affect (see Figure 8.9). As a result, there is a potential aviation safety risk and the Proposed Development may only proceed once all parties are content that any risks are resolved.

A detailed desktop review will be undertaken to characterise existing and future aviation, military and communications baseline conditions in the aviation, military and communications study area to inform the Offshore EIA Report. This will be undertaken by reviewing the relevant aviation legislation and guidance documents, as well as data sources such as aviation flying charts and other flight information publications.

In terms of potential impacts on aviation, the key potential issues to resolve are associated with the impact of wind turbines on civilian and military radar systems; including ATC and AD radar systems. It is important therefore to accurately identify which radars have the potential to be affected by the wind turbines associated with the Proposed Development. An initial assessment has determined which radars are likely to be affected by the Proposed Development and this will be formally confirmed once MoD and NERL carry out pre-planning RLOS assessments as described in section 8.3.3.2.

An initial review of the aviation, military and communications study area has been carried out in order to identify which aviation activities might be affected by the Proposed Development; this included the following aviation receptors:

- civil airport patterns and procedures;
- military aerodrome patterns and procedures;
- civil ATC radar;
- military ATC radar;
- military AD radar;
- military low flying;
- Helicopter Main Routes (HMRs);
- offshore helicopter operations (including Search and Rescue (SAR)); and
- offshore helicopter installations (oil and gas platforms).

In terms of airspace, the Proposed Development is located to the east of Airway P18 (see Figure 8.9) which is primarily used by commercial aircraft routing to, and from, Aberdeen Airport. The north-eastern portion of the Proposed Development also overlaps the lateral boundaries of Danger Areas D613C and D613D (see Figure 8.9). These Danger Areas are activated periodically from FL 100 (10,000 ft) to FL 660 (66,000 ft) for military air combat training and supersonic flight. The presence of wind turbines within the boundaries of these Danger Areas, and just outside the boundaries of Airway P18, are not in themselves expected to impact on aviation operations. This will be covered in detail in the Offshore EIA Report.

From the review, it was confirmed that the Proposed Development was sufficiently distant from civil airports and military aerodromes to not have any potential impact on their patterns and procedures. The nearest civil airport is Aberdeen Airport and the nearest military aerodrome is Leuchars station; both of which are identified on Figure 8.9. It was also determined that there were no HMRs or offshore helicopter installations within the aviation, military and communications study area. As a result, these aviation receptors can be scoped out of the EIA while the remaining receptors (civil ATC radar, military ATC radar, military AD radar, military low flying and offshore helicopter operations (including SAR)) remain scoped in (see section 8.3.6).

In terms of aviation radar, it was identified that there are five relevant ATC and AD radar systems located throughout eastern Scotland and northern England. These radars provide coverage over much of the

North Sea and could potentially be affected by the Proposed Development. The relevant civilian and military radars are as follows:

- MoD Brizlee Wood AD radar;
- MoD Buchan AD radar;
- MoD Leuchars Station ATC radar;
- NERL Allanshill ATC radar; and
- NERL Perwinnes ATC radar.

8.3.4 PROPOSED APPROACH TO THE ENVIRONMENTAL IMPACT ASSESSMENT

The aviation, military and communications offshore EIA will follow the methodology set out in chapter 5. Specific to the aviation, military and communications EIA, the following guidance documents will also be considered:

- Civil Aviation Publication (CAP) 393 – Air Navigation: The Order and the Regulations (2016);
- CAP 670 - Air Traffic Services Safety Requirements (Issue 3, 7 June 2019);
- CAP 764 - CAA Policy and Guidelines on Wind turbines (Version 6, February 2016);
- CAP 774 - The UK Flight Information Services (Version 3, 25 May 2017);
- CAP 032 - UK Integrated Aeronautical Information Package (2020);
- Military Aviation Authority (MAA): MAA Regulatory Publication 3000 Series: Air Traffic Management Regulations (21 September 2018);
- MAA: Manual of Military Air Traffic Management (30 September 2019);
- UK Military Aeronautical Information Publication (2020);
- Marine Guidance Note (MGN) 543: Offshore Renewable Energy Installations - Guidance on UK Navigational Practice, Safety and Emergency Response Issues (19 August 2016); and
- CAA Visual Flight Rules Chart (CAA, 2020).

8.3.5 EMBEDDED MITIGATION

Measures adopted as part of the Proposed Development will include:

- Adherence to CAP 393 Article 223 which sets out the mandatory requirements for lighting of offshore wind turbines. This will require approval and implementation of a Lighting and Marking Plan (LMP) which will set out specific requirements in terms of aviation lighting to be installed on the wind turbines. The LMP will be prepared in consultation with the CAA and other aviation stakeholders and will take into account requirements for aviation lighting as specified in Article 223 of the UK Air Navigation Order (ANO) 2016 and changes to International Civil Aviation Organization (ICAO) Annex 14 Volume 2, chapter 6, paragraph 6.2.4 promulgated in November 2016; and
- All structures > 91.4 m in height will be charted on aeronautical charts and reported to the Defence Geographic Centre (DGC) which maintains the UKs database of tall structures (Digital Vertical Obstruction File) at least ten weeks prior to construction.

The requirement and feasibility of additional measures will be dependent on the significance of the effects on aviation, military and communications and will be consulted upon with statutory consultees throughout the EIA process.

8.3.6 POTENTIAL PROPOSED DEVELOPMENT IMPACTS

A range of potential impacts on aviation, military and communications have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of the Proposed Development. The impacts that have been scoped into the Proposed Development assessment are outlined in Table 8.7 together with a description of any additional data collection (e.g. site-specific surveys) and/or supporting analyses (e.g. modelling) that will be required to enable a full assessment of the impacts.

On the basis of the baseline aviation, military and communications information currently available and the Proposed Development description outlined in chapter 3, a number of impacts are proposed to be scoped out of the assessment for aviation, military and communications. These impacts are outlined, together with a justification for scoping them out, in Table 8.8.

8.3.7 POTENTIAL CUMULATIVE EFFECTS

Although the predicted effects from the Proposed Development on aviation, military and communications receptors are considered to be localised to within the footprint of the project, there is potential for the predicted impacts to interact with impacts from other projects and activities in the aviation, military and communications study area and lead to a cumulative effect on receptors. To ensure cumulative effects are appropriately assessed, the maximum adverse scenarios for each of the projects or activities across all phases of the Proposed Development will be considered.

The cumulative assessment will consider other offshore wind farms and associated helicopter requirements within the aviation, military and communications study area.

An overview of the methodology relating to the CEA is presented within section 5.3.7.

8.3.8 POTENTIAL TRANSBOUNDARY IMPACTS

A screening of transboundary impacts has been carried out and is presented in Annex C. This screening exercise identified that there is no potential for transboundary impacts upon aviation, military and communications due to the construction, operational and maintenance, and decommissioning impacts of the Proposed Development.

8.3.9 SCOPING QUESTIONS TO CONSULTEES

- Do you agree that the existing data available to describe the aviation, military and communications baseline remains sufficient to describe the aviation, military and communications baseline in relation to the Proposed Development?
- Do you agree that the embedded mitigation described provides a suitable means for managing and mitigating the relevant potential effects of the Proposed Development on the aviation, military and communications receptors?
- Do you agree with the assessment of aviation, military and communications receptors to be scoped out of the Proposed Development EIA?

Table 8.7: Impacts Proposed to be Scoped Into the Proposed Development Assessment for Aviation, Military and Communications.

Impact	Embedded Mitigation	Justification	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Proposed Approach for the Undertaking of Proposed Development Specific Modelling to Inform the Assessment of Potential Impacts
Construction				
Potential impact on low flying (including SAR helicopter operations) due to presence of obstacles (cranes, stationary wind turbines).	Installation of appropriate aviation lighting and promulgation on aviation charts.	Wind turbines create a physical obstruction to low flying operations.	Consultation with the MoD and SAR helicopter operators will be required on wind turbine layout.	No modelling required for this impact.
Operation and Maintenance				
Potential impact on NERL ATC radars due to presence of wind turbines.	No embedded mitigation for this impact.	Wind turbines can cause permanent interference to civil ATC radars.	RLOS and operational assessments to be carried out by NERL.	Pre-planning RLOS assessment by NERL will be required.
Potential impact on Military ATC radar due to presence of wind turbines.	No embedded mitigation for this impact.	Wind turbines can cause permanent interference to military ATC radars.	RLOS and operational assessments to be carried out by MoD.	Pre-planning RLOS assessment by MoD will be required.
Potential impact on Military AD radars due to presence of wind turbines.	No embedded mitigation for this impact.	Wind turbines can cause permanent interference to military AD radars.	RLOS and operational assessments to be carried out by MoD.	Pre-planning RLOS assessment by MoD will be required.

Impact	Embedded Mitigation	Justification	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Proposed Approach for the Undertaking of Proposed Development Specific Modelling to Inform the Assessment of Potential Impacts
Potential impact on low flying (including SAR helicopter operations) due to presence of wind turbines.	Installation of appropriate aviation lighting and promulgation of information on aviation charts.	Wind turbines create a physical obstruction to low flying operations.	Consultation with the MoD and SAR helicopter operators will be required on wind turbine layout.	No modelling required for this impact.
Decommissioning				
Potential impact on low flying (including SAR helicopter operations) due to presence of obstacles (cranes, stationary wind turbines).	Installation of appropriate aviation lighting and promulgation on aviation charts.	Wind turbines can create a physical obstruction to low flying operations.	Consultation with the MoD and SAR helicopter operators will be required on wind turbine layout..	No modelling required for this impact.

Table 8.8: Impacts Proposed to be Scoped Out of the Proposed Development Assessment for Aviation, Military and Communications.

Impact	Justification
Construction	
Potential impact on civil airport patterns and procedures due to presence of obstacles (cranes, stationary wind turbines).	The array area will be sufficiently distant from any civilian airports to have any potential impact on their patterns and procedures. Therefore, subject to consultation with the relevant stakeholders and feedback received on this Offshore Scoping Report, the Applicant intends to scope this impact out from further consideration within the Offshore EIA Report.
Potential impact on military aerodrome patterns and procedures due to presence of obstacles (cranes, stationary wind turbines).	The array area will be sufficiently distant from any military aerodromes to have any potential impact on their patterns and procedures. Therefore, subject to consultation with the relevant stakeholders and feedback received on this Offshore Scoping Report, the Applicant intends to scope this impact out from further consideration within the Offshore EIA Report.
Potential impacts on HMRs due to presence of wind turbines.	There are no HMRs within the aviation, military and communications study area that can be affected by the Proposed Development. Therefore, subject to consultation with the relevant stakeholders and feedback received on this Offshore Scoping Report, the Applicant intends to scope this impact out from further consideration within the Offshore EIA Report.
Potential impacts on offshore helicopter installations (oil & gas platforms) due to the presence of wind turbines.	There are no offshore helicopter installations within the aviation, military and communications study area that can be affected by the Proposed Development. Therefore, subject to consultation with the relevant stakeholders and feedback received on this Offshore Scoping Report, the Applicant intends to scope this impact out from further consideration within the Offshore EIA Report.

8.4 MARINE ARCHAEOLOGY AND ORDNANCE

8.4.1 INTRODUCTION

This section of the Offshore Scoping Report identifies marine archaeology resources of relevance to the Proposed Development and considers the potential impacts from the construction, operation and maintenance, and decommissioning of the Proposed Development (seaward of the MLWS mark) on marine archaeology resources.

8.4.2 STUDY AREA

The marine archaeology study area is defined as the area encompassing the offshore components of the Proposed Development (i.e. the array area and proposed export cable corridor seaward of MLWS) as this area is considered to be directly affected by the Proposed Development and a 2 km buffer to allow the site-specific data to be put in a wider context (Figure 8.10).

The intertidal zone (between MHWS and MLWS) study area is defined as the search area for the Proposed Development, plus a 500 m buffer. This study area overlaps with the onshore cultural heritage assessment (see Onshore Scoping Report).

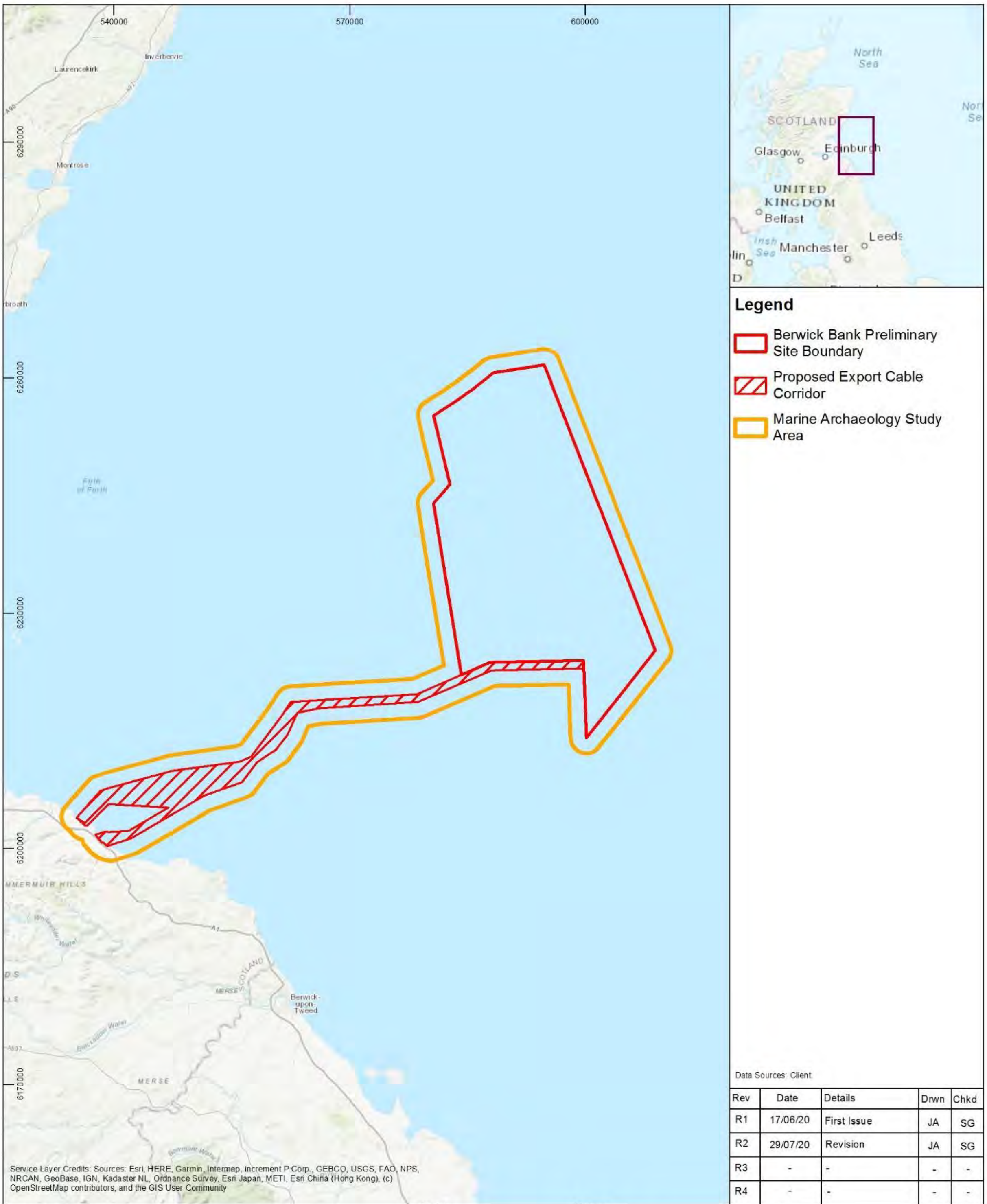
8.4.3 BASELINE ENVIRONMENT

8.4.3.1 Desktop Study

An initial desk-based review of literature and data sources to support this Offshore Scoping Report has identified a number of baseline datasets. These are summarised at Table 8.9 below.

Table 8.9: Summary of Key Desktop Reports.

Title	Source	Year	Author
Records of Wrecks and Obstructions	UKHO	Ongoing	UKHO
National Record of the Historic Environment (NRHE)	HES	Ongoing	HES
Records of MPAs	HES online portal	Ongoing	HES
Technical Report for SEA of North Sea Area SEA5	Flemming, N	2004	Flemming, N
Firth of Forth Round 3 Offshore Wind Far, Phase 1: Maritime Cultural Heritage Baseline Technical Report	Seagreen Wind Energy	2011	Headland Archaeology
Seagreen Offshore Wind Farm Project Marine Archaeology Written Scheme of Investigation (WSI) & Protocol for Archaeological Discoveries (PAD)	Seagreen Wind Energy Ltd	2019	Seagreen Wind Energy Ltd



Rev	Date	Details	Drwn	Chkd
R1	17/06/20	First Issue	JA	SG
R2	29/07/20	Revision	JA	SG
R3	-	-	-	-
R4	-	-	-	-

Project Name	Scale	Datum	Drawing Number
BERWICK BANK WIND FARM	1:750,000	WGS 1984	RPSE_SG2_SCO_034_02
	Plot Size: W:17cm, H:23cm	Projection: WGS 1984 UTM Zone 30N	

Drawing Title
MARINE ARCHAEOLOGY STUDY AREA

0 2.5 5 10 15 nm
0 5 10 20 30 km

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Figure 8.10: Marine Archaeology Study Area.

8.4.3.2 Site-specific Survey Data

A geophysical survey of the Proposed Development was undertaken between August and October 2019. The data were collected to a specification appropriate to achieve the following interpretation requirements:

- Magnetometer: identification of anomalies > 5 nT;
- SSS: ensonification of anomalies > 0.3 m;
- SBP: penetration > 10 m; and
- Multibeam bathymetry: ensonification of anomalies < 1.0 m.

All data were collected and referenced relative to the WGS84 datum and UTM30N projection. Details of the survey specification of the offshore and nearshore geophysical surveys are presented within Table 8.10 and Table 8.11.

Table 8.10: Offshore Geophysical Survey Specification.

Vessel / Sensor	Sidescan Sonar	Multibeam	Magnetometer	Sub-bottom
Fugro Pioneer	Edgetech 4200 (300//900 kHz)	Kongsberg 2040 Dual head (400 kHz)	Geometrics G-882	Innomar SES-2000 Medium
Fugro Frontier	Edgetech 4200 (300//900 kHz)	Kongsberg 2040 Dual head (400 kHz)	Geometrics G-882	Innomar SES-2000 Medium

Table 8.11: Nearshore Geophysical Survey Specification.

Vessel / Sensor	Sidescan Sonar	Multibeam	Magnetometer	Sub-bottom
Fugro Mercator	Edgetech 4200 (300//900 kHz)	Reson 7125 (400 kHz)	Geometrics G-882	Innomar SES-2000 Medium
Fugro Seeker	Edgetech 4200 (300//900 kHz)	Reson 7125 (400 kHz)	Geometrics G-882	Innomar SES-2000 Medium

8.4.3.3 Baseline Characterisation

The area of the Proposed Development was submerged during the late glacial/early Holocene and prior to this it was covered in a succession of ice sheets. During periods of glaciation it would have been uninhabitable, however during inter-glacial periods there is a potential for periglacial occupation at times when the seabed would have formed dry land. The zones of highest potential for the survival of archaeological material are likely to be those on the edges of channels and floodplains, where old ground surfaces and organic remains are most likely to survive. These deposits often lie beneath relatively thin layers of seafloor sediment and may be vulnerable to exposure.

The effects of repeated glaciations, marine transgressions and associated fluvial activity mean that the potential for the survival of any archaeology from this period is unlikely. No in-situ finds have been recorded within the Proposed Development. The absence of peat and organic sediments within the array area suggests a low potential for palaeo-landscapes and palaeoenvironmental evidence, although isolated and residual finds could be found buried deep in glacial deposits. Closer to the shoreline, if peat and organic muds are present there is some potential for palaeoenvironmental evidence and the preservation of organic material in association with early prehistoric activity along the western extent of the proposed export cable corridor.

A summary of the known archaeological features is provided below:

- there are no protected areas or statutory designations in relation to submerged landscapes within the limits of the Proposed Development;
- no designated wrecks are recorded within the limits of the Proposed Development;
- a total of 14 wrecks and obstructions lie within the limits of the array area and marine archaeology study area buffer recorded by the UKHO (Figure 8.11);
- a total of 14 wrecks and obstructions recorded by the UKHO lies within or adjacent to the limits of the proposed export cable corridor (Figure 8.11);
- the frequency of recorded wreck sites increases in close proximity to the shore; and
- a large number of wrecks (both vessels and aircraft) are recorded in the NRHE without known positions.

There is also an absence of charted wrecks pre-dating the 19th century within the limits of the offshore Proposed Development. The known shipwrecks are predominantly iron and steel vessels dating from the 19th and 20th centuries. The preponderance of iron and steel wrecks in the record could potentially mask the presence of earlier shipwrecks, which are of potentially greater archaeological interest. Compared to iron and steel wrecks, wooden shipwrecks tend to be older, smaller and to have carried less ferrous material. They also tend to break up more quickly than iron and steel wrecks and are thus more likely to be scattered, dispersed and have a generally lower physical profile on the seabed. Consequently, they are less likely to be located by geophysical survey.

There is therefore a generally moderate to good potential for unexpected remains to be discovered within the limits of the Proposed Development.

Five recorded sites lie within the intertidal zone of the northern cable landing point and include Skateraw Harbour, St Dennis's Chapel graveyard and other finds at Chapel Point. There are no recorded sites within the search area for the southern cable landing point.

8.4.4 PROPOSED APPROACH TO THE ENVIRONMENTAL IMPACT ASSESSMENT

A Marine Archaeology Technical Report will be prepared to characterise the baseline conditions for the Proposed Development. Specific to the marine archaeology, the following guidance documents will also be considered:

- Marine Scotland Act 2010;
- Protection of Military Remains Act 1986;
- Ancient Monuments and Areas Act 1979;
- Merchant Shipping Act 1995;
- Marine Policy Statement 2011;
- Standard and guidance for historic environment desk-based assessment (Chartered Institute for Archaeologists, 2014);
- Scottish National Marine Plan (Scottish Government, 2015b); and
- Designation Policy and Selection Guidance (HES, 2019).

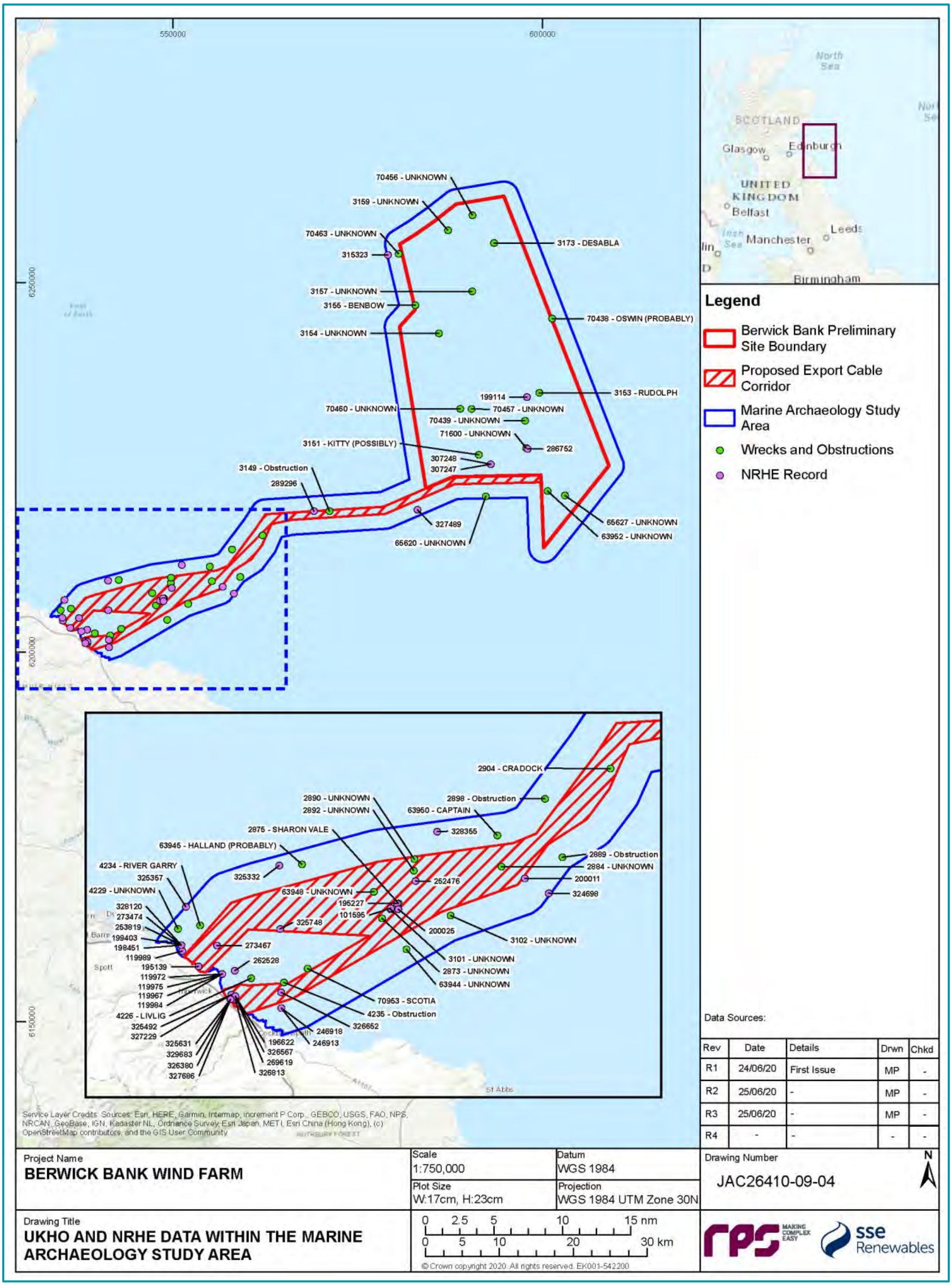


Figure 8.11: The Position of UKHO and NRHE Records with the Proposed Development.

8.4.4.1 Desktop Review

Information on marine archaeology will be collected through a detailed desktop review of existing studies and datasets from the following principal primary sources:

- records of UKHO wrecks and obstructions;
- records of MPAs held by Historic Scotland in their online Historic Environment Portal; and
- catalogue of heritage sites recorded on the NRHE held by Historic Scotland and accessed via their website called Canmore.

The baseline data will be plotted to identify the general distribution of known and recorded shipping casualties and geophysical anomalies with archaeological potential. Information drawn from secondary sources will be used qualitatively, particularly to develop an understanding of the likelihood of unknown and unrecorded maritime archaeological sites.

8.4.4.2 Geophysical Data Assessment

The archaeological review of the Proposed Development geophysical data (see section 8.4.3.2) will be undertaken by a qualified and experienced maritime archaeologist with a background in geophysical and hydrographic data acquisition, processing and interpretation. An initial review of the data (including magnetometer, SSS, SBP and MBES) will be undertaken to gain an understanding of the geological and topographic make-up of the survey area.

SSS is considered the best tool for the identification of anthropogenic contacts on the seabed through its ability to ensonify small features and so forms the basis of any archaeological assessment of data.

Magnetometer data indicate the presence of ferrous and thus usually anthropogenic material both on, and under the seabed and where line spacing allows. The survey line spacing for Proposed Development ranges between 75 m and 200 m which is too great for the accurate positioning of magnetic anomalies but can indicate areas of archaeological potential. A magnetic anomaly position can only be determined from directly below the sensor, or where lines are run close together to position an anomaly seen on two, or more, lines. Where possible, significant magnetic anomalies were correlated with contacts visible on the seabed.

Whilst SBP and MBES are useful tools for archaeological assessment, their primary use, outside of seabed and palaeo-landscape characterisation, is in the corroboration of contacts identified in the SSS and magnetometer data. As such, all contacts of potential anthropogenic origin will be assessed for archaeological potential primarily alongside the magnetometer data, with SBP and MBES data used to corroborate identified contacts.

The archaeological potential will be assigned to each contact based on the criteria outlined in Table 8.12 below.

MAKING COMPLEX EASY

For a better world of energy

Table 8.12: Criteria for the Assessment of Archaeological Potential.

Potential	Criteria
Low	An anomaly potentially of anthropogenic origin but that is unlikely to be of archaeological significance – Examples may include discarded modern debris such as rope, cable, chain or fishing gear; small isolated anomalies with no wider context; or small boulder-like features with associated magnetometer readings.
Medium	An anomaly believed to be of anthropogenic origin but that would require further investigation to establish its archaeological significance – Examples may include larger unidentifiable debris or clusters of debris, unidentifiable structures, or significant magnetic anomalies.
High	An anomaly almost certainly of anthropogenic origin and with a high potential of being of archaeological significance – high potential anomalies tend to be the remains of wrecks, the suspected remains of wrecks, or known structures of archaeological significance.

8.4.5 EMBEDDED MITIGATION

As part of the project design process, a number of designed-in measures are proposed to reduce the potential for impacts on marine archaeology (see Table 8.13). As there is a commitment to implementing these measures, they are considered inherently part of the design and will evolve over the development process as the EIA progresses and will inform the preparation of a WSI and PAD. These measures are considered standard industry practice for this type of development.

As well as identifying surface contacts of potential archaeological interest the geophysical and hydrographic survey data will be reviewed to assess the potential survival of palaeolandscapes within the limits of the Proposed Development.

Sub-surface data acquired from SBP and seismic surveys is key to understanding the palaeolandscape potential of the study area. Sedimentary horizon grids and geological maps derived from the interpretation of sub-surface data and the current seabed derived from MBES data will be assessed. Sedimentary deposits will be correlated with geological formations, and the depositional context and make-up of the deposits presented. The results inform the characterisation of the palaeoenvironmental and archaeological potential included in this report.

8.4.6 POTENTIAL PROPOSED DEVELOPMENT IMPACTS

When taking into account the baseline marine archaeology information (see section 8.4.3), the embedded mitigation included in Table 8.13 and the Proposed Development description outlined in chapter 3, all impacts are proposed to be scoped out of the assessment for marine archaeology. These impacts are outlined, together with a justification for scoping them out, in Table 8.14.

Within the intertidal zone, the potential Impacts during construction include direct impacts on buried archaeological remains arising from installation of underground cables, including exposure of remains within a working wayleave along the finalised cable route.

Table 8.13: Embedded Measures to be Adopted as Part of the Project.

Measures Adopted as Part of the Proposed Development	Justification
The identification and implementation of Archaeological Exclusion Zones (AEZs) around sites identified as having a known important archaeological potential. To ensure that all offshore infrastructure will be located to avoid any known wrecks (50 m buffer around known wreck, 100 m buffer around designated wreck). The size of the AEZ should be evidence-based and established using the precautionary principle to ensure that it is of sufficient size to protect the site from the nature of impact (Wessex Archaeology, 2007; Wessex Archaeology for The Crown Estate, 2020).	To avoid direct impacts on sites of identified archaeological importance.
Archaeological input into specifications for and analysis of future pre-construction geophysical surveys.	To avoid future impacts on sites of known archaeological interest.
Archaeologists to be consulted in the preparation of any pre-construction ROV/diver surveys and, if appropriate, in monitoring/checking of data.	To avoid impacts on unrecognised archaeological sites and/or to improve understanding of identified sites of potential archaeological importance.
All anomalies of unconfirmed archaeological potential to be taken into account during final design. If they are likely to be impacted, these anomalies would undergo further archaeological investigation. Should these anomalies prove to be of archaeological importance then future AEZs may be implemented following consultation with HES.	To avoid direct impacts on sites of archaeological importance.
Archaeological input into specifications for and analysis of pre-construction geotechnical surveys. This might include the presence of a geoarchaeologist on board the survey vessel and a provision for sampling, analysis and reporting of recovered cores. The results of all geoarchaeological investigations to be complied in a final report which includes a sediment deposit model.	To offset the potential impact of offshore development activities on potential geoarchaeological and palaeoenvironmental sediments.
Provision of a PAD similar to that set out by TCE (2014) for unexpected archaeological discoveries made during the course of the development.	To enable the protection and, if necessary, recording of any sites/objects of archaeological significance identified during the course of the development.
Archaeologists to be consulted in advance of pre-construction site preparation activities and, if appropriate, to carry out watching briefs of such work.	To record archaeological remains that may be affected by pre-construction operations.
Mitigation of unavoidable direct impacts on known sites of archaeological importance. Options include i) preservation by record, and ii) stabilisation.	To offset the effects of disturbance/destruction of irreplaceable archaeological remains.

Table 8.14: Impacts Proposed to be Scoped Out of the Proposed Development Assessment for Marine Archaeology.

Impact	Justification
Construction	
Construction activities causing the removal or disturbance of sediments resulting in a potential effect on near-surface prehistoric land surfaces.	A Marine Archaeology Technical Report, together with associated data review of the geophysical data for the array area and proposed export cable corridor, will provide an overview of the identifiable marine archaeology features within the marine archaeology study area. This Marine Archaeology Technical Report form the basis of a WSI and PAD, which will be prepared for approval with HES. The WSI and PAD will include (as outlined in Table 8.13 above): • The identification of AEZs around sites identified as having a known important archaeological potential; • Archaeological input into specifications for and analysis of future pre-construction geophysical surveys; • Archaeologists to be consulted in the preparation of any pre-construction ROV/diver surveys and, if appropriate, in monitoring/checking of data; • All anomalies of unconfirmed archaeological potential to be taken into account during final design; • Archaeological input into specifications for and analysis of pre-construction geotechnical surveys; • Provision of a PAD similar to that set out by TCE (2014) for unexpected archaeological discoveries; • Archaeologists to be consulted in advance of pre-construction site preparation activities and, if appropriate, to carry out watching briefs of such work; and • Mitigation of unavoidable direct impacts on known sites of archaeological importance. Options include i) preservation by record, and ii) stabilisation. These measures will therefore ensure that all impacts are reduced to not significant in EIA terms. Therefore, subject to consultation with HES and feedback received on this Offshore Scoping Report, the Applicant intends to scope this impact out from further consideration within the Offshore EIA Report.
Construction activities causing the removal or disturbance of sediments resulting in a potential effect on shipwrecks and aircraft wrecks.	
Construction of wind turbines and substations causing the removal or disturbance of sediments resulting in a potential effect on deeply buried prehistoric land surfaces.	
Construction activities resulting in an increase in suspended sediment concentrations and associated sediment deposition on shipwrecks and aircraft wrecks.	
Operation and Maintenance	
Maintenance activities causing the removal or disturbance of sediments resulting in a potential effect on near-surface prehistoric land surfaces.	Justification as described within construction phase.
Maintenance activities causing the removal or disturbance of sediments resulting in a potential effect on shipwrecks and aircraft wrecks.	

Impact	Justification
Decommissioning	
Decommissioning activities causing the removal or disturbance of sediments resulting in a potential effect on near-surface prehistoric land surfaces.	Justification as described within construction phase.
Decommissioning activities causing the removal or disturbance of sediments resulting in a potential effect on shipwrecks and aircraft wrecks.	

8.4.7 SCOPING QUESTIONS TO CONSULTEES

- Do you agree with the Study Area as defined e.g. the Berwick Bank OWF array area, the Berwick Bank OWF export cable routes corridor and a wider search area encompassing 2 km from the limits of the offshore Proposed Development up to the MLWS?
- Do you agree that the proposed embedded mitigation is appropriate for the mitigation of marine archaeology receptors?
- Do you agree that it is appropriate to scope out those impacts those impacts proposed to be scoped out that the assessment of marine archaeology receptors should be scoped out of the Proposed Development EIA?

8.5 SEASCAPE, LANDSCAPE, VISUAL RESOURCES AND CULTURAL HERITAGE

8.5.1 INTRODUCTION

This section of the Offshore Scoping Report identifies the elements of the seascape, landscape, visual resources and cultural heritage setting of relevance to the Proposed Development. and considers the potential impacts from the construction, operation and maintenance, and decommissioning of the offshore and intertidal components (seaward of MHWS) of the Proposed Development on:

- seascape of offshore receptors seaward of MHWS; and
- seascape of onshore receptors landwards of MHWS, settings of onshore and offshore designated cultural heritage assets in coastal settings.

8.5.2 STUDY AREA

8.5.2.1 SLIVA

To establish the baseline environments for both the offshore and landfall elements of the Proposed Development, two separate Zones of Theoretical Visibility (ZTV) will be prepared. These are described below:

- seascape, landscape, visual resources array study area: UK guidance (SNH, 2017b) on the landscape and visual effects of an offshore wind farm recommends a study area of a 50 km radius for wind turbines 150 m high to blade tip and taller. This reflects the distance that wind turbines of this height would potentially be visible to the human eye. A preliminary offshore landscape and visual ZTV has been prepared to a 50 km radius from the outer boundary of the array area to ensure that all coastal landscape and visual, and cultural heritage setting receptors that may experience significant effects are identified, see Figure 8.12.
- seascape, landscape, visual resources proposed export cable corridor study area: A separate 5 km radius ZTV has been prepared for the proposed export cable corridor, reflecting the anticipated low-level nature of the proposed construction, maintenance and decommissioning infrastructure and activities. This ZTV radius is calculated from indicative points along the edge of the landfall corridor and from a height of 13 m above ordnance datum (AOD), based on a vessel 10 m in height at MHWS (+3 m AOD). The seascape, landscape, and visual resources proposed offshore cable corridor study area is illustrated in Figure 8.12.

8.5.2.2 Cultural Heritage setting

The study area for the cultural heritage setting assessment adopts that of the seascape, landscape and visual resources assessment: a 50 km buffer around the array area and a 5 km buffer around the proposed export cable corridor (see Figure 8.12).

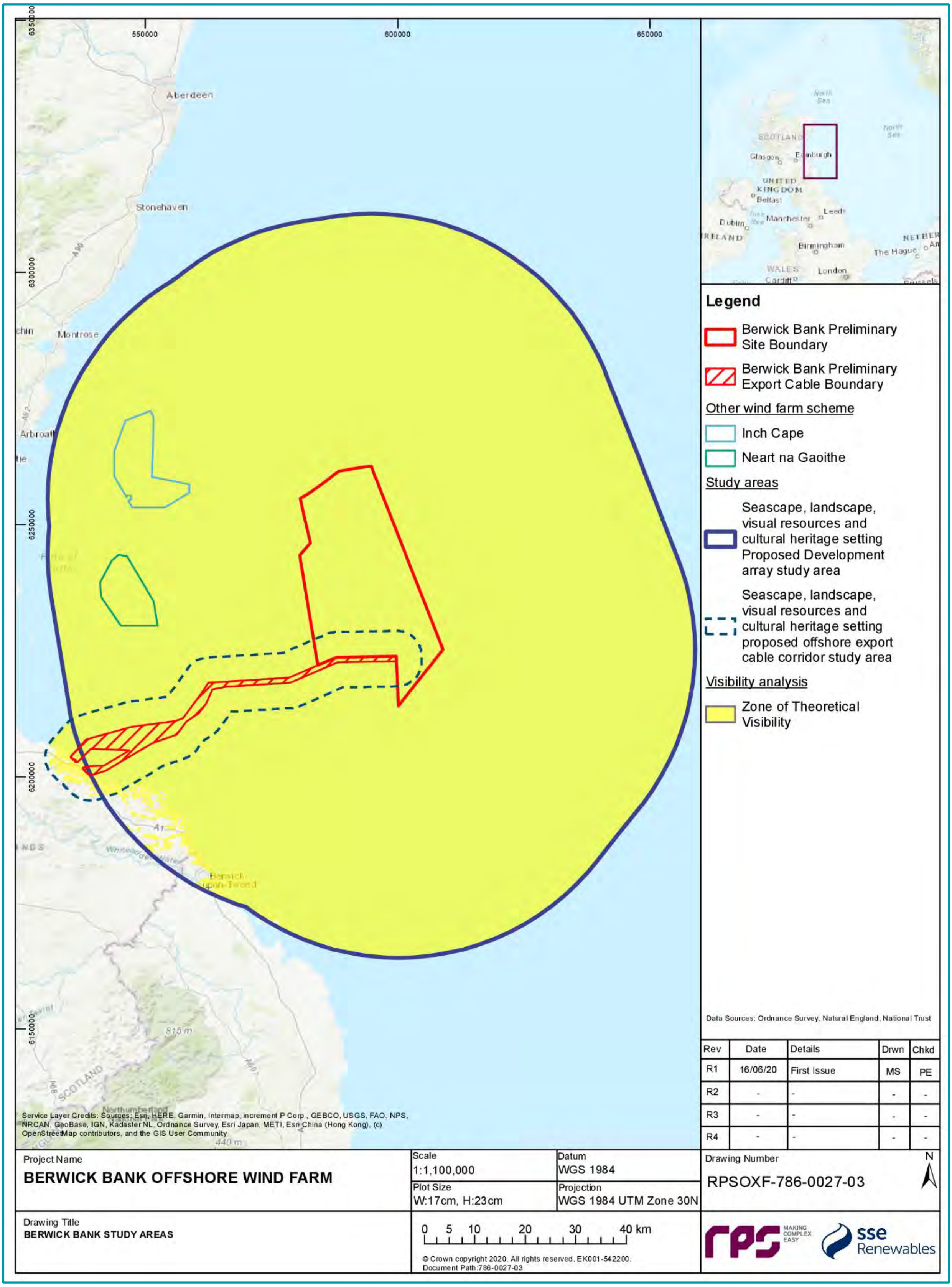


Figure 8.12: Seascape, Landscape, Visual Resources and Cultural Heritage Study Areas.

8.5.3 BASELINE ENVIRONMENT

8.5.3.1 Desktop Study

An initial desk-based review of literature and data sources to support this Offshore Scoping Report has identified a number of baseline datasets. These are summarised in Table 8.15 below.

Table 8.15: Summary of Key Desktop Reports.

Title	Source	Year	Author
Number 112: The Borders Landscape Assessment	SNH	1998a	Ash Consulting Group
Number 91: The Lothians Landscape Assessment	SNH	1998b	Ash Consulting Group
National Coastal Character Map	SNH	2010	SNH
Seascape Character Assessment for the North East Inshore and Offshore Marine Plan Areas	MMO	2018	Land Use Consultants (LUC)
Northumberland Landscape Character Assessment	Northumberland County Council (NCC)	2010	LUC
Northumberland Coast Area of Outstanding Natural Beauty (AONB) Management Plan 2014 to 2019	NCC	2014	Northumberland Coast AONB Partnership
Historic Environment Scotland Spatial Data Warehouse.	Historic Environment Scotland [online GIS downloader]	2020	Historic Environment Scotland
National Heritage List for England	Historic England [online GIS downloader]	2020	Historic England
National Trust Property Search Map	National Trust [online search map]	2020	National Trust

8.5.3.2 Site-specific Survey Data

No site-specific field surveys have been undertaken to inform the Offshore Scoping Report for seascape, landscape, visual resources and cultural heritage setting. This is because viewpoint photography will be undertaken following consultation, to confirm appropriate candidate viewpoint locations and receptors. Consultation with key stakeholders to identify potential visual receptors is a standard approach to seascape, landscape, visual resources and cultural heritage setting assessments, and would include SNH, Natural England and Northumberland Coast AONB Partnership. This will also be used to inform the seascape, visual resources and cultural heritage baseline and assessments included within the Offshore EIA Report.

8.5.3.3 Baseline Characterisation

The following forms a summary of the data collated and work undertaken to date and is illustrated in Figure 8.13 to Figure 8.16.

- preliminary review of legislative and policy context;
- review of landscape designations;
- preliminary review of national, regional and local landscape/coastal character assessments including landscape character areas (LCA) and types; and
- preparation of preliminary proposed ZTV's.

A preliminary appraisal of the existing baseline within the seascape, landscape, visual resources and cultural heritage setting array study area and the seascape, landscape, visual resources and cultural heritage setting proposed export cable corridor study area has been undertaken as is presented below.

Landscape and Coastal Character

Seascape and landscape resources within the seascape, landscape, visual resources and cultural heritage setting array study area and the seascape, landscape, visual resources and cultural heritage setting proposed export cable corridor study area may be affected either directly or indirectly by construction, operation and maintenance or decommissioning activities within the array area, or the construction, maintenance or decommissioning of the export cable landfall and offshore export cable laying activities.

National Coastal Character

Scotland

At a national scale, the seascape, landscape, visual resources and cultural heritage setting array study area and the seascape, landscape, visual resources and cultural heritage setting proposed export cable corridor study area would collectively coincide with two of thirteen Scottish coastal character types that occur in 33 indicative National Seascape Character Areas. The following coastal character types are relevant to the seascape, landscape, visual resources and cultural heritage setting impact assessment;

- type 1: Remote High Cliffs
- type 2: Rocky Coastline/ Open Sea Views

England

At a national scale the MMO identified Marine Character Areas (MCA's) within the Seascape Character Assessment for the North East Inshore and Offshore Marine Plan Areas (September 2018). The following coastal character type is relevant to the seascape, landscape, visual resources and cultural heritage setting impact assessment;

- MCA 23: Rural Northumberland and Coastal Waters

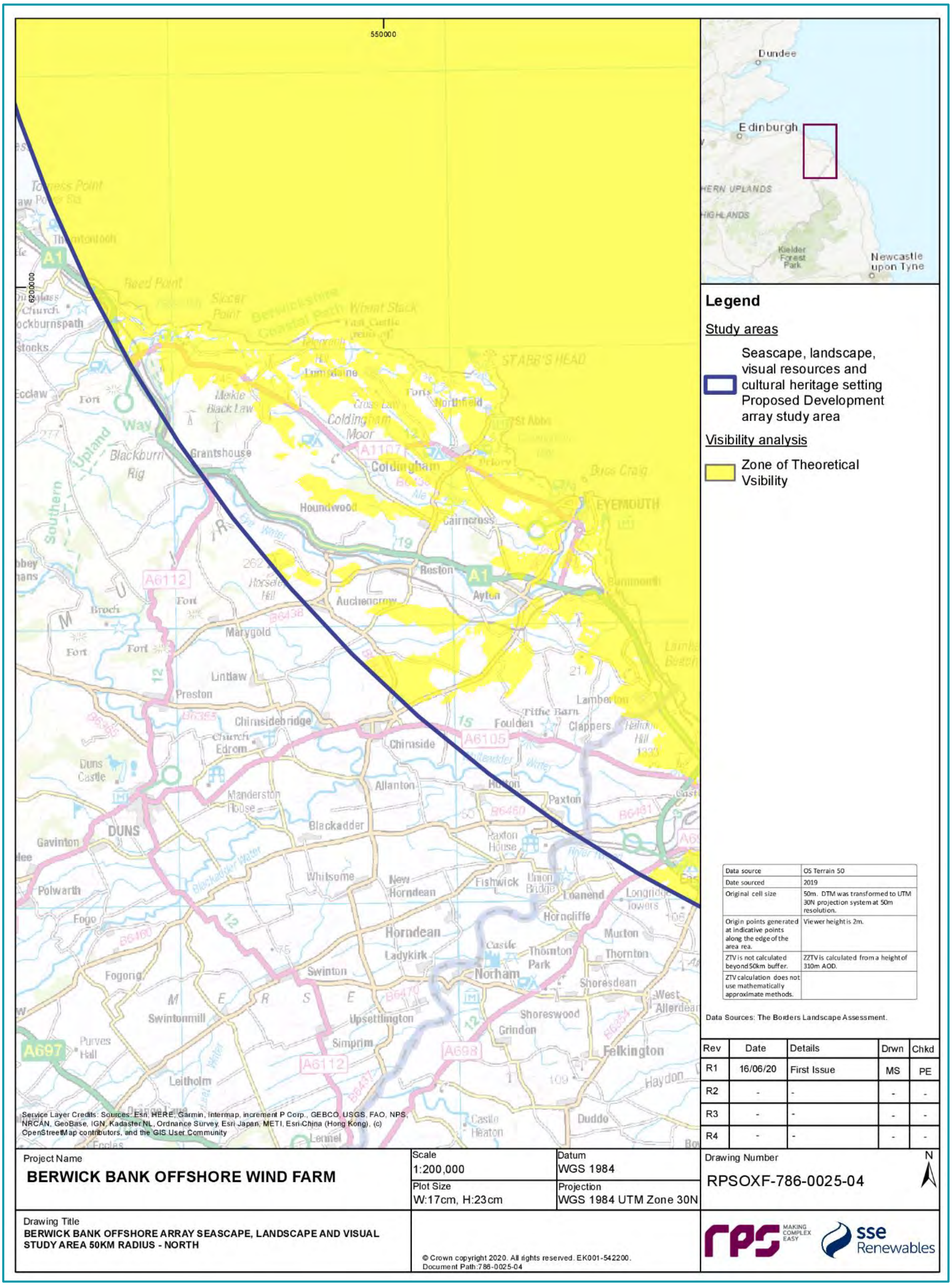
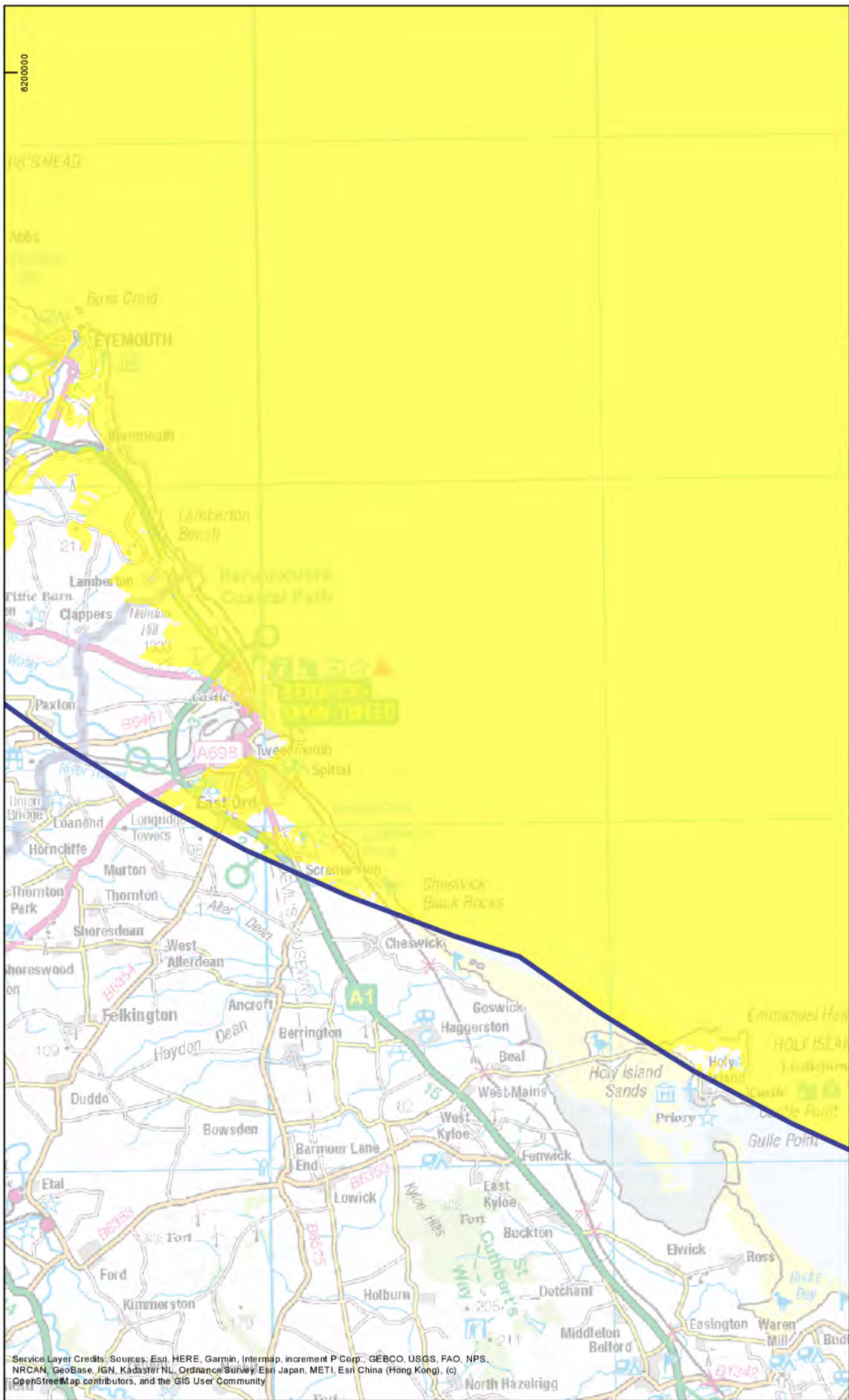


Figure 8.13: Zone of Theoretical Influence in the Northern Extent of the Seascape, Landscape, Visual Resources and Cultural Heritage Setting Array Study Area.



Legend

Study areas

Seascape, landscape, visual resources and cultural heritage setting Proposed Development array study area

Visibility analysis

Zone of Theoretical Vsibility

Data source	OS Terrain 50
Date sourced	2019
Original cell size	50m. DTM was transformed to UTM 30N projection system at 50m resolution.
Origin points generated at indicative points along the edge of the area rea.	Viewer height is 2m.
ZTV is not calculated beyond 50km buffer.	ZZTV is calculated from a height of 310m AOD.
ZTV calculation does not use mathematically approximate methods.	

Data Sources: The Borders Landscape Assessment.

Rev	Date	Details	Drwn	Chkd
R1	16/06/20	First Issue	MS	PE
R2	-	-	-	-
R3	-	-	-	-
R4	-	-	-	-

Project Name **BERWICK BANK OFFSHORE WIND FARM**	Scale 1:200,000 Plot Size W:17cm, H:23cm	Datum WGS 1984 Projection WGS 1984 UTM Zone 30N	Drawing Number RPSOXF-786-0025-04
Drawing Title **BERWICK BANK OFFSHORE ARRAY SEASCAPE, LANDSCAPE AND VISUAL STUDY AREA 50KM RADIUS - SOUTH**			

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Document Path:786-0025-04

Figure 8.14: Zone of Theoretical Influence in the Southern Extent of the Seascape, Landscape, Visual Resources and Cultural Heritage Setting Array Study Area.

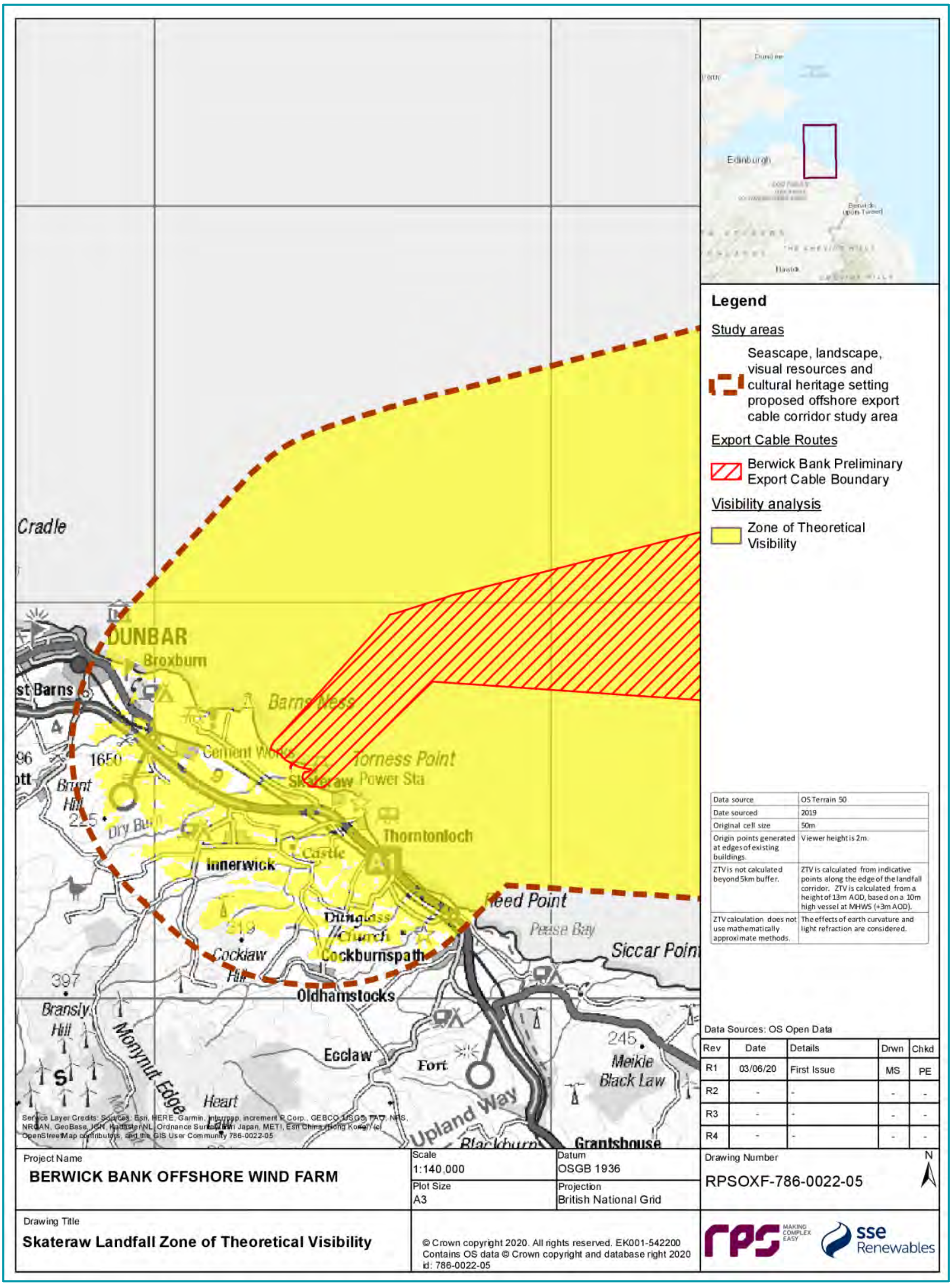

Figure 8.15: **Zone of Theoretical Influence of the Proposed Export Cable Corridor at the of the Skateraw Landfall within the Seascape, Landscape, Visual Resources and Cultural Heritage Study Area.**

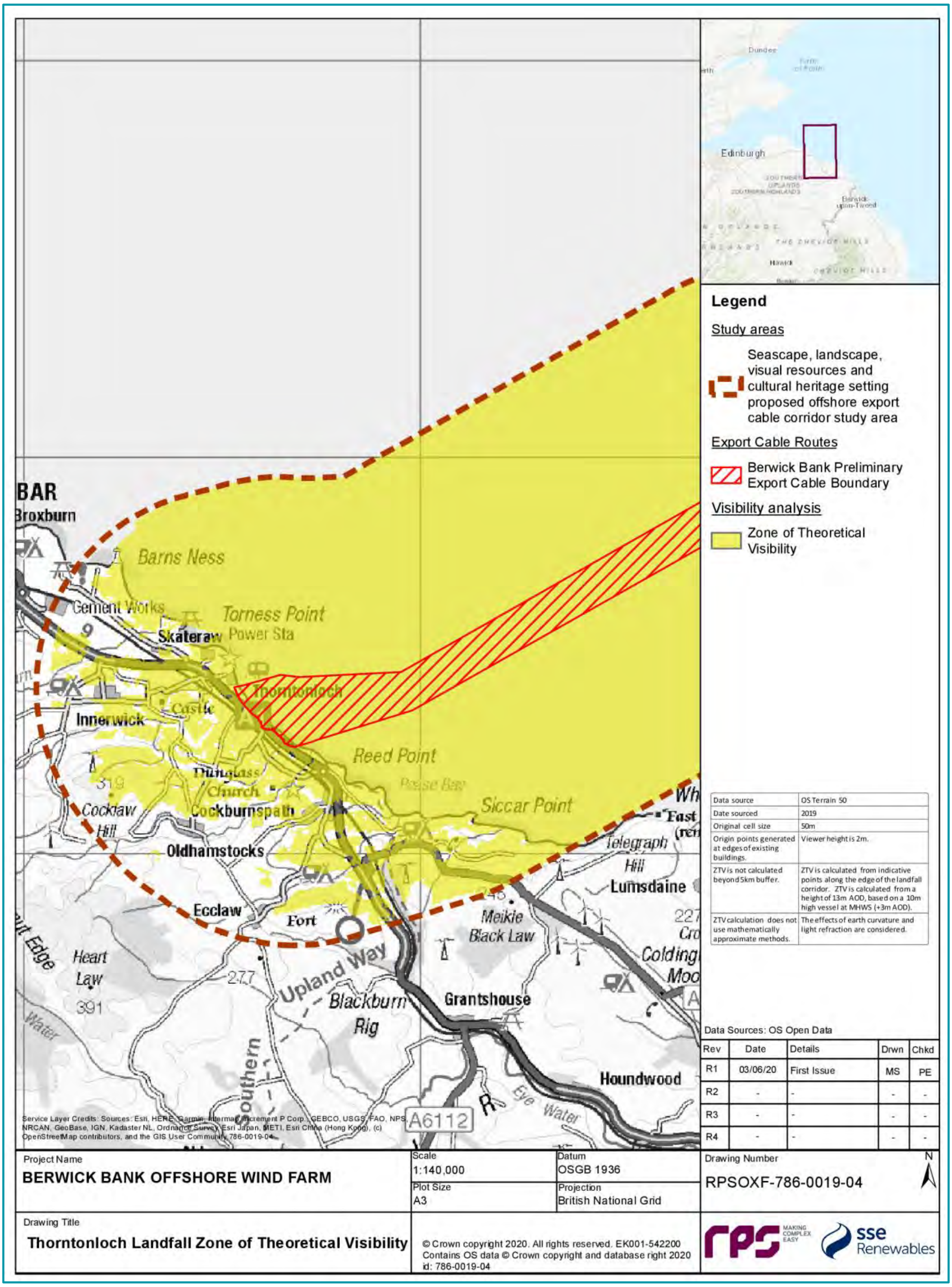

Figure 8.16: **Zone of Theoretical Influence of the Proposed Export Cable Corridor of the Thorntonloch Landfall within the Seascape, Landscape, Visual Resources and Cultural Heritage Setting Study Area.**

Regional Landscape Character

East Lothian Council

SNH appointed Ash Consulting Group to undertake a landscape characterisation of the Lothians. The Lothians Landscape Assessment: No 91 was published in 1998. The seascape, landscape, visual resources and cultural heritage setting proposed export cable corridor study area coincides with land within the Coastal Margins and the Upland Fringes Landscape Character Types (LCT) identified within this assessment. The Coastal Margins LCT is further divided to form the following LCA;

- Dunbar Plain LCA 23
- North Berwick Plain LCA 24

The Upland Fringes LCT within the seascape, landscape, visual resources and cultural heritage setting proposed export cable corridor study area forms the following LCA;

- Eastern Lammermuirs LCA 8

The Borders Council

SNH appointed Ash Consulting Group to undertake a landscape characterisation of the Borders. The Borders Landscape Assessment: No 112 was published in 1998. The seascape, landscape, visual resources and cultural heritage setting array study area and the seascape, landscape, visual resources and cultural heritage setting proposed export cable corridor study area would coincide with land within the Coastal Zone and Tweed Lowlands Regional Landscape Areas (RLA) within Coastal, River Valley and Lowland areas of the Borders district, identified within this assessment and illustrated within Figure 8.17 to Figure 8.19. RLA's are sub-divided to form the Coastal Farmland, Coastal Pasture, Coastal Moorland and Costal Valley LCT. The Coastal Margins LCT is further divided to form the following LCA;

- Coldingham and Cockburnspath Coastal Farmland LCT 19;
- Lamberton Moor Coastal Pasture LCT 20; and
- Coldingham Moor Coastal Moorland LCT 21.

The River Valley LCT is further divided to form the following LCA;

- Lower Eyewater Valley Coastal Valley LCT 30.

The Lowland LCT is further divided to form the following LCA;

- Eyewater Lowland Rolling Lowland Margin LCT 16.

There are no designated landscapes within the seascape, landscape, visual resources and cultural heritage setting array study area or the seascape, landscape, visual resources and cultural heritage setting proposed export cable corridor study area within Scotland.

Northumberland County Council (NCC)

NCC appointed LUC Consultants to undertake a landscape characterisation of Northumberland. The Northumberland Landscape Character Assessment was published in 2010, as illustrated in Figure 8.20. The seascape, landscape, visual resources and cultural heritage setting array study area would coincide with land within the LCT 5: Sandy Coastline and the following specific LCA;

- LCA 01a: Tweed River Mouth
- LCA 03a: Haggerston
- LCA 04a: North Tweed Coast
- LCA 05a: Holy Island Coast.

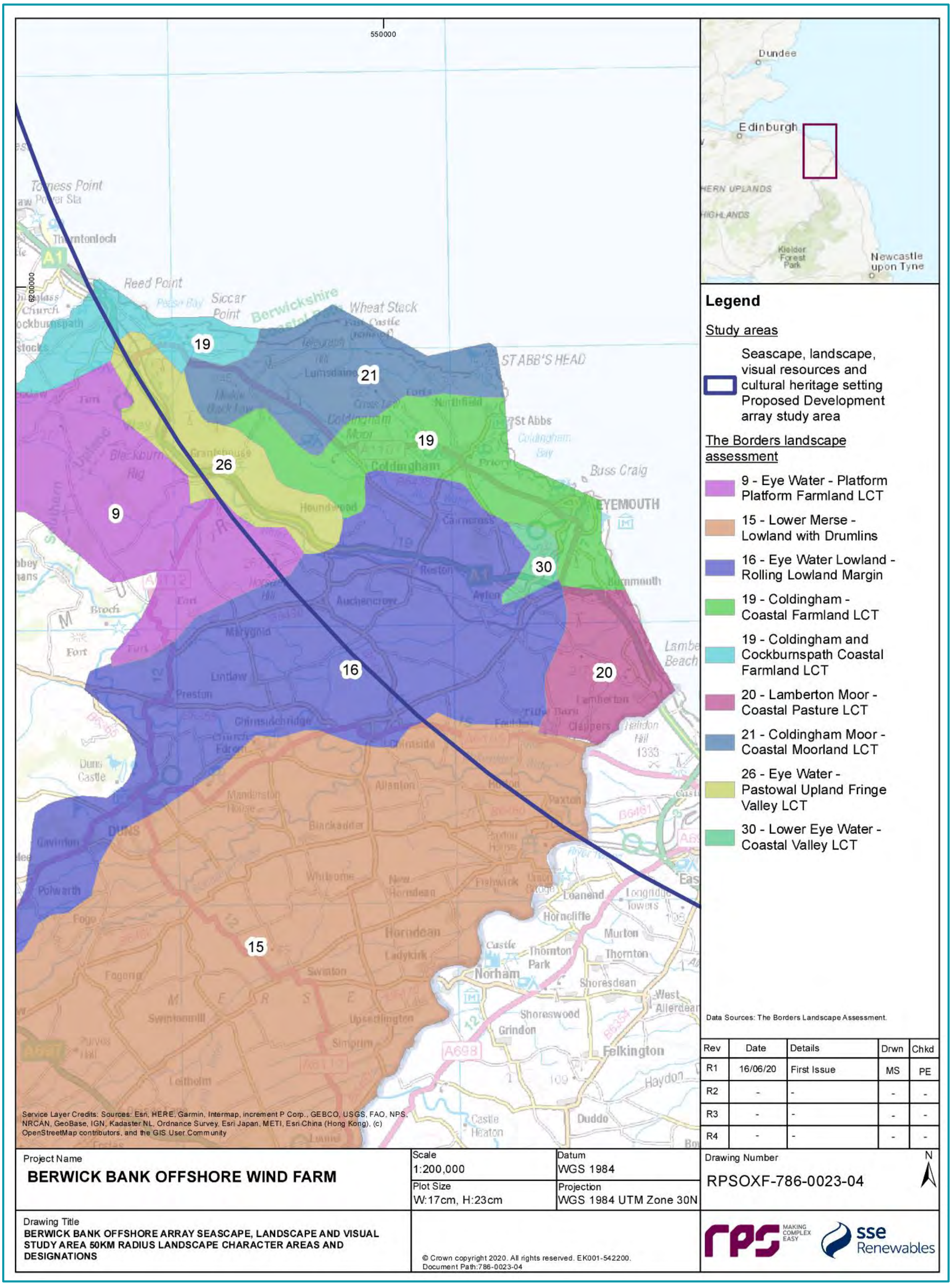

Figure 8.17: Borders Landscape Assessment.

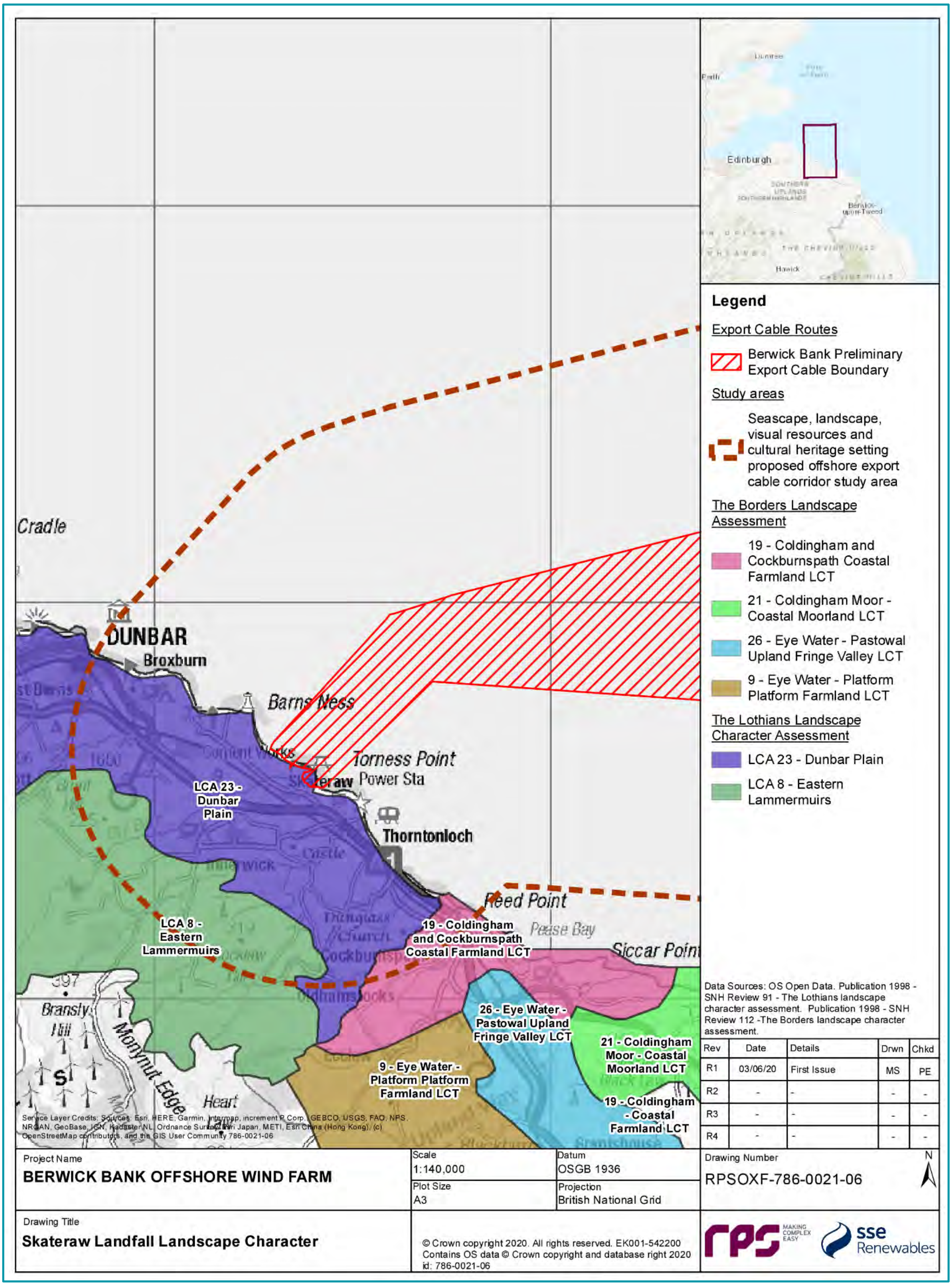

Figure 8.18: Borders Landscape Assessment – Skateraw Landfall.

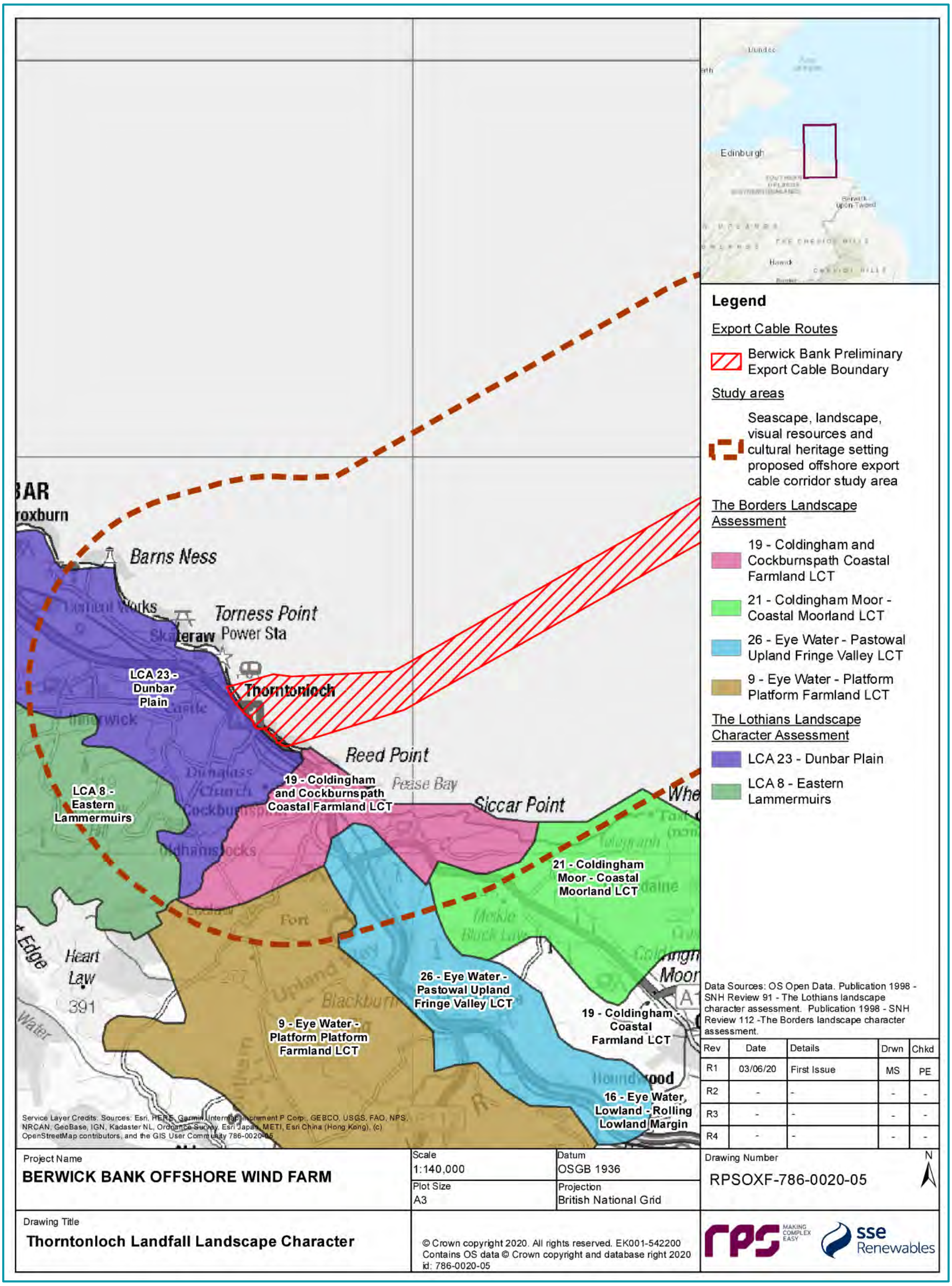

Figure 8.19: Borders Landscape Assessment – Thorntonloch Landfall.

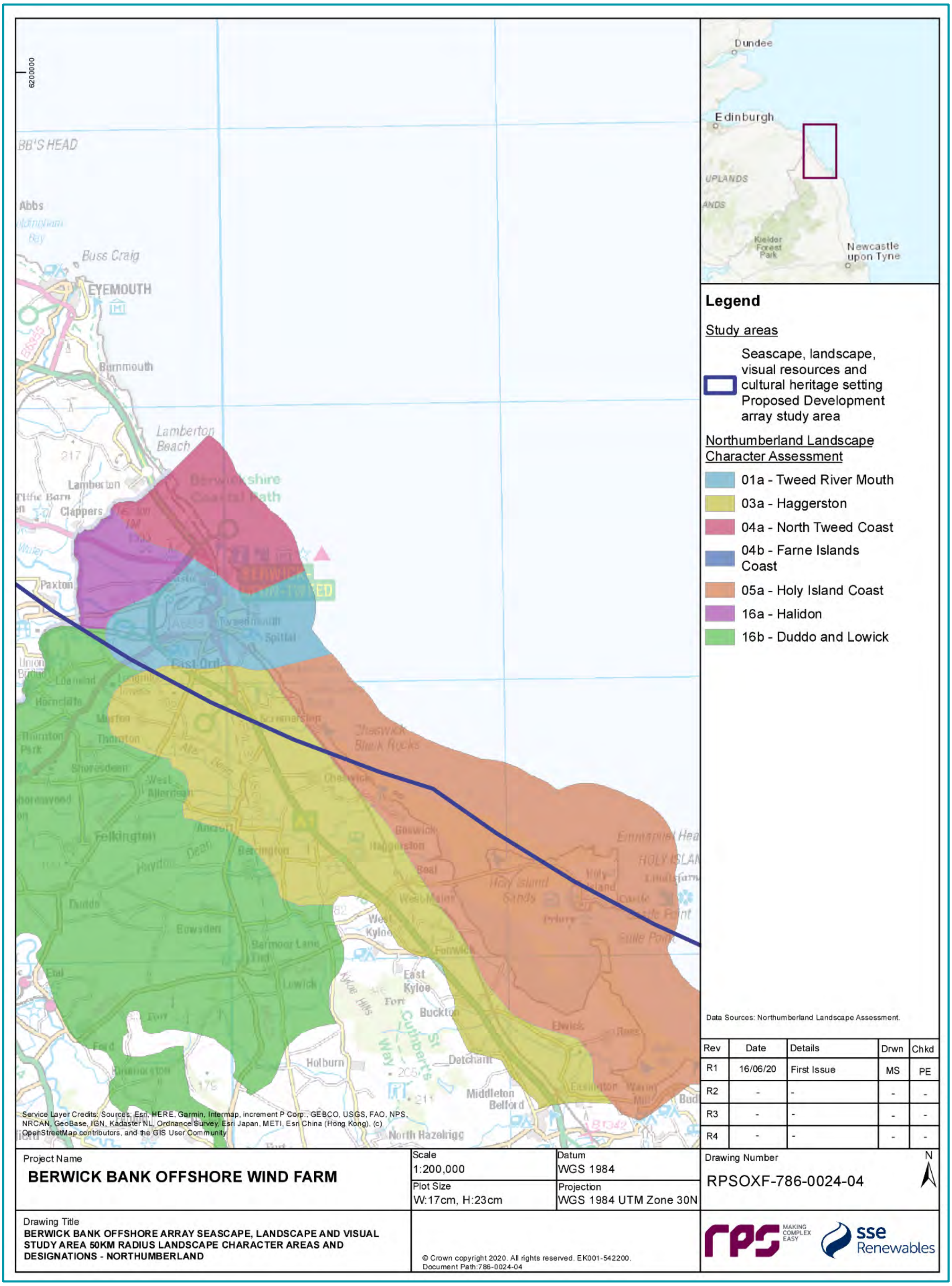

Figure 8.20: Northumberland Landscape Character Assessment.

The Northumberland Coast AONB coincides with the edge of the 50 km radius seascape, landscape, visual resources and cultural heritage setting array study area at Holy Island, as illustrated within Figure 8.21 to Figure 8.22.

Key Visual Receptors

Land-based receptors within the coastal landscape of the ZTV's likely to have views of either the construction, operation and maintenance or decommissioning activities within the array area, or the construction, maintenance and decommissioning of the landfall and offshore cable laying activities are as follows;

- walkers, equestrians and cyclists using the public rights of way network including the Berwickshire Coastal Path;
- users of beaches, public open space and common land;
- occupiers of residential properties at St Abbs, Coldingham, Eyemouth, Burnmouth, Berrwick-Upon-Tweed, Cockburnspath and Cove;
- tourists and visitors using facilities such as hotels and cafes within settlements;
- tourists and visitors at coastal caravan and camping sites;
- tourists and visitors at attractions;
- occupiers of vehicles travelling on the A1 and A1107;
- passengers on trains on the East Coast Mainline Railway; and
- residents and walkers at high points at St Abbs Head, Greenside Hill, Blackcastle Hill, Fast Castle Head and Lindisfarne Castle.

Marine Receptors

The sea area within the seascape, landscape, visual resources and cultural heritage setting array study area and the seascape, landscape, visual resources and cultural heritage setting proposed export cable corridor study area is relatively busy and is used by both commercial and recreational vessels. There are several consented, but yet to be constructed, offshore wind farms located within the seascape, landscape, visual resources and cultural heritage setting array study area, such as Seagreen 1, Inch Cape and Neart na Gaoithe (as illustrated in Figure 8.12).

Extensive recreational boating occurs in the area of sea associated with the coastline, with motor cruising areas extending to the east towards the array area. Other recreation activities, including canoeing, kayaking, windsurfing, kite surfing and scuba diving can be found along the coast with activities expected to stay within 1 km of shore. These nearshore recreational receptors are unlikely to be impacted by the presence of the Proposed Development and the change to the marine seascape due to their distance from the array area. Further, these recreational receptors are typically transient visitors that are unlikely to be significantly impacted by the change to the marine seascape.

There is also the potential for diving to occur in the vicinity of the array area and/or proposed export cable corridor. However, impacts to scuba divers are to be assessed within the Infrastructure and Other Users assessment (Section 8.6.6) and will not be assessed within the Seascape and Visual Resource assessment.

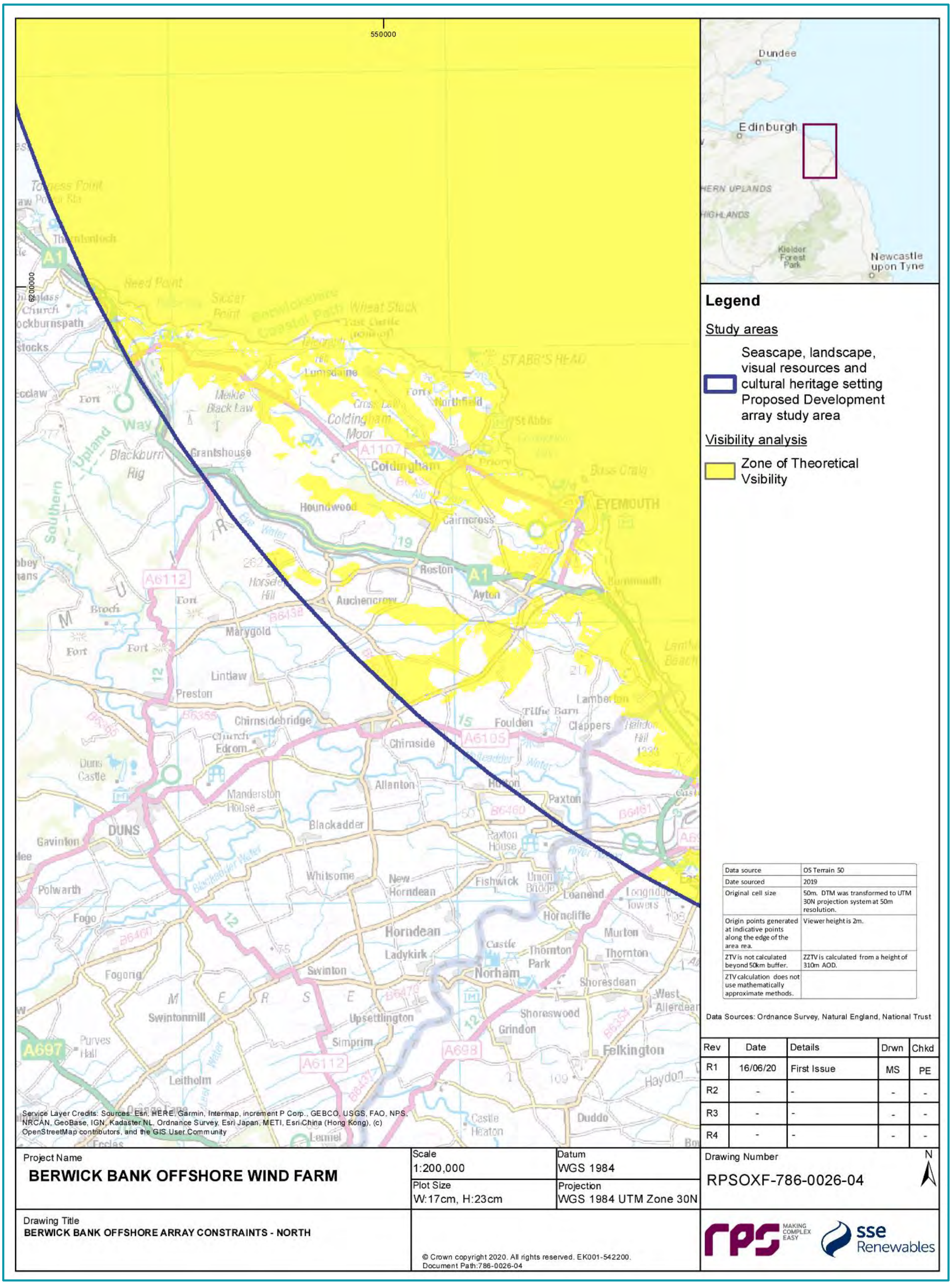

Figure 8.21: Landscape Constraints within the Northern Extent of the Seascape, Landscape, Visual Resources and Cultural Heritage Setting Array Study Area.

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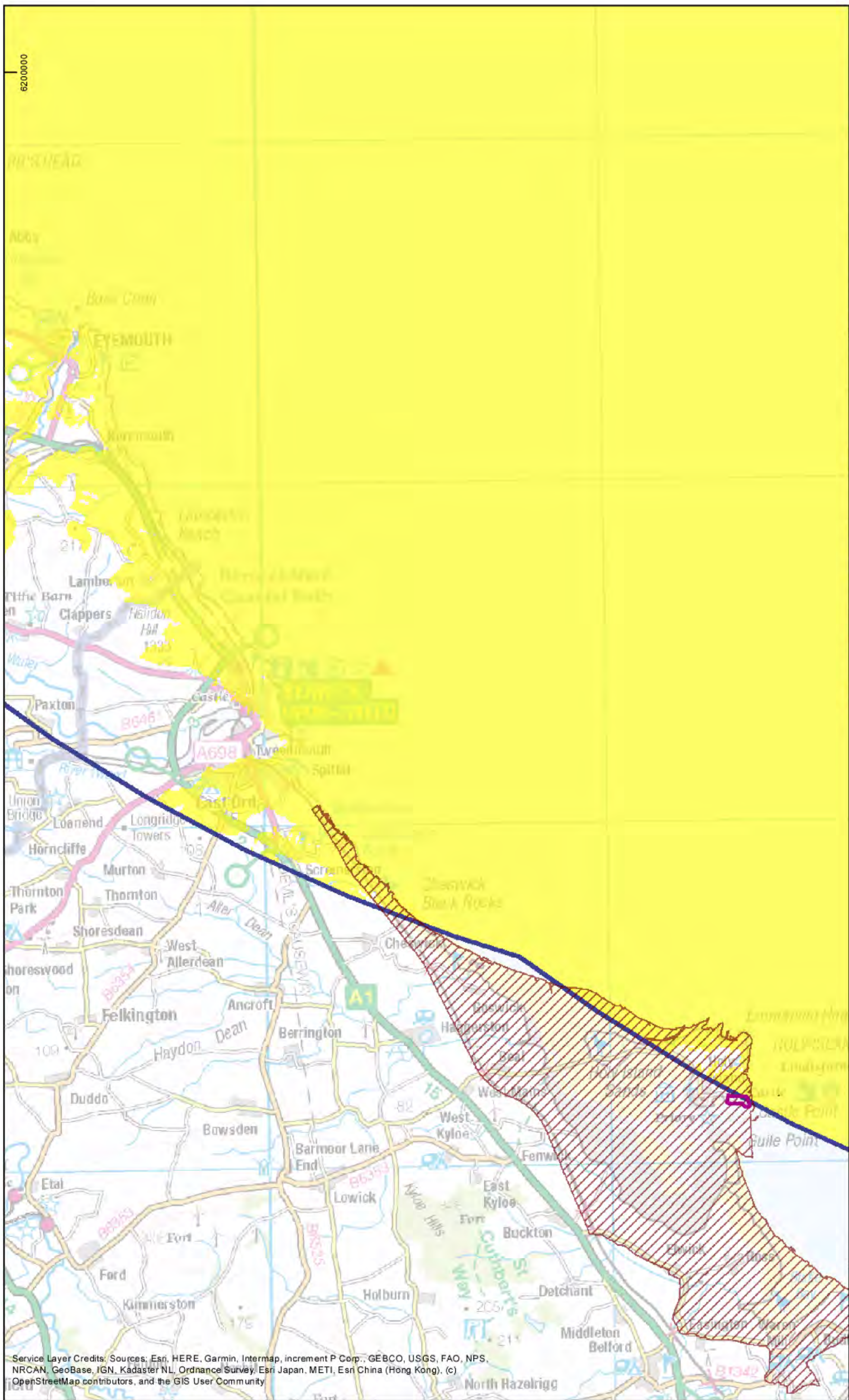

Legend

Study areas

- Seascape, landscape, visual resources and cultural heritage setting Proposed Development array study area

Visibility analysis

- Zone of Theoretical Vsibility

Landscape constraints

- Northumberland Coast AONB
- National Trust land (England)

Data source	OS Terrain 50
Date sourced	2019
Original cell size	50m. DTM was transformed to UTM 30N projection system at 50m resolution.
Origin points generated at indicative points along the edge of the area rea.	Viewer height is 2m.
ZTV is not calculated beyond 50km buffer.	ZZTV is calculated from a height of 310m AOD.
ZTV calculation does not use mathematically approximate methods.	

Data Sources: Ordnance Survey, Natural England, National Trust

Rev	Date	Details	Drwn	Chkd
R1	16/06/20	First Issue	MS	PE
R2	-	-	-	-
R3	-	-	-	-
R4	-	-	-	-

Project Name **BERWICK BANK OFFSHORE WIND FARM**	Scale 1:200,000	Datum WGS 1984	Drawing Number RPSOXF-786-0026-04
	Plot Size W:17cm, H:23cm	Projection WGS 1984 UTM Zone 30N	N

Drawing Title
BERWICK BANK OFFSHORE ARRAY CONSTRAINTS - SOUTH

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Figure 8.22: Landscape Constraints within the Southern Extent of the Seascape, Landscape, Visual Resources and Cultural Heritage Setting Array Study Area.

Based on the above, the seascape character within the seascape, landscape, visual resources and cultural heritage setting array study area and seascape, landscape, visual resources and cultural heritage setting proposed export cable corridor study area can be described as influenced by commercial shipping and recreational vessels, with the future construction of several offshore wind farms planned. The construction of the Proposed Development within this area will occur once the aforementioned offshore wind farms have begun construction or have completed construction. Therefore, the seascape, landscape, visual resources and cultural heritage setting array study area will be heavily influenced by offshore infrastructure associated with the various offshore wind farms in the Firth of Forth.

Onshore Cultural Heritage

The seascape, landscape, visual resources and cultural heritage setting array study area extends over a small part of the Scottish coastline, between St Abb's Head (Siccar Point) and Berwick-upon-Tweed, and includes a small part of the Northern England coast, around Berwick-upon-Tweed and Holy Island. Within that study area there are 57 scheduled monuments, 489 listed buildings (30 are Category A or Grade I Listed, 15 are Grade II* Listed and 70 are Category B Listed. The remainder are either Category C or Grade II Listed), three gardens and designed landscapes, six conservation areas, one historic battlefield, and two National Trust properties, illustrated in Figure 8.23.

The scheduled monuments include eight sites in coastal settings where views out to sea and along the coastline, and views from the sea towards the monuments, contribute to their cultural significance. These include forts and castles on cliff tops along the coastline: from Fast Castle, 950 m NNE of Dowlaw (SM 4328) to Eyemouth Fort (SM 3190), just northwest of Eyemouth. Lindisfarne Priory scheduled monument (1011650) and Grade I Listed Lindisfarne Castle (1042306), on Holy Island, lie just outside (by 1 km) the seascape, landscape, visual resources and cultural heritage setting array study area boundary.

The listed buildings include groups in townscape settings, which include Coldingham, Eyemouth and Berwick-upon-Tweed, where their settings are localised to the urban setting. Relatively few are in coastal settings where views out to sea and along the coastline, or views from the sea towards them contribute to their cultural significance. Those that are in coastal settings, where views out to and from the sea contribute to their cultural significance, are the Category A Listed Bell Rock Lighthouse (LB 45197), Category B Listed St Abb's Head Lighthouse (LB 4103) and Grade II Listed Longstone Lighthouse, on the Farne Islands.

The gardens and designed landscapes within the seascape, landscape, visual resources and cultural heritage setting array study area include Ayton Castle and Netherbyres (Inventory Gardens and Designed Landscapes), and Lindisfarne Castle (a Registered Park and Garden).

The six conservation areas within the seascape, landscape, visual resources and cultural heritage setting array study area are Ayton, Coldingham, Eyemouth, St Abbs, Berwick-upon-Tweed and Holy Island.

The historic battlefield within the seascape, landscape, visual resources and cultural heritage setting array study area is the Site of The Battle of Halidon Hill 1333 (1000012), inland and northwest of Berwick-upon-Tweed.

The National Trust properties within the seascape, landscape, visual resources and cultural heritage setting array study area are: Grade I Listed Lindisfarne Castle (1042306), on Holy Island, and the Farne Islands, a national nature reserve.

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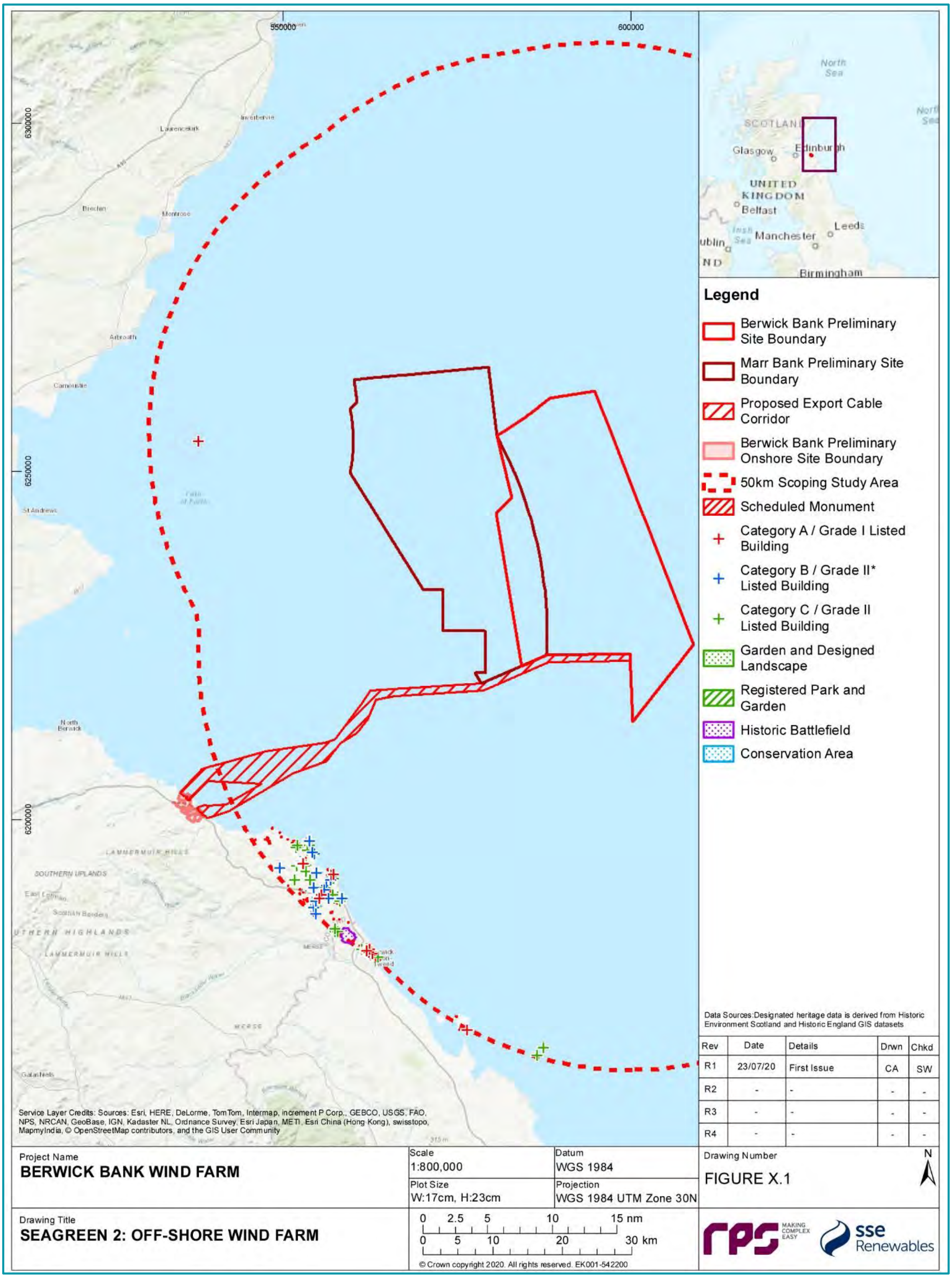


Figure 8.23: Onshore Cultural Heritage Receptors within the Seascape, Landscape, Visual Resources and Cultural Heritage Setting Array Study Area.

8.5.4 PROPOSED APPROACH TO THE ENVIRONMENTAL IMPACT ASSESSMENT

The seascape, landscape, visual resources and cultural heritage setting Offshore EIA Report chapter will follow the methodology set out in chapter 5. Specific to the seascape, landscape, visual resources and cultural heritage setting EIA, the following guidance documents will also be considered. Due to the potential for impact on both Scottish and English receptors, both Scottish and English guidance will be considered:

- An Approach to Landscape Character Assessment, Natural England (2014);
- Guidance: Assessing the Cumulative Effects of Wind Farms (SNH) (2012a);
- Guidance on the Assessment of the impact of offshore wind farm: Seascape and Visual Impact Report, published by Department of Trade and Industry (2001);
- Guidelines for Landscape and Visual Impact Assessment, Third Edition (GLVIA3), published by the Landscape Institute and Institute of Environmental Management and Assessment (IEMMA) (2013);
- Guide to Best Practice in Seascape Assessment, Maritime Ireland/Wales INTERREG Report No. 5. Published by Countryside Council for Wales, Brady Shipman and Martin, University College Dublin (2001);
- Landscape Character Assessment: Guidance for England and Scotland, published by SNH and the Countryside Agency (2002a);
- Landscape Institute Technical Guidance Note 06/19: Visual Representation of Development Proposals (September 2019);
- Offshore Renewables – Guidance on Assessing the Impact on Coastal Landscape and Seascape (SNH) (2012b);
- Scottish Seascape in relation to Wind farms (SNH) (2005).
- The European Landscape Convention, Council of Europe, ETS No. 176 (2000, ratified 2006);
- The Siting and Design of Aquaculture in the landscape: Landscape and Visual Considerations (SNH) (2011);
- Visual Assessment of Wind Farms: Best Practice, published by SNH and University of Newcastle (2002b); and
- Visual Representation of Wind Farms: Guidance, Version 2.2, published by SNH (2017b).

The seascape, landscape, visual resources and cultural heritage setting impact assessment, including a summary of relevant legislative and planning policy context will be prepared detailing the proposed assessment methodology developed in consultation with relevant stakeholders. It is proposed that this will follow the EIA methodology set out in chapter 5. Specific to the seascape, landscape, visual resources and cultural heritage setting impact assessment, the following will be considered:

- the baseline stage will evaluate the sensitivity or nature of receptors through the analysis of their susceptibility to change as a result of the Proposed Development, and value;
- the nature or magnitude of impact on receptors will be evaluated using current best practice guidance; and
- significance of effect will be assessed through a combination of sensitivity/susceptibility and magnitude to establish which are significant. Professional judgement informed by best practice guidance and consultation will be used to determine significance.

The seascape, landscape, visual resources and cultural heritage setting impact assessment will define a ‘maximum adverse scenario’ and establish an indicative layout to form the basis for the assessment. The influence of wind turbine height, spacing and layout pattern would be considered in defining the maximum adverse scenario, and the layout option under consideration would be used to inform this assessment. The size and spacing of wind turbines have the potential to influence the nature of the visual effect of the offshore wind farm. These effects range from a complex ‘massing’ effect associated with a higher number of small capacity wind turbines which result in a dense wind turbine layout, to less complex but more visible wind turbines associated with lower numbers of larger capacity wind turbines, which result in a more widely spaced layout.

Offshore wind energy development, wherever it occurs, is usually visible in some form. The Proposed Development would have the following general attributes typical of most wind farms: engineered, large scale, simple in form, smooth texture, monochrome/muted colour and strong vertical form. Responses by people to wind farms can vary from ‘beautiful’ to ‘offensive’, with respondents perceiving wind wind turbines as potentially rhythmic, unusual, safe, interesting, invigorating, majestic and spiritual on the one hand and degrading, jarring, overbearing, industrial, clashing and ugly on the other. Wind energy development thus gives rise to a spectrum of responses from individuals and organisations who perceive its effects ranging from strongly adverse to strongly beneficial.

The LSE within the Offshore EIA Report will be described covering type (i.e. direct, indirect or cumulative), temporal nature (short, medium and long term, permanent or temporary), and valency (beneficial or positive and adverse or negative). The heading ‘valency’, originally used in the Durham County Council Impact Assessment Matrices (unpublished, 1996) but now much more widely recognised, is an important one and provides scope to recognise that change of whatever type and scale within a landscape or seascape can be viewed positively or negatively by different individuals. For the purposes of this assessment, effects will be defined based on the scenario of an individual who may perceive the Proposed Development as a negative addition to the seascape or view. Effects will therefore be defined as adverse within the Offshore EIA Report; but may in fact be seen as beneficial or positive by large numbers of viewers. An individual who perceives offshore wind farms as a positive addition to the seascape or view may consider the same effects to be beneficial or neutral in nature.

Visualisations

Wirelines/photomontages will be used to illustrate the potential seascape, landscape and visual impact of the Proposed Development, in relation to cultural heritage setting, and it is proposed that the photomontages would follow recognised UK guidance for the visualisation of offshore wind farms. Wirelines have been developed for the following viewpoints:

- Dunnottar Castle (Scheduled Monument) (SM986);
- Bell Rock Lighthouse (Category A Listed) (LB 45197);
- St Andrews Cathedral and Priory and adjacent ecclesiastical remains (Scheduled Monument) (SM13322);
- Fast Castle, 950m NNE of Dowlaw (Scheduled Monument) (SM 4328); and
- Lindisfarne Castle (Grade I Listed) (1042306).
- The locations of these viewpoints is illustrated in Figure 8.24, and the wirelines are presented in Figure 8.25 to Figure 8.29.

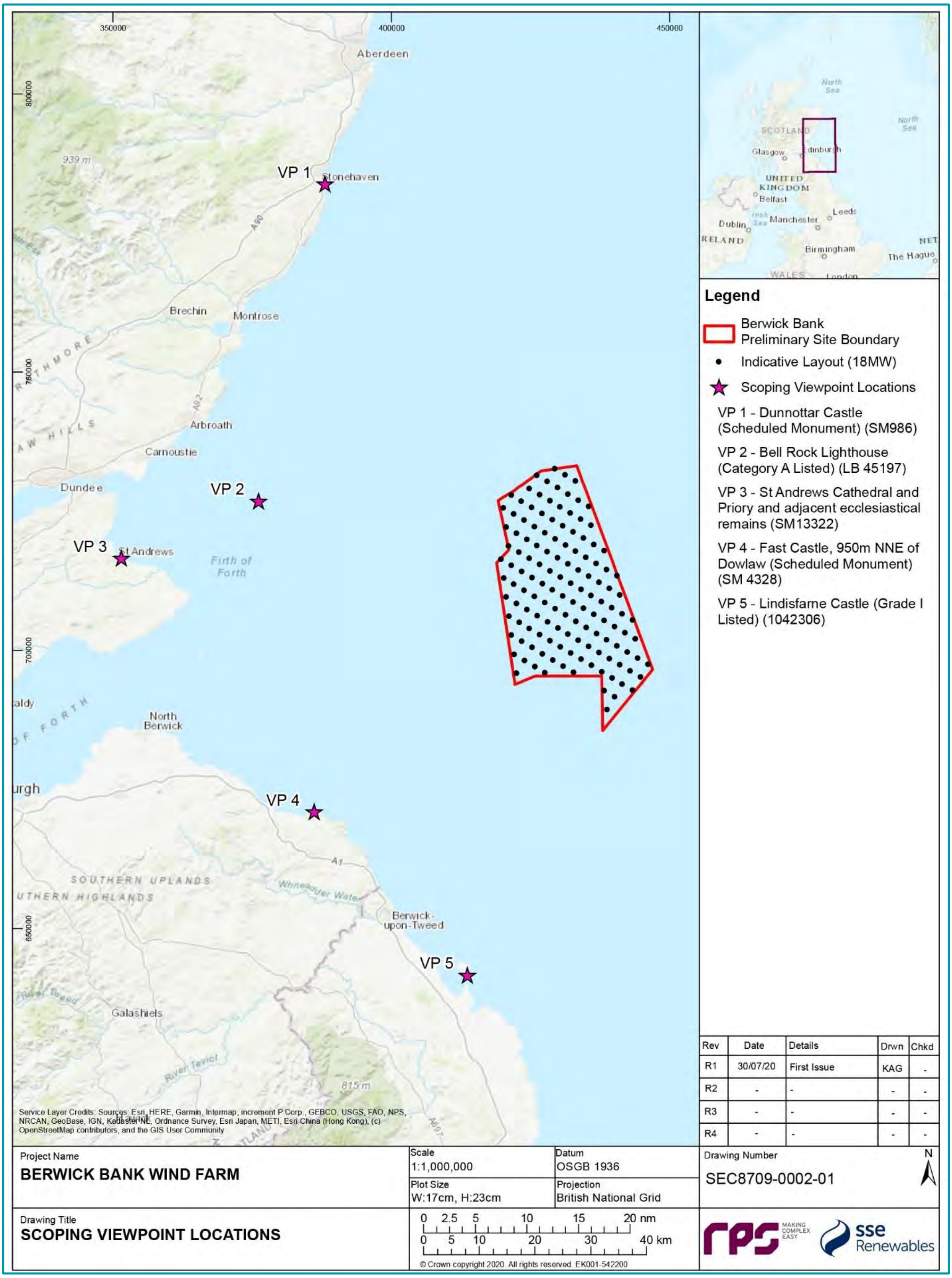


Figure 8.24: Location of the Berwick Bank Cultural Heritage Setting Viewpoint Locations.

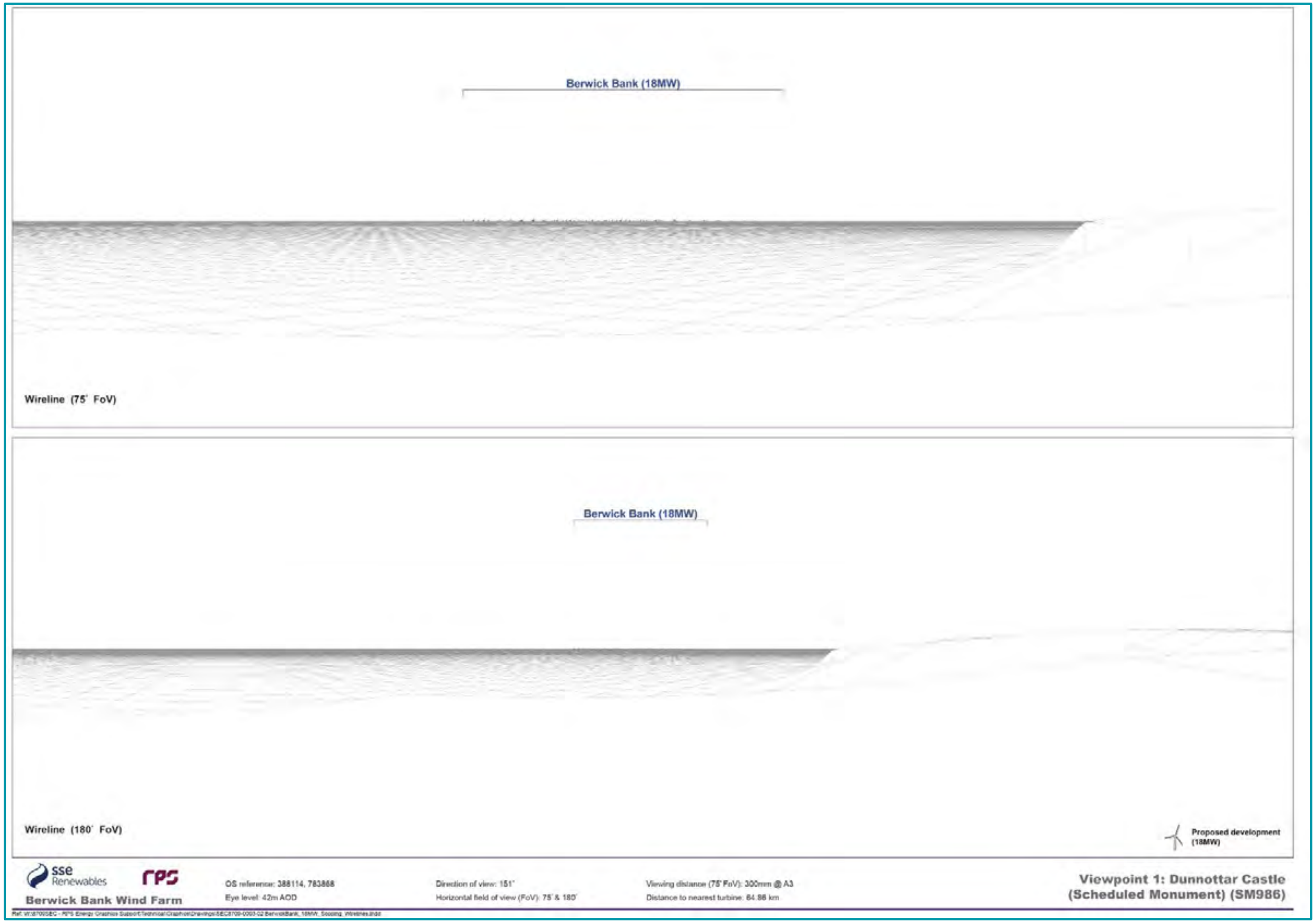


Figure 8.25: Wireline from Viewpoint 1: Dunnottar Castle (Scheduled Monument) (SM986).

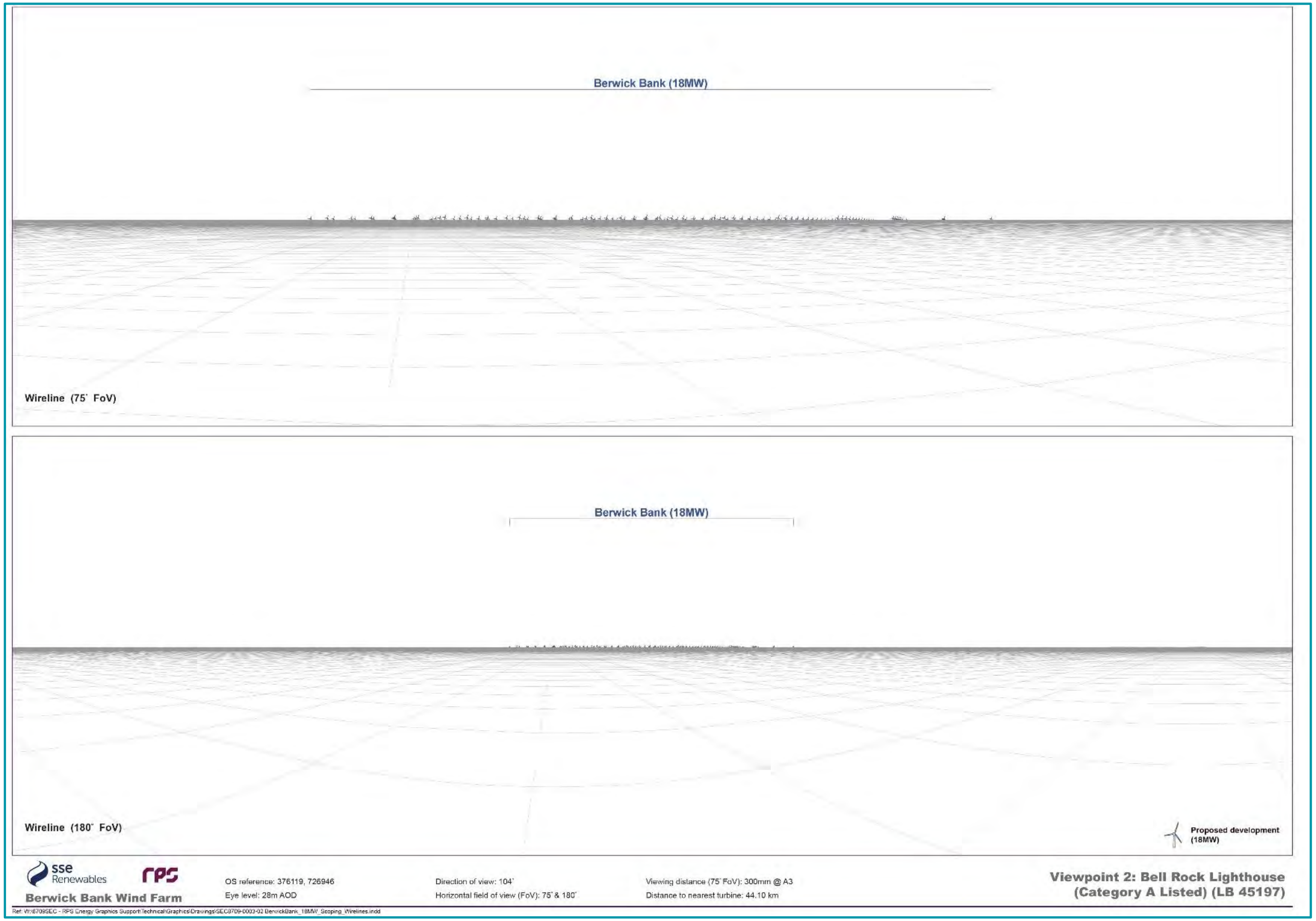


Figure 8.26: Wireline from Viewpoint 2: Bell Rock Lighthouse (Category A Listed) (LB 45197).

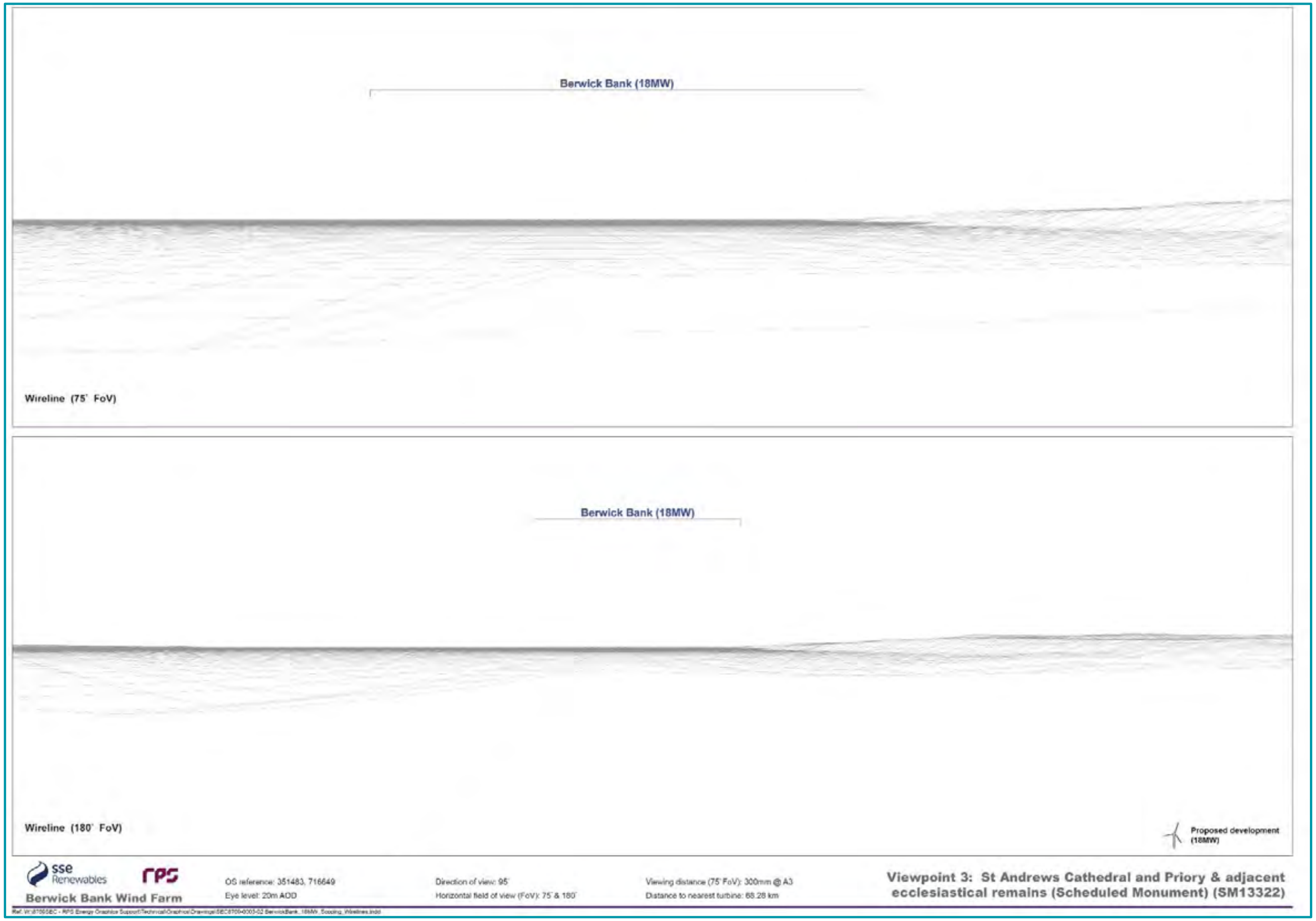


Figure 8.27: Wireline from Viewpoint 3: St Andrews Cathedral and Priory and adjacent ecclesiastical remains (Scheduled Monument) (SM13322).

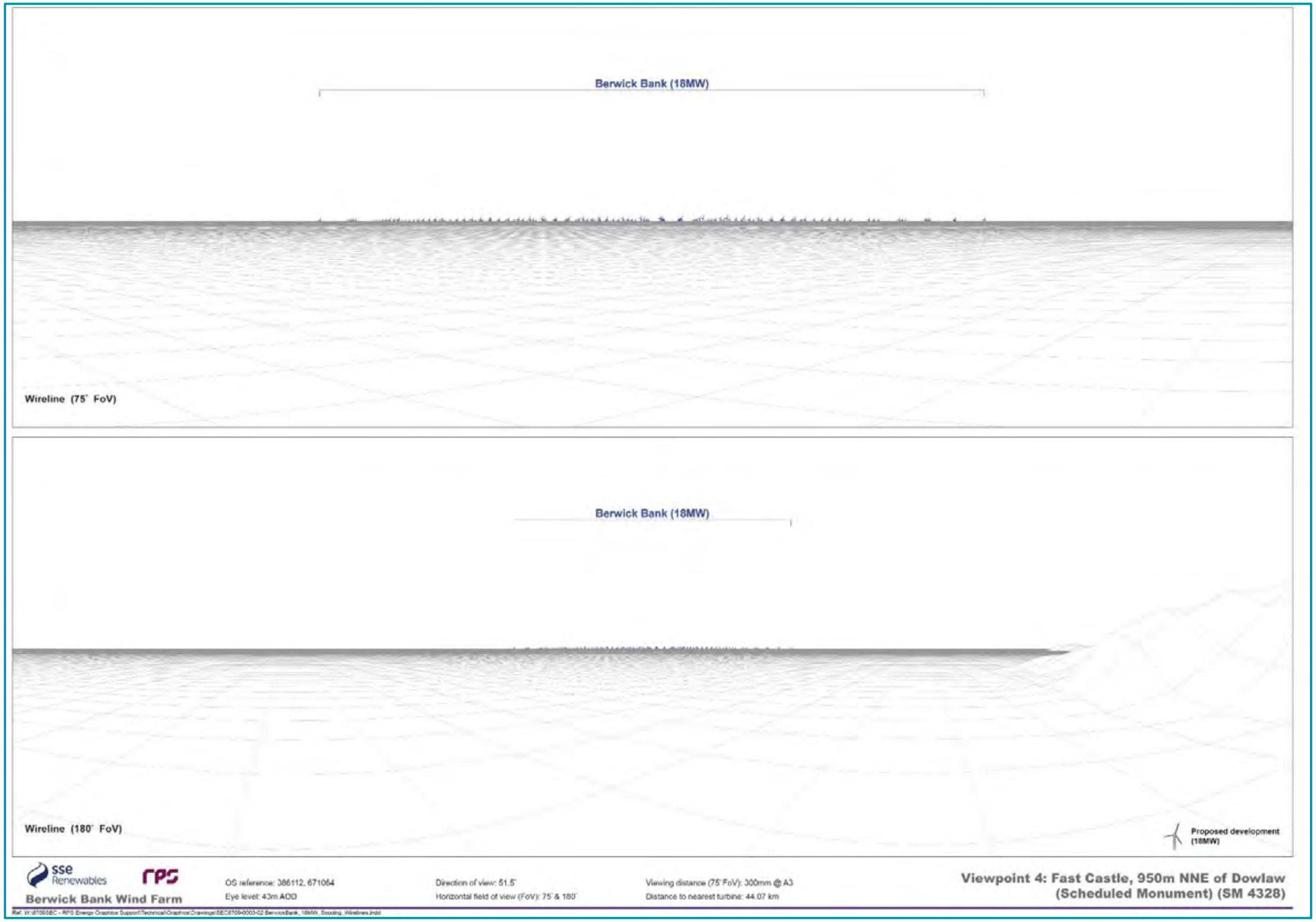


Figure 8.28: Wireline from Viewpoint 4: Fast Castle, 950m NNE of Dowlaw (Scheduled Monument) (SM 4328).

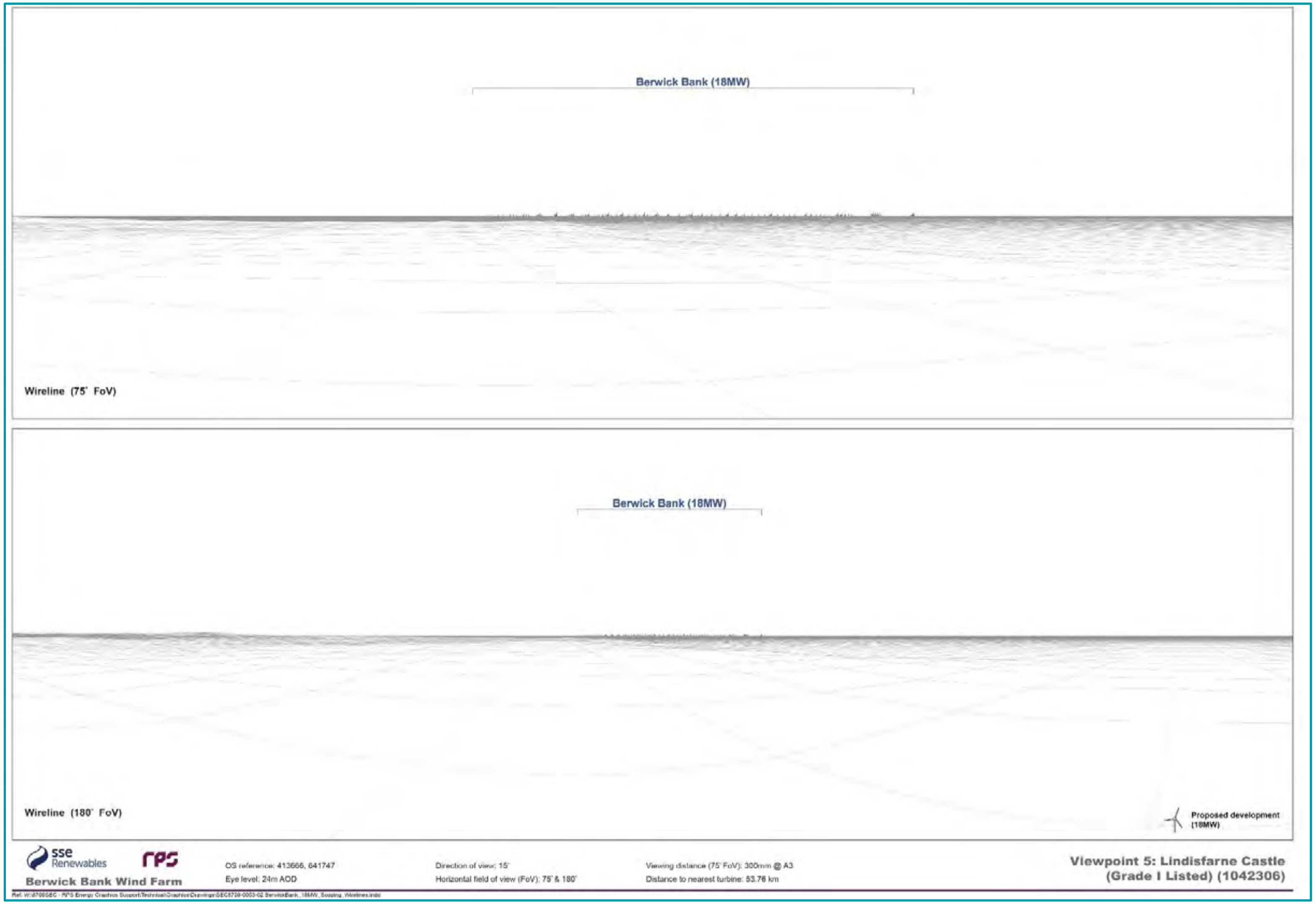


Figure 8.29: Wireline from Viewpoint 5: Lindisfarne Castle (Grade I Listed) (1042306).

8.5.5 EMBEDDED MITIGATION

Measures adopted as part of the Proposed Development will include:

- design and layout of wind turbines, offshore substations and platforms within the array area to minimise loss of landscape features at landfall site and achieve appropriate design and layout of wind turbines within array; and
- minimise construction footprint at landfall site and minimise infrastructure and length of construction phase.

The requirement and feasibility of additional measures will be dependent on the significance of the effects on seascape, landscape, visual resources and cultural heritage setting, and will be consulted upon with statutory consultees throughout the EIA process.

8.5.6 POTENTIAL PROPOSED DEVELOPMENT IMPACTS

A range of potential impacts on seascape, landscape, visual resources and cultural heritage setting have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of the Proposed Development. The impacts that have been scoped into the Proposed Development assessment are outlined in Table 8.16 together with a description of any additional data collection (e.g. site-specific surveys) and/or supporting analyses (e.g. modelling) that will be required to enable a full assessment of the impacts.

On the basis of the baseline seascape, landscape, visual resources and cultural heritage setting information currently available and the Proposed Development description outlined in chapter 3, a number of impacts are proposed to be scoped out of the assessment for seascape, landscape, visual resources and cultural heritage setting. These impacts are outlined, together with a justification for scoping them out, in Table 8.17.

8.5.7 POTENTIAL CUMULATIVE EFFECTS

There is potential for cumulative effects to occur with other plan or projects within the seascape, landscape, visual resources and cultural heritage setting array study area and the seascape, landscape, visual resources and cultural heritage setting proposed export cable corridor study area.

The assessment of cumulative effects on seascape, landscape and visual resources will be undertaken in accordance with guidance within the SNH (2012) document Assessing the Cumulative Effects of Wind Farms and as set out in section 5.3.7. Cumulative effects occur when a combination of two or more developments influence the perception of seascape/landscape character. Cumulative visual effects occur in several ways, either arising when developments are visible in combination or succession from a particular viewpoint, or appearing sequentially as multiple developments when moving through the landscape. Cumulative effects can also develop through a gradual change in perception over time. In establishing the baseline conditions, the seascape, landscape, visual resources and cultural heritage setting impact assessment would take account of the presence of other operational or consented coastal and offshore developments.

Table 8.16: Impacts Proposed to be Scoped Into the Proposed Development Assessment for Seascape, Landscape and Visual Resources.

Impact	Embedded Mitigation	Justification	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Proposed Approach for the Undertaking of Proposed Development Specific Modelling to Inform the Assessment of Potential Impacts
Construction				
SLVIA Onshore: Temporary impacts on coastal landscape character.	Minimise construction footprint at landfall site and minimise infrastructure and length of construction phase.	There is the potential that the construction of the Proposed Development may have a direct and/or indirect impacts on features, elements and characteristics of coastal landscapes.	SNH and NCC Landscape Character Assessments. Project specific site-based landscape analysis.	Preparation of ZTV.
SLVIA Onshore: Temporary impacts on visual amenity.	Minimise construction footprint at landfall site and minimise infrastructure and length of construction phase.	There is the potential that the construction of the Proposed Development may have a direct effect on seaward views gained by land-based visual receptors.	Site based visual analysis.	Preparation of ZTV.
Operation and Maintenance				
SLVIA Onshore: Long term impacts on coastal landscape character.	Minimise loss of landscape features at landfall site and achieve appropriate design and layout of wind turbines within the array area.	There is the potential that the operation of the Proposed Development may have direct and indirect impacts on features, elements and characteristics of coastal landscapes.	SNH and NCC Landscape Character Assessments. Site based landscape analysis.	Preparation of ZTV and wirelines/photomontages.

Impact	Embedded Mitigation	Justification	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Proposed Approach for the Undertaking of Proposed Development Specific Modelling to Inform the Assessment of Potential Impacts
SLVIA Onshore: Long term impacts on visual amenity.	Minimise loss of landscape features at landfall site and achieve appropriate design and layout of wind turbines within the array area.	There is the potential that the operation of the Proposed Development may have direct effects on views gained by land based visual receptors.	Site based visual analysis.	Preparation of ZTV and wirelines/photomontages.
Decommissioning				
SLVIA Onshore: Temporary impacts on coastal landscape character.	Minimise decommissioning footprint at landfall site and minimise infrastructure and length of decommissioning phase.	There is the potential that the decommissioning of the Proposed Development may have direct and indirect impacts on features, elements and characteristics of coastal landscapes.	SNH and NCC Landscape Character Assessments. Site based landscape analysis.	No additional modelling required for this impact.
SLVIA Onshore: Temporary impacts on visual amenity.	Minimise decommissioning footprint at landfall site and minimise infrastructure and length of decommissioning phase.	There is the potential that the decommissioning of the Proposed Development may have direct effects on views gained by land based visual receptors.	Site based visual analysis.	No additional modelling required for this impact.

Table 8.17: Impacts Proposed to be Scoped Out of the Proposed Development Assessment for Seascape, Landscape and Visual Resources.

Impact	Justification
Construction	
SLVIA Marine: Temporary impacts on seascape character and marine based visual receptors as a result of array construction activities.	Due to the current baseline level of shipping and navigation in the seascape, landscape, visual resources and cultural heritage setting array study area, it is deemed unlikely that temporary increases in vessels due to the construction of the Proposed Development would impact the seascape character and marine visual receptors. Further, these construction activities will be temporary in nature and will likely occur in intermittent intervals due to weathering conditions etc. Therefore, subject to consultation with the relevant stakeholders and feedback received on this Offshore Scoping Report, the Applicant intends to scope this impact out of further consideration within the EIA.
SLVIA Onshore: Temporary night time impacts on coastal landscape character and visual amenity as a result of temporary lighting within the array zone.	Lighting associated with the array area construction activities are highly unlikely to be visible/perceptible beyond 39.2 km from the array area. Therefore, subject to consultation with the relevant stakeholders and feedback received on this Offshore Scoping Report, the Applicant intends to scope this impact out of further consideration within the EIA.
Cultural Heritage: Impacts of the Proposed Development on the settings of onshore cultural heritage assets	The Proposed Development will be sited almost 50 km offshore. Construction work associated with the Proposed Development would give rise to only short-term temporary visual effects on onshore designated heritage assets identified in section 8.5.3. Therefore, subject to consultation with the relevant stakeholders and feedback received on this Scoping Report, the Applicant intends to scope this impact out of further consideration within the EIA.
Operation and Maintenance	
SLVIA Marine: Long-term impacts on seascape character and marine based visual receptors as a result of array.	Based on the current seascape character and marine based visual receptors baseline, there are very few receptors within the seascape, landscape, visual resources and cultural heritage setting array study area and the seascape, landscape, visual resources and cultural heritage setting study proposed export cable corridor area. Infrastructure such as wind turbines and offshore platforms are unlikely to significantly alter or impact the offshore seascape area, as there are several other offshore wind farms in the Firth of Forth which are due to be constructed. Further, the seascape, landscape, visual resources and cultural heritage setting array study area is located in an area which does not support high levels of other activities, such as oil and gas, and therefore receptors which may be able to view the Proposed Development. Subject to consultation with the relevant stakeholders and feedback received on this Offshore Scoping Report, the Applicant therefore intends to scope this impact out of further consideration within the EIA.

Impact	Justification
SLVIA Onshore: Long-term nighttime impacts on coastal landscape character and visual amenity.	Wind turbine mounted aviation warning lights and navigation lights are highly unlikely to be visible/perceptible beyond 39.2 km from the array area. No permanent light sources will be present at the landfall location. Therefore, subject to consultation with the relevant stakeholders and feedback received on this Offshore Scoping Report, the Applicant intends to scope this impact out of further consideration within the EIA.
Cultural Heritage: Impacts of the Proposed Development on the settings of onshore cultural heritage assets	The Proposed Development will be sited almost 50 km offshore. The nearest designated heritage assets (two Scheduled Monuments (St Abb's Kirk, church and monastic remains, St Abb's Head (SM 2975)), will lie approximately 43 km from the Proposed Development on the coastline north of St Abb's. Isle of May Priory (SM 838) which occupies an offshore island setting at the mouth of the Firth of Forth, is sited 60 km southwest of the Proposed Development. Lindisfarne Priory scheduled monument (1011650) and Grade I Listed Lindisfarne Castle (1042306), is sited 51 km south southwest of the Proposed Development. The Proposed Development would be visible from designated heritage assets located in coastal settings (and from Isle of May Priory (SM 838)), but at distances offshore are such that the character of their coastal settings are not considered to be adversely affected. As shown in Figure 8.25 to Figure 8.29. Therefore, subject to consultation with the relevant stakeholders and feedback received on this Scoping Report, the Applicant intends to scope this impact out of further consideration within the EIA.
Decommissioning	
SLVIA Marine: Temporary impacts on seascape character and marine based visual receptors as a result of array decommissioning activities.	Decommissioning activities will be of a similar magnitude to construction activities and are therefore deemed unlikely to significantly impact the seascape character and marine based visual receptors. Therefore, subject to consultation with the relevant stakeholders and feedback received on this Offshore Scoping Report, the Applicant intends to scope this impact out of further consideration within the EIA.
SLVIA Onshore: Temporary nighttime impacts on coastal landscape character and visual amenity as a result of temporary lighting within the array zone.	Lighting associated with the array area decommissioning activities are highly unlikely to be visible/perceptible beyond 39.2 km from the array area. Therefore, subject to consultation with the relevant stakeholders and feedback received on this Offshore Scoping Report, the Applicant intends to scope this impact out of further consideration within the EIA.
Cultural Heritage: Impacts of the Proposed Development on the settings of onshore cultural heritage assets	Decommissioning of the Proposed Development would give rise to only short-term temporary visual effects on onshore designated heritage assets, like those arising from construction. Therefore, subject to consultation with the relevant stakeholders and feedback received on this Scoping Report, the Applicant intends to scope this impact out of further consideration within the EIA.

8.5.8 POTENTIAL TRANSBOUNDARY IMPACTS

A screening of transboundary impacts has been carried out and is presented in Annex C. This screening exercise identified that there is no potential for transboundary impacts upon seascape, landscape, visual resources and cultural heritage setting due to the construction, operational and maintenance, and decommissioning impacts of the Proposed Development.

8.5.9 SCOPING QUESTIONS TO CONSULTEES

- Do you agree that the existing data available to describe the seascape, landscape, visual resources and cultural heritage setting baseline remains sufficient to describe the physical environment in relation to the Proposed Development?
- Do you agree that the embedded mitigation described provides a suitable means for managing and mitigating the potential effects of the Proposed Development on the seascape, landscape, visual resources and cultural heritage setting receptors?
- Do you agree that the assessment of marine based seascape and visual receptors should be scoped out of the Proposed Development EIA?
- Do you agree that the assessment of effects from offshore infrastructure on the settings of cultural heritage receptors should be scoped out of the Proposed Development EIA?

8.6 INFRASTRUCTURE AND OTHER USERS

8.6.1 INTRODUCTION

This section of the Offshore Scoping Report identifies the elements of the infrastructure and other users of relevance to the Proposed Development and considers the potential impacts from the construction, operation and maintenance, and decommissioning of the offshore and intertidal components (seaward of the MHWS mark) on these infrastructure and other user receptors.

8.6.2 STUDY AREA

The infrastructure and other users study area is shown in Figure 8.30, this includes the array area and proposed export cable corridor.

The infrastructure and other users study area varies in scale depending on the receptor and has been divided into different areas according to each receptor, as listed below:

- infrastructure and other users study area: Inner (purple) area (within 1 km of the array area and proposed export cable corridor). This area includes the extent of potential direct physical overlap between the Proposed Development activities and the following receptors:
  - recreational receptors (including receptors carrying out fishing, sailing and motor cruising; kite surfing; surfing; windsurfing; sea/surf kayaking and canoeing; and beach users);
  - offshore energy projects (e.g. offshore wind farms, tide and wave projects);
  - cable and pipeline operators;
  - carbon capture and storage, natural gas storage and underground coal gasification;
  - oil and Gas; and
  - coal deposits.
- infrastructure and other users study area: potential increased turbidity area. This area is based on one tidal ellipse of the Proposed Development (see chapter 3 for further information) and relates to the potential for increases in suspended sediments to occur relating to the Proposed Development. As details relating to the tidal ellipse are not yet available, this study area is not specifically defined at this stage. This study area relates to only those receptors which are susceptible to increases in SSCs, specifically:
  - aggregate extraction and disposal sites; and
  - recreational receptors (diving sites).
- the cumulative effect assessment will consider all other projects/plans within the broad infrastructure and other users study area (yellow area).

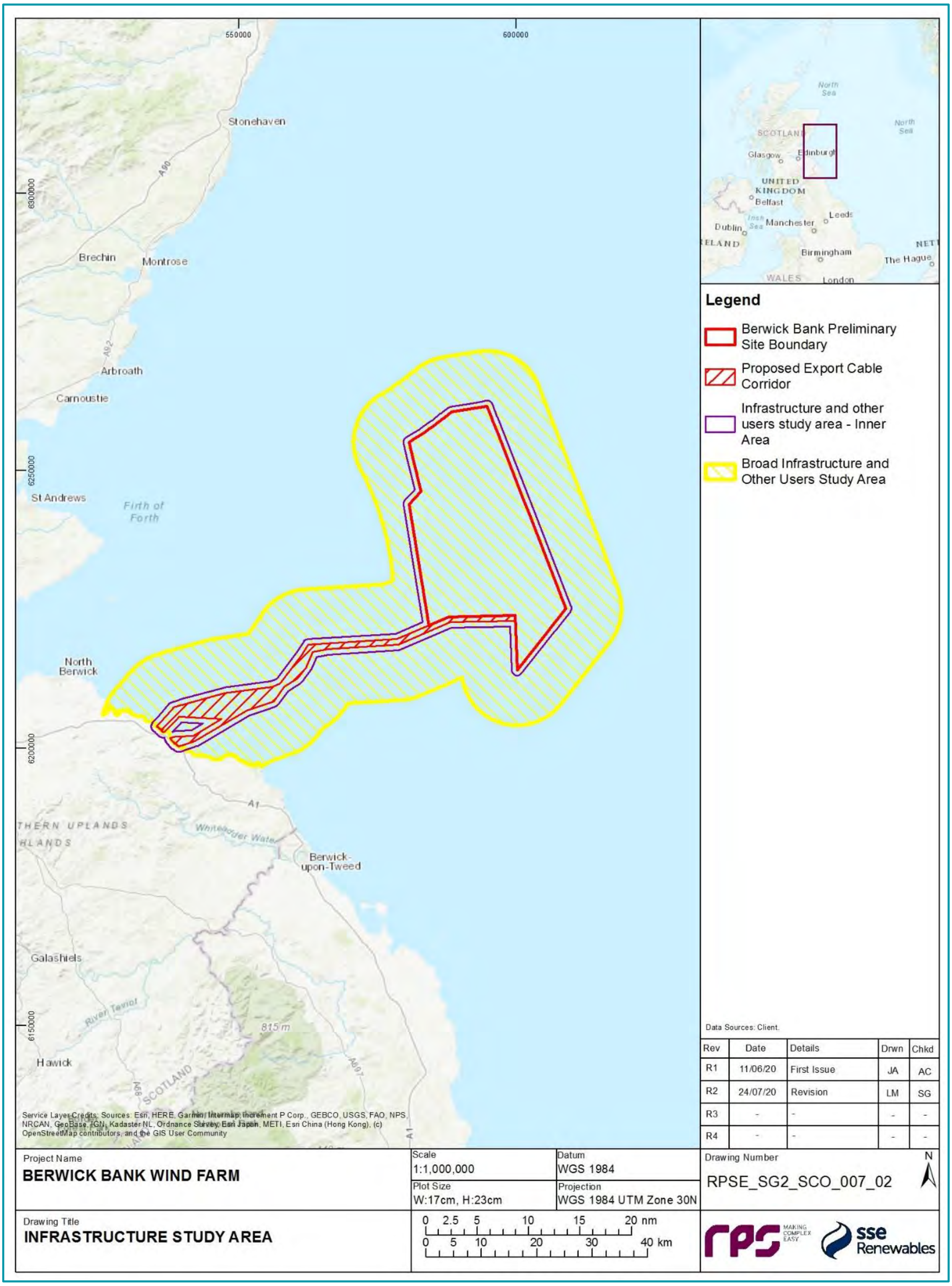


Figure 8.30: Infrastructure and Other Users Study Area.

8.6.3 BASELINE ENVIRONMENT

8.6.3.1 Desktop Study

An initial desk-based review of literature and data sources to support this Offshore Scoping Report has identified a number of baseline datasets. These are summarised at Table 8.18 below.

Table 8.18: Summary of Key Desktop Reports.

Title	Source	Year	Author
Scottish Marine Recreation and Tourism Survey	Marine Scotland	2015	Marine Scotland
UK Coastal Atlas of Recreational Boating	RYA	2019a	RYA
Webmap service – Offshore Wind Farms	C4Offshore	Compiles a series of data	N/A
Webmap service – Various layers including offshore cables and disposal sites	NMPi	N/A	N/A
Webmapping Service – Infrastructure	Oil and Gas	N/A	N/A
Scotland tourism board	VisitScotland	N/A	N/A

8.6.3.2 Site-specific Survey Data

No site-specific surveys have been undertaken to inform the Offshore Scoping Report for infrastructure and other users. Due to availability of suitable data throughout the Forth and Tay; new data or modelling studies will not be required to characterise the infrastructure and other users baseline for the Offshore EIA Report.

8.6.3.3 Baseline Characterisation

This section provides an overview of recreational boating (including sailing and motor cruising), recreational fishing, other recreational activities, offshore energy projects, offshore cable and pipelines, carbon capture, natural gas storage and underground gasification, oil and gas, coal deposits, and marine aggregate extraction and disposal sites, within the Infrastructure and Other Users Study Area (inner) (Figure 8.30).

Recreational Activity

The NMPI presents several data layers for recreational activities which provide an overview of recreational activities around the Scottish Coast. Figure 8.31 provides a heat map of 23 different recreation and tourism activities undertaken at sea or around the coastline (Marine Scotland, 2015b). Extensive recreational boating occurs in the area of sea between North Berwick, and Elie and Earlferry, with motor cruising areas extending to the east towards the array area (Figure 8.31 and Figure 8.32).

Activity is lower along the proposed export cable corridor, with recreational boating expected to be more transitory in nature (NMPI, N/A).

Recreational sea angling occurs to the north and to the south of the array area, with an increase in effort towards the coast and near to the proposed export cable corridor landfall (Figure 8.31 and Figure 8.32). High levels of shore angling can be found along the beaches where the offshore export cable is expected to make landfall (NMPI, N/A).

Other recreation activities, including canoeing, kayaking, windsurfing, kite surfing and scuba diving can be found along the coast with activities expected to stay within 1 km of shore (Figure 8.31 and Figure 8.33), with the exception of diving. Scuba diving occurs within the infrastructure and other users study area along the proposed export cable corridor. The distance between the closest dive site and the array area is 7.6 km.

It is noted that all recreational activities are highly seasonal and dependant on certain weather conditions.

Offshore Wind Farms

Offshore energy projects within the infrastructure and other users study area (inner) include Marr Bank Wind Farm (early planning stage) and Neart Na Gaoithe (consent authorised), illustrated in Figure 8.34. The export cable corridor for the Neart na Gaoithe offshore wind farm intersects the proposed export cable corridor of the Proposed Development.

Wave and Tidal Projects

There are no wave and tidal energy projects within the infrastructure and other users study area (inner). Wave and tidal projects have therefore not been considered further within this Offshore Scoping Report.

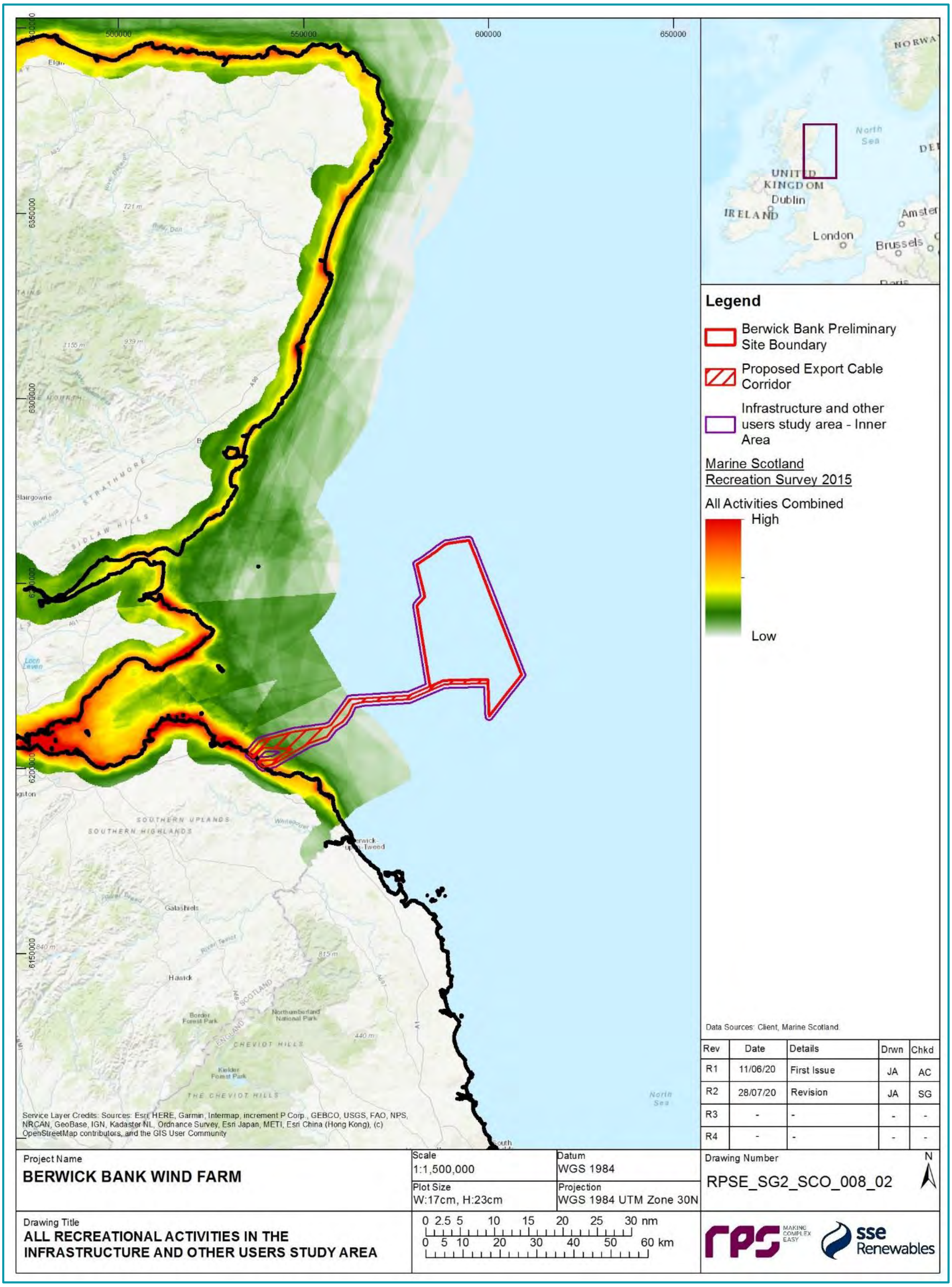


Figure 8.31: All Recreational Activities in the Infrastructure and Other Users Study Area.

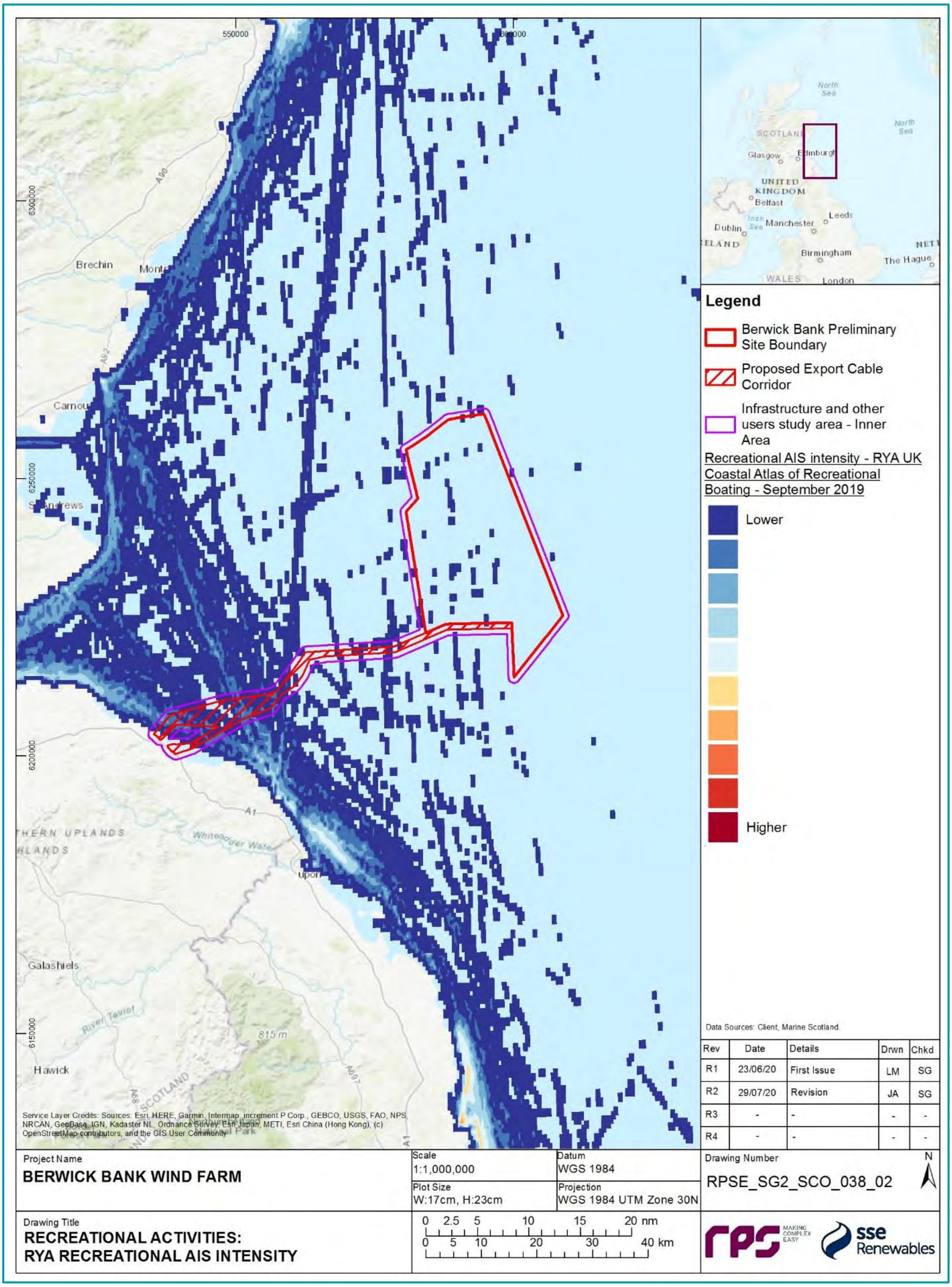


Figure 8.32: RYA Recreational AIS Intensity in the Infrastructure and Other Users Study Area.

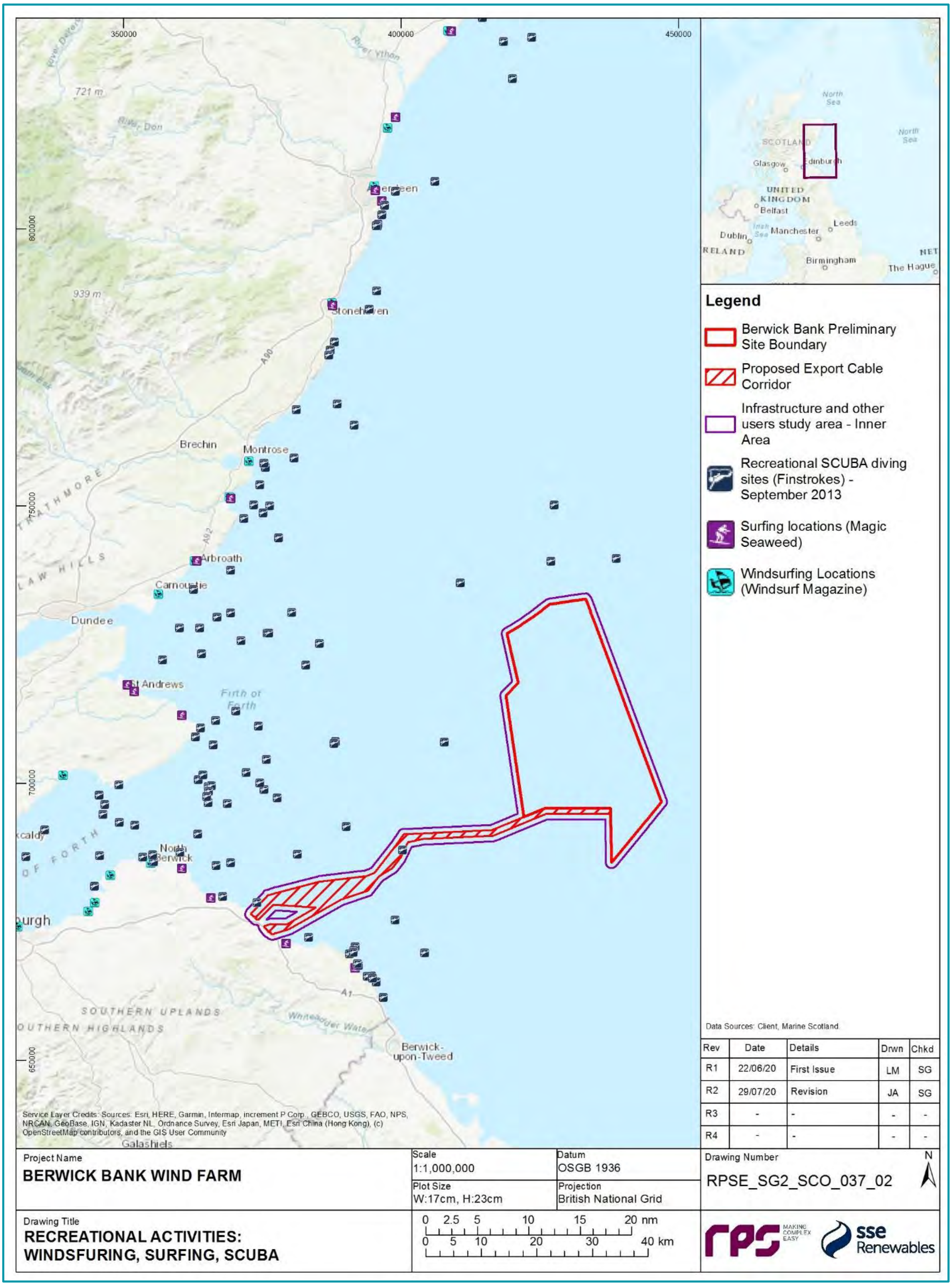
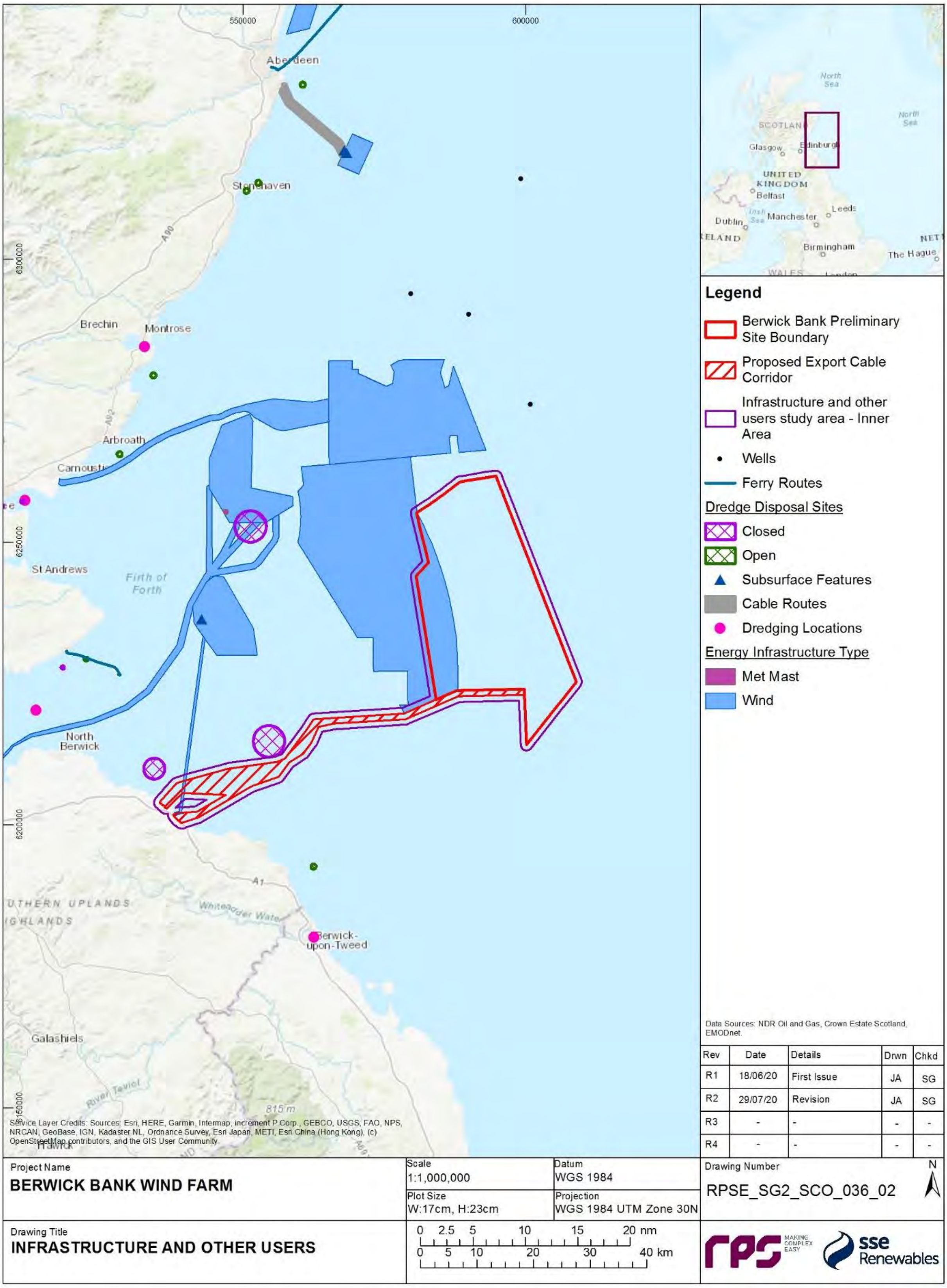


Figure 8.33: Recreational Activities (Windsurfing, Surfing and Scuba) in the Infrastructure and Other Users Study Area.



Rev	Date	Details	Drwn	Chkd
R1	18/06/20	First Issue	JA	SG
R2	29/07/20	Revision	JA	SG
R3	-	-	-	-
R4	-	-	-	-

Figure 8.34: Key Infrastructure and Other Users in the Vicinity of the Proposed Development.

Oil and Gas Operations

The Firth of Forth supports oil and gas activities such as those associated with the Grangemouth refinery, oil storage and tanker terminals. However, there are currently no active licence blocks located within or in close proximity to the Proposed Development. The closest active licence block, Block 27/9 - North Sea Natural Resources Ltd, is located approximately 68 km from the array area.

In July 2019, the Oil and Gas Authority (OGA) launched the 32nd Offshore Licensing Round with 768 blocks or part-blocks on offer across the main producing areas of the UKCS. The closest block is Licence Block 27/3 which is located 65.1 km from the Proposed Development. In March 2020, the OGA announced a 'temporary pause' on offshore licencing rounds in March 2020, with no 33rd round to be launched in 2020/2021. Given the lack of existing activity in the area, it is likely that there is limited potential for exploration in this area of the North Sea.

There are no oil and gas pipelines location within the infrastructure and other users study area (inner). The closest pipeline (Everest To Teeside (Cats Trunkline) gas pipe) is located approximately 99 km from the array area.

As there are no oil and gas licence blocks or pipelines within the infrastructure and other users study area (inner), oil and gas activities have not been considered further within this Offshore Scoping Report.

The following services are associated with the oil and gas industry:

- helicopters: the oil and gas industry relies on helicopters for personnel transfer and emergency evacuation. Helicopter and associated aviation considerations are addressed separately in section 8.3; and
- vessels: the oil and gas industry require supply or support vessels for its operations. Vessels and associated navigational considerations are addressed separately in section 8.2.

Carbon Capture, Natural Gas Storage, Underground Gasification and Coal Deposits

There is no carbon capture, natural gas storage, underground gasification or coal deposits located within the infrastructure and other users study area (inner). Carbon capture, natural gas storage, underground gasification and coal deposits have therefore not been considered further within this Offshore Scoping Report.

Subsea Telecommunication Cables

A review of the active and disused subsea cables has identified no telecommunication cables in the infrastructure and other users study area (inner). The nearest active cable is located approximately 40 km from Thorntonloch Landfall area, located between mainland and Holy Island. Subsea cables have therefore not been considered further within this Offshore Scoping Report.

Marine Disposal Sites

A review of potential active or closed marine disposal sites identified no active or closed disposal sites within the infrastructure and other users study area (inner) (Figure 8.34). The closest site is a closed disposal site, located approximately 1 km from the Skateraw Landfall area, bordering the infrastructure and other users study area, and an open disposal site approximately 16.5 km from the Thorntonloch Landfall area.

Although there is a disposal site bordering the infrastructure and other users study area, this site is closed and therefore marine disposal sites have therefore not been considered further within this Offshore Scoping Report.

Marine Aggregate Extraction Sites

Although Scotland has a considerable marine sand and gravel resource, the marine aggregate industry has historically been very small due to more readily accessible land supplies. Marine aggregate licences have historically been issued to two sites in Scotland, one site in the Firth of Forth and the second site in the Firth of Tay (The Scottish Government, 2015) which do not overlap the infrastructure and other users study area. There are currently no active licences for marine aggregate extraction in the Forth and Tay marine region. Marine aggregate extraction sites have therefore not been considered further within this Offshore Scoping Report.

8.6.4 PROPOSED APPROACH TO THE ENVIRONMENTAL IMPACT ASSESSMENT

The infrastructure and other users EIA will follow the methodology set out in chapter 5. Specific to the infrastructure and other users EIA, the following guidance documents will also be considered:

- The RYA's Position on Offshore Renewable Energy Developments: Paper 1 (of 4) – Wind Energy, June 2019 (RYA, 2019b);
- Assessment of Impact of Offshore Wind Energy Structures on the Marine Environment (Marine Institute, 2000);
- Guidance on Environmental Impact Assessment of Offshore Renewable Energy Development on Surfing Resources and Recreation (Surfers Against Sewage (SAS), 2009);
- European Subsea Cables UK Association (ESCA) Guideline No 6, The Proximity of Offshore Renewable Energy Installations and Submarine Cable Infrastructure in UK Waters (ESCA, March 2016);
- ICPC recommendations:
  - Recommendation No.2. Recommended Routing and Reporting Criteria for Cables in Proximity to Others (ICPC, 2015);
  - Recommendation No.3. Criteria to be Applied to Proposed Crossings Submarine Cables and/or Pipelines (ICPC, 2014); and
  - Recommendation No.13. The Proximity of Offshore Renewable Wind Energy Installations and Submarine Cable Infrastructure in National Waters (ICPC, 2013).
- TCE and CES Agreements and Oil and Gas Licences (OGA, 2018);
- Oil and Gas UK, Pipeline Crossing Agreement and Proximity Agreement Pack (Oil and Gas UK, 2015); and
- TCE Guidance: Offshore wind farms and electricity export cables – crossing agreements (TCE, 2012).

8.6.5 EMBEDDED MITIGATION

Measures adopted as part of the Proposed Development will include:

- timely and efficient distribution of NtM, Kingfisher notifications and other navigational warnings of the position and nature of works associated with the Proposed Development;
- application and use of Safety Zones during construction, maintenance and decommissioning activities associated with wind turbines and offshore platforms;

- use of advisory safety distances around vessels undertaking construction, major maintenance and decommissioning activities; and
- crossing or laying of cables over or adjacent to known or future cables will be subject to crossing and/or proximity agreements.

The requirement of additional measures will be dependent on the significance of the effects on infrastructure and other users associated with the Proposed Development, and will be agreed following consultation with statutory stakeholders.

8.6.6 POTENTIAL PROPOSED DEVELOPMENT IMPACTS

A range of potential impacts on infrastructure and other users have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of the Proposed Development. The impacts that have been scoped into the Proposed Development assessment for infrastructure and other users, are outlined in Table 8.19. together with a description of any additional data collection (e.g. site-specific surveys) and/or supporting analyses (e.g. modelling) that will be required to enable a full assessment of the impacts.

On the basis of the baseline infrastructure and other users' information currently available and the Proposed Development description outlined in chapter 3, a number of impacts are proposed to be scoped out of the assessment for infrastructure and other users. These impacts are outlined, together with a justification for scoping them out, in Table 8.20.

8.6.7 POTENTIAL CUMULATIVE EFFECTS

There is the potential for cumulative effects to occur as the result of the Proposed Development with other plans or projects. The CEA will follow the methodology set-out in chapter 5.

8.6.8 POTENTIAL TRANSBOUNDARY IMPACTS

A screening of transboundary impacts has been carried out and is presented in Annex C. This screening exercise identified that there is no potential for transboundary impacts upon infrastructure and other users due to construction, operational and maintenance, and decommissioning impacts of the Proposed Development.

8.6.9 SCOPING QUESTIONS TO CONSULTEES

- Do you agree that the existing data available to describe the infrastructure and other users baseline remains sufficient to describe the baseline environment in relation to the Proposed Development?
- Do you agree that the embedded mitigation described provides a suitable means for managing and mitigating the potential effects of the Proposed Development on infrastructure and other user receptors?
- Do you agree with the potential impacts to be scoped out of the Proposed Development assessment?
- Do you agree with the potential impacts to be scoped in for the Proposed Development assessment?

Table 8.19: Impacts Proposed to be Scoped into the Proposed Development Assessment for Infrastructure and Other Users.

Impact	Embedded Mitigation	Justification	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Proposed Approach for the Undertaking of Proposed Development Specific Modelling to Inform the Assessment of Potential Impacts
Construction				
Displacement of recreational sailing and motor cruising, recreational fishing (boat angling) and other recreational activities (diving vessels) due to safety zones and advisory safety distances in the array area and proposed export cable corridor may result in a loss of recreational resource.	• Promulgation of information.	The construction of infrastructure and implementation of safety distances around construction vessels may displace recreation vessels.	None required.	No modelling required for this impact.

Impact	Embedded Mitigation	Justification	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Proposed Approach for the Undertaking of Proposed Development Specific Modelling to Inform the Assessment of Potential Impacts
Displacement of recreational fishing (shore angling) and other recreational activities (kayaking, kite surfing, surfing and windsurfing, scuba diving and beach users) due to advisory safety distances in the nearshore and intertidal section of the proposed export cable corridor resulting in a loss of recreational resource.	• Promulgation of information.	The construction of infrastructure and implementation of safety distances around the landfall location may prevent access to the area for recreation users.	None required.	No modelling required for this impact.
Installation of the export cable, including associated safety distances, may temporarily affect or restrict access to the Neart na Gaoithe offshore export cable.	• Promulgation of information.; and • Crossing and/or proximity agreements.	The construction of export cables and implementation of safety distances around vessels may affect or restrict access to existing cables.	None required.	No modelling required for this impact.

Impact	Embedded Mitigation	Justification	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Proposed Approach for the Undertaking of Proposed Development Specific Modelling to Inform the Assessment of Potential Impacts
Operation and Maintenance				
Displacement of recreational sailing and motor cruising, recreational fishing (boat angling) and other recreational activities (diving vessels), resulting in a loss of recreational resource.	• Promulgation of information.	As per construction phase.	None required.	No modelling required for this impact.
Maintenance activities, including associated safety distances, for the export cable may temporarily affect or restrict access to the Neart na Gaoithe offshore export cable.	• Promulgation of information; and • Crossing and/or proximity agreements.	As per construction phase.	None required.	No modelling required for this impact.
Decommissioning				
Displacement of recreational sailing and motor cruising, recreational fishing (boat angling) and other recreational activities (diving vessels), resulting in a loss of recreational resource.	• Promulgation of information.	As per construction phase.	None required.	No modelling required for this impact.

Impact	Embedded Mitigation	Justification	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Proposed Approach for the Undertaking of Proposed Development Specific Modelling to Inform the Assessment of Potential Impacts
Displacement of recreational fishing (shore angling) and other recreational activities (kayaking, kite surfing, surfing and windsurfing, scuba diving and beach users) along the nearshore and intertidal section of the proposed export cable corridor resulting in a loss of recreational resource.	• Promulgation of information.	As per construction phase.	None required.	No modelling required for this impact.
Decommissioning activities, including associated safety distances, for the export cable may temporarily affect or restrict access to the Neart na Gaoithe offshore export cable.	• Promulgation of information; and • Crossing and/or proximity agreements.	As per construction phase.	None required.	No modelling required for this impact.

Table 8.20: Impacts Proposed to be Scoped Out of the Proposed Development Assessment for Infrastructure and Other Users.

Impact	Justification
Construction	
Impact on wave and tidal projects	There are no wave and tidal projects within the infrastructure and other users study area (inner). As such, impacts on wave and tidal projects have been scoped out of the assessment.
Impact on oil and gas activities within licenced blocks	There are no licenced oil and gas licence blocks within the infrastructure and other users study area (inner). As such, impacts on oil and gas licence blocks have been scoped out of the assessment.
Impact on carbon capture, natural gas storage, underground gasification and coal deposits	There are no carbon capture, natural gas storage, underground gasification or coal deposit projects within the infrastructure and other users study area (inner). As such, impacts on carbon capture, natural gas storage, underground gasification and coal deposit projects have been scoped out of the assessment.
Impact on subsea telecommunications cables	There are no subsea telecommunications cables within the infrastructure and other users study area (inner). As such, impacts on subsea telecommunications cables have been scoped out of the assessment.
Impact on marine disposal sites	There are no marine disposal sites within the infrastructure and other users study area (inner). As such, impacts on marine disposal sites have been scoped out of the assessment.
Impact on marine aggregate extraction sites	There are no marine aggregate extraction sites within the infrastructure and other users study area (inner). As such, impacts on marine aggregate extraction sites have been scoped out of the assessment.
Operation and Maintenance	
Displacement of recreational fishing (shore angling) and other recreational activities (kayaking, kite surfing, surfing and windsurfing, beach users) along the nearshore and intertidal section of the proposed export cable corridor resulting in a loss of recreational resource	Operational and maintenance phase effects have been scoped out due to the expected low frequency of cable inspection, repair or reburial activities along the intertidal sections of the export cable. Any effects are likely to be limited to the presence of a temporary advisory clearance distance around the vessels carrying out maintenance activities. Notices to Mariners will be issued to advise other users of the nature, location and timing of any major maintenance activities.
Impact on wave and tidal projects	As per the construction phase.
Impact on oil and gas activities	As per the construction phase.

Impact	Justification
Impact on carbon capture, natural gas storage, underground gasification and coal deposits	As per the construction phase.
Impact on subsea telecommunications cables	As per the construction phase.
Impact on marine disposal sites	As per the construction phase.
Impact on marine aggregate extraction sites	As per the construction phase.
Decommissioning	
Impact on wave and tidal projects	As per the construction phase.
Impact on oil and gas activities	As per the construction phase.
Impact on carbon capture, natural gas storage, underground gasification and coal deposits	As per the construction phase.
Impact on subsea telecommunications cables	As per the construction phase.
Impact on marine disposal sites	As per the construction phase.
Impact on marine aggregate extraction sites	As per the construction phase.

8.7 OFFSHORE SOCIO-ECONOMICS AND TOURISM

8.7.1 INTRODUCTION

This section of the Offshore Scoping Report identifies the elements of offshore socio-economics and tourism of relevance to the Proposed Development and considers the potential impacts from the construction, operation and maintenance, and decommissioning of the offshore and intertidal components (seaward of the MHWS mark) of the Proposed Development on onshore and offshore socio-economics and tourism receptors.

8.7.2 STUDY AREA

The selection of the study areas for the socio-economic impact analysis will take account of the spatial scale at which impacts upon different receptors are likely to materialise. This is likely to vary across receptors and will therefore require a localised study area and a larger regional study area. The study area will be linked to the selection of construction, and operation and maintenance ports and the supply of a range of inputs and services for the Proposed Development.

The local socio-economics study area will cover the Proposed Development and coastline authorities (East Lothian, Fife, Dundee City, and Angus local authorities) as illustrated in Figure 8.35. It will be linked to the selection of construction, and operation and maintenance ports and the supply of a range of inputs and services for the Proposed Development.

A larger regional socio-economics study area will also be defined to reflect the wider reach of Scottish Gross Value Added (GVA) and employment impacts that are likely to materialise through the supply chain and provision of labour. This regional study area will be defined following review of the results of the socio-economics assessment being undertaken.

8.7.3 BASELINE ENVIRONMENT

8.7.3.1 Desktop Study

An initial desk-based review of literature and data sources to support this Offshore Scoping Report has identified a number of baseline datasets in the form of both pre-existing, non- Proposed Development specific datasets. Information on population within the socio-economics study area and the regional socio-economics study area will be collected through a detailed desktop review of existing studies and datasets. Key reports and datasets include, but are not limited to:

- A review of East Lothian tourism for 2018 (Scottish Tourism Alliance, 2019);
- Scotland's Labour Market: People, Places and Regions Annual Population Survey 2019 (Scottish Government, 2019); and
- Mid-2019 Population Estimates Scotland (National Records of Scotland, 2019).

8.7.3.2 Site-specific Survey Data

No site-specific surveys have been undertaken to inform the Offshore Scoping Report for socio-economics and tourism and will not be undertaken to support the development of the Offshore EIA Report. This is because sufficient secondary data is available for the development of a baseline from which the potential impacts can be assessed.

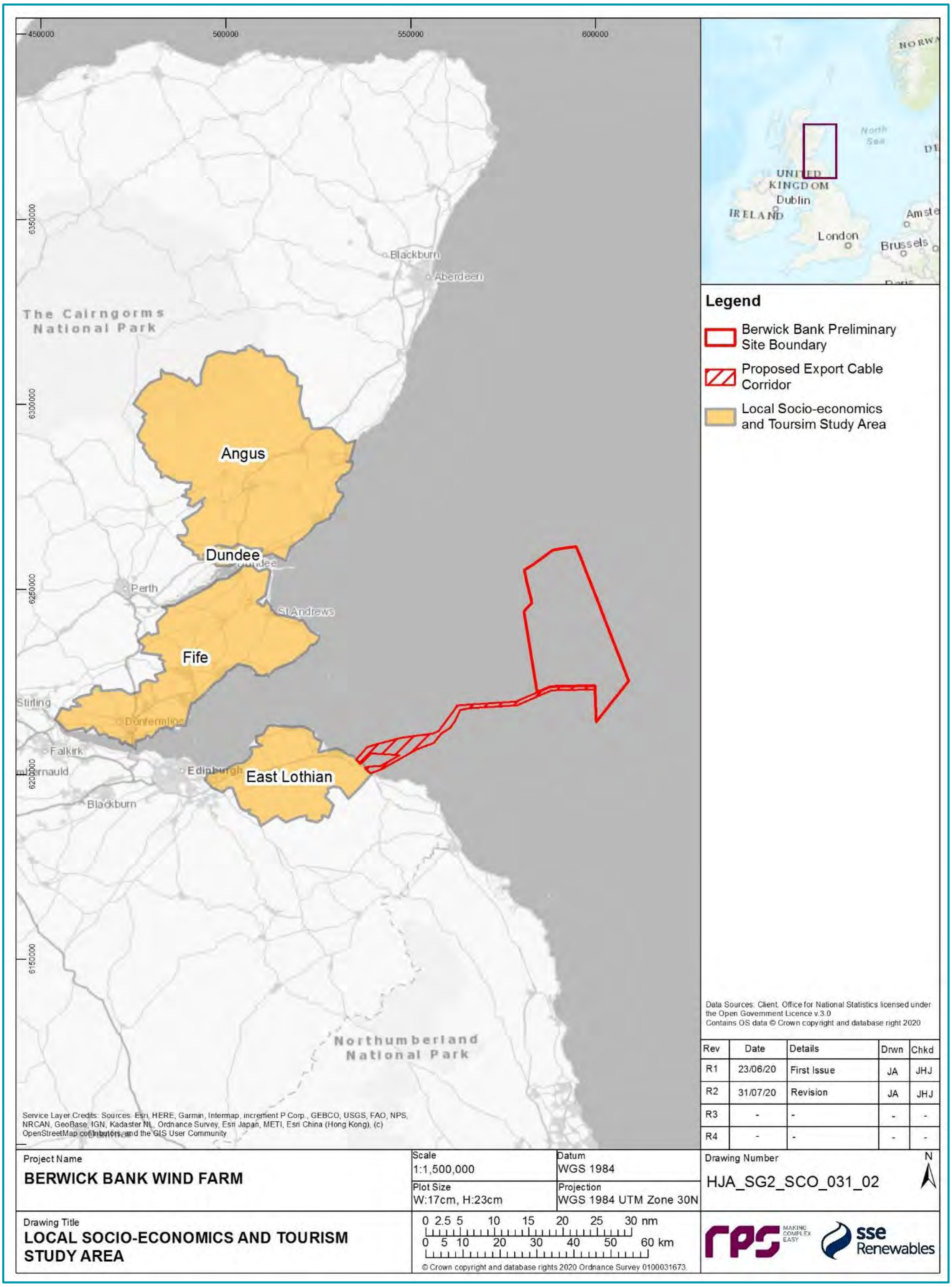


Figure 8.35: Local Socio-Economics and Tourism Study Area for the Proposed Development.

8.7.3.3 Baseline Characterisation

While the Proposed Development occurs offshore, the socio-economic impacts and those associated with recreation value will also occur onshore. The socio-economic and tourism baseline environment will provide an overview of the following topic areas within the onshore and offshore environment:

- population;
- employment and economic activity;
- industry;
- income and wealth;
- transport and commuting; and
- tourism and leisure.

Socio-Economics Overview

Based on a review of the associated socio-economic baseline developed to support the assessment of impacts associated with Seagreen 1 (Seagreen Wind Energy, 2018), the majority of the open coastline between Aberdeen and Eyemouth is sparsely populated with major population centres present within the Firths of Forth and Tay (Dundee and Edinburgh).

An overview of the population counts and demographic structure of the coastal settlements within the Regional Study Area are presented in Table 8.21 below. In mid-2019, the median age across the local authorities within the Regional Study Area ranged from 36.5 years of age in the City of Edinburgh, to 47.1 years of age in Angus (National Records of Scotland, 2019). The percentage of the population in the working age group varied from 60% of the population of Angus, to 70% of the City of Edinburgh. These percentage contributions were also reflected within the pensionable age demographics, with the City of Edinburgh having the lowest total percentage within the pensionable age category (15%) compared to the highest in Perth & Kinross and Angus (23%) (National Records of Scotland, 2019).

A review of Scotland's labour market (Scottish Government, 2020b) suggests that in 2019 the second highest employment rate across Scotland was in Perth and Kinross with 83.4% employment. Comparatively, the lowest employment rate across Scotland was observed in Dundee City with an employment rate of 68.6%. (Scottish Government, 2020b). Across Scotland, the employment rate has increased in 28 local authorities and decreased in 4 over the past ten years. Young people (16 to 24 years old) make up a comparatively high concentration of the workforce in the accommodation and food services, and wholesale, retail, repair of vehicles sectors. Meanwhile, workers aged 50 and over make up a comparatively high concentration of the workforce in the agriculture, forestry and fishing and transport and storage sectors (Scottish Government, 2020b).

The renewable energy sector has grown steadily in Scotland over the past few years, with an annual capacity increase of 770 MW between 2009 to 2019 (Scottish Renewables, 2020). Turnover from the renewable energy sector was £5,544 million in 2017, of which £511 million was related to the offshore wind sector (Scottish Renewables, 2020). A survey in 2017 suggest that around 17,700 full-time employees in the Scottish renewable energy sector, of which 3,400 were within the offshore wind segment (Office for National Statistics, 2019).

Table 8.21: **Estimated Mid-2019 population of the coastal settlements associated with the Regional Study Area (Source: National Records of Scotland, 2019).**

Local Authority	Population Count	Median Age	Under 16 (%)	Working Age (%)	Pensionable Age (%)
Aberdeen City	228,670	37.3	15	69	15
Aberdeenshire	261,210	44.0	19	62	19
Angus	116,200	47.1	16	60	23
Dundee City	149,320	37.0	16	67	17
Perth & Kinross	151,950	47.0	16	61	23
Fife	373,550	43.8	17	63	20
Falkirk	160,890	43.4	17	64	18
West Lothian	183,100	41.0	19	64	16
City of Edinburgh	524,930	36.5	15	70	15
Midlothian	92,460	41.6	19	62	18
East Lothian	107,090	44.6	18	62	20

GVA is a key indicator used to measure economic performance. Total GVA in the UK is £1,820 billion, and in Scotland is £138 billion. Annual GVA growth of 3.6% and 3.2% has been recorded in the UK and Scotland, respectively (Office for National Statistics, 2018). The GVA per head in the UK was estimated at £27,555 compared to £25,485 in Scotland (Office for National Statistics, 2018). Statistics on GVA per head provide an overview of the value added by production activity in an area to the resident population of that area. However, these stats can be subject to distortion due to the effects of commuting and variations in the age distribution of the population.

In 2016, approximately 30% of Scotland's GVA was generated in its two largest cities: Glasgow (£20.37 billion or 15.2%) and Edinburgh (£19.94 billion or 14.9%). The GVA data for the other local authorities included within the socio-economics and tourism Regional Study Area are presented in Table 8.22. The percentage of total Scottish GVA in these local authorities ranges from 1.1% (Midlothian) to 14.9% (City of Edinburgh), with GVA per head ranging from £16,790 in Midlothian to £46,151 in Aberdeen City.

Table 8.22: 2016 GVA Statistics for the Local Authorities within the Socio-Economics and Tourism Regional Study Area (The Scottish Parliament, 2018).

Local Authority	Total GVA (£ millions)	Percentage of Total Scottish GVA 2016	GVA per Head (£)
Aberdeen City	10,607	7.9	46,151
Aberdeenshire	6,931	5.2	26,433
Angus	2,167	1.6	18,597
Dundee City	3,574	2.7	24,104
Perth & Kinross	3,882	2.9	25,765
Fife	7,509	5.6	20,276
Falkirk	3,260	2.4	20,457
West Lothian	3,784	2.8	21,005
City of Edinburgh	19,942	14.9	39,321
Midlothian	1,488	1.1	16,790
East Lothian	1,765	1.3	16,957

Tourism Overview

Due to the offshore nature of the Proposed Development boundary, it is unlikely to support recreational or tourism activities. The western boundary of the array area is approximately 39.2 km from the nearest coastline and approximately 16.4 km from the closest recognised Royal Yachting Association (RYA) sailing area. There are several wrecks located within the array area and proposed export cable corridor, but the depths of these wrecks exceed those which attract recreational divers. Likewise, the seabed within the array area and proposed export cable corridor is relatively featureless and does not contain notable features which typically attract recreational divers. The nearshore and inshore waters which the proposed export cable corridor crosses may also support recreational sea angling.

The coastline around Scotland supports popular activities such as waking, wildlife and birdwatching, gold, beach activities, wild-fowling, horse-riding, camping, sailing, recreational angling, bathing, water and jet skiing, canoeing and motor boarding activities (LUC, 2007). A review of the tourism in the region associated within the landfall locations (Thorntonloch and Skateraw, in East Lothian) suggests approximately 62% of tourists visit the beach and approximately 55% undertake sightseeing and tours (Scottish Tourism Alliance, 2019). In 2018, nearly half (48%) of all visitors undertook some kind of sporting activity, and hiking / walking / rambling remains the most popular sporting activity amongst visitors, especially overseas visitors (36%), whilst golf and birdwatching are undertaken by around one-tenth of all visitors, outdoor water sports only 5% and fishing only 2% (Scottish Tourism Alliance, 2019).

8.7.4 PROPOSED APPROACH TO THE ENVIRONMENTAL IMPACT ASSESSMENT

The socio-economics and tourism EIA will follow the methodology set out in chapter 5. The assessment will consider the LSE associated of the offshore infrastructure on onshore and offshore receptors. The socio-economic impacts of the construction and operation of the Proposed Development have the potential to be significant and will impact at a regional and local level.

The assessment will be based on a desktop review of existing relevant studies and national datasets and indicators and will be supported by the development of a socio-economic model. The assessment will also draw on the information provided in other topics such as commercial fisheries (section 8.1), shipping and navigation (section 8.2), aviation, military and communications (section 8.3), marine archaeology (section 8.4), seascape and visual resources (section 8.58.4.7), and infrastructure and other users (section 8.6). The economic impacts and benefits will be quantified in terms of Scottish GVA and expected jobs in Scotland. The methodology for the socio-economic assessment will consider the results from the economic impact model that takes account of all possible impacts: direct, indirect, induced, supply chain effects, and potential for local production and maintenance.

A Project level socio-economics Technical Report will be developed and will support the Offshore and Onshore EIA Reports socio-economics and tourism assessments. This Technical Report will be appended to the Offshore EIA Report. Embedded Mitigation

There are no embedded mitigations considered for socio-economics receptors, as it is anticipated that the overriding socio-economic impacts of the Proposed Development will be positive in nature. Consultation will be carried out with local stakeholders and public sector bodies, such as Scottish Enterprise, and through other activities that raise awareness of the opportunities that the Proposed Development provide to maximise the positive socio-economic impacts.

Several opportunities which could be considered to enhance the positive impacts include:

- the use of locally manufactured content where possible;
- the use of local contractors during construction for onshore infrastructure and potential offshore construction work where possible;
- employment and training possibilities for local people on the operation and maintenance of a wind farm where feasible; and
- supporting the community through sponsorship of local groups and teams.

8.7.5 POTENTIAL PROPOSED DEVELOPMENT IMPACTS

A range of potential impacts on socio-economics and tourism have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of the Proposed Development. The impacts that have been scoped into the Proposed Development assessment are outlined in Table 8.23 together with a description of any additional data collection (e.g. site-specific surveys) and/or supporting analyses (e.g. modelling) that will be required to enable a full assessment of the impacts.

On the basis of the baseline socio-economics and tourism information currently available and the Proposed Development description outlined in chapter 3, no impacts are proposed to be scoped out of the assessment for at this stage.

Table 8.23: Impacts Proposed to be Scoped into the Proposed Development Assessment for Socio-Economics and Tourism.

Impact	Justification	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Proposed Approach for the Undertaking of Proposed Development Specific Modelling to Inform the Assessment of Potential Impacts
Construction			
Impact on employment in construction in the supply chain	Potential expenditure from the construction to support employment in Scottish companies that are directly engaged in the construction supply chain. The construction of the Proposed Development could also go on to support employment indirectly in the wider Scottish supply chain.	A desk-based review will be undertaken to develop a baseline understanding of the socio-economic and tourism related conditions.	An economic impact model to estimate the direct, indirect and induced employment impact of expenditure on construction of the Proposed Development in the socio-economics study area will be developed.
Impact on the amount of GVA supported by construction activity	Potential expenditure on the construction of the Proposed Development to support GVA in Scottish companies that are directly engaged in the construction supply chain. The construction of the Proposed Development could also go on to support employment indirectly in the wider supply chain.	As above.	An economic impact model to estimate the direct, indirect and induced GVA impact of expenditure on construction of Proposed Development in the socio-economics study area will be developed.
Impact on access to construction-related employment amongst local residents	Direct and indirect employment associated with the construction phase could increase the range and supply of employment opportunities that are accessible to residents of the area.	As above.	No specific modelling is required for this impact assessment.
Impact on the demand for housing, accommodation and local services	Direct and indirect employment generated during the construction phase could increase demand for housing, accommodation and local services during the construction phase.	As above.	No specific modelling is required for this impact assessment.
Impact on tourism and recreation activity and associated economic value	The construction of the Proposed Development could lead to disruption of local tourism and recreational resources.	As above.	No specific modelling is required for this impact assessment.

Impact	Justification	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Proposed Approach for the Undertaking of Proposed Development Specific Modelling to Inform the Assessment of Potential Impacts
Operation and Maintenance			
Impact on employment in operation and maintenance and in the supply chain	As for construction phase.	As above.	As for construction phase.
Impact on the amount of GVA (£m) supported by operation and maintenance activity	As for construction phase.	As above.	As for construction phase.
Impact on access to operation and maintenance related employment amongst local residents	As for construction phase.	As above.	No specific modelling is required for this impact assessment..
Impact on the demand for housing, accommodation and local services	Direct and indirect employment generated during the operation and maintenance phase could increase demand for housing, accommodation and local services.	As above.	No specific modelling is required for this impact assessment.
Impact on local tourism and recreational resources	As for construction phase.	As above.	No specific modelling is required for this impact assessment.
Decommissioning			
Impact on decommissioning related employment	As for construction phase.	As above.	As for construction phase.

Impact	Justification	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Proposed Approach for the Undertaking of Proposed Development Specific Modelling to Inform the Assessment of Potential Impacts
Impact on the amount of GVA (£m) supported during decommissioning activity	As for construction phase.	As above.	As for construction phase.
Impact on access to decommissioning related employment amongst local residents	As for construction phase.	As above.	As for construction phase.
Impact on demand for housing, accommodation and local services	As for construction phase.	As above.	As for construction phase.
Impact on local tourism and recreational resources	As for construction phase.	As above.	As for construction phase.

8.7.6 POTENTIAL CUMULATIVE EFFECTS

Although the predicted effects of the Proposed Development on socio-economics are considered to be localised, there is potential for cumulative effects to occur from other projects or activities within the regional socio-economics study area. Projects and activities which will be considered include:

- other offshore wind farms and associated onshore cabling and infrastructure;
- onshore energy generation projects;
- road and rail projects;
- major residential, commercial and leisure projects; and
- minerals extraction and landfill projects.

8.7.7 POTENTIAL TRANSBOUNDARY IMPACTS

A screening of transboundary impacts has been carried out and is presented in Annex C. This screening exercise identified that there is the potential for transboundary impacts upon socio-economics and tourism due to construction, operational and maintenance, and decommissioning impacts of the Proposed Development. These relate to:

- foreign commercial fishing; and
- foreign shipping and navigation.

It considered that there is the potential for transboundary impacts to occur if there is a potential impact on shipping and navigation or commercial fishing vessels associated with other EEA States. These have been considered in section 8.1 and section 8.2, respectively.

Potential transboundary socio-economics and tourism impacts upon other EEA states may arise through the purchase of project components, equipment and the sourcing of labour from companies based outside the UK. Under Regulation 41 part 6(a) of the EIA Regulations, the Scottish Ministers must enter into consultation with any EEA State concerned regarding the potential significant effects of the development on the environment of that EEA State and the measures envisaged to reduce or eliminate such effects. The sourcing of materials and labour from other EEA states is assumed to provide beneficial effects to the economies of other EEA states and so the consideration of measures envisaged to reduce or eliminate such effects is not relevant in the context of transboundary impacts. It is therefore proposed that transboundary impacts on offshore socio-economic and tourism receptors are screened out.

8.7.8 SCOPING QUESTIONS TO CONSULTEES

- Are there any additional baseline datasets to those included in section 8.7.3 that should be reviewed to characterise the socio-economics baseline?
- Do you agree that all potential impacts have been identified for socio-economics receptors?

9 SUMMARY OF THE OFFSHORE SCOPING REPORT

9.1 OVERVIEW

The Applicant is proposing the development of the Berwick Bank Wind Farm (the Project) in the outer Firth of Forth and Firth of Tay, 39.2 km east of the East Lothian coastline. The Applicant intends to submit separate consents, licences and permissions for the offshore (seaward of MHWS and onshore (landward of MLWS) infrastructure of the Project. This Offshore Scoping Report therefore considers all of the offshore infrastructure of the Project, seaward of MHWS (i.e. the Proposed Development). This Offshore Scoping Report has been provided in support of the Applicant's request for a Scoping Opinion from Marine Scotland in relation to the Proposed Development.

The purpose of this Offshore Scoping Report is to provide stakeholders with information on the Proposed Development, and allow for engagement with stakeholders on the key topics to be addressed in the Offshore EIA Report, as well as the baseline data sources and assessment methodologies to be used to inform the Offshore EIA Report. This Offshore Scoping Report has identified the potentially significant effects associated with the construction, operation and maintenance, and decommissioning phases of the Proposed Development, on a range or receptors. For each receptor group identified, this Offshore Scoping Report has identified the desktop and site-specific survey and data requirements to support baseline characterisation, including Proposed Development-specific studies to be undertaken as part of the offshore EIA.

For the purpose of this Offshore Scoping Report, the following technical topics have been considered:

- offshore physical environment
  - physical processes;
  - subsea noise;
  - airborne noise; and
  - air quality.
- offshore biological environment
  - benthic subtidal and intertidal ecology;
  - fish and shellfish ecology;
  - marine mammals; and
  - ornithology.
- offshore human and socio-economic environment
  - commercial fisheries;
  - shipping and navigation;
  - aviation, military and communications;
  - marine archaeology;
  - seascape, visual resources and cultural heritage setting;
  - infrastructure and other users; and
  - offshore socio-economic and tourism.

9.2 SCOPED IN IMPACTS

The potential impacts of the Proposed Development have been identified in this Offshore Scoping Report for each offshore EIA topic area listed in section 9.1 . Where it has been concluded that there was a potential for significant impact, or where further assessment or data collection was required to determine potential for significant impact, these impacts have been scoped in for assessment in the Offshore EIA Report. These are detailed in chapter 6 to chapter 8 of this Offshore Scoping Report and are summarised in Annex A, and a proposed approach to assessment has been provided.

9.3 SCOPED OUT IMPACTS

Where it has been concluded that there was no potential for significant impact, or where no further assessment or data collection was required to determine potential for significant impact, these impacts have been scoped out for assessment in the Offshore EIA Report. These have been scoped out based on an assessment of the Project Description outlined in chapter 3, the site selection process outlined in chapter 4, the baseline characterisation and the embedded mitigation measures outlined for each offshore EIA topic outlined in chapter 6 to chapter 8. The impacts that are proposed to be scoped out are summarised in Table 9.1 .

Table 9.1: Impacts Scoped out of the Offshore EIA Report.

Offshore EIA Topic	Construction Phase	Operation and Maintenance Phase	Decommissioning Phase
Physical processes	Scour of seabed sediments.	Scour of seabed sediments.	Scour of seabed sediments.
Airborne noise	Piling activities will generate construction noise that may impact recreational and leisure receptors in the nearshore environment.	Airborne noise associated with the operation and maintenance of the Proposed Development may impact recreational and leisure receptors in the nearshore environment.	Decommissioning activities will generate decommissioning noise that may impact recreational and leisure receptors in the nearshore environment.
	Piling activities will generate construction noise that may exceed guideline levels for commercial fishing vessels and commercial shipping traffic.	Airborne noise may exceed guideline levels for commercial fishing vessels and commercial shipping traffic.	Airborne noise may exceed guideline levels for commercial fishing vessels and commercial shipping traffic.
	Piling activities will generate construction noise that may exceed guideline levels for manned gas platforms.	Airborne noise may exceed guideline values for offshore accommodation platforms.	Airborne noise may exceed guideline values for offshore accommodation platforms.
Air quality	Atmospheric emissions from vessel and helicopter movements.	Atmospheric emissions from vessel and helicopter movements.	Atmospheric emissions from vessel and helicopter movements.
Benthic subtidal and intertidal ecology	Accidental pollution during construction, operation and maintenance and decommissioning.	Accidental pollution during construction, operation and maintenance and decommissioning.	Accidental pollution during construction, operation and maintenance and decommissioning.
	Impacts from release of sediment bound contaminants.	Impacts from release of sediment bound contaminants.	Impacts from release of sediment bound contaminants.
Fish and shellfish ecology	Accidental release of pollutants.	Accidental release of pollutants.	Accidental release of pollutants.
		Underwater noise from wind turbine operation and vessels.	

Offshore EIA Topic	Construction Phase	Operation and Maintenance Phase	Decommissioning Phase
		Colonisation of hard structures.	
Marine mammals	Accidental pollution.	Accidental pollution.	Accidental pollution.
	Changes in water clarity.	Changes in water clarity.	Changes in water clarity.
	Operational noise.	Operational noise.	Operational noise.
Offshore and intertidal ornithology	Pollution impacts.	Pollution impacts.	Pollution impacts.
	Disturbance from offshore export cable construction.		
Commercial fisheries	No impacts scoped out.	No impacts scoped out.	No impacts scoped out.
Shipping and navigation	No impacts scoped out.	No impacts scoped out.	No impacts scoped out.
Aviation, military and communications	Potential impact on civil airport patterns and procedures due to presence of obstacles (cranes and stationary wind turbines).	Potential impact on civil airport patterns and procedures due to presence of obstacles (cranes and stationary wind turbines).	Potential impact on civil airport patterns and procedures due to presence of obstacles (cranes and stationary wind turbines).
	Potential impact on military aerodrome patterns and procedures due to presence of obstacles (cranes and stationary wind turbines).	Potential impact on military aerodrome patterns and procedures due to presence of obstacles (cranes and, stationary wind turbines).	Potential impact on military aerodrome patterns and procedures due to presence of obstacles (cranes and stationary wind turbines).
	Potential impacts on HMRs due to presence of wind turbines.	Potential impacts on HMRs due to presence of wind turbines.	Potential impacts on HMRs due to presence of wind turbines.
	Potential impacts on offshore helicopter installations (oil & gas platforms) due to the presence of wind turbines.	Potential impacts on offshore helicopter installations (oil & gas platforms) due to the presence of wind turbines.	Potential impacts on offshore helicopter installations (oil & gas platforms) due to the presence of wind turbines.

Offshore EIA Topic	Construction Phase	Operation and Maintenance Phase	Decommissioning Phase
Infrastructure and other users	Impact on wave and tidal projects.	Impact on wave and tidal projects.	Impact on wave and tidal projects.
	Impact on oil and gas activities within licenced blocks.	Impact on oil and gas activities within licenced blocks.	Impact on oil and gas activities within licenced blocks.
	Impact on carbon capture, natural gas storage, underground gasification and coal deposits.	Impact on carbon capture, natural gas storage, underground gasification and coal deposits.	Impact on carbon capture, natural gas storage, underground gasification and coal deposits.
	Impact on subsea telecommunications cables.	Impact on subsea telecommunications cables.	Impact on subsea telecommunications cables.
	Impact on marine disposal sites.	Impact on marine disposal sites.	Impact on marine disposal sites.
	Impact on marine aggregate extraction sites.	Impact on marine aggregate extraction sites.	Impact on marine aggregate extraction sites.
		Displacement of recreational fishing (shore angling) and other recreational activities (kayaking, kite surfing, surfing and windsurfing, beach users) along the nearshore and intertidal section of the proposed export cable corridor resulting in a loss of recreational resource.	

Offshore EIA Topic	Construction Phase	Operation and Maintenance Phase	Decommissioning Phase
Marine archaeology	Construction and decommissioning activities causing the removal or disturbance of sediments resulting in a potential effect on near-surface prehistoric land surfaces.	Maintenance activities causing the removal or disturbance of sediments resulting in a potential effect on near-surface prehistoric land surfaces.	Construction and decommissioning activities causing the removal or disturbance of sediments resulting in a potential effect on near-surface prehistoric land surfaces.
	Construction or decommissioning activities causing the removal or disturbance of sediments resulting in a potential effect on shipwrecks and aircraft wrecks.	Maintenance activities causing the removal or disturbance of sediments resulting in a potential effect on shipwrecks and aircraft wrecks.	Construction or decommissioning activities causing the removal or disturbance of sediments resulting in a potential effect on shipwrecks and aircraft wrecks.
	Construction of wind turbines and substations causing the removal or disturbance of sediments resulting in a potential effect on deeply buried prehistoric land surfaces.		
	Construction activities resulting in an increase in SSCs and associated sediment deposition on shipwrecks and aircraft wrecks.		

Offshore EIA Topic	Construction Phase	Operation and Maintenance Phase	Decommissioning Phase
Seascape, visual resources and cultural heritage setting	Temporary impacts on seascape character and marine based visual receptors as a result of array construction and decommissioning activities.	Long-term impacts on seascape character and marine based visual receptors as a result of array.	Temporary impacts on seascape character and marine based visual receptors as a result of array construction and decommissioning activities.
	Temporary night-time impacts on coastal landscape character and visual amenity as a result of temporary lighting within the array zone.	Long-term night-time impacts on coastal landscape character and visual amenity.	Temporary night-time impacts on coastal landscape character and visual amenity as a result of temporary lighting within the array area.
	Impacts of the Proposed Development on the settings of onshore cultural heritage assets	Impacts of the Proposed Development on the settings of onshore cultural heritage assets	Impacts of the Proposed Development on the settings of onshore cultural heritage assets
Offshore socio-economic and tourism	No impacts scoped out.	No impacts scoped out.	No impacts scoped out.

9.4 TRANSBOUNDARY IMPACTS

A transboundary screening assessment for the Proposed Development has been undertaken as is presented in Annex C.

The following topics have been screened into further consideration of transboundary impacts:

- fish and shellfish ecology;
- commercial fisheries; and
- shipping and navigation.

9.5 CONSULTATION

The proposed approach to stakeholder engagement during the pre-application phase is outlined in section 5.3.4. Because the Proposed Development is within Scottish Territorial Waters, the PAC Regulations apply, therefore as part of further consultation during the pre-application phase, a pre-application event will be held during spring of 2021. Further details on this PAC event will be published in Edinburgh Gazette and other local press. A PAC report will also be prepared and submitted with the Marine Licence Application for the Proposed Development. A summary of all the consultation undertaken will be presented in the Offshore EIA Report. Combined Public exhibitions will be held for the onshore and offshore projects elements to give a full understanding of the development.

9.6 NEXT STEPS

The Applicant will participate in pre-application consultation with key stakeholders in preparation for commencing technical reporting, assessment and preparation of the Offshore EIA Report.

MAKING COMPLEX EASY

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ANNEX A SCOPING ROAD MAP

A.1 INTRODUCTION

As outlined in section 5.3.2, the Offshore Scoping Road Map for the Proposed Development will be used as a tool to facilitate early engagement with stakeholders and subsequent engagement throughout the pre-application phase, including consultation on the developing baseline characterisation and development of the final application documentation. This Offshore Scoping Road Map will be an integral part of consultation with stakeholders throughout the pre-application phase. The Offshore Scoping Road Map is a 'live' document which will be used to reach and record further points of agreement on scoping impacts out of the assessment, and/or agreeing the level of assessment which will be presented for impacts, so that the focus in the EIA submission documents is on likely significant effects.

The information included within the Offshore Scoping Road Map (Table A 1) includes:

- expected receptors: Receptors expected to occur within the zone of influence, based on an initial desktop review;
- sensitivity and evidence: Brief review of the sensitivity of the relevant receptors and evidence available on potential effects;
- baseline data sources: Description of data and information to be used to inform the baseline characterisation. See further information below;
- enhancement, mitigation and monitoring: Potential measures which could be applied to remove significant effects; and
- approach to EIA: Briefly describes whether impacts are scoped into the EIA, scoped out (with the relevant justification) or whether the impact has the potential to be scoped out at a later date.

At scoping the purpose of the Offshore Scoping Road Map is to separate the key impacts which will be considered in detail in the final application from those which are less important (i.e. not likely to influence the decision to consent the project), with three broad categories:

- impacts scoped in: For the key impacts which will be considered in the EIA. Where appropriate, a brief outline of how these impacts will be assessed is provided.
- impacts scoped out: The Road Map will provide justification for scoping impacts out of assessment in the EIA.
- scoped in, with the potential to be scoped out: This category is for impacts which are not likely to lead to a significant effect on a receptor, but for which there is not sufficient justification available at the time of drafting this Offshore Scoping Report to remove the impact entirely.

The conclusion of the scoping stage assessments for the Proposed Development are presented in Table A 1 below

Table A 1: Scoping Road Map.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Physical Processes					
Increase in suspended sediments due to construction (and decommissioning) related activities such as possible seabed preparation activities if required, wind turbine foundation installation or array cable installation and the potential impact to physical features within the array area – construction and decommissioning phases.	Benthic subtidal and intertidal ecology receptors, physical features and morphology.	There is potential for increased suspended sediment concentrations and associated deposition associated with seabed preparation activities, foundation installation and cable installation activities. This assessment will consider the potential impacts arisings due to changes in SSC and deposition, to physical features and morphology (e.g. bank morphology). Elevations in SSC and subsequent deposition of disturbed sediments also have the potential to result in adverse and indirect impacts on a variety of receptor groups which lie in other Offshore EIA Report topics, such as benthic subtidal and intertidal ecology, fish and shellfish ecology, marine mammals, marine archaeology and infrastructure and other users. For these receptor groups, a significance of effect will not be assigned within the physical processes assessment.	Data collected during the 2019 geophysical survey campaign and to be collected during the 2020 geotechnical survey campaign will provide data to support the development of the physical processes numerical modelling. Data collected from previous metocean surveys may also be utilised.	N/A	Scoped in – numerical modelling will be conducted to provide an overview of the potential impact.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
		There is potential for increased suspended sediment concentrations and associated deposition associated with decommissioning activities. Effects are likely to be similar to those described during the construction phase.			
Increase in suspended sediments due to construction (and decommissioning) related activities such as seabed preparation activities and export cable installation/repair, and the potential impact to physical features within the Proposed Development export cable corridor– construction and decommissioning phases.	Benthic subtidal and intertidal ecology receptors.	Sediment disturbance may arise from export cable installation. This assessment will consider the potential impacts arisings due to changes in SSC and deposition, to physical features and morphology (e.g. bank morphology). Elevations in SSC and subsequent deposition of disturbed sediments have the potential to result in adverse and indirect impacts on a variety of receptor groups, which are listed above. There is potential for increased suspended sediment concentrations and associated deposition associated with decommissioning activities. Effects are likely to be similar to those described during the construction phase.	As above.	N/A	Scoped in – numerical modelling will be conducted to provide an overview of the potential impact.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Impacts to hydrodynamics, sediment transport and beach morphology due to cable installation/repair activities and potential impact to physical features at landfall – Construction and decommissioning phases.	Benthic subtidal and intertidal ecology receptors.	Cable installation activities at the landfall have the potential to impact on the physical environment at the shoreline. Decommissioning activities at the landfall have the potential to impact on the physical environment at the shoreline.	As above.	N/A	Scoped in – numerical modelling will be conducted to provide an overview of the potential impact. The potential for impacts relating to the decommissioning of cables at the landfall will be assessed as part of the cable landfall desktop analysis described in relation to the construction and operation phases. The potential for impacts relating to the decommissioning of cables at the landfall will be assessed as part of the cable landfall desktop analysis described in relation to the construction and operation phases.
Impacts to the wave regime due to presence of infrastructure in the physical processes study area, and the associated potential impacts along adjacent shorelines – operation and maintenance phase.	Benthic subtidal and intertidal ecology receptors.	The interaction of the wind turbine foundations and associated infrastructure and the wave regime will result in a reduction to wave energy. This in turn has the potential to impact upon adjacent coastlines and offshore physical features and morphology.	As above.	N/A	Scoped in – numerical modelling will be conducted to provide an overview of the potential impact. Potential impacts in relation to decommissioning of cables at the landfall will be assessed as part of the cable landfall desktop analysis.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Impacts to tidal regime due to presence of infrastructure in the physical processes study area and associated potential impacts to physical features and morphology (e.g. bank morphology) – operation and maintenance phase.	Benthic subtidal and intertidal ecology receptors.	The interaction of the wind turbine foundations and associated infrastructure and the tidal regime will result in a change to sediment transport regimes. This in turn has the potential to impact upon adjacent coastlines and offshore physical features and morphology.	As above.	N/A	Scoped in – numerical modelling will be conducted to provide an overview of the potential impact.
Impacts to sediment transport and sediment transport pathways due to presence of infrastructure in the physical processes study area and associated potential impacts to physical features and morphology (e.g. bank morphology)– operation and maintenance phase.	Benthic subtidal and intertidal ecology receptors.	Foundations within the array may interrupt sediment transport pathways. In addition, cable protection may result in localised secondary scour or pose an obstacle to sediment transport pathways.	As above.	N/A	Scoped in – numerical modelling will be conducted to provide an overview of the potential impact.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Impacts to beach morphology, hydrodynamics and sediment transport (littoral drift) due to operation and maintenance activities and potential impact to physical features at landfall – operation and maintenance phase.	Benthic subtidal and intertidal ecology receptors.	Should the cable become exposed at the landfall, there is potential for impact on local coastal processes.	As above.	N/A	Scoped in – numerical modelling will be conducted to provide an overview of the potential impact.
Increase in suspended sediments due to operation and maintenance related activities such as cable repairs, and the potential impact to physical features within the array area – operation and maintenance phase.	Benthic subtidal and intertidal ecology receptors.	Sediment disturbance may arise from maintenance activities such as array cable repairs within the array area. This assessment will consider the potential impacts arisings due to changes in SSC and deposition, to physical features and morphology (e.g. bank morphology). Elevations in SSC and subsequent deposition of disturbed sediments have the potential to result in adverse and indirect impacts on a variety of receptor groups, as listed for the construction phase.	As above.	N/A	Scoped in – numerical modelling will be conducted to provide an overview of the potential impact.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Increase in suspended sediments due to operation and maintenance related activities such as cable repairs, and the potential impact to physical features within the proposed export cable corridor – operation and maintenance phase.	Benthic subtidal and intertidal ecology receptors.	Sediment disturbance may arise from maintenance activities such as export cable repairs. This assessment will consider the potential impacts arisings due to changes in SSC and deposition, to physical features and morphology (e.g. bank morphology). Elevations in SSC and subsequent deposition of disturbed sediments have the potential to result in adverse and indirect impacts on a variety of receptor groups, as listed for the construction phase.	As above.	N/A	Scoped in – numerical modelling will be conducted to provide an overview of the potential impact.
Scour of seabed sediments.	Benthic subtidal and intertidal ecology receptors.	There is the potential for scouring of seabed sediments to occur due to interactions between metocean regime (wave, sand and currents) and foundations or other seabed structures. This scouring can develop into depressions around the structure.	N/A	The use of scour protection around offshore structures and foundations. Development and adherence to a Cable Plan.	Scoped out - The Applicant has proposed the use of scour protection which will therefore reduce the risk of seabed sediment scour.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Subsea Noise					
Increased subsea noise can impact sensitive ecological receptors due to impact piling, use of construction or decommissioning vessels and cable installation and decommissioning activities.	Impacts are assessed in marine mammal, fish and shellfish ecology, commercial fisheries and infrastructure and other users chapters.	See marine mammal, fish and shellfish ecology, commercial fisheries and infrastructure and other users chapters.	Desktop data sources and bathymetry data.	Noise mitigation including piling ramp-up and slow start.	Scoped in – noise modelling will be carried out and the potential effects on identified receptors will be assessed within the relevant technical chapters of the Offshore EIA Report (marine mammals, fish and shellfish, commercial fisheries and infrastructure and other users).
Airborne Noise					
Change in noise level associated with the construction of the Proposed Development - Human Receptors	Human receptors landward of MLWS	There is the potential for activities associated with the construction of the Proposed Development to temporarily increase the noise levels experienced during offshore and nearshore construction activities.	Baseline survey measurements will be conducted in accordance with current guidance including BS 4142:2014+A1:2019 Method for rating and assessing industrial and commercial sound, and BS 7445-2:1991 Description and measurement of environmental noise.	N/A	Scoped in.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Ground-borne vibration as a result of the construction works which may cause disturbance to human receptors.	Human receptors landward of MLWS	There is the potential for activities associated with the construction of the Proposed Development to result in ground-borne vibration which may lead to perceptible levels of vibration at nearby receptors. At higher levels this can cause disturbance to residents.	As above.	N/A	Scoped in.
Noise and vibration during offshore and nearshore construction activities may cause disturbance to ecological / geological receptors	Ecological / geological receptors landward of MLWS.	There is the potential for activities associated with the construction of the Proposed Development to result in noise and vibration disturbance to wildlife, including protected species and designated sites. Vibration impacts may cause disturbance to designated geological sites such as the Barns Ness Coast SSSI.	As above.	N/A	Scoped in.
Piling activities will generate construction noise that may impact recreational and leisure receptors in the nearshore environment – construction phase.	Recreational users of the nearshore environment.	Nearshore construction activities will include cable laying, which will be conducted via a Cable Lay Vessel with support via a ROV.	N/A	N/A	Scoped out - It is unlikely that the construction activities associated with the Proposed Development will significantly affect these receptors. Construction activities within the offshore area are not predicted to affect these activities due to the offshore location of the project.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Piling activities will generate construction noise that may exceed guideline levels for commercial fishing vessels and commercial shipping traffic – construction phase.	Commercial fishing vessels and commercial shipping traffic.	N/A	N/A	N/A	Scoped out - The maximum scenario distance of the receptors from the nearest turbine/project boundary is proposed as 500 m for commercial fishing vessel and 1 nm for commercial shipping traffic, based on navigational safety guidelines. The effect of airborne noise from piling on receptors onboard commercial fishing vessels and commercial ships will be negligible.
Piling activities will generate construction noise that may exceed guideline levels for manned gas platforms – construction phase.	Manned gas platforms.	N/A	N/A	N/A	Scoped out - The nearest gas platform with accommodation, to the Proposed Development, is located greater than 65 km away. Given this distance, the effect of operational noise on receptors onboard gas accommodation platforms has therefore been scoped out of this assessment.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Airborne noise associated with the operation and maintenance of the Proposed Development may impact recreational and leisure receptors in the nearshore environment – operation and maintenance phase.	Recreational users of the nearshore environment.	N/A	N/A	N/A	Scoped out - It is unlikely that there will be airborne noise effects from the operational wind turbines on nearshore recreational and leisure noise sensitive receptors due to the low level of noise associated within this phase of the project. Any maintenance activities (e.g. cable inspection, repair or reburial) will be expected to be of low frequency along the intertidal sections of the proposed export cable corridor.
Airborne noise may exceed guideline levels for commercial fishing vessels and commercial shipping traffic - operation and maintenance phase.	Commercial fishing vessels and commercial shipping traffic.	N/A	N/A	N/A	Scoped out - The maximum scenario distance of the receptors from the nearest turbine/project boundary is proposed as 500 m for commercial fishing vessel and 1 nm for commercial shipping traffic based on navigational safety guidelines. The effect of airborne noise from operation and maintenance activities receptors onboard commercial fishing vessels and commercial ships will therefore be negligible.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Airborne noise may exceed guideline values for offshore accommodation platforms - operation and maintenance phase.	Manned gas platforms.	N/A	N/A	N/A	Scoped out - The nearest gas platform with accommodation, to the Proposed Development, is located greater than 65 km away.
Airborne noise and vibration impacts to human receptors – operation and maintenance phase.	Human receptors landward of MLWS.	N/A	N/A	N/A	Scoped out - There are unlikely to be any noise and vibration impacts relating to the operational phase of the wind turbines due to the very large distance between the nearest wind turbines and the shore (approximately 39.2 km) and the low level of noise associated within this phase of the project.
Decommissioning activities will generate decommissioning noise that may impact recreational and leisure receptors in the nearshore environment.	Recreational users of the nearshore environment.	N/A	N/A	N/A	Scoped out - Nearshore decommissioning activities are unlikely to affect recreational and leisure receptors due to the unexpected requirement for high-level emitting activities near to shore.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Airborne noise may exceed guideline levels for commercial fishing vessels and commercial shipping traffic.	Commercial fishing vessels and commercial shipping traffic.	N/A	N/A	N/A	Scoped out - The maximum distance of the receptors from the nearest turbine/project boundary is proposed as 500 m for commercial fishing vessel and 1 nm for commercial shipping traffic based on navigational safety guidelines. The effect of airborne noise from decommissioning activities to receptors onboard commercial fishing vessels and commercial ships will therefore be negligible.
Airborne noise may exceed guideline values for offshore accommodation platforms.	Manned gas platforms.	N/A	N/A	N/A	Scoped out - Decommissioning activities will be similar to construction activities with the exception that piling operations will not be required. Given that the level of noise generated from the decommissioning will be less than the construction phase, the effect of airborne noise from piling for receptors onboard gas accommodation platforms has been scoped out of this assessment.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Airborne noise and vibration impacts to human receptors – decommissioning phase.	Human receptors landward of MLWS.	N/A	N/A	N/A	Scoped out - The detail and scope of the decommissioning works would be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the regulator. A decommissioning plan would be provided.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Air Quality					
Atmospheric emissions from vessel and helicopter movements.	Users of the marine environment.	N/A	N/A	N/A	Scoped out - Atmospheric emissions from the Proposed Development is likely to be from the fuel used to power vessels and helicopters used in the construction of the Proposed Development. Taking into account the dispersive nature of the offshore environment, the distance of Proposed Development from any static sources of potential pollutants and the relatively small potential contribution that the Proposed Development may make to emissions when compared with the total vessel and helicopter movements in the North Sea, it is considered highly unlikely that concentrations of potential atmospheric pollutants will be at levels of environmental concern within Proposed Development.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Generation of dust and particulates at the selected landfall site (e.g. from earth moving, directional drilling, open cut trenches)) have the potential to have an adverse (smothering) impact on ecological receptors.	Ecological receptors landward of MHWS	N/A	N/A	Best-practice measures included in the dust and air quality management plan within the CoCP.	Scoped out – The Barns Ness SSSI is within 50 m of the landfall, however it is considered unlikely that areas of these habitats below MHWS would be sensitive to dust deposition. Further, best-practice measures included in the dust and air quality management plan within the CoCP will provide the necessary prevention and mitigation of potential impacts such that the effects will be negligible.
The generation of dust and particulates at the selected landfall site have the potential to affect human health and cause nuisance as a result of dust soiling of surfaces at residential properties	Human receptors landward of MHWS.	N/A	N/A	N/A	With less than 10 properties within 350 m of landfall options, the overall sensitivity to human health impacts considered to be low. The low sensitivity with the low magnitude of dust emissions during the offshore construction phase results in a negligible risk of dust impacts on human health.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Exhaust emissions from offshore vessels used in the construction / operation and maintenance and decommissioning phase having the potential to increase local ambient concentrations of Sulphur Dioxide (SO_2), NO_2, PM_{10} and $PM_{2.5}$ and impact human health	Human receptors landward of MHWS.	N/A	N/A	N/A	Engine exhausts from offshore vessels associated with the construction, operation and maintenance, and decommissioning phases would contribute, at a small scale, to atmospheric emissions from existing shipping traffic in the area. It is considered that associated atmospheric emissions of infrequent vessel movements associated with the Proposed Development would be negligible in comparison to the total shipping activity in the area.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Benthic Ecology					
Temporary habitat loss/disturbance – construction and decommissioning phases.	All benthic IEFs as identified through site-specific benthic surveys.	There is potential for temporary, direct habitat loss and disturbance as a result of site preparation activities in advance of installation activities, cable installation activities (including pre-cabling seabed clearance and anchor placements), and placement of spud-can legs from jack-up operations.	Benthic subtidal and intertidal surveys are planned to collect site-specific data in order to characterisation the baseline of the benthic subtidal and intertidal ecology study area. Details of the scope of these surveys are presented in section 7.1.3.2.	The development of, and adherence to, an appropriate CoCP; The development of, and adherence to, Environmental Management Plans, including Marine Pollution Contingency Plans and Invasive Non-Indigenous Species Management Plan; and Development of, and adherence to, a Decommissioning Plan.	Scoped in.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Increased suspended sediment concentrations and associated deposition – construction and decommissioning phases.	All benthic IEFs as identified through site-specific benthic surveys.	Sediment disturbance arising from construction activities (e.g. foundation and cable installation, and seabed preparation works) may result in indirect impacts on benthic communities as a result of temporary increases in suspended sediment concentrations (SSCs) and associated sediment deposition (i.e. smothering effects). Changes in SSCs can impact benthic receptors through water clarity due to change in suspended solids, and light due to smothering and siltation rate changes.	As above.	As above.	Scoped in - The outputs of numerical modelling undertaken for the physical processes assessment will inform this impact assessment.
Long-term subtidal habitat loss – operation and maintenance phase.	All benthic IEFs as identified through site-specific benthic surveys.	There is the potential for long-term habitat loss to occur directly under all foundation structures and associated scour protection, and under any cable protection required along the inter-array and offshore export cables.	As above.	As above.	Scoped in.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Temporary subtidal habitat loss/disturbance.	All benthic IEFs as identified through site-specific benthic surveys.	Temporary habitat loss/disturbance may occur during the operational and maintenance phase as a result of maintenance operations (e.g. cable repair/reburial, use of jack-up vessels to facilitate wind turbine component repairs etc.). The impacts associated with these operations are likely to be similar in nature to those associated with the construction phase although of reduced magnitude.	As above.	As above.	Scoped in.
Colonisation of hard structures.	All benthic IEFs as identified through site-specific benthic surveys.	Artificial structures placed on the seabed (i.e. foundations and scour/cable protection) in the offshore environment are expected to be colonised by a range of marine organisms leading to localised increases in biodiversity. These structures may also facilitate the spread of marine invasive and non-native species.	As above.	As above.	Scoped in.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Changes in physical processes.	All benthic IEFs as identified through site-specific benthic surveys.	The presence of foundation structures, associated scour protection and cable protection may introduce localised changes to the tidal flow and wave climate, resulting in potential changes to the sediment transport pathways and associated effects on benthic ecology.	As above.	As above.	Scoped in - the outputs of numerical modelling undertaken for physical processes will inform this impact assessment.
Removal of hard substrates – decommissioning phase.	All benthic IEFs as identified through site-specific benthic surveys.	The removal of foundations and any scour/cable protection during decommissioning has the potential to lead to loss of species/habitats colonising these structures.	As above.	As above.	Scoped in.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Accidental pollution during construction, operation and maintenance and decommissioning.	All benthic IEFs as identified through site-specific benthic surveys.	There is a risk of pollution being accidentally released during the construction, operational and maintenance and decommissioning phases from sources including vessels/vehicles and equipment/machinery.	N/A	N/A	Scoped out - the risk of accidental pollution events is managed by the implementation of measures set out in standard post consent plans, e.g. Environmental Management Plans, including Marine Pollution Contingency Plans. These plans include planning for accidental spills, address all potential contaminant releases and include key emergency contact details. Therefore, the likelihood of an accidental spill occurring is very low and in the unlikely event that such events occur, the magnitude of these will be minimised through measures such as marine pollution contingency planning.
Impacts from release of sediment bound contaminants.	All benthic IEFs as identified through site-specific benthic surveys.	Seabed disturbance associated with construction, maintenance and decommissioning activities (e.g. foundation and cable installation) could lead to the remobilisation of sediment-bound contaminants that may result in harmful and adverse effects on benthic communities.	Site specific sediment chemistry sampling will be undertaken across the array area and proposed export cable corridor during subtidal sampling to provide evidence in support of this proposal.	N/A	Scoped out - due to the limited historic oil and gas activities in the vicinity of the Proposed Development, the nature of the sediments present (i.e. low levels of fines) and the large distance from shore which suggests a limited input from terrestrial sources, the risk of sediment bound contaminants being present in concentrations likely to be harmful to benthic receptors is considered to be low.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Fish and Shellfish Ecology					
Temporary habitat loss and disturbance – construction and decommissioning phases.	All fish and shellfish IEFs as identified through site-specific surveys and analysis of desktop data sources.	There is potential for temporary, direct habitat loss and disturbance due to cable laying operations (including anchor placements), spud-can leg impacts from jack-up operations and seabed preparation works for gravity base foundations.	Desktop data sources and epibenthic beam trawl	The development of, and adherence to, an appropriate CoCP. The development of, and adherence to, Environmental Management Plans, including Marine Pollution Contingency Plans. Development of, and adherence to, a Decommissioning Plan.	Scoped in.
Underwater noise – construction and decommissioning phases.	All fish and shellfish IEFs as identified through site-specific surveys and analysis of desktop data sources.	There is potential for mortality, injury and/or distance to sensitive fish and shellfish species as a result of construction and decommissioning activities such as pile-driving and vessel noise.	As above.	Piling ramp-up and soft-start measures Development of, and adherence to, a Decommissioning Plan.	Scoped in - Modelling undertaken for section 6.2 will be used to inform the assessment of underwater noise impacts to fish and shellfish.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Increased suspended sediment concentrations and associated sediment deposition – construction and decommissioning phases.	All fish and shellfish IEFs as identified through site-specific surveys and analysis of desktop data sources.	There is potential for an increase in suspended sediments and associated deposition during construction and decommissioning activities such as cable installation and seabed preparation.	As above.	The development of, and adherence to, an appropriate CoCP. The development of, and adherence to, Environmental Management Plans, including Marine Pollution Contingency Plans. Development of, and adherence to, a Decommissioning Plan.	Scoped in - The outputs of numerical modelling undertaken for the physical processes assessment will inform this impact assessment.
Long-term habitat loss – operation and maintenance phase.	All fish and shellfish IEFs as identified through site-specific surveys and analysis of desktop data sources.	The presence of wind turbines and scour/cable protection will result in the loss of habitat.	As above.	As above.	Scoped in.
Temporary habitat loss – operation and maintenance phase.	All fish and shellfish IEFs as identified through site-specific surveys and analysis of desktop data sources.	There is potential for temporary, direct habitat loss and disturbance due to operations to remove array and export cables, and jack-up operations to remove foundations, resulting in potential effects on fish and shellfish ecology.	As above.	As above.	Scoped in.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Electromagnetic Fields (EMF) from subsea electrical cabling – operation and maintenance phase.	All fish and shellfish IEFs as identified through site-specific surveys and analysis of desktop data sources.	EMF generated through the subsea electrical cabling may affect fish and shellfish prey/predator relationship by inhibiting/interfering with the detection of EMF behaviours.	As above.	As above.	Scoped in.
Accidental release of pollutants – all phases.	N/A	The impact of pollution including accidental spills and contaminant releases associated with the construction of infrastructure and use of supply/service vessels may lead to direct mortality fish and shellfish receptors or a reduction in species' survival rates.	N/A	N/A	Scoped out – the risk of such events is managed by the implementation of measures set out in standard post consent plans, e.g. Environmental Management Plans, including Marine Pollution Contingency Plans. These plans include planning for accidental spills, address all potential contaminant releases and include key emergency contact details. Therefore, the likelihood of an accidental spill occurring is very low and in the unlikely event that such events occur, the magnitude of these will be minimised through measures such as marine pollution contingency planning.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Underwater noise from wind turbine operation and vessels – operation and maintenance phase.	N/A	There is potential for distance to sensitive fish and shellfish species as a result of operational noise.	N/A	N/A	Scoped out – Noise generated by operational wind wind turbines is of a very low frequency and low sound pressure level (Andersson *et al*., 2011). Studies have found that sound levels are only high enough to possibly cause a behavioural reaction within metres from a wind turbine and therefore such levels are not considered to have potentially effects on fish and shellfish receptors.
Colonisation of hard structures - operation and maintenance phase.	N/A	There is the potential for the introduction of subsurface structures to provide suitable substrate for colonisation by marine species which may lead to effects on fish and shellfish receptors by creating reef habitat.	N/A	N/A	Scoped out - the increase in surface area suitable for colonisation would be extremely small in the context of hard and soft sediment habitats in the fish and shellfish study area and therefore this would not have a potentially significant effect on the diversity or population levels.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Marine Mammals					
Injury and disturbance from piling – construction phase.	Harbour porpoise, white-beaked dolphin, bottlenose dolphin, minke whale, grey seals, harbour seals.	Impact piling during construction may result in hearing damage/auditory injury (PTS) or behavioural disturbance/displacement of marine mammals	Desktop data sources. Ongoing aerial surveys to obtain density estimates, where data allows, for each species within the relevant impact footprint.	Piling ramp-up and soft-start measures.	Scoped in – subsea noise modelling to be undertaken to inform assessment.
Disturbance of marine mammals from vessel use and other construction activities – construction phase.	Harbour porpoise, white-beaked dolphin, bottlenose dolphin, minke whale, grey seals, harbour seals.	The impact of other construction related activities (e.g. dredging, trenching, rock placement) and associated vessel use may result in behavioural disturbance/ displacement of marine mammals including the potential for landfall activities to result in disturbance to seals at nearby haul-out sites.	As above.	Vessel Management Plan.	Scoped in.
Increased vessel may result in collision with marine mammals – all phases.	Harbour porpoise, white-beaked dolphin, bottlenose dolphin, minke whale, grey seals, harbour seals.	Increased vessel traffic during construction, operation and maintenance, and decommissioning activities may result in collisions with marine mammals.	As above.	Vessel Management Plan.	Scoped in.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Changes in prey availability – all phases.	Harbour porpoise, white-beaked dolphin, bottlenose dolphin, minke whale, grey seals, harbour seals.	Changes in prey abundance and distribution resulting from construction, operation and maintenance, and decommissioning activities may impact on the ability of marine mammals to forage in the area.	As above.	N/A	Scoped in.
Injury and disturbance from operation and maintenance activities.	Harbour porpoise, white-beaked dolphin, bottlenose dolphin, minke whale, grey seals, harbour seals.	Increased vessel traffic and associated activities during operation and maintenance activities may result in disturbance of marine mammals	As above.	N/A	Scoped in.
Injury and disturbance from decommissioning activities.	Harbour porpoise, white-beaked dolphin, bottlenose dolphin, minke whale, grey seals, harbour seals.	Underwater noise generated during decommissioning activities may result in hearing damage/auditory injury or disturbance of marine mammals.	As above.	N/A	Scoped in.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Accidental pollution.	N/A	The impact of pollution including accidental spills and contaminant releases associated with the construction of infrastructure and use of supply/service vessels may lead to direct mortality of marine mammals or a reduction in prey availability, either of which may affect species' survival rates.	N/A	N/A	Scoped out - with implementation of an appropriate pollution prevention plan, and based on evidence from other consented offshore wind farms, significant impact within the equivalent extent of a wind farm's array plus buffer area is considered very unlikely to occur, and a major incident that may impact any species at a population level is considered very unlikely.
Changes in water clarity.	N/A	Disturbance to water quality as a result of construction operations can have both direct and indirect impacts on marine mammals. Indirect impacts would include effects on prey species (which is scoped in and is listed in Table 7.13). Direct impacts include the impairment of visibility and therefore foraging ability which might be expected to reduce foraging success.	N/A	N/A	Scoped out - Marine mammals are well known to forage in tidal areas where water conditions are turbid and visibility conditions poor, therefore low light levels, turbid waters and suspended sediments are unlikely to negatively impact marine mammal foraging success. Whilst elevated levels of SSC arising during construction of the offshore wind farm may decrease light availability in the water column and produce turbid conditions, the maximum impact range is expected to be localised with sediments rapidly dissipating over one tidal excursion.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Operational noise.	N/A	Operational noise may result in behavioural disturbance/displacement of marine mammals.	N/A	N/A	Scoped out - The MMO (2014) review of post-consent monitoring at offshore wind farms found that available data on the operational wind turbine noise, from the UK and abroad, in general showed that noise levels from operational wind turbines are low and the spatial extent of the potential impact of the operational wind turbine noise on marine receptors is generally estimated to be small, with behavioural response only likely at ranges close to wind turbines. In addition, previous modelling by Subacoustech (e.g. Hornsea Project Three EIA) concluded that underwater noise during the operational phase is expected to have a negligible range of influence on any marine receptors.
Ornithology					
Temporary habitat loss/ disturbance – construction and decommissioning phases.	All ornithology receptors identified as IEFs.	Presence of vessels and construction works may disturb birds from foraging areas in the short-term.	Baseline surveys and data analysis described in section 7.4.1.	Cable landfall avoids designated sites.	Scoped in.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Indirect impacts – construction and decommissioning phases.	All ornithology receptors identified as IEFs.	Reduction or disruption to prey availability may cause displacement from the area or reduced energy intake, affecting productivity or survival in the short-term.	See section 7.1.7 for assessment of effects on fish and shellfish ecology.	As described in section 7.2.5 for fish and shellfish ecology.	Scoped in.
Collision – operation and maintenance phase.	Gannet and kittiwake.	Additional mortality may cause a decrease in seabird populations.	Baseline surveys and data analysis described in section 7.4.1.	Final design may avoid areas of consistently and significantly high seabird sensitivity.	Scoped in - Collision risk modelling and population viability analysis may be required for some species.
Disturbance/displacement – operation and maintenance phase.	Kittiwake, guillemot, razorbill and puffin.	Presence of operational wind turbines and associated maintenance activities may disturb birds and displace them from foraging/ resting areas over the long-term.	Baseline surveys and data analysis described in section 7.4.1.	Final design may avoid areas of consistently and significantly high seabird sensitivity.	Scoped in - displacement matrices and population viability analysis may be required for some species.
Barrier to movement – operation and maintenance phase.	All ornithology receptors identified as IEFs.	Presence of operational wind turbines may result in additional energy expenditure as migrating or commuting birds are forced to fly longer distances around the wind farm over the long-term.	Baseline surveys and data analysis described in section 7.4.1.	N/A	Scoped in - no specific modelling required for this impact, although quantification of impact may be integrated with disturbance/ displacement.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Indirect impacts – operation and maintenance phase.	All ornithology receptors identified as IEFs.	Reduction or disruption to prey availability may cause displacement from the area or reduced energy intake, affecting productivity or survival in the long-term.	See section 7.1.7 for assessment of effects on fish and shellfish ecology.	As described in section 7.2.5 for fish and shellfish ecology.	Scoped in
Pollution impacts – all phases.	All ornithology receptors identified as IEFs.	N/A	N/A	Pollution Prevention Plan.	Scoped out - embedded and applied mitigation implemented during construction will avoid the risk of significant pollution incidence and as a result seabirds and shorebirds are extremely unlikely to be adversely affected by any such incident.
Disturbance from offshore export cable construction – construction phase.	Kittiwake, guillemot, razorbill and puffin, IEFs identified in the proposed export cable corridor.	It is extremely unlikely that there would be any significant disturbance to seabirds as a result of the construction process for the proposed export cable corridor. Installation is likely to be of short duration, temporary in any location at a time and therefore disturbance will be localised around the source.	N/A	VMP	Scoped out - it is considered extremely unlikely that there would be any significant disturbance to seabirds as a result of the construction process for the offshore proposed export cable corridor. Installation is likely to be of short duration, temporary in any location at a time and therefore disturbance will be localised around the source.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Commercial Fisheries					
Temporary loss or restricted access to fishing grounds – all phases.	Commercial fisheries receptors identified through the EIA process.	The presence of project infrastructure may result in a loss or restricted access to fishing grounds during the operation and maintenance phase. The implementation of safety zones around major maintenance activities may also result in temporary localised loss or restricted access to grounds.	Analysis of fisheries data and information. Consultation with fisheries stakeholders.	Ongoing consultation with the fishing industry and appointment of a FLO; Development of a FMMS; Adherence to best practice guidance with regards to fisheries liaison (e.g. FLOWW, 2014; 2015); Timely and efficient distribution of NtM, Kingfisher notifications and other navigational warnings of the position and nature of works associated with the Proposed Development; Use of guard vessels and OFLOs, as appropriate; Implementation of a VMP; Notification to the UKHO of the proposed works to	Scoped in.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
				facilitate the promulgation of maritime safety information and updating of nautical charts and publications; and Undertaking of post-lay and cable burial inspection surveys.	
Displacement of fishing activity into other areas – all phases.	Commercial fisheries receptors identified through the EIA process.	Fishing activity may be displaced to other areas as a result of loss of grounds/restricted access to fishing grounds during the operation and maintenance phase.	Analysis of fisheries data and information. Consultation with fisheries stakeholders.	As above.	Scoped in.
Interference with fishing activity – all phases.	Commercial fisheries receptors identified through the EIA process.	There may be potential for transiting maintenance vessels to cause interference (conflict) with fishing activities/fishing gears.	Analysis of fisheries data and information. Consultation with fisheries stakeholders.	As above.	Scoped in.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Increased steaming times – all phases.	Commercial fisheries receptors identified through the EIA process.	The presence of project infrastructure and the implementation of safety zones around major maintenance activities may result in increases in steaming times/routes to/from fishing grounds.	Analysis of fisheries data and information. Consultation with fisheries stakeholders. Outcomes of the shipping and navigation impact assessment.	As above.	Scoped in.
Safety issues for fishing vessels – all phases.	Commercial fisheries receptors identified through the EIA process.	Navigational safety risks (e.g. collision/allision) may arise as a result of increased vessel traffic associated with maintenance works and the presence of project infrastructure (see section 8.2.6). In addition to navigational safety risks, in the specific case of vessels engaged in fishing, there may be additional risks such as the potential for snagging with project infrastructure and the presence of objects/obstacles on the seabed.	Analysis of fisheries data and information. Consultation with fisheries stakeholders. Outcomes of the shipping and navigation impact assessment.	As above.	Scoped in - The outputs of the Shipping and Navigation assessment will be reviewed to inform this assessment.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Potential impacts on commercially exploited species – all phases.	Commercial fisheries receptors identified through the EIA process.	As described in Fish and Shellfish Ecology.	As described in Fish and Shellfish Ecology.	As above.	As described in Fish and Shellfish Ecology.
Loss or restricted access to fishing grounds – operation and maintenance phase.	Commercial fisheries receptors identified through the EIA process.	The presence of project infrastructure may result in a loss or restricted access to fishing grounds during the operation and maintenance phase. The implementation of safety zones around major maintenance activities may also result in temporary localised loss or restricted access to grounds.	Analysis of fisheries data and information. Consultation with fisheries stakeholders.	As above.	Scoped in.
Shipping and Navigation					
Vessel displacement – construction and decommissioning phases.	All shipping and navigation receptors.	Vessels may be displaced from their existing routes due to construction activities associated with the Proposed Development.	A dedicated vessel traffic survey will be undertaken to characterise vessel movements in the area.	Promulgation of information as required (e.g. NtM, Kingfisher Bulletin). Buoyed construction area in agreement with NLB.	Scoped in - Future traffic pattern will be modelled.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Increased vessel to vessel collision risk between a third-party vessel and a project vessel – construction and decommissioning phases.	All shipping and navigation receptors.	The presence of project vessels during construction may increase the likelihood of vessel to vessel encounters and subsequently increase the collision risk between third-party and vessels associated with the Proposed Development.	A dedicated vessel traffic survey will be undertaken to characterise vessel movements in the area.	Promulgation of information as required (e.g. NtM, Kingfisher Bulletin). Marine coordination and communication to manage project vessel movements. Compliance of all project vessels with international marine regulations as adopted by the Flag State, notably COLREGs (IMO, 1974) and SOLAS (IMO, 1974). Application for safety zones during construction of up to 500 m.	Scoped in.
Increased vessel to vessel collision risk between third party vessels – construction and decommissioning phases.	All shipping and navigation receptors.	Displaced vessels may lead to increased traffic densities in certain areas and a subsequent increase in collision risk between third party vessels.	A dedicated vessel traffic survey will be undertaken to characterise vessel movements in the area.	Promulgation of information as required (e.g. NtM, Kingfisher Bulletin).	Scoped in - Modelling of collision risk will be carried out for the O & M phase. Any differences during construction will be discussed.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Vessel to structure allision risk – construction and decommissioning phases.	All shipping and navigation receptors.	Partially complete and completed structures within the array area could create an allision risk (powered or drifting) to passing traffic.	A dedicated vessel traffic survey will be undertaken to characterise vessel movements in the area.	Appropriate marking on Admiralty charts. Promulgation of information as required (e.g. NtM, Kingfisher Bulletin). Buoyed construction area in agreement with NLB. Application for safety zones during construction of up to 500 m. Marking and lighting of the site in agreement with NLB and in line with IALA Recommendation O-139 (IALA, 2013). Guard vessel(s) as required by risk assessment.	Scoped in - Modelling of collision risk will be carried out for the operation and maintenance phase. Any differences during construction will be discussed.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Reduced access to local ports – construction and decommissioning phases.	All shipping and navigation receptors.	Access to local ports may be impacted due to construction activities associated with the Proposed Development.	A dedicated vessel traffic survey will be undertaken to characterise vessel movements in the area.	Marine coordination and communication to manage project vessel movements. Compliance of all project vessels with international marine regulations as adopted by the Flag State, notably COLREGs (IMO, 1974) and SOLAS (IMO, 1974).	Scoped in.
Commercial traffic displacement – operation and maintenance phase.	All shipping and navigation receptors.	Commercial vessels may be displaced from their existing routes due to the presence of the Proposed Development.	A dedicated vessel traffic survey will be undertaken to characterise vessel movements in the area.	Promulgation of information as required (e.g. NtM, Kingfisher Bulletin).	Scoped in – maximum adverse scenario deviated routes shall be presented, with input of operators and consideration of other offshore structures, to show how the routes will be affected by the Proposed Development.
Fishing vessel and recreational vessel displacement – operation and maintenance phase.	All shipping and navigation receptors.	Fishing vessels and recreational vessels may be displaced from their existing routes due to the presence of the Proposed Development.	A dedicated vessel traffic survey will be undertaken to characterise vessel movements in the area.	Promulgation of information as required (e.g. NtM, Kingfisher Bulletin).	Scoped in.
Increased vessel to vessel collision risk between a third-party vessel and a project	All shipping and navigation receptors.	The presence of project vessels during operation may increase the likelihood of vessel to vessel encounters and subsequently increase the collision risk	A dedicated vessel traffic survey will be undertaken to characterise vessel	Promulgation of information as required (e.g. NtM, Kingfisher Bulletin).	Scoped in.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
vessel – operation and maintenance phase.		between third-party and vessels associated with the Proposed Development.	movements in the area.	Marine coordination and communication to manage project vessel movements. Compliance of all project vessels with international marine regulations as adopted by the Flag State, notably COLREGs (IMO, 1974) and SOLAS (IMO, 1974).	
Increased vessel to vessel collision risk between third-party vessels (route-based) – operation and maintenance phase.	All shipping and navigation receptors.	Displaced vessels may lead to increased traffic densities in certain areas and a subsequent increase in collision risk between third party commercial vessels.	A dedicated vessel traffic survey will be undertaken to characterise vessel movements in the area.	Promulgation of information as required (e.g. NtM, Kingfisher Bulletin). Application for safety zones during major maintenance of up to 500 m.	Scoped in - Collision risk modelling will be undertaken to assess the change in collision risk for third party vessels between pre and post offshore wind farm cases.
Increased vessel to vessel collision risk involving fishing vessels and/or recreational vessels – operation and maintenance phase.	All shipping and navigation receptors.	Displaced vessels may lead to increased traffic densities in certain areas and a subsequent increase in encounters.	A dedicated vessel traffic survey will be undertaken to characterise vessel movements in the area.	Promulgation of information as required (e.g. NtM, Kingfisher Bulletin). Application for safety zones during major maintenance of up to 500 m.	Scoped in - Change in collision rate will be estimated based on encounters assessment.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Vessel to structure allision risk for commercial vessels – operation and maintenance phase.	All shipping and navigation receptors.	Structures within the array area could create an allision risk (powered or drifting) to passing commercial vessels.	A dedicated vessel traffic survey will be undertaken to characterise vessel movements in the area.	Appropriate marking on Admiralty charts. Promulgation of information as required (e.g. NtM, Kingfisher Bulletin). Application for safety zones during periods of major maintenance of up to 500 m. Marking and lighting of the site in agreement with NLB and in line with IALA Recommendation O-139 (IALA, 2013). Guard vessel(s) as required by risk assessment.	Scoped in - Powered and drifting allision risk modelling will be undertaken.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Vessel to structure allision risk for fishing vessels in transit - operation and maintenance phase.	All shipping and navigation receptors.	Structures within the array area could create an allision risk (powered or drifting) to passing fishing vessels.	A dedicated vessel traffic survey will be undertaken to characterise vessel movements in the area.	Appropriate marking on Admiralty charts. Promulgation of information as required (e.g. NtM, Kingfisher Bulletin). Application for safety zones during periods of major maintenance of up to 500 m. Marking and lighting of the site in agreement with NLB and in line with IALA Recommendation O-139 (IALA, 2013). Guard vessel(s) as required by risk assessment.	Scoped in - Powered and drifting allision risk modelling will be undertaken.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Vessel to structure allision risk for recreational vessels - operation and maintenance phase.	All shipping and navigation receptors.	Structures within the array area could create an allision risk (powered or drifting) to passing recreational vessels.	A dedicated vessel traffic survey will be undertaken to characterise vessel movements in the area.	Appropriate marking on Admiralty charts. Promulgation of information as required (e.g. NtM, Kingfisher Bulletin). Application for safety zones during periods of major maintenance of up to 500 m. Marking and lighting of the site in agreement with NLB and in line with IALA Recommendation O-139 (IALA, 2013). Guard vessel(s) as required by risk assessment. Minimum blade clearance of at least 22 m above MHWS	Scoped in.
Reduced access to local ports - operation and maintenance phase.	All shipping and navigation receptors.	Access to local ports may be impacted due to construction activities associated with the Proposed Development.	A dedicated vessel traffic survey will be undertaken to characterise vessel movements in the area.	Promulgation of information as required (e.g. NtM, Kingfisher Bulletin).	Scoped in.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Reduction of under keel clearance – operation and maintenance phase.	All shipping and navigation receptors.	The implementation of cable protection to cables associated with the Proposed Development may reduce water depths in proximity and therefore reduce the under keel clearance for third-party traffic.	An assessment of the vessel traffic in proximity to the proposed export cable corridor will be undertaken (AIS only) and assessed against water depths within the corridor to identify any areas where under keel clearance may be of concern.	Appropriate marking on Admiralty charts. Promulgation of information as required (e.g. NtM, Kingfisher bulletin). Suitable implementation and monitoring of cable protection (via burial, or external protection where adequate burial depth as identified by risk assessment is not feasible).	Scoped in.
Anchor interaction with subsea cables – operation and maintenance phase.	All shipping and navigation receptors.	The presence of subsea cables associated with the Proposed Development may increase the likelihood of anchor interaction for third-party vessels including a snagging risk.	An assessment of the vessel traffic in proximity to the proposed export cable corridor will be undertaken (AIS only) including identification of areas where anchoring activity occurs frequently.	Appropriate marking on Admiralty charts. Promulgation of information as required (e.g. NtM, Kingfisher bulletin). Suitable implementation and monitoring of cable protection (via burial, or external protection where adequate burial depth as identified by risk assessment is not feasible).	Scoped in.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Interference with marine navigation, communications and position fixing equipment – operation and maintenance phase.	All shipping and navigation receptors.	Communication and position fixing equipment may be affected by the presence of installations within the array area, or proposed export cable corridor.	A dedicated marine traffic survey will be undertaken to determine traffic levels and routeing in the area.	N/A	Scoped in.
Reduction of emergency response capability due to increased incident rates and reduced access for SAR responders – operation and maintenance phase.	All shipping and navigation receptors.	The presence of the Proposed Development will increase the number of vessels in the area which may result in an increased number of incidents requiring emergency response and may reduce access for SAR responders.	MAIB and RNLI incident data assessment will be assessed to characterise baseline incident rates.	Compliance with MGN 543 (MCA, 2016) and its annexes (in particular SAR annex 5 (MCA, 2018)) were applicable. Marking and lighting of the site in agreement with NLB and in line with the IALA O-139 (IALA, 2013). Production of a Marine Pollution Contingency Plan.	Scoped in.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Aviation, Military and Communications					
Potential impact on low flying (including SAR helicopter operations) due to presence of obstacles (cranes, stationary wind turbines) – construction and decommissioning phases.	Civilian ATC radar: Persinnes.	Wind turbines create a physical obstruction to low flying operations.	Consultation with the MoD and SAR helicopter operators will be required on wind turbine layout.	Installation of appropriate aviation lighting and promulgation on aviation charts.	Scoped in.
Potential impact on NERL ATC radar due to presence of wind turbines – operational and maintenance phase.	Military ATC radar: MoD Leuchars.	Wind turbines can cause permanent interference to civil ATC radars.	RLOS and operational assessments to be carried out by NERL.	N/A	Scoped in - mitigation requirements to be agreed with NERL.
Potential impact on Military ATC radar due to presence of wind turbines – operational and maintenance phase.	Military ATC radar: MoD Leuchars.	Wind turbines can cause permanent interference to military ATC radars.	RLOS and operational assessments to be carried out by NERL.	N/A	Scoped in - mitigation requirements to be agreed with MOD.
Potential impact on Military AD radars due to presence of wind turbines – operational and maintenance phase.	Military AD radar: MoD Brizlee Wood, MoD Buchan.	Wind turbines can cause permanent interference to military AD radars.	RLOS and operational assessments to be carried out by MoD.	N/A	Scoped in - mitigation requirements to be agreed with MOD.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Potential impact on low flying (including SAR helicopter operations) due to presence of wind turbines – operational and maintenance phase.	Civilian ATC radar: Persinnes.	Wind turbines create a physical obstruction to low flying operations.	Consultation with the MoD and SAR helicopter operators will be required on wind turbine layout.	Installation of appropriate aviation lighting and promulgation on aviation charts.	Scoped in.
Potential impact on civil airport patterns and procedures due to presence of obstacles (cranes, stationary wind turbines) – construction phase.	Aberdeen airport is the nearest airport.	There is sufficient distance from any civilian airports to have no potential impact on their patterns and procedures.	N/A	N/A	Scoped out - The array area will be sufficiently distant from any civilian airports to have any potential impact on their patterns and procedures.
Potential impact on military aerodrome patterns and procedures due to presence of obstacles (cranes, stationary wind turbines).	Leuchars station is the nearest aerodrome.	There is sufficient distance from any civilian airports to have no potential impact on their patterns and procedures.	N/A	N/A	Scoped out - The array area will be sufficiently distant from any military aerodromes to have any potential impact on their patterns and procedures.
Potential impacts on HMRs due to presence of wind turbines.	There are no HMR or helicopter installations within the aviation, military and communications study area.	There are no HMR or helicopter installations within the aviation, military and communications study area.	N/A	N/A	Scoped out - There are no HMRs within the aviation, military and communications study area.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Potential impacts on Offshore helicopter installations (oil and gas platforms) due to the presence of turbine.	There are no offshore helicopter installation requirements within the aviation, military and communications study area.	There are no offshore helicopter installation requirements within the aviation, military and communications study area.	N/A	N/A	Scoped out - There are no offshore helicopter installations within the aviation, military and communications study area that can be affected by the Proposed Development.
Infrastructure and Other Users					
Displacement of recreational sailing and motor cruising, recreational fishing (boat angling) and other recreational activities (diving vessels) due to safety zones and advisory safety distances in the array area and proposed export cable corridor may result in a loss of recreational resource– all phases.	Recreational activities including boating, sea angling, canoeing, kayaking, windsuring, kite surfing and scuba diving.	The construction and decommissioning of infrastructure and implementation of safety distances around construction, operation and maintenance or decommissioning vessels may displace recreational sailing vessels.	Desktop data sources.	Promulgation of information.	Scoped in.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Displacement of recreational fishing (shore angling) and other recreational activities (kayaking, kite surfing, surfing and windsurfing, beach users) due to advisory safety distances in the nearshore and intertidal section of the proposed export cable corridor resulting in a loss of recreational resource– construction and decommissioning phases.	Recreational activities including boating, sea angling, canoeing, kayaking, surfing, windsurfing, kite surfing and scuba diving.	The construction and decommissioning of infrastructure and implementation of safety distances around construction or decommissioning vessels may displace recreational fishing vessels.	Desktop data sources.	Promulgation of information.	Scoped in.
Installation of the export cable, including associated safety distances, may temporarily affect or restrict access to the Neart na Gaoithe offshore export cable – construction phase.	Neart na Gaoithe.	The construction of export cables and implementation of safety distances around vessels may affect or restrict access to existing cables.	None required.	Promulgation of information.; and Crossing and/or proximity agreements	Scoped in.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Displacement of recreational sailing and motor cruising, recreational fishing (boat angling) and other recreational activities (diving vessels), resulting in a loss of recreational resource – operation and maintenance and decommissioning phases.	Recreational activities including boating, sea angling , canoeing, kayaking, surfing, windsurfing, kite surfing and scuba diving.	As per construction phase.	None required.	Promulgation of information.	Scoped in.
Maintenance activities, including associated safety distances, for the export cable may temporarily affect or restrict access to the Neart na Gaoithe offshore export cable – operation and maintenance phase.	Neart na Gaoithe.	As per construction phase.	None required.	Promulgation of information; and Crossing and/or proximity agreements.	Scoped in.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Displacement of recreational fishing (shore angling) and other recreational activities (kayaking, kite surfing, surfing and windsurfing, beach users) along the nearshore and intertidal section of the proposed export cable corridor resulting in a loss of recreational resource – decommissioning phase.	Recreational activities including boating, sea angling, canoeing, kayaking, surfing, windsurfing, kite surfing and scuba diving.	As per construction phase.	None required.	Promulgation of information.	Scoped in.
Decommissioning activities, including associated safety distances, for the export cable may temporarily affect or restrict access to the Neart na Gaoithe offshore export cable – decommissioning phase.	Neart na Gaoithe.	As per construction phase.	None required.	Promulgation of information; and Crossing and/or proximity agreements.	Scoped in.
Impact on wave and tidal projects – all phases.	N/A	N/A	None required.	N/A	Scoped out - There are no wave and tidal projects within the infrastructure and other users study area (inner).
Impact on oil and gas activities within licenced blocks – all phases.	N/A	N/A	None required.	N/A	Scoped out - There are no licenced oil and gas licence blocks within the infrastructure and other users study area (inner).

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Impact on carbon capture, natural gas storage, underground gasification and coal deposits – all phases.	N/A	N/A	None required.	N/A	Scoped out - There are no carbon capture, natural gas storage, underground gasification or coal deposit projects within the infrastructure and other users study area (inner).
Impact on subsea telecommunications cables – all phases.	N/A	N/A	None required.	N/A	Scoped out - There are no subsea telecommunications cables within the infrastructure and other users study area (inner).
Impact on marine disposal sites – all phases.	N/A	N/A	None required.	N/A	Scoped out - There are no marine disposal sites within the infrastructure and other users study area (inner).
Impact on marine aggregate extraction sites – all phases.	N/A	N/A	None required.	N/A	Scoped out - There are no marine aggregate extraction sites within the infrastructure and other users study area (inner).

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Displacement of recreational fishing (shore angling) and other recreational activities (kayaking, kite surfing, surfing and windsurfing, beach users) along the nearshore and intertidal section of the proposed export cable corridor resulting in a loss of recreational resource – operation and maintenance phase.	N/A	N/A	None required.	N/A	Scoped out - Operational and maintenance phase effects have been scoped out due to the expected low frequency of cable inspection, repair or reburial activities along the intertidal sections of the export cable. Any effects are likely to be limited to the presence of a temporary advisory clearance distance around the vessels carrying out maintenance activities. Notices to Mariners will be issued to advise other users of the nature, location and timing of any major maintenance activities.
Marine Archaeology and Ordnance					
Construction and decommissioning activities causing the removal or disturbance of sediments resulting in a potential effect on near-surface prehistoric land surfaces – construction and decommissioning phases.	Near surface prehistoric land surfaces.	N/A	Desktop data sources Archaeological analysis of geophysical survey data.	The identification of AEZs around sites identified as having a known important archaeological potential; Archaeological input into specifications for and analysis of future pre-construction geophysical surveys; Archaeologists to be consulted in the	Scoped out - A Marine Archaeology Technical Report, together with associated data review of the geophysical data for the array area and proposed export cable corridor, will provide an overview of the identifiable marine archaeology features within the marine archaeology study area. This Marine Archaeology Technical Report form the basis of a WSI and PAD, which will be prepared for approval with Historic Environment Scotland. The WSI

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
				preparation of any pre-construction ROV/diver surveys and, if appropriate, in monitoring/checking of data; All anomalies of unconfirmed archaeological potential to be taken into account during final design; Archaeological input into specifications for and analysis of pre-construction geotechnical surveys; Provision of a Protocol for Archaeological Discoveries similar to that set out by The Crown Estate (2014) for unexpected archaeological discoveries; Archaeologists to be consulted in advance of pre-construction site preparation activities	and PAD is outlined in Table 8.13 above): These measures will ensure that all impacts are reduced to not significant in EIA terms.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
				and, if appropriate, to carry out watching briefs of such work; and Mitigation of unavoidable direct impacts on known sites of archaeological importance. Options include i) preservation by record, and ii) stabilisation.	
Construction or decommissioning activities causing the removal or disturbance of sediments resulting in a potential effect on shipwrecks and aircraft wrecks – construction and decommissioning phases.	Shipwrecks and aircraft wrecks.	N/A	As above.	As above.	As above.
Construction of wind turbines and substations causing the removal or disturbance of sediments resulting in a potential effect on deeply buried prehistoric land surfaces – construction phase.	Deeply buried prehistoric land surfaces.	N/A	As above.	As above.	As above.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Construction activities resulting in an increase in suspended sediment concentrations and associated sediment deposition on shipwrecks and aircraft wrecks – construction phase.	Shipwrecks and aircraft wrecks.	N/A	As above.	As above.	As above.
Maintenance activities causing the removal or disturbance of sediments resulting in a potential effect on near-surface prehistoric land surfaces - operation and maintenance phase.	Near surface prehistoric land surfaces.	N/A	As above.	As above.	As above.
Maintenance activities causing the removal or disturbance of sediments resulting in a potential effect on shipwrecks and aircraft wrecks - operation and maintenance phase.	Shipwrecks and aircraft wrecks.	N/A	As above.	As above.	As above.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Seascape, Visual Resources and Cultural Heritage Setting					
Temporary impacts on coastal landscape character – construction and decommissioning phases.	Landscape character.	There is the potential that the construction of the Proposed Development may have a direct and/or indirect impacts on features, elements and characteristics of coastal landscapes. There is the potential that the decommissioning of the Proposed Development may have direct and indirect impacts on features, elements and characteristics of coastal landscapes.	SNH and NCC Landscape Character Assessments. Project specific site-based landscape analysis.	Minimise construction footprint at landfall site and minimise infrastructure and length of construction and decommissioning phases.	Scoped in – preparation of ZTV.
Temporary impacts on visual amenity – construction and decommissioning phases.	Visual amenity.	There is the potential that the construction of the Proposed Development may have a direct effect on seaward views gained by land-based visual receptors. There is the potential that the decommissioning of the Proposed Development may have direct effects on views gained by land based visual receptors.	Site based visual analysis.	Minimise construction footprint at landfall site and minimise infrastructure and length of construction and decommissioning phases.	Scoped in – preparation of ZTV.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Long term impacts on coastal landscape character – operation and maintenance phase.	Landscape character.	There is the potential that the operation of the Proposed Development may have direct and indirect impacts on features, elements and characteristics of coastal landscapes.	SNH and NCC Landscape Character Assessments. Site based landscape analysis.	Minimise loss of landscape features at landfall site and achieve appropriate design and layout of wind turbines within the array area.	Scoped in - Preparation of ZTV and wirelines/photomontages.
Long term impacts on visual amenity – operation and maintenance phase.	Visual amenity.	There is the potential that the operation of the Proposed Development may have direct effects on views gained by land based visual receptors.	Site based visual analysis.	Minimise loss of landscape features at landfall site and achieve appropriate design and layout of wind turbines within the array area.	Scoped in - Preparation of ZTV and wirelines/photomontages.
Temporary impacts on seascape character and marine based visual receptors as a result of array construction and decommissioning activities – construction and decommissioning phases.	Seascape Character and marine based visual receptors.	N/A	N/A	N/A	Scoped out - Due to the current baseline level of shipping and navigation in the seascape, landscape, visual resources and cultural heritage setting array study area, it is deemed unlikely that temporary increases in vessels due to the construction of the Proposed Development would impact the seascape character and marine visual receptors. Further, these construction activities will be temporary in nature and will likely occur in intermittent intervals due to weathering conditions etc.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Temporary night time impacts on coastal landscape character and visual amenity as a result of temporary lighting within the array zone – construction and decommissioning phases.	Seascape Character and marine based visual receptors.	N/A	N/A	N/A	Scoped out - Lighting associated with the array area construction activities are highly unlikely to be visible/perceptible beyond 39.2 km from the array area.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Long-term impacts on seascape character and marine based visual receptors as a result of array – operation and maintenance phase.	Seascape Character and marine based visual receptors.	N/A	N/A	N/A	Scoped out - based on the current seascape character and marine based visual receptors baseline, there are very few receptors within the seascape, landscape, visual resources and cultural heritage setting array study area and the seascape, landscape, visual resources and cultural heritage setting study proposed export cable corridor area. Infrastructure such as wind turbines and offshore platforms are unlikely to significantly alter or impact the offshore seascape area, as there are several other offshore wind farms in the Firth of Forth which are due to be constructed. Further, the seascape, landscape, visual resources and cultural heritage setting array study area is located in an area which does not support high levels of other activities, such as oil and gas, and therefore receptors which may be able to view the Proposed Development.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Long-term night time impacts on coastal landscape character and visual amenity – operation and maintenance phase.	Seascape Character and marine based visual receptors.	N/A	N/A	N/A	Scoped out – Wind turbine mounted aviation warning lights and navigation lights are highly unlikely to be visible/perceptible beyond 39.2 km from the array area. No permanent light sources will be present at the landfall location.
Cultural Heritage: Impacts of the Proposed Development on the settings of onshore cultural heritage assets	Onshore cultural heritage receptors	N/A	N/A	N/A	Scoped out - The Proposed Development would be visible from designated heritage assets located in coastal settings (and from Isle of May Priory (SM 838)), but at distances offshore are such that the character of their coastal settings are considered to be adversely affected. Construction and decommissioning work associated with the Proposed Development would give rise to only short-term temporary visual effects on onshore designated heritage assets identified.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Offshore Socio-economics and Tourism					
Impact on employment in construction, operation and maintenance and decommissioning in the supply chain – all phase.	Population; Employment and economic activity; Industry; Income and wealth; Transport and commuting; and Tourism and leisure.	Potential expenditure from the construction to support employment in Scottish companies that are directly engaged in the construction supply chain. The construction of the Proposed Development could also go on to support employment indirectly in the wider Scottish supply chain.	A desk-based review will be undertaken to develop a baseline understanding of the socio-economic and tourism related conditions.	The use of locally manufactured content where possible; The use of local contractors during construction for onshore infrastructure and potential offshore construction work where possible; Employment and training possibilities for local people on the operation and maintenance of a wind farm where feasible; and Supporting the community through sponsorship of local groups and teams.	Scoped in - An economic impact model to estimate the direct, indirect and induced employment impact of expenditure on construction of the Proposed Development in the impact area will be developed.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Impact on the amount of GVA supported by construction, operation and maintenance and decommissioning activity – all phase.	As above.	Potential expenditure on the construction of the Proposed Development to support GVA in Scottish companies that are directly engaged in the construction supply chain. The construction of the Proposed Development could also go on to support employment indirectly in the wider supply chain.	A desk-based review will be undertaken to develop a baseline understanding of the socio-economic and tourism related conditions.	As above.	Scoped in – as above.
Impact on access to construction, operation and maintenance and decommissioning -related employment amongst local residents - all phase.	As above.	Direct and indirect employment associated with the construction phase could increase the range and supply of employment opportunities that are accessible to residents of the area.	A desk-based review will be undertaken to develop a baseline understanding of the socio-economic and tourism related conditions.	As above.	Scoped in.
Impact on the demand for housing, accommodation and local services - all phase.	As above.	Direct and indirect employment generated during the construction phase could increase demand for housing, accommodation and local services during the construction phase.	A desk-based review will be undertaken to develop a baseline understanding of the socio-economic and tourism related conditions.	As above.	Scoped in.

Impact	Expected receptors	Sensitivity and evidence	Information to Inform baseline characterisation	Enhancement, Mitigation and Monitoring Commitment	Approach to EIA
Impact on tourism and recreation activity and associated economic value - all phase	As above.	The construction of the Proposed Development could lead to disruption of local tourism and recreational resources.	A desk-based review will be undertaken to develop a baseline understanding of the socio-economic and tourism related conditions.	As above.	Scoped in

ANNEX B ENHANCEMENT, MITIGATION AND MONITORING COMMITMENTS

B.1 INTRODUCTION

Throughout this Offshore Scoping Report, a range of 'embedded design measures have been applied and are detailed in the technical assessments (see chapters 6 to 8). The following commitments register summarises the enhancement, mitigation and monitoring commitments set out in this Scoping report and categorises these as per section 5.3 as either:

- Primary inherent mitigation (P);
- Secondary foreseeable mitigation (S); or
- Tertiary inexorable mitigation (T).

Both primary and tertiary measures can be embedded into the project design. The basis of the EIA can therefore be undertaken on the basis that these measures will definitely be delivered and therefore any effects which might arise without these mitigation measures do not need to be identified as potential effects as there is no potential for them to arise (IEMA, 2016).

Mitigation measures will evolve whilst the EIA progresses and in response to stakeholder engagement, therefore this Enhancement, Mitigation and Monitoring Commitments Register (Table B.1) is a 'live' document, and will be update over the course of the EIA process. Any additional measures identified throughout the EIA process will also be updated in the Offshore Scoping Road Map (Annex A).

Table B.1: Proposed Development Enhancement, Mitigation and Monitoring Commitments Register.

Reference	Proposed Development phase	Enhancement, Mitigation and Monitoring Commitment	Offshore Topics of Relevance															Means of Implementation	Mitigation category (primary (P), secondary (S) or tertiary (T))
			Physical Processes	Subsea Noise	Airborne Noise	Air Quality	Benthic Subtidal and Intertidal Ecology	Fish and Shellfish Ecology	Marine Mammals	Ornithology	Commercial Fisheries	Shipping and Navigation	Aviation, Military and Communications	Infrastructure and Other Users	Marine Archaeology	Seascape, Visual Resources and Cultural Heritage Setting	Offshore Socio-economics and Tourism		
1	Operation and maintenance.	The use of scour protection around offshore structures and foundations will be employed.	✔															Secured in the Section 36 Consent and Marine Licence, via the requirement for a Scour Protection Management Plan and Cable Specification Installation Plan.	S
2	Operation and maintenance.	Suitable implementation and monitoring of cable protection through the Development and adherence to a Cable Plan (CaP).	✔															Secured in the Section 36 Consent and Marine Licence, via the requirement for a Cable Plan (CaP).	S
3	Construction.	*Implementation of piling soft-start and ramp-up measures.*		✔				✔	✔									Secured in the Section 36 Consent and Marine Licence via the requirement for a Construction Method Statement (CMS).	P

Reference	Proposed Development phase	Enhancement, Mitigation and Monitoring Commitment	Offshore Topics of Relevance															Means of Implementation	Mitigation category (primary (P), secondary (S) or tertiary (T))
			Physical Processes	Subsea Noise	Airborne Noise	Air Quality	Benthic Subtidal and Intertidal Ecology	Fish and Shellfish Ecology	Marine Mammals	Ornithology	Commercial Fisheries	Shipping and Navigation	Aviation, Military and Communications	Infrastructure and Other Users	Marine Archaeology	Seascape, Visual Resources and Cultural Heritage Setting	Offshore Socio-economics and Tourism		
4	Construction.	Development of, and adherence to, a CoCP.				✔	✔	✔										Secured in the Section 36 Consent and Marine Licence, via the requirement for a CoCP	T
5	Construction, operation and maintenance, and decommissioning.	Development of, and adherence to, an Environmental Management Plan, including Marine Pollution Contingency Plan and Invasive Non-Indigenous Species Management Plan.					✔	✔		✔		✔						Secured in the Marine Licence via the requirement for an Environmental Management Plan, including Marine Pollution Contingency Plans and Invasive Non-Indigenous Species Management Plan.	T
6	Construction, operation and maintenance, and decommissioning.	Development of, and adherence to, a Pollution Prevention Plan.							✔	✔								Secured in the Marine Licence via the requirement for a Pollution Prevention Plan.	T

Reference	Proposed Development phase	Enhancement, Mitigation and Monitoring Commitment	Offshore Topics of Relevance															Means of Implementation	Mitigation category (primary (P), secondary (S) or tertiary (T))
			Physical Processes	Subsea Noise	Airborne Noise	Air Quality	Benthic Subtidal and Intertidal Ecology	Fish and Shellfish Ecology	Marine Mammals	Ornithology	Commercial Fisheries	Shipping and Navigation	Aviation, Military and Communications	Infrastructure and Other Users	Marine Archaeology	Seascape, Visual Resources and Cultural Heritage Setting	Offshore Socio-economics and Tourism		
7	Decommissioning	Development of, and adherence to, a Decommissioning Plan.					✓	✓	✓	✓								Secured in the Marine Licence via the requirement for a Decommissioning Plan.	T
8	Construction, operation and maintenance, and decommissioning.	Development of, and adherence to, a Vessel Management Plan.							✓	✓	✓	✓						Secured in the Section 36 Consent and Marine Licence via the requirement for a Vessel Management Plan (VMP)	T
9	Construction, operation and maintenance, and decommissioning.	On-going consultation with fishing industry via the appointment of a Fisheries Liaison Officer (FLO).									✓							Secured in the Section 36 Consent and Marine Licence via the requirement for appointment of a Fisheries Liaison Officer (FLO)	T

			Offshore Topics of Relevance																
Reference	**Proposed Development phase**	**Enhancement, Mitigation and Monitoring Commitment**	**Physical Processes**	**Subsea Noise**	**Airborne Noise**	**Air Quality**	**Benthic Subtidal and Intertidal Ecology**	**Fish and Shellfish Ecology**	**Marine Mammals**	**Ornithology**	**Commercial Fisheries**	**Shipping and Navigation**	**Aviation, Military and Communications**	**Infrastructure and Other Users**	**Marine Archaeology**	**Seascape, Visual Resources and Cultural Heritage Setting**	**Offshore Socio-economics and Tourism**	**Means of Implementation**	**Mitigation category (primary (P), secondary (S) or tertiary (T))**
10	Construction, operation and maintenance, and decommissioning.	Development of a Fisheries Management and Mitigation Strategy (FMMS).									✔							Secured in the Section 36 Consent and Marine Licence via the requirement for a Fisheries Management and Mitigation Strategy (FMMS)	T
11	Construction, operation and maintenance, and decommissioning.	Timely and efficient distribution of NtM, Kingfisher notifications and other navigational warnings of the position and nature of works associated with the Proposed Development.									✔			✔				Secured in the Section 36 Consent and Marine Licence.	T
12	Construction, operation and maintenance, and decommissioning.	Use of guard vessels, where necessary.									✔	✔						Secured in the Section 36 Consent and Marine Licence via the requirement for an application for safety zones and requirement for a Vessel Management Plan (VMP)	S

			Offshore Topics of Relevance																
Reference	Proposed Development phase	Enhancement, Mitigation and Monitoring Commitment	Physical Processes	Subsea Noise	Airborne Noise	Air Quality	Benthic Subtidal and Intertidal Ecology	Fish and Shellfish Ecology	Marine Mammals	Ornithology	Commercial Fisheries	Shipping and Navigation	Aviation, Military and Communications	Infrastructure and Other Users	Marine Archaeology	Seascape, Visual Resources and Cultural Heritage Setting	Offshore Socio-economics and Tourism	Means of Implementation	Mitigation category (primary (P), secondary (S) or tertiary (T))
13	Construction, operation and maintenance, and decommissioning.	Appointment of Offshore Fisheries Liaison Officers (OFLOs), where necessary.									✓							Secured in the Section 36 Consent and Marine Licence via the requirement for an OFLO	P
14	Construction, operation and maintenance, and decommissioning.	Application and use of Safety Zones during construction, maintenance and decommissioning activities associated with wind turbines and offshore platforms.										✓		✓				Secured via an application for safety zone prior to construction commencing	T
15	Construction, operation and maintenance, and decommissioning	Notification to the UK Hydrographic Office (UKHO) of the proposed works to facilitate the promulgation of maritime safety information and updating of nautical/admiralty charts and publications.									✓	✓						Secured in the Section 36 Consent and Marine Licence	T

Reference	Proposed Development phase	Enhancement, Mitigation and Monitoring Commitment	Offshore Topics of Relevance															Means of Implementation	Mitigation category (primary (P), secondary (S) or tertiary (T))
			Physical Processes	Subsea Noise	Airborne Noise	Air Quality	Benthic Subtidal and Intertidal Ecology	Fish and Shellfish Ecology	Marine Mammals	Ornithology	Commercial Fisheries	Shipping and Navigation	Aviation, Military and Communications	Infrastructure and Other Users	Marine Archaeology	Seascape, Visual Resources and Cultural Heritage Setting	Offshore Socio-economics and Tourism		
16	Construction, and operation and maintenance	Undertaking of post-lay and cable burial inspection surveys.									✔							Secured in the Section 36 Consent and Marine Licence via the requirement for Cable Specification and Installation Plan (CSIP)	T
17	Construction, operation and maintenance, and decommissioning.	Compliance with MGN 543 (MCA, 2016) and its annexes.										✔						Secured in the Section 36 Consent and Marine Licence via the requirement for an Aid to Navigation Management Plan	T
18	Construction, operation and maintenance, and decommissioning.	Marking and lighting of the site in agreement with NLB and in line with IALA Recommendations.										✔						Secured in the Section 36 Consent and Marine Licence via the requirement for an Aid to Navigation Management Plan	T

			Offshore Topics of Relevance																
Reference	**Proposed Development phase**	**Enhancement, Mitigation and Monitoring Commitment**	**Physical Processes**	**Subsea Noise**	**Airborne Noise**	**Air Quality**	**Benthic Subtidal and Intertidal Ecology**	**Fish and Shellfish Ecology**	**Marine Mammals**	**Ornithology**	**Commercial Fisheries**	**Shipping and Navigation**	**Aviation, Military and Communications**	**Infrastructure and Other Users**	**Marine Archaeology**	**Seascape, Visual Resources and Cultural Heritage Setting**	**Offshore Socio-economics and Tourism**	**Means of Implementation**	**Mitigation category (primary (P), secondary (S) or tertiary (T))**
19	Construction, operation and maintenance, and decommissioning.	Compliance of all project vessels with international marine regulations as adopted by the Flag State, notably the International Regulations for Preventing Collisions at Sea (COLREGs) (IMO, 1974) and the International Convention for the Safety of Life at Sea (SOLAS) (IMO, 1974).										✓						Secured in the Section 36 Consent and Marine Licence via the requirement for a Vessel Management Plan (VMP)	T
20	Construction, operation and maintenance, and decommissioning.	Blade clearance of at least 22 m above MHWS (in line with RYA policy (RYA, 2015).										✓						Secured via the Section 36 Consent and Marine Licence	P
21	Construction.	Minimise construction footprint at landfall site and minimise infrastructure and length of construction phase.														✓		Secured via the Section 36 Consent and Marine Licence	P

Reference	Proposed Development phase	Enhancement, Mitigation and Monitoring Commitment	Offshore Topics of Relevance															Means of Implementation	Mitigation category (primary (P), secondary (S) or tertiary (T))
			Physical Processes	Subsea Noise	Airborne Noise	Air Quality	Benthic Subtidal and Intertidal Ecology	Fish and Shellfish Ecology	Marine Mammals	Ornithology	Commercial Fisheries	Shipping and Navigation	Aviation, Military and Communications	Infrastructure and Other Users	Marine Archaeology	Seascape, Visual Resources and Cultural Heritage Setting	Offshore Socio-economics and Tourism		
22	Construction, operation and maintenance, and decommissioning.	Design and layout of wind turbines, offshore substations and platforms within the Proposed Development array area to minimise loss of landscape features at landfall site and achieve appropriate design and layout of wind turbines within array.														✔		Secured via the Section 36 Consent, Marine Licence and T&CP permission.	P
23	Construction, operation and maintenance and decommissioning.	Adherence to CAP 393 Article 223 (CAA, 2018) which sets out the mandatory requirements for lighting of offshore wind turbines.											✔					Secured in the Section 36 Consent and Marine Licence via the requirement for Lighting and Marking Plan	T
24	Operation and maintenance.	All structures over 91.4 m in height will be charted on aeronautical charts and reported to the Defence Geographic Centre (DGC).											✔					Secured in the Section 36 Consent and Marine Licence via the requirement for notifications	T

Reference	Proposed Development phase	Enhancement, Mitigation and Monitoring Commitment	Offshore Topics of Relevance: Physical Processes	Subsea Noise	Airborne Noise	Air Quality	Benthic Subtidal and Intertidal Ecology	Fish and Shellfish Ecology	Marine Mammals	Ornithology	Commercial Fisheries	Shipping and Navigation	Aviation, Military and Communications	Infrastructure and Other Users	Marine Archaeology	Seascape, Visual Resources and Cultural Heritage Setting	Offshore Socio-economics and Tourism	Means of Implementation	Mitigation category (primary (P), secondary (S) or tertiary (T))
25	Operation and maintenance.	Crossing or laying of cables over or adjacent to known or future cables will be subject to crossing and/or proximity agreements.												✓				Secured through a commercial agreement with cable owner/operators	T
26	Construction, operation and maintenance, and decommissioning	Development and agreement of an archaeological Written Scheme of Archaeological Investigation (WSI), including: • The identification and implementation of Archaeological Exclusion Zones (AEZs) around sites identified as having a known important archaeological potential; • Archaeological input into specifications for and analysis of future pre-construction geophysical and geotechnical surveys;													✓			Secured in the Section 36 Consent and Marine Licence via the requirement for a WSI	T

Reference	Proposed Development phase	Enhancement, Mitigation and Monitoring Commitment	Offshore Topics of Relevance															Means of Implementation	Mitigation category (primary (P), secondary (S) or tertiary (T))
			Physical Processes	Subsea Noise	Airborne Noise	Air Quality	Benthic Subtidal and Intertidal Ecology	Fish and Shellfish Ecology	Marine Mammals	Ornithology	Commercial Fisheries	Shipping and Navigation	Aviation, Military and Communications	Infrastructure and Other Users	Marine Archaeology	Seascape, Visual Resources and Cultural Heritage Setting	Offshore Socio-economics and Tourism		
		• Archaeological input into specifications for and analysis of pre-construction geotechnical surveys • Archaeologists to be consulted in the preparation of any pre-construction ROV/diver surveys and, if appropriate, in monitoring/checking of data • Provision and adherence to a Protocol for Archaeological Discoveries (PAD); • Identification and implementation of Archaeological Exclusion Zones (AEZs) around sites identified of archaeological potential; • Archaeologists to be consulted in advance of pre-construction site																	

Reference	Proposed Development phase	Enhancement, Mitigation and Monitoring Commitment	Physical Processes	Subsea Noise	Airborne Noise	Air Quality	Benthic Subtidal and Intertidal Ecology	Fish and Shellfish Ecology	Marine Mammals	Ornithology	Commercial Fisheries	Shipping and Navigation	Aviation, Military and Communications	Infrastructure and Other Users	Marine Archaeology	Seascape, Visual Resources and Cultural Heritage Setting	Offshore Socio-economics and Tourism	Means of Implementation	Mitigation category (primary (P), secondary (S) or tertiary (T))
		preparation activities and, if appropriate, to carry out watching briefs of such work; • All anomalies of unconfirmed archaeological potential to be taken into account during final design; and • Mitigation of unavoidable direct impacts on known sites of archaeological importance. Options include i) preservation by record, and ii) stabilisation																	
27	Construction and decommissioning.	The proposed offshore export cable corridor landfall (below MHWS) avoids designated sites for birds.								✔								Secured via the Section 36 Consent, Marine Licence and T&CP permission.	P

ANNEX C TRANSBOUNDARY SCREENING

C.1 INTRODUCTION

The section identifies the potential transboundary receptors that may be affected by the Proposed Development, and assess potential impacts associated with construction, operation and maintenance, and decommissioning phases of the Proposed Development.

C.1.1 BACKGROUND

The potential for transboundary effects to arise is a result of an impact from a proposed development within one European Economic Area (EEA) state which has the potential to affect the environment of another EEA state(s).

The Applicant has completed a transboundary screening impact assessment, including a screening matrix, for potential transboundary effects arising from the construction, operation and maintenance, and decommissioning of the Proposed Development. The outcome of this transboundary screening assessment is set out below. Where no potential transboundary impacts have been identified as part of the transboundary screening process, this also stated below. Marine Scotland Consenting and Licensing Guidance for Offshore Wind, Wave and Tidal Energy Applications (Scottish Government, 2018) advises that transboundary impacts in relation to offshore renewable energy projects in Scotland are likely to relate primarily to

- projects that may have an impact on mobile species; and
- where projects are close to national boundaries or areas administered by other relevant authorities.

C.1.1.1 Legislative Context

The United Nations Economic Commission for Europe (UNECE) Convention on EIA in a Transboundary Context (the Espoo Convention) (as amended), provides guidance on assessment of Transboundary impacts with the aim of promoting "environmentally sound and sustainable development, while enhancing international co-operation in assessing environmental impacts of a proposed project".

The Espoo Convention (named after the Finish city of Espoo where the Convention was adopted) requires that EIAs consider potential impacts across national borders where there is the potential for an activity occurring in one country to have the potential for significant effect in another country. The UK is also a signatory to the Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (the 'Aarhus Convention') and its Protocol which provide people with the rights to easily access information, participate effectively in decision-making in environmental matters and to seek justice if their rights are violated (The Planning Inspectorate, 2018).

European Union (EU) Directive 85/337/EEC (as amended) (the EIA Directive) implements both the Espoo and Aarhus Conventions in EU States. This Directive is transposed into UK law through the EIA Regulations (see section 5.3.8).

Environmental Impact Assessment

Under the EIA Regulations (see section 5.3.8), (Part 9) – Projects with Significant Transboundary Effects", Scottish Ministers are required to determine if a proposed development is likely to have significant impacts on the receiving environment of another European Economic Area (EEA) State – i.e. a "transboundary impact". Regulation 30 1(a) states that "*where it comes to the attention of the Scottish Ministers that works proposed to be carried out in Scotland are the subject of an EIA application and are* *likely to have significant effects on the environment in an EEA State other than the United Kingdom"* Scottish Ministers must:

- send to the EEA State, as soon as possible and no later than their date of publication in The Edinburgh Gazette… the particulars mentioned in paragraph (3) (and paragraph 4 if required)
- publish the information in a notice placed in The Edinburgh Gazette, indicating the address where further information is available; and
- give the EEA State a reasonable period of time in which to indicate whether it wishes to participate in the procedure for which these Regulations provide.
- The information required to be shared with EEA States includes:
- a description of the works, together with any available information on their possible significant effect on the environment in another EEA State; and
- information on the nature of the decision which may be taken.

Habitats Regulations Appraisal

The Habitats Directive has been transposed into UK law through:

- the Conservation (Natural Habitats &c.) Regulations 1994 (as amended);
- the Conservation of Habitats and Species Regulations 2017; and
- the Conservation of Offshore Marine Habitats and Species Regulations 2017 (which apply to marine licences and Section 36 applications within the Scottish Offshore region.

Where Scottish Ministers are required to undertake an appropriate assessment of a project in relation to Natura interest associated with a proposed project potential cumulative effects, including transboundary and cross border effects, it is required that the proposed projects' HRA will provide the required information in relation to potential transboundary impacts.

C.2 CONSULTATION

Once an EEA State has confirmed that they wish to participate in discussion on potential transboundary assessment of a project, that EEA State must be consulted. The Secretary of State must supply the required information as set out above. It is proposed that the following EU states should be consulted:

- Netherlands;
- Denmark;
- Germany; and
- Norway.

C.3 SCREENING OF TRANSBOUNDARY IMPACTS

Figure C.1 illustrates the proximity of the Proposed Development to other EEA states. The distance of the Proposed Development to other EEA states with which there may be the potential for transboundary impacts has been considered within this assessment.

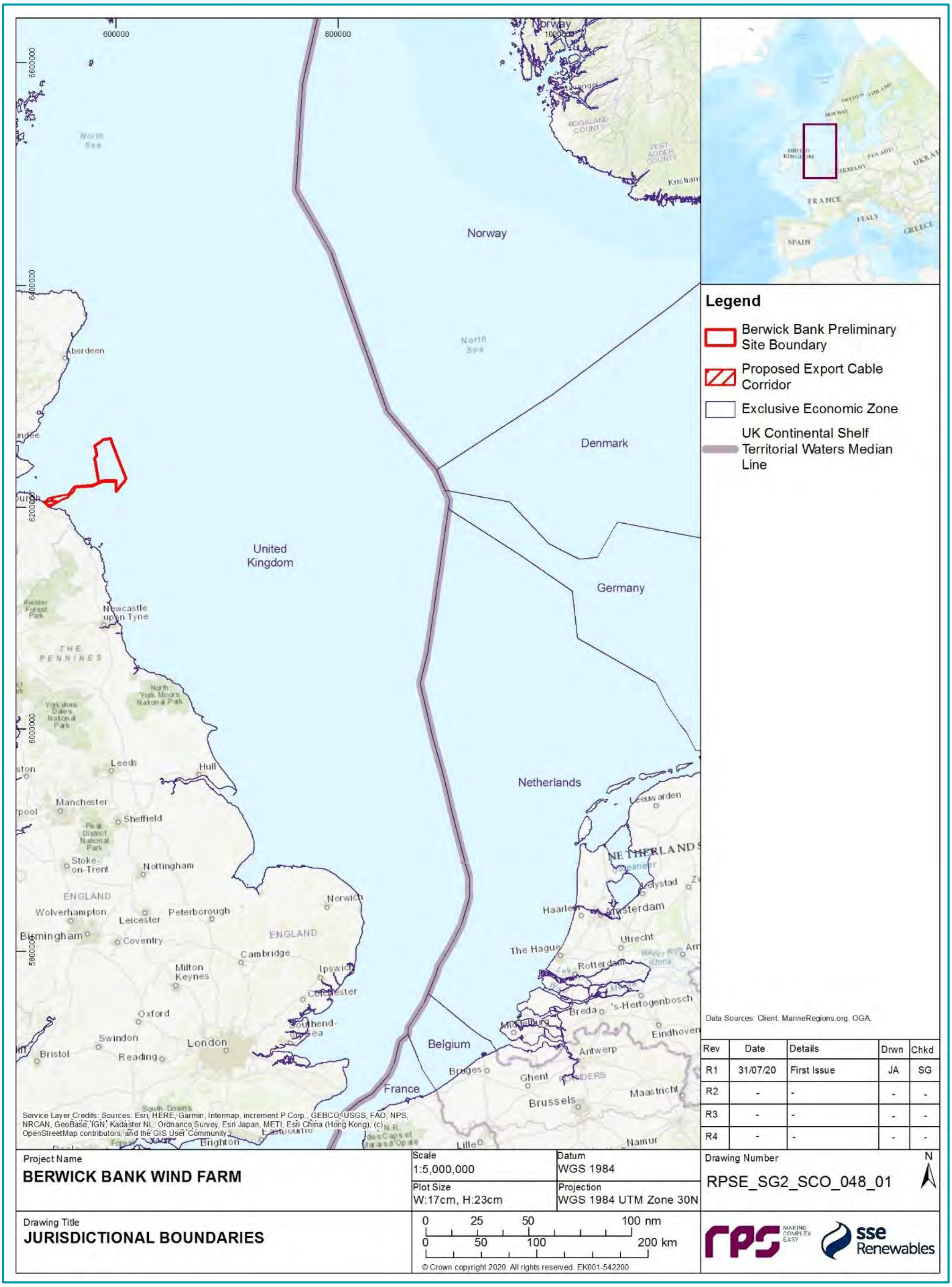

Figure C.1: Location of the Proposed Development in relation to other EEA States.

C.3.1 PHYSICAL AND BIOLOGICAL ENVIRONMENT

The Applicant has carried out a transboundary screening for all potential physical and biological receptors. This is set out in Table C.1. The conclusion of the transboundary screening assessment undertaken for each physical and biological environment topic is presented in the sections below. Where impacts have proposed to be scoped out of the Offshore EIA Report, these have not been considered within this transboundary screening assessment, on the basis that no significant effects are predicted and will therefore not result in a significant effect in another EEA state.

C.3.1.1 Physical Processes

It is considered likely that potential impacts on physical processes receptors will be localised and temporary in nature as any sediments suspended during activities associated with the construction, operation and maintenance, or decommissioning of the Proposed Development are likely to re-settle.

Therefore, considering both the location of the Proposed Development and the identified physical processes receptors and initial assessment of the physical processes baseline characterisation, no potential transboundary impacts are predicted for physical processes.

C.3.1.2 Benthic Ecology

Potential impacts on benthic subtidal and intertidal ecology receptors include:

- temporary habitat loss / disturbance;
- increased suspended sediment concentrations and associated deposition;
- long-term subtidal habitat loss;
- temporary subtidal habitat loss / disturbance;
- colonisation of hard structures; and
- changes in physical processes.

It is considered likely that potential impacts such as temporary habitat loss/disturbance, long-term and temporary subtidal habitat loss, colonisation of hard structures and changes in physical processes on benthic subtidal and internal ecology receptors will largely be focused within the footprint of the Proposed Development and therefore no potential for transboundary impacts are predicted. Potential impacts as a result of suspension of sediments (SSC) are likely to be restricted to one tidal excursion.

Therefore, considering both the location of the Proposed Development and an initial assessment of baseline characterisation, no potential transboundary impacts are precited for benthic subtidal and intertidal ecology.

The potential for the Proposed Development to impact benthic subtidal and intertidal features of nature conservation designations outside of the UK Exclusive Economic Zone (EEZ) will be considered within the HRA process, including the interaction between physical processes and benthic ecology.

C.3.1.3 Fish and Shellfish Ecology

Potential impacts on fish and shellfish ecology receptors include:

- temporary habitat loss and disturbance;
- underwater noise;
- increased suspended sediment concentrations and associated sediment deposition;
- long-term habitat loss; and
- electromagnetic Fields (EMF) from subsea electrical cabling.

There is the potential for injury and/or disturbance to fish receptors as a result of increased noise during the construction phase of the Proposed Development. In particular, increased noised during construction has the potential to affect Annex II migratory fish species, or species that have commercial value. It is therefore considered that there is the potential for transboundary impacts as a result of the construction of the Proposed Development.

The potential for the Proposed Development to impact fish and shellfish features of nature conservation designations outside of the UK EEZ will be considered within the HRA process, including the interaction between physical processes and fish and shellfish ecology.

C.3.1.4 Marine Mammals

Potential impacts on marine mammal receptors include:

- injury and disturbance from piling;
- disturbance of marine mammals from vessel use and other construction activities;
- increased vessel may result in collision with marine mammals;
- changes in prey availability; and
- injury and disturbance from operation and maintenance activities.

The regional marine mammal study area extends beyond the limits of Scottish or UK territorial waters, and it is acknowledged that some marine mammals can travel large distances to forage, including between the waters of neighbouring EU countries'. Direct impacts may occur as a result of, for example, piling during construction of foundations, and indirect impacts may occur as a result of, for example, changes in prey availability. There is therefore the potential for transboundary impacts associated with the Proposed Development. However, it is not expected that any impact from the Proposed Development will have a direct impact on the environment of any another EEA State, therefore it is not anticipated that there will significant transboundary effects.

The potential for the Proposed Development to impact marine mammals notified interest features of nature conservation designations outside of the UK EEZ will be considered within the HRA process.

C.3.1.5 Ornithology

Potential impacts on Offshore and Intertidal Ornithology receptors include:

- temporary habitat loss/disturbance;
- indirect impact;
- collision;
- disturbance/displacement; and
- barrier to movement

Considering both the location of the Proposed Development and the identified key ornithology receptors, the potential for transboundary impacts is considered unlikely because there are no non-UK seabird breeding colonies within mean-maximum (+ 1 S.D.) foraging range (of gannet, which has the largest range of the key species) of the Proposed Development along a marine pathway. This agrees with the outcome of the Seagreen 1 transboundary impact assessment (Seagreen, 2017) with concluded that "*potential transboundary impacts are considered unlikely*".

In the seabird breeding season, there are no known seabird colonies in non-UK countries that lie within the mean-maximum foraging range of seabird species likely to occur within the Proposed Development ZoI. It can therefore be concluded that there will be no transboundary impacts associated with breeding seabirds.

During the non-breeding season, it is considered that there is a low likelihood of non-breeding seabirds from non-UK countries, to move through the Proposed Development array area, and there is sufficient alternative foraging habitat to support any birds displaced by the Proposed Development. The potential for impact from collision, displacement or barrier effects is therefore considered unlikely.

The potential for the Proposed Development to impact ornithology features of nature conservation designations outside of the UK EEZ will be considered within the HRA process.

Table C.1: Offshore Transboundary Screening Matrix for Proposed Development – Physical and Biological Environment.

Screening Criteria	Physical Processes	Benthic Ecology	Fish and Shellfish Ecology	Marine Mammals	Ornithology
Characteristics of the development For a more detailed description of the Proposed Development, see section 3.	The array area covers approximately 775 km^2 and is located approximately 39.2 km offshore at its closest distance to shore. This area is where the offshore infrastructure, such as the wind turbines, offshore substation(s) and array cables, will be located. The proposed export cable corridor has been identified and will connect the array area to Thorntonloch Landfall and/or Skateraw Landfall. The Proposed Development encompasses the: • array area: This is where the offshore wind farm will be located, which will include the wind turbines, wind turbine foundations, array cables, and a range of offshore substations and offshore interconnector cables; and • proposed export cable corridor: This is where the permanent offshore electrical infrastructure, specifically where the offshore export cable(s) will be located. The Proposed Development will be comprised of up to 242 wind turbines, and the final number of wind turbines will be dependent on the capacity of individual wind turbines used. There is the potential for a reduced number of wind turbines to be used if an increased output of wind turbine model is available when the final project design is developed compared to those commercially available at present. The maximum rotor blade diameter is expected to be no greater than 270 m, with a maximum blade tip height of 310 m above Lowest Astronomical Tide (LAT) and a minimum blade tip height of 186 m above LAT. The top of the wind turbine (the nacelle) will be approximately 175 m above LAT. A scheme for wind turbine lighting and navigation marking will be agreed with consultees. The minimum distance between the bottom of the blade and the water surface will be between 22 m to 40 m. The layout of the wind turbines will be developed to best utilise both the available wind resource and suitability of seabed conditions while ensuring environmental effects and impacts on other marine users (such as fisheries and shipping routes) are minimised. The final layout of the wind turbine array will be decided at the final design stage.				
Geographical area	The array area lies approximately 39.2 km offshore east from the East Lothian coastline, in Scotland. The Proposed Development lies 291.1 km from the Netherlands, 279.7 km from Denmark, 287.6 km from Germany and 243.2km from Norway.				
Location of development (including existing use)	The Proposed Development is located within the former Firth of Forth Zone. The Proposed Development comprises an area of approximately 775 km^2 located to the east of Marr Bank, and overlapping Berwick Bank in the south				
Cumulative effects	The approach to cumulative effects is detailed in each technical section – see chapter 6 and chapter 7.				

Screening Criteria	Physical Processes	Benthic Ecology	Fish and Shellfish Ecology	Marine Mammals	Ornithology
Carrier	No potential transboundary impacts are predicted.	No potential transboundary impacts are predicted.	There is the potential for transboundary impacts associated with the Proposed Development on marine mammals receptors.	No potential transboundary impacts are predicted.	No potential transboundary impacts are predicted.
Environmental importance			Magnitude of impact will be determined during EIA.		
Extent			There is the potential for transboundary impacts associated with the Proposed Development on marine mammals receptors.		
Magnitude			Duration of impact will be determined during EIA.		
Probability			Frequency of impact will be determined during EIA.		
Duration			Reversibility of impact will be determined during EIA.		
Frequency			Magnitude of impact will be determined during EIA.		

Screening Criteria	Physical Processes	Benthic Ecology	Fish and Shellfish Ecology	Marine Mammals	Ornithology
Reversibility			There is the potential for transboundary impacts associated with the Proposed Development on marine mammals receptors.		

C.3.2 HUMAN ENVIRONMENT

The Applicant has carried out a transboundary screening for all potential human environment receptors. This is set out in Table C.2. The conclusion of the transboundary screening assessment undertaken for each human environment topic is presented in the sections below. Where impacts have proposed to be scoped out of the Offshore EIA Report, these have not been considered within this transboundary screening assessment, on the basis that no significant effects are predicted and will therefore not result in a significant effect in another EEA state.

C.3.2.1 Commercial Fisheries

As identified within section 8.1 commercial fisheries, because the Proposed Development array is located beyond the 12 NM limit, where EU member states currently have access to fishing, there is potential for transboundary impacts upon commercial fisheries due to the construction, operation and maintenance, and decommissioning phase of the Proposed Development. These include:

- loss or restricted access to fishing grounds;
- displacement of fishing activities into other areas;
- interference with fishing activity;
- increased steaming times;
- safety issues for fishing vessels; and
- potential impacts on commercially exploited species.

Where significant fishing activity is identified for non-UK fleets within the commercial fisheries study area, these will be included as a receptor throughout the impact assessment.

It is therefore concluded that there is the potential for transboundary impacts associated with the Proposed Development.

C.3.2.2 Shipping and Navigation

The Proposed Development is located in a relatively busy shipping area. Potential impacts on shipping and navigation receptors include:

- vessel displacement due to construction activities;
- increased vessel to vessel collision risk between a third-party vessel and a project vessel due to the presence of project related vessels;
- increased vessel to vessel collision risk between third party vessels due to vessel displacement;
- vessel to structure allision risk due to the presence of new structures associated with the Proposed Development;
- reduced access to local ports due to construction activities associated with the Proposed Development;
- commercial traffic displacement due to the presence of the Proposed Development;
- fishing vessel and recreational vessel displacement due to the presence of the Proposed Development;
- increased vessel to vessel collision risk between a third-party vessel and a project vessel due to the presence of project vessels;
- increased vessel to vessel collision risk between third-party vessels (route-based) due to the displacement of vessels from their usual routes;
- increased vessel to vessel collision risk involving fishing vessels and/or recreational vessels due to the displacement of fishing and/or recreational vessels;
- vessel to structure allision risk for commercial vessels due to the presence of new structures associated with the Proposed Development;

- vessel to structure allision risk for fishing vessels in transit due to the presence of new structures associated with the Proposed Development;
- vessel to structure allision risk for recreational vessels due to the presence of new structures associated with the Proposed Development;
- reduced access to local ports due to maintenance activities with the Proposed Development;
- reduction of under keel clearance due to the presence of cables/cable protection associated with the Proposed Development;
- anchor interaction with subsea cables due to the presence of subsea cables associated with the Proposed Development;
- interference with marine navigation, communications and position fixing equipment due to the presence of new structures associated with the Proposed Development; and
- reduction of emergency response capability due to increased incident rates and reduced access for SAR responders due to an increase in the number of vessels in the area and a reduction of freely navigable sea room and airspace.

It is considered that there is the potential for transboundary impacts, particularly in relation to transits to/from other countries including effects on shipping routes to/from other EEA State ports.

C.3.2.3 Aviation, Military and Communications

Potential impacts associated with the Proposed Development identified for aviation, military and communication receptors include:

- potential impacts on low flying operation during all phases; and
- potential impacts on NERL ATC radar, Military ATC radar and military AD radars during the operation and maintenance phase.

As there are no oil and gas installations in the area, there is no potential for low flying operations (where oil and gas platforms are serviced from non-EEA States) associated with other EEA States to be affected. Radars identified are all UK based, therefore considering the location of the Proposed Development and the identified receptors above, no transboundary impacts associated with aviation, military and communications are predicted to arise.

C.3.2.4 Seascape, Landscape, Visual Resources and Cultural Heritage Setting

Potential impacts associated with the Proposed Development identified for seascape, landscape, visual resources and cultural heritage setting include:

- temporary impacts on coastal landscape character;
- temporary impact on visual amenity;
- long-term impacts on coastal landscape character; and
- long-term impacts on visual amenity.

Considering the location of the Proposed Development which is over 243 km from the nearest neighbouring EAA state (Figure C.1), no transboundary impacts on seascape, landscape, visual resources and cultural heritage setting are predicted to arise as a result of the Proposed Development.

C.3.2.5 Infrastructure and Other Users

Potential impacts associated with the Proposed Development identified for infrastructure and other users receptors include:

- displacement of recreational sailing and motor cruising, recreational fishing and other recreational activities during all phases; and

- displacement of recreational fishing and other recreational activities along the nearshore and intertidal section of the proposed export cable corridor.

As no potential infrastructure and other users receptors associated with other EEA States have been identified it is considered that there are no potential transboundary impacts upon infrastructure and other users due to construction, operational and maintenance, and decommissioning associated with the Proposed Development.

C.3.2.6 Offshore Socio-economics and Tourism

Potential impacts associated with the Proposed Development identified for offshore socio-economics and tourism receptors include:

- impact on employment in the supply chain;
- impact on the amount of GVA supported;
- impact on access to related employment amongst local residents;
- impact on the demand for housing, accommodation and local services; and
- impact on tourism and recreation activity and associated economic value.

It considered that there is the potential for transboundary impacts to occur if there is a potential impact on commercial fishing vessels or shipping and navigation receptors associated with other EEA States. These have been considered above.

Potential transboundary socio-economics and tourism impacts upon other EEA states may arise through the purchase of project components, equipment and the sourcing of labour from companies based outside the UK. Under Regulation 41 part 6(a) of the EIA Regulations, the Scottish Ministers must enter into consultation with any EEA State concerned regarding the potential significant effects of the development on the environment of that EEA State and the measures envisaged to reduce or eliminate such effects. The sourcing of materials and labour from other EEA states is assumed to provide beneficial effects to the economies of other EEA states and so the consideration of measures envisaged to reduce or eliminate such effects is not relevant in the context of transboundary impacts. It is therefore proposed that transboundary impacts on offshore socio-economic and tourism receptors are screened out.

Table C.2: Offshore Transboundary Screening Matrix for Berwick Bank Wind Farm – Human Environment.

Screening Criteria	Commercial Fisheries	Shipping and Navigation	Aviation, Military and Communications	Infrastructure and Other Users	Offshore Socio-economics and Tourism
Characteristics of the development For a more detailed description of the Proposed Development, see section 3.	The array area covers approximately 775 km^2 and is located approximately 39.2 km offshore at its closest distance to shore. This area is where the offshore infrastructure, such as the wind turbines, offshore substation(s) and array cables, will be located. The proposed export cable corridor has been identified and will connect the array area to the Thorntonloch Landfall and/or Skateraw Landfall. The Proposed Development encompasses the: • array area: This is where the offshore wind farm will be located, which will include the wind turbines, wind turbine foundations, array cables, and a range of offshore substations and offshore interconnector cables; and • proposed export cable corridor: This is where the permanent offshore electrical infrastructure, specifically where the offshore export cable(s) will be located The Proposed Development will be comprised of up to 242 wind turbines, and the final number of wind turbines will be dependen t on the capacity of individual wind turbines used. There is the potential for a reduced number of wind turbines to be used if an increased output of wind turbine model is available when the final project design is developed compared to those commercially available at present. The maximum rotor blade diameter is expected to be no greater than 270 m, with a maximum blade tip height of 310 m above LAT and a minimum blade tip height of 186 m above LAT. The top of the wind turbine (the nacelle) will be approximately 175 m above LAT. A scheme for wind turbine lighting and navigation marking will be agreed with consultees. The minimum distance between the bottom of the blade and the water surface will be between 22 m to 40 m. The layout of the wind turbines will be developed to best utilise both the available wind resource and suitability of seabed conditions while ensuring environmental effects and impacts on other marine users (such as fisheries and shipping routes) are minimised. The final layo ut of the wind turbine array will be decided at the final design stage.				
Geographical area	The array area lies approximately 39.2 km offshore east from the East Lothian coastline, in Scotland. The Proposed Development lies 291.1 km from the Netherlands, 279.7 km from Denmark, 287.6 km from Germany and 243.2km from Norway.				
Location of development (including existing use)	The Proposed Development is located within the former Firth of Forth Zone. The Proposed Development comprises an area of appr oximately 775 km^2 located to the east of Marr Bank, and overlapping Berwick Bank in the south				
Cumulative effects	The approach to cumulative effects is detailed in each technical section – see chapter 8.				

Screening Criteria	Commercial Fisheries	Shipping and Navigation	Aviation, Military and Communications		Infrastructure and Other Users	Offshore Socio-economics and Tourism
Carrier	There is potential for transboundary impacts upon commercial fisheries due to the construction, operation and maintenance, and decommissioning phases of the Proposed Development	There is potential for transboundary impacts upon commercial fishing vessels and shipping and navigation routes due to the construction, operation and maintenance, and decommissioning phases of the Proposed Development	No transboundary impacts are predicted to arise.	No transboundary impacts are predicted to arise.	No transboundary impacts are predicted to arise.	No transboundary impacts are predicted to arise.
Environmental importance						
Extent						
Magnitude	Magnitude of impact will be determined during EIA.	Magnitude of impact will be determined during EIA.				
Probability	There is potential for transboundary impacts upon commercial fisheries due to the construction, operation and maintenance, and decommissioning phase of the Proposed Development	There is potential for transboundary impacts upon commercial fishing vessels and shipping and navigation routes due to the construction, operation and maintenance, and decommissioning phases of the Proposed Development				

Screening Criteria	Commercial Fisheries	Shipping and Navigation	Aviation, Military and Communications	Infrastructure and Other Users	Offshore Socio-economics and Tourism
Duration	Duration of impact will be determined during EIA.	Duration of impact will be determined during EIA.			
Frequency	Frequency of impact will be determined during EIA.	Frequency of impact will be determined during EIA.			
Reversibility	Reversibility of impact will be determined during EIA.	Reversibility of impact will be determined during EIA.			

C.4 CONCLUSIONS

This transboundary screening has been carried out considering the location of the Proposed Development and the current Project Description. There is the potential for transboundary impacts associated with the Proposed Development for the following topics:

- fish and shellfish ecology;
- commercial fisheries; and
- shipping and navigation.

C.5 REFERENCES

Scottish Government (2018). *Offshore Wind, Wave and Tidal Energy Applications: Consenting and Licensing Manual*. Available at: https://www.gov.scot/publications/marine-scotland-consenting-licensing-manual-offshore-wind-wave-tidal-energy-applications/pages/5/. Accessed June 2020.

The Planning Inspectorate (2018). *Advice Note Twelve: Transboundary Impacts and Process*. Available at: https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/2013/04/Advice-note-12v2.pdf. Accessed June 2020.