MAY 2017

Seagreen Phase 1 Offshore Project

Scoping Report
Round 3: Firth of Forth

(A4MR/SEAG-AB-DEV230-SPR-311)

EXECUTIVE SUMMARY

i. Seagreen Wind Energy Limited ("Seagreen") received consents for the Seagreen Alpha and Seagreen Bravo offshore wind farms and the associated Offshore Transmission works from Marine Scotland Licensing Operations Team (MS-LOT) in October 2014. This consent decision was successfully challenged through Judicial Review raised by the Royal Society for the Protection of Birds ("RSPB") in 2015. The Judicial Review decision was subsequently appealed by Scottish Ministers in 2016. The appeal decision has not yet been made.

ii. Seagreen intends to make a new application for consent for offshore wind farm project or projects within the Phase 1 area of the Firth of Forth Offshore Wind Zone (the "Site") to enable use of the advances in wind turbine design since the original consent application was submitted. This Scoping Report accompanies a request for a Scoping Opinion from MS-LOT in relation to the proposed new consent application.

iii. The Seagreen Wind Farm ("the Development") will be located within the same area as that considered in the 2012 Environmental Impact Assessment (EIA) for the Seagreen Alpha and Seagreen Bravo Wind Farms (the "Site"). The Development is being promoted to address the scenario whereby the existing proposed Seagreen Alpha and Seagreen Bravo Wind Farms are not developed pursuant to consents which were granted by Scottish Ministers in 2014, but which have been the subject of a judicial review whose final outcome is not yet known.

iv. The finalised layout of the Development will be determined through an iterative process, taking cognisance of the EIA, to ensure that the Development is placed within areas of the Site so as to limit any environmental effects. It is expected that the Development may be built out in stages

v. Seagreen intends to submit an Environmental Statement (ES) to accompany the consent application for the Development, which will present the findings of the EIA and demonstrate how design of the Development has been progressed to ensure that environmental effects are avoided and minimised. The Offshore Transmission works was consented separately under the original application (Marine Licence No, 04678/14/0) and was not subjected to the ongoing judicial review.

vi. Seagreen will use of this Scoping Report as a means to begin consultation with stakeholders and consultees to commence discussion of the survey methodologies to inform the EIA. Seagreen will maintain this communication and involvement with consultees throughout the consenting and construction processes as the Development progresses.

vii. This Scoping Report constitutes the information submitted as part of a formal request for a Scoping Opinion and aims to inform stakeholders about the proposed Development. It provides an overview of the existing physical, human and biological environment and identifies known and accessible data sources. The report provides an initial review of potential effects associated with the construction, operation and decommissioning of the Development (both in isolation and in-combination with other

projects). For each parameter of study, Seagreen proposes methods for how these effects will be assessed as part of future EIA works where significant effects are predicted.

viii. This Scoping Report indicates the areas proposed for further detailed investigation during the EIA and additionally identifies a number of areas, which have been suggested to be scoped out of detailed consideration in the EIA. Those topics which are proposed to be considered within the EIA are:

- Ornithology;
- Fish and shellfish resource – underwater noise only;
- Marine mammals – underwater noise only;
- Shipping and navigation;
- Seascape, landscape and visual amenity; and
- Military and Civil Aviation.

ix. Those topics that have been scoped out from the EIA are;

- Physical Environment
- Water and sediment quality;
- Benthic ecology;
- Commercial fisheries;
- Archaeology and cultural heritage;
- Socio-economics, tourism and recreation; and
- Other marine users and activities.

x. This Scoping Report has been prepared in accordance with The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000, as amended by the Electricity Works (Environmental Impact Assessment) (Scotland) Amendment Regulations 2008 and the Marine Works (Environmental Impact Assessment) Regulations 2007, as amended by the Marine Works (Environmental Impact Assessment) (Amendment) Regulations 2011 and the Marine Works (Environmental Impact Assessment) (Amendment) Regulations 2015. It is acknowledged that new EIA Regulations are coming into force on 16 May 2017 and that this Scoping Report will be considered under the new EIA regulations; however as per the transitional provisions within the EIA Directive (Directive 2011/92/EU, as amended by Directive 2014/52/EU) those topics requiring consideration and the minimum content of the Scoping Report will be as per the current EIA regulations.

xi. Seagreen invites consultees to respond to this Scoping Report by providing a formal opinion on the key areas identified, the data sources and the methodology proposed.

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LIST OF ACRONYMS & ABBREVIATIONS

Acronym / Abbreviation	Full Text
AA	Appropriate Assessment
AC	Alternating Current
AD	Air Defence
BDMPS	Biologically Defined Minimum Population Scales
BEIS	Business, Energy and Industrial Strategy
BWEA	British Wind Energy Association
BPEO	Best Practice Environmental Option
CD	Chart Datum
CEFAS	Centre for Environment, Fisheries and Aquaculture Science
CEH	Centre for Ecology and Hydrology
CEMP	Construction Environmental Management Plan
CIEEM	Charted Institute for Ecology and Environmental Management
CfD	Contracts for Difference
CO	Conservation Objective
COWRIE	Collaborative Offshore Wind Research Into the Environment
CRM	Collision Risk Modelling
DC	Direct Current
DECC	Department of Energy and Climate Change
DEFRA	Department for Environment, Food and Rural Affairs
DEPONS	Disturbance Effect on the Harbour Porpoise Population in the North Sea
EC	European Council
ECMA	East Coast Management Area
ECR	Export Cable Route
EIA	Environmental Impact Assessment
EMF	Electro-Magnetic Field
EMP	Environmental Management Plan
ES	Environmental Statement
EU	European Union
FAME	Future of the Marine Environment
FLO	Fisheries Liaison Officer
FTOWDG	Forth and Tay Offshore Wind Developers Group
GBS	Gravity Based System
GIS	Geographic Information System

Acronym / Abbreviation	Full Text
GW	Gigawatts
HAT	Highest Astronomical Tide
HRA	Habitats Regulations Assessment
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
HW	High Water
IBA	Important Bird Area
IBTS	International Bottom Trawl Survey
ICES	International Council for the Exploration of the Sea
IEMA	Institute of Environmental Management and Assessment
ISA	Immediate Study Area
JNCC	Joint Nature Conservation Committee
km	Kilometre
kV	Kilovolt
LAT	Lowest Astronomical Tide
LiDAR	Light Detection and Ranging
LSE	Likely Significant Effect
Ltd	Limited
m	Metre
m/s	Metres per second
m/yr	Metres per year
mg/l	Milligram per litre
MCA	Marine and Coastguard Agency
MHWS	Mean High Water Spring
MLWS	Mean Low Water Spring
MOD	Ministry of Defence
MPA	Marine Protected Area
MS	Marine Scotland
MSL	Mean Sea Level
MS-LOT	Marine Scotland Licencing Operational Team
MW	Mega Watt
NATS	National Air Traffic Services
NGET	National Grid Electricity Transmission
NLB	Northern Lighthouse Board
NM	Nautical Mile

Acronym / Abbreviation	Full Text
NPF	National Planning Framework
NTS	Non-Technical Summary
OESEA3	Offshore Energy Strategic Environmental Assessment 3
OFTO	Offshore Transmission Owner
OREI	Offshore Renewable Energy Installations
OSP	Offshore Substation Platform
OSPAR	The convention for the protection of the marine environment of the north east Atlantic
OWF	Offshore Wind Farm
PAN	Planning Advice Note
PEXA	Military Practice and Exercise Area
PMF	Priority Marine Features
PSA	Particle Size Analysis
PSR	Primary Surveillance Radar
pSPA	Proposed Special Protection Area
R3	Round 3
RAF	Royal Air Force
RCAHMS	Royal Commission on the Ancient and Historic Monuments of Scotland
RES	Renewable Energy Strategy
RSA	Regional Study Area
RSPB	Royal Society for the Protection of Birds
RYA	Royal Yachting Association
SAC	Special Area of Conservation
SCANS	Small Cetaceans in the European Atlantic and North Sea
SEA	Strategic Environmental Assessment
SEPA	Scottish Environment Protection Agency
SLVIA	Seascape and Landscape Visual Impact Assessment
SMP	Seabird Monitoring Programme
SMRU	Sea Mammal Research Unit
SNCB	Statutory Nature Conservation Bodies
SNH	Scottish Natural Heritage
SPA	Special Protection Area
SPP	Scottish Planning Policy
spp.	Species
SSE	Scottish and Southern Energy
SSSI	Site of Special Scientific Interest

Acronym / Abbreviation	Full Text
STW	Scottish Territorial Waters
TSS	Total Suspended Solids
UK	United Kingdom
UKHO	United Kingdom Hydrographic Office
VMS	Vessel Monitoring Systems
WeBS	Wetlands Bird Survey
WSA	Wider Study Area
WTG	Wind Turbine Generator
WWT	Wildfowl and Wetlands Trust
ZAP	Zone Appraisal and Planning
ZDA	Zone Development Agreement

CHAPTER 1: INTRODUCTION

1.1. This Scoping Report has been prepared to support a request from Seagreen Wind Energy Limited ("Seagreen") (Company no. 06873902) for a Scoping Opinion for the Seagreen Phase 1 Wind Farm Project (the "Development") from the Scottish Ministers via the Marine Scotland Licencing Operations Team (MS-LOT). The purpose of this Scoping Report is to identify potentially significant effects associated with the Development during construction, operation and decommissioning. The identification of potential significant effects is based upon an understanding of the environmental conditions likely to be encountered within the Phase 1 development area and the sensitivity of the receptors. Where significant effects are not anticipated to arise Seagreen proposes that these topics and/or receptors are scoped out of further assessment in line with the Environmental Impact (EIA) Regulations (the Electricity Works (EIA) (Scotland) Regulations 2017 and the Marine Works (EIA) (Scotland) Regulations 2017).

1.2. This Scoping Report details the proposed scope for the EIA and eventual production of an ES to accompany consent applications[1] for the Development. Additionally, this report will identify key design changes associated with the proposed development over the previous consent applications by Seagreen (for the Seagreen Alpha and Seagreen Bravo offshore wind farms) and will look at the implications of these changes in terms of environmental impacts.

BACKGROUND

1.3. Seagreen was awarded exclusive development rights in the Firth of Forth Round 3 Offshore Wind Zone (the "Firth of Forth Zone") by The Crown Estate in 2010. Seagreen is a partnership between Scottish and Southern Energy (SSE) (Company no. SC117119) and Fluor Limited (Company no 1274885), the UK operating arm of Fluor Corporation. Seagreen and its partner companies (hereinafter collectively known as the "Seagreen Partners") have a successful history of identifying and developing UK offshore wind sites, including the Greater Gabbard and Beatrice offshore wind farms. Over the years the Seagreen Partners have developed robust methodologies in the appraisal of onshore and offshore wind development opportunities, which will be utilised within the Firth of Forth Zone. The Firth of Forth Zone lies beyond the 12 nautical mile (NM) Scottish territorial waters limit.

1.4. In 2012, Seagreen submitted an application to construct and operate two offshore wind farms, Seagreen Alpha and Seagreen Bravo, within the Phase 1 development area of the Zone (the "Site"), see Figure 2.1. The associated infrastructure required to facilitate the export of power to the national electricity transmission grid was also included within that application. The application was accompanied by an Environmental Statement (the "2012 ES") which presented the findings of the EIA and highlighted potential significant effects and required mitigation. Consent for both the Seagreen Alpha and Seagreen Bravo Wind Farms and the Offshore Transmission Asset was awarded by Scottish Ministers in October 2014.

[1] Applications for a marine licence and consent under section 36 Electricity Act 1989.

1.5. At the same time, consent was also awarded for two nearby offshore wind farm projects located inshore, within Scottish territorial waters. These are Neart na Gaoithe, developed by Mainstream Renewable Power, and Inch Cape, developed by Red Rock Power (formerly Repsol SA).

1.6. In January 2015, the Royal Society for the Protection of Birds (the RSPB) successfully brought a Judicial Review challenging the offshore consents awarded to Seagreen Alpha, Seagreen Bravo, Inch Cape and Neart Na Gaoithe offshore wind farms. The challenge focussed on the cumulative impacts of the wind farm projects on seabirds from protected breeding colonies on the east coast of Scotland. The Judicial Review decision is now subject to appeal by Scottish Ministers. The Seagreen Offshore Transmission works consent was not challenged and remains in place. The appeal outcome is anticipated during summer 2017.

1.7. Delays that have followed from the legal challenge to the offshore consents have resulted in Seagreen considering an application for consent for a revised wind farm design (the Development), utilising the advances in wind turbine technology since the original submission, located within the same Phase 1 development area, i.e. the Site. The Development is being promoted to address the scenario whereby the existing proposed Seagreen Alpha and Seagreen Bravo Wind Farms are not developed pursuant to consents which are the subject of the unresolved Judicial Review. The decision on whether to take forward Seagreen Alpha and Seagreen Bravo Wind Farms cannot be taken until the final outcome of the judicial review and (if the consents are ultimately quashed) any subsequent re-determination of the original applications has taken place leaving consents which are free from legal challenge.

1.8. In 2013 Seagreen was granted Planning Permission in Principle (PPP) by Angus Council for the Onshore Transmission works (onshore export cable, onshore substation and grid connection) for the Development. In 2016 Seagreen obtained an updated PPP from Angus Council for the Onshore Transmission works to maintain a valid, live consent in response to the delay in the offshore consenting process.

1.9. Seagreen believes that any future EIA for an offshore wind farm site or sites within the Phase 1 area of the Firth of Forth Zone must take into account the knowledge and experience gained through the 2012 EIA process, the consent determination and the subsequent Judicial Review outcome in relation to the original consent. Experience and technical understanding from other projects, including those Round 3 offshore wind farms that that have successfully gone through consenting, are now commencing construction or are operational should also be considered. In 2017, Arcus Consultancy Services Ltd, supported by technical experts, was commissioned by Seagreen to review the environmental work undertaken to date, in order to identify the key environmental issues and potential effects associated with the construction, operation and eventual decommissioning of the proposed Development through a targeted scoping exercise.

STRUCTURE OF THE SCOPING REPORT

1.10. The structure of this report is as follows;

- Project description;
- Justification for the Development;
- Overview of the EIA process;
- Consideration of relevant technical topics; and
- Recommendations for progression of the EIA.

1.11. This scoping report concerns the proposed development of an offshore wind farm project or projects in the Site. The consent for the Offshore Transmission Asset remains in place and there is therefore no requirement to consider it in this Scoping report.

HOW TO RESPOND TO SCOPING

1.12. Seagreen is committed to informing and engaging with organisations and members of the public interested in the development of the Zone. Authorities, groups and organisations to be consulted during the progression of the EIA are presented in Appendix A.

1.13. A number of questions have been included within this Scoping Report and are designed to focus the responses of the consultees.

1.14. There are a number of ways in which you can be kept informed of developments:

Seagreen website and email

1.15. The scoping report, other documents and updates will be published on the website.

Website: www.seagreenwindenergy.com

Email: info@seagreenwindenergy.com

Consultation events

1.16. Seagreen will be organising briefing sessions, public exhibitions and consultation evenings throughout the duration of the development process. Information regarding the time and location of such events will be made known to the public in advance.

Telephone

1.17. You can call 0141 224 7192 to register your interest.

Write to us

1.18. You can write to us at:

Seagreen Wind Energy Limited

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Glasgow

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CHAPTER 2: PROJECT DESCRIPTION

SITE LOCATION AND SPECIFICATION

2.1. The Development will be the first to be taken forward for development by Seagreen in the Firth of Forth Zone. The Site lies approximately 27 km offshore, east of the Angus coastline in Scotland. The Site is in the north of the Firth of Forth Zone (see Figure 2.1) and comprises an area of approximately 391 km^2 located to the east of Scalp Bank. The Site being considered in this Scoping Report is the same as that considered in the 2012 ES that supported the consent applications for the Seagreen Alpha and Seagreen Bravo offshore wind warms. The finalised layout of the Development will be determined through an iterative process, incorporating of the findings of the EIA and other technical studies, to ensure that any environmental effects from the Development are limited.

2.2. Given the lapse in time and the advancement in technology since the original consent application by Seagreen in 2012, alterations have been made to the Development to reduce its environmental effects. The physical and technical characteristics of the Development are provided in **Table 2.1** with a comparison showing how the design has evolved.

2.3. The maximum site capacity will ultimately be determined through technical evaluation of production WTGs at the time of application. Seagreen currently holds a grid connection agreement with NGET for a TEC of 1050 MW for the Phase 1 projects. The stated number of WTGs is based on the assumption of installing WTGs of up to 15 MW capacity at a minimum spacing of 1 km. Through consideration of the environmental and technical constraints within the Site the final design envelope for construction may consist of fewer WTGs of higher capacity. A detailed analysis of existing data, supplemented by new site data as required, will improve understanding of the extent of the area for development and ascertain the most suitable locations for WTGs. This will enable the Development capacity and the ultimate Site boundaries to be refined and confirmed prior to construction.

Table 2.1 Characteristics of the Development

Key Parameter	2012 Design Envelope Seagreen Alpha & Bravo	2017 Design Envelope
Area (km^2)	391	391
Distance from shore (closest point) (km)	27	27
Total maximum installed capacity (MW)	1,050	TBC[2]
Maximum capacity of turbines (MW)	7	Expected to be up to 15 MW
Number of wind turbine generators (WTGs)	150	70 -120
Maximum rotor diameter (m)	122 - 167	220
Maximum hub height above Lowest Astronomical Tide (LAT) (m)	87.1 - 126	140
Maximum tip height above LAT (m)	148.1 – 209.7	280
Minimum blade clearance above LAT (m)	26.1 - 42.7	29.1 - 42.7
Minimum separation distance between WTGs (m)	610 - 835	1,000
Colour of WTGs	Pale matt grey/off-white colour and will include aviation lighting	
Other infrastructure		
Meteorological masts	Up to six (three in each wind farm) ranging from 87.1 m to 209.7 m above LAT	Up to three ranging from 140 m to 280 m above LAT
Wave buoys	Up to six	
Scour protection and cable protection	As required	

THE DEVELOPMENT

2.4. The offshore construction period for the Development is likely to take approximately 36 months; subject to a finalised construction programme of works. It is expected that construction would begin in 2022, however the final start date will be dependent on securing a Contract for Difference contract for the Development and the programme defined in this. It is expected that construction and commissioning will be undertaken in a phased approach.

2.5. A number of elements in addition to the WTGs themselves make up the Development and are discussed below.

Wind Turbine Generator Arrays

2.6. WTGs of up to 8 MW have been utilised within offshore wind farm developments to date and are currently available to the market. It should be noted that the final decision on the preferred WTG will not be made until all statutory consents are in

[2] The maximum installed capacity will be > 50MW requiring application to Scottish Ministers under Section 36, Electricity Act 1989

place and the Development has secured a CfD. Greater capacity WTGs are in development for offshore installation and are expected to be in production by this time. The design life of the wind farm will be 50 years though the lease term with The Crown Estate is expected to be in the region of 50 years.

2.7. The WTG array layout for the Development will be designed to best utilise the available wind resource while at the same time seeking to reduce environmental effects and impacts on other marine users. The maximum height of the WTGs is expected to be up to 280 m from mean sea level to the blade tip in the vertical position, however new WTGs available on the market at the time of construction will be considered and their detailed dimensions are not yet known. The nacelles and rotor will be mounted upon a cylindrical steel tower; which will in turn be supported by a substructure and foundation, the design and type of which is yet to be confirmed.

Foundation and Substructures

2.8. Different foundation and substructure designs are being considered for the Development. The refinement of these options, based on the available geotechnical data and on future studies, shall be required prior to the final selection of the preferred foundation and substructure design. Foundations and substructures under consideration are:

- Monopiles;
- Pin piled jackets
- Suction caisson jackets; and
- Gravity bases.

2.9. Selection of the preferred design will be based on a detailed assessment of ground conditions and other factors influencing design viability, including project economics prior to construction.

Offshore Platforms and Inter Array Cables

2.10. The generated electrical power from the WTGs will be transmitted through 33 kilovolt (kV) or 66kV inter array cables to an offshore substation. The inter array cables will be buried where possible to provide protection. The offshore substation will step up the voltage to 220 kV for export to the onshore transmission grid. A High Voltage Alternating Current (HVAC) or High Voltage Direct Current (HVDC) connection design may be used. It is expected that the offshore substation platform or platforms will be supported on foundations and substructures similar to the WTGs. There is an existing consent for the Seagreen Phase 1 Offshore Transmission works which, as noted previously, remains valid.

Meteorological Mast

2.11. A floating LiDAR providing meteorological data was installed within the Site during 2017. This was the subject of a separate Marine Licence issued by MS-LOT (Licence No. 06190/16/0). The floating LiDAR will provide site specific wind data to inform wind resource predictions and layout design.

2.12. Up to three permanent meteorological masts may be installed at key locations across the Site determined by the finalised layout. Instrumentation mounted on the meteorological mast towers will enable measurement of wind speed and direction profiles. The meteorological mast maximum height will be governed by the WTG selected for installation at the Development.

2.13. As with WTG foundations, the type of foundation for the offshore meteorological mast will depend upon a number of physical parameters such as water depth and geological conditions. The ultimate design will be informed by the geophysical survey and subsequent geotechnical investigations at the site which will take place prior to submission.

2.14. Meteorological instrumentation will include a number of anemometers installed at several heights on the mast to facilitate measurement of the wind speed and wind shear profiles, wind vanes to measure wind direction, pressure and temperature and humidity sensors.

Wave Buoys

2.15. Wave buoys will be deployed at a number of locations within the Site to measure wave height, period, direction and spreading angle. The wave data will be sent via satellite telemetry to the shore and recorded internally for Seagreen and will provide input for the development of a forecast model for the region. The wave buoys will be moored at each location and protected by guard buoys to increase the visibility and awareness of the measuring equipment. Consultation will be undertaken with the local fishing interests prior to deployment and the standard marine notification requirements will be followed.

2.16. Seagreen will consult with the Northern Lighthouse Board (NLB) regarding lighting; however it is Seagreen's understanding that each wave buoy will be marked with a flashing amber light to standard requirements and an additional radar reflector fitted to enhance radar visibility. Seagreen will seek a clearance of up to 350 m at each wave buoy location. It is anticipated that the wave buoys will be deployed for a period of up to three years. They will be serviced over this period at approximately six month intervals. At the end of the deployment period each wave buoy and mooring will be fully recovered from the Site.

EXPORT CABLE ROUTE

2.17. Whilst not part of this application, subsea power cables are required to connect the Development to the Onshore Transmission Works where the generated power will be connected to the terrestrial electricity transmission grid. These cables will also comprise internal fibre optic communication links for wind farm control purposes. In October 2014 Seagreen obtained a Marine Licence for the Offshore Transmission works from Scottish Ministers (Licence No. 04678/14/0). The licence permits the installation of offshore transmission infrastructure, including up to five Offshore Substation Platforms (OSPs) with connecting high voltage cables and high voltage export cables, in up to six trenches, from the OSPs within the Site to Mean High Water Springs (MHWS) at the landfall at Carnoustie.

2.18. The licence states that the final choice of OSP foundation and substructure design will be made as part of the detailed design as and when constraints such as geotechnical issues are fully understood.

CHAPTER 3: THE NEED FOR THE PROJECT

EUROPEAN AND UK RENEWABLE ENERGY TARGETS

3.1. On 29 March 2017, the United Kingdom (UK) formally notified its intention to leave the European Union (EU) under Article 50 of the Lisbon Treaty of the EU (European Commission, 2017). It is anticipated that the Great Repeal Bill (Department for Exiting the European Union, 2017) will convert all directly applicable EU laws, rules and targets into domestic UK governance and will preserve all laws made in the UK to implement our EU obligations. Therefore, it is considered that the existing EU renewable energy targets for the UK, such as the requirements of the EU Renewable Energy Directive 2009/28/EC (the "Directive") (EUR-Lex, 2009), will remain applicable throughout the process of exiting the EU and even after the UK has formally exited the EU. It is considered unlikely that any new EU legislation or updates to existing directives not ratified by March 2017, such as the November 2016 proposal (EUR-Lex, 2017) to revise the Directive, will be transposed to UK law.

3.2. The EU Renewable Energy Directive sets national binding targets for all EU countries, with an aim to deliver 20% of energy consumed in the EU from renewable energy sources by 2020 (EUR-Lex, 2009). The UK is a signatory to the Directive and through the Renewable Energy Strategy (RES) has set a target of increasing its proportion of renewable energy by a factor of almost seven from 2.25% in 2008 to 15% by 2020 (HM Government, 2009). The 2017 Renewable Energy Progress Report (EUR-Lex, 2017) summarises the progress countries within the EU are making towards 2020 targets. Based on the 2017 publication, the UK is currently projected to miss its 2020 targets by 0.2%, indicating a need for further renewable energy developments.

3.3. The UK Overarching National Policy Statement for Energy (EN-1) was published in July 2011, and states that offshore wind is expected to provide the largest single contribution towards the 2020 renewable energy generation capacity (DECC, 2011a). Paragraph 3.3.10 of EN-1 confirms that the UK Government is committed to increasing the amount of renewable energy capacity available and in the short to medium term this new capacity is likely to be driven by both onshore and offshore wind projects. Paragraph 3.4.3 states that "offshore wind is expected to provide the largest single contribution towards the 2020 renewable energy generation targets" (ibid.). In conjunction, the UK National Policy Statement for Renewable Energy Infrastructure (EN-3) was also published in July 2011, stating that "offshore wind farms are expected to make up a significant proportion of the UK's renewable energy generating capacity up to 2020 and towards 2050" (DECC, 2011b).

3.4. The third UK Offshore Energy Strategic Environmental Assessment (OESEA3) Post Consultation Report was published in July 2016, building upon previous SEAs undertaken in 2009 and 2011 that had identified potential offshore wind capacity in UK waters (excluding the Scottish territorial waters) which formed the basis of the Round 3 offshore wind programme. Whilst support of offshore wind is still included in the OESEA3, no formal targets for generating capacity are provided.

Round 3

3.5. Round 3 of the UK offshore wind licensing arrangements identified nine offshore wind farm zones of varying sizes within UK waters that theoretically could deliver the offshore wind capacity identified within the SEAs. Successful development partners were identified in January 2010, with the first offshore projects submitted to the Planning Inspectorate in England and Wales and to MS-LOT in Scotland 2012.

3.6. As noted previously, a Judicial Review process is currently ongoing over the validity of the offshore wind farm consent decisions granted by the Scottish Ministers in October 2014 for the Seagreen Alpha and Seagreen Bravo wind farm projects and the adjacent Inch Cape and Neart na Gaoithe projects in Scottish territorial waters (see Chapter 1 for more information). The territorial waters projects were not part of the OESEA process but were the subject of a separate SEA undertaken by the Scottish Government.

RENEWABLE ENERGY AND PLANNING POLICY IN SCOTLAND

3.7. Scotland's geography and climate offers enormous potential for the development of renewable energy resources and there is potential for Scotland to go beyond the fundamental renewables targets proposed for the UK as a whole. A mixture of legally binding targets for reducing carbon emissions and increasing energy demands has led to increased support for electricity generation from renewable sources, including offshore wind.

3.8. The Climate Change (Scotland) Act 2009 (the "Act") introduced binding targets on the Scottish Government to reduce net Scottish greenhouse gas emissions by 80% by 2050 from 1990 levels, with an interim target of 42% by 2020. In support of this objective, the Act commits to a generating capacity equivalent to 100% of national electricity needs from renewable energy development by 2020 (ibid.).

3.9. The Reducing Emissions in Scotland: 2016 progress report (Committee on Climate Change, 2016) states that in 2015, renewable energy capacity has reached 7.7 gigawatts (GW) in Scotland, of which 5.6 GW was from wind generation and this accounted for 39% of the UK's wind capacity. The report estimates that between 14 and 16 GW of installed renewable capacity will be needed by 2020 to generate the equivalent of 100% of Scotland's electricity consumption, and to achieve this, "the pace of increase in capacity and renewable generation will need to rise" (ibid.).

3.10. In 2016, the Scottish Government published "A Plan For Scotland: The Scottish Government's Programme for Scotland 2016-17", which reiterates the national commitment to addressing climate change and reduce Scottish greenhouse gas emissions beyond those currently required by law. This will be achieved by introducing a new Scottish Climate Change Bill in 2017.

3.11. Further to this, the Scottish Government published the Draft Climate Change Plan (the draft third report on policies and proposals 2017 – 2032) in January 2017. This plan builds upon targets set within the Climate Change (Annual Targets) (Scotland) Order 2016, which were considered to contain a more ambitious set of targets at the time than those proposed by the Committee on Climate Change. The Draft Climate

Change Plan advises that energy supply and capacity will be delivered by a range of renewable technologies, including offshore wind.

3.12. The consultation period linked with the publication of the Draft Scottish Energy Strategy: The Future of Energy in Scotland opened in January 2017. The draft strategy document sets out the Scottish Governments long-term vision for energy, with a new 2030 renewables target proposed that will aim to deliver the equivalent of half of Scotland's heat, transport and energy needs from renewable sources. The targets specified within the draft strategy document are consistent with those detailed in the Act. Generally the draft strategy supports increasing renewable energy generation in Scotland and offers a firm commitment from the Scottish Government to support the continued growth of the renewable energy sector in Scotland. In respect of offshore wind development, the draft strategy emphasises that "with appropriate regulatory support, offshore wind development has a bright future in Scotland" whilst "Scotland is at the forefront of offshore renewables generation with world-leading innovative projects in offshore wind" (Scottish Government, 2017b).

3.13. Scottish Ministers are responsible for the National Planning Framework (NPF) for Scotland, which sits at the top of the policy hierarchy and is the long term strategy for the development in Scotland over the next 25 years. The current plan, NPF3, was published in June 2014. This indicates that some of Scotland's coal and nuclear plants are nearing the end of their operational lifespan (albeit some of these resources have already closed), and as such, increased renewable energy capacity can help meet the electricity capacity shortfalls which may arise (Scottish Government, 2014).

3.14. The NPF is supported by the Scottish Planning Policy (SPP) (Scottish Government, 2014). This includes policy on a series of topics, including renewable energy, and acknowledges Scotland's offshore renewable energy resources.

3.15. Development plans and statements of policy are a material consideration with regard to the authorisation of electricity generation schemes under Section 36 of the Electricity Act 1989, however offshore developments located below Mean Low Water Springs (MLWS) fall outside the control of the terrestrial planning system.

OFFSHORE WIND IN SCOTLAND

3.16. In 2011 Blue Seas – Green Energy: A Sectoral Marine Plan for Offshore Wind Energy in Scottish Territorial Waters was published, which sets out the Scottish Government's vision for developing offshore wind energy up to and beyond 2020. In Part A, the Plan states that the East Region (comprising a wide area east of the Firth of Forth and the Firth of Tay) "has favourable conditions for the development of offshore wind". The significant strategic issues relate to fishing, shipping, and the environment. Evidence suggests that these issues can be addressed through appropriate mitigation measures. The Plan states that three short term sites within STW have been identified as being suitable for development by 2020. It also states that there is also a large Round 3 offshore wind development (the Firth of Forth Zone) just outside the STW boundary but within Scottish Offshore Waters. The

cumulative impacts of these developments will require further consideration (Scottish Government, 2011).

3.17. Scotland's National Marine Plan (Scottish Government, 2015), published in March 2015 ("the Plan"), covers the management of inshore and offshore waters off the coast of Scotland whilst setting the strategic framework and planning policies for Scotland's marine environment. The Plan includes an objective promoting sustainable development of offshore wind in the most suitable locations, to contribute to achieving energy efficiency and generation targets. Proposals for commercial offshore wind and marine renewable energy developments are to be sited in the Plan option areas identified through the Sectoral Marine Planning process for offshore renewables, as these areas are considered the most appropriate strategic locations for offshore wind developments. Paragraph 11.5 of the Plan (page 82) states that "Scotland is well placed to become a key hub for the design, development and deployment of the next generation of offshore wind technologies".

OFFSHORE WIND DEVELOPMENT IN THE FIRTH OF FORTH AND SURROUNDING AREA

3.18. During 2008, the Crown Estate requested initial expressions of interest from companies and consortia wishing to be considered for developing commercial scale wind farms within Scottish territorial waters. In February 2009, a number of companies and consortia were awarded exclusive development rights by The Crown Estate for 10 sites with a total award capacity of 6,438 MW. Of these, the Inch Cape and Neart na Gaoithe projects (Table 3.1) are located within STW offshore of the Firth of Forth and Firth of Tay and were progressed to consent award (see Figure 4.1). The consents for these projects are also ongoing subjects of the previously mentioned Judicial Review process.

Table 3.1 Scottish Territorial Waters Offshore Wind Generation Sites

Site Name	Applicant	Size (MW)	Area (km²)	Status
Inch Cape	Inch Cape Offshore Ltd	784	149.9	Consent subject to challenge
Neart na Gaoithe	Mainstream Renewable Power Ltd	450	105.1	Consent subject to challenge

FIRTH OF FORTH ROUND 3 ZONE

3.19. The Firth of Forth Round 3 Zone was defined by The Crown Estate in 2009. The Crown Estate has confirmed that this boundary is fixed and no further variation will be possible. The Zone lies approximately 25 km offshore of Angus, Fife and East Lothian on the East coast of Scotland. The area of the Zone is approximately 2,850 km² and it is situated immediately east of STW 12 NM limit (see Figure 2.1).

3.20. As described previously in Chapter 1, Seagreen was awarded exclusive rights to develop the Firth of Forth Zone in January 2010 and has a formal ZDA with The Crown Estate. The ZDA provides the contractual programme milestones for the

development of the Zone and identifies a revised target generation capacity of 1,050MW to be delivered across the Zone.

3.21. During the original Round 3 bid process, Seagreen identified phases of development and potential wind farm sites within the Zone following a desk based assessment of zone environmental and technical data (constraints mapping). Data was initially compiled from a number of primary sources including Seazone, UKDEAL, Kingfisher and The Crown Estate on the parameters identified in Table 3.2.

Table 3.2 Parameters for Site Selection

Zone Data Compilation
• Water Depth and Distance to Shore; • Wind Speed and Metocean Conditions; • Environmental designations (existing and proposed, onshore and offshore) including Special Protection Areas (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.

3.22. Constraint mapping facilitated the initial differentiation of the Zone into four discrete areas of which the Phase 1 area was considered to be the least constrained and has been developed first by Seagreen (see Figure 2.1).

3.23. Seagreen have undertaken a structured Zone Appraisal and Planning (ZAP) exercise to define development areas within the Zone, to appraise and manage consenting risks, and to identify the cumulative and in-combination impacts of development of the Zone. An initial ZAP report was published in 2010 (Seagreen, 2010) presenting the outputs from the initial Zone appraisal. Two subsequent ZAP update reports have been published in 2011 (Seagreen, 2011) and in 2014 (Seagreen, 2014) to inform on the evolution of Seagreen's intentions for development of the Firth of Forth Zone in response to the increasing understanding of the environmental constraints through the development of projects in the Phase 1 area. It is expected that the ZAP process will continue through the forthcoming EIA process and will assist in the future delineation of, and amendments to, proposed site boundaries within the Zone. Any future ZAP reports will also be published and issued to stakeholders.

QUESTIONS FOR CONSULTEES

3.1 Are the policy and legislation documents identified within this chapter considered relevant to the Development?

3.2 Are there any other areas of policy guidance the determining authority would recommend is included within the application?

CHAPTER 4: ENVIRONMENTAL IMPACT ASSESSMENT

4.1. The Development requires assessment under:

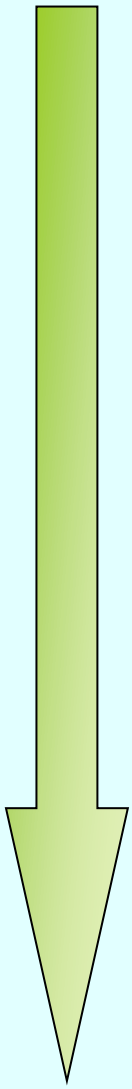
- The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017. This replaces The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000, as amended by the Electricity Works (Environmental Impact Assessment) (Scotland) Amendment Regulations 2008; and
- The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017. This which replaces The Marine Works (Environmental Impact Assessment) Regulations 2007, as amended by the Marine Works (Environmental Impact Assessment) (Amendment) Regulations 2011 and the Marine Works (Environmental Impact Assessment) (Amendment) Regulations 2015.

APPROACH TO EIA

4.2. Given that that Seagreen's original application for the Seagreen Alpha and Seagreen Bravo Wind Farms was determined to be an EIA development and that the Development significant effects, a Screening Request is not being sought from MS-LOT as it is assumed an EIA is required. The EIA will include the following standard stages, which are illustrated in Table 4.1:

- Scoping determination of the issues to be addressed by the EIA (this report);
- Consultation with regulators, stakeholder and local communities;
- Updated baseline assessment;
- Impact identification and evaluation during the construction, operation and decommissioning phases;
- Identification of mitigation and resultant residual impacts, and a commitment to mitigation measures;
- Identification of monitoring requirements;
- Submission of the ES to the relevant authorities as part of the consent application process; and, if required,
- Liaison and consultation to resolve matters or representations/objections.

Table 4.1 Stages of the EIA

Stage	Task	Aim/Objective	Work/Output (examples)	Public Participation and Consultation
Scoping	Scoping study	To identify the potentially significant direct and indirect impacts of the Development.	Targets for specialist studies.	Consultation with statutory and non-statutory consultees.
EIA 	Primary data collection	To characterise the existing environment.	Background data including existing literature and specialist studies.	Public participation is an important part of the planning process, in particular at the EIA and pre-application stages. Preliminary consultation with key consultees is considered important for setting the framework for consent. Consultation with statutory and non-statutory organisations and individuals with an interest in the area and the proposed development throughout the EIA process forms an integral part of the Seagreen approach to EIA.
	Specialist studies	To further investigate those environmental parameters which may be subject to potentially significant impacts.	Specialist reports.	
	Impact assessment	To evaluate the existing environment, in terms of sensitivity. To evaluate and predict the impact (i.e. magnitude) on the existing environment. To assess the significance of the predicted impacts.	Potential adverse and beneficial impacts.	
	Mitigation measures	To identify appropriate and practicable mitigation measures and enhancement measures.	The provision of solutions to avoid or minimise adverse impacts as far as possible. Feedback into the design process, as applicable.	
	Environmental Statement	Production of the ES in accordance with EIA guidance Including a Non Technical Summary (NTS).	ES - Four main volumes: • NTS • Written statement • Appendices • Figures	
	Pre-Application Consultation	Advertising of application for licensing must occur in relation to Marine Licence and any Section 36 application.	Application for consent.	
	Post submission	Liaison and consultation to resolve matters or representations/objections.	**Correspondence with relevant stakeholders.**	
EIA Consent Decision				

Identification and Evaluation of Effects

4.3. An effect is determined from the existing baseline environment and the alteration of any physical, chemical, biological or perceived characteristics of that environment. For each parameter considered to be modified by the construction, operational and decommissioning phases of the development, a list of potential effects shall be identified. An assessment of significance of each effect will be made. In order to determine significance, a number of criteria must be considered:

- Magnitude of the effect (local/strategic);
- Spatial extent of the effect(small scale/large scale);
- Duration of the effect (short term/long term);
- Reversibility of the effect (including species or habitat recoverability);
- Sensitivity and level of tolerance of the receptor or species;
- Conservation or protected status;
- Probability of occurrence of the effect;
- Confidence in the effect prediction; and
- The margins by which set values are exceeded (e.g. noise standards).

4.4. Where an effect can be quantified, thresholds are applied to determine the significance of an effect, unless otherwise stated.

4.5. Where an effect cannot be quantified because of the nature or complexity of the effect, a subjectivity scale is used to determine its significance e.g. local, regional, national importance.

4.6. Following the identification of receptor value and sensitivity and magnitude of the impact, it is possible to calculate the significance of the effect following the matrix presented in Table 4.2.

4.7. In order to provide a consistent approach to the treatment of different technical effects, the following terminology will be used in the ES to define effects:

- Adverse – detrimental or negative effects to an environmental resource or receptor;
- Negligible – either adverse or beneficial effects to an environmental resource that are assessed as being environmentally acceptable; and
- Beneficial – advantageous or positive effects to an environmental resource or receptor.

Table 4.2 Significance Criteria of Effect

Value / Sensitivity	Magnitude			
	High	**Medium**	**Low**	**Negligible**
High	Major	Major	Moderate	Minor
Medium	Major	Moderate	Minor	Negligible
Low	Moderate	Minor	Negligible	Negligible
Negligible	Minor	Negligible	Negligible	Negligible

4.8. The significance of the effects identified can then be defined according to the terminology in Table 4.3. This methodology provides a consistent framework for considering and evaluating effects.

Table 4.3 Terminology for Classifying and Defining Environmental Effects

Effect Significance	Definition
Major	Very large or large change in site / asset conditions, both adverse or beneficial, which are likely to be important considerations at a regional or district level because they contribute to achieving national, regional or local objectives, or, could result in exceedance of statutory objectives and / or breaches of legislation.
Moderate	Intermediate change in site / asset conditions, which are likely to be important considerations at a local level.
Minor	Small change in site / asset conditions, which may be raised as local issues but are unlikely to be important in the decision making process.
Negligible	A barely discernible change which may not be detectable in site /asset condition and is likely to have a negligible influence on the site/ asset.
No Impact	No discernible change in site/asset conditions, likely to have no measurable influence, irrespective of other effects.

Design Envelope

4.9. For the purposes of the EIA a range of potential WTG and foundation types will be considered and the worst case scenario will be assessed, in accordance with current best practice and the "Rochdale Envelope Principle"[3], for each topic

4.10. The Rochdale cases have established a process within which the effects of projects, where the final design is not available at the consent application stage, can be addressed by setting a series of minimum and maximum parameters for which the significant effects are established. The detailed design of the project can then vary within this envelope without rendering the ES findings inadequate. This approach has been confirmed by the courts as enabling the legal requirements of the relevant EIA regulations to be complied with, so long as appropriate conditions are placed in the resulting consents to ensure that the worst case likely effects will not be exceeded

[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.

by the final built development, and will not give rise to a likely significant effect on the environment which has not been assessed within the ES.

4.11. The key drivers for the flexibility of design elements includes:

- The ability to optimise projects in both design and economic terms to ensure that schemes are sufficiently attractive to investors to secure the significant capital that is required to bring projects through to delivery;
- To allow for detailed design to be refined in the project procurement phase, notably taking into account the evolution of foundation and WTG technologies available and variety of installation techniques; and
- An essential need to maintain competitive market behaviour in the supply chain without prejudicing legal procurement rules.

4.12. The need for optimisation contains two important dependent requirements:

- The ability to avoid fundamental supply chain constraints that could prevent delivery of the project; and
- The ability to maximise energy capture, not just focussing on total MW capacity, and to positively influence project economics.

4.13. Details of the parameters to be taken into account during the EIA are provided in Chapter 2.

Mitigation

4.14. Where the assessment identifies that the Development is likely to give rise to a significant adverse environmental effect, Seagreen will propose mitigation measures to avoid or reduce the effect. Mitigation measures will also be incorporated into the design of the Development and associated infrastructure where possible.

Environmental Statement

4.15. The ES for the Development will report on the EIA process and will contain:

- Description of the Development proposal, including any alternatives considered;
- Description of the existing environment at the Site and its environs;
- Prediction of potential effects on the existing human, physical and biological environment at the Site;
- Description of mitigation measures;
- Description of monitoring requirements; and
- a Non-Technical Summary. (NTS).

Consultation

4.16. A co-ordinated approach to the consenting process, with the emphasis on early stakeholder involvement, is consistent with the provisions of the Planning etc. (Scotland) Act 2006 and the Marine (Scotland) Act 2010. Seagreen has an existing relationship with the relevant stakeholders and will continue to actively seek the

views of regulators and stakeholders. As mentioned previously the authorities, groups and organisations to be consulted during the progression of the EIA are presented in Appendix A.

REQUIREMENT FOR APPROPRIATE ASSESSMENT

4.17. In accordance with 2017 EIA Regulations, where a Habitats Regulations Appraisal (HRA) is required in relation to an EIA project, there is a requirement to ensure that the HRA and EIA are coordinated.

4.18. The EC Directive on the conservation of natural habitats and of wild fauna and flora 92/43/EEC, generally known as 'The Habitats Directive' requires that certain important habitats and species are given legal protection through a network of protected sites, the Natura 2000 Network of European Sites. The Natura 2000 network includes Special Areas of Conservation (SACs) designated under the Habitats Directive and Special Protection Areas (SPAs) classified under the Birds Directive (Directive 2009/147/EC of the European Parliament and of the Council).

4.19. In addition to SACs and SPAs it is the UK Government's policy, and that of the devolved administration in Scotland, to provide Ramsar sites (designated under the Ramsar Convention on Wetlands of International Importance (Ramsar, 1971)) with the same level of protection as that provided for Natura 2000 sites. Together, SPAs, SACs and Ramsar sites make up the UK's contribution to the EU's Natura 2000 network of protected areas.

4.20. For Marine Protected Areas (MPAs), designated under the Marine (Scotland) Act 2010 (where occurring in territorial waters) or Marine and Coastal Access Act 2009 (where occurring in offshore waters), consideration of potential for effects is also necessary.

4.21. Under the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended by the Conservation of Habitats and Species Regulations 2010 and the Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007 (as amended), the competent authority (in this case the Scottish Government) must consider whether a plan or project has the potential to have an adverse effect on the integrity of a Natura 2000 site or a relevant marine site (including candidate and proposed sites) through a Habitats Regulations Assessment (HRA).

4.22. A single AA was published by Marine Scotland in support of the 2014 decision to award consent to the Seagreen Alpha, Seagreen Bravo, Inch Cape and Neart na Gaoithe wind farms. The Marine Scotland AA concluded no adverse effects on the integrity of the protected sites given in Table 4.4 below. The conclusions of the Marine Scotland AA in respect of the Fowlsheugh SPA and the Forth Islands SPA, and the methods used to determine them were the subject of a Judicial Review challenge by RSPB against the wind farm consents issued by the Scottish Government. The court ruled in favour of RSPB (Court of Session 2016), however, the Scottish Ministers raised an appeal against the judgement which was heard in February 2017. At the time of writing, the outcomes of the appeal are not yet known.

Table 4.4 Designated Sites

Site Name	Primary reasons for designation
Buchan Ness to Collieston Coast SPA	Breeding seabirds
Fowlsheugh SPA	Breeding seabirds
Forth Islands SPA	Breeding seabirds
St Abb's Head to Fast Castle SPA	Breeding seabirds
Moray Firth SAC	Bottlenose dolphin
Firth of Tay and Eden Estuary SAC	Harbour seal
Isle of May SAC	Grey seal
Berwickshire & North Northumberland Coast SAC	Grey seal
River South Esk SAC	Migratory fish
River Tay SAC	Migratory fish
River Teith SAC	Migratory fish
River Dee SAC	Migratory fish
River Tweed SAC	Migratory fish

4.23. In 2014, prior to the original consent decision, the Scottish Ministers designated the Firth of Forth Banks Complex MPA for benthic ecology, subtidal habitats and geomorphological features. The Scottish Ministers have also consulted on the possible designation of a further marine SPA for breeding and non-breeding seabirds, the Outer Firth of Forth and St. Andrews Bay Complex SPA. This site is now a proposed SPA (pSPA) and is therefore subject to the same level of consideration as the designated sites.

Requirement for an AA

4.24. Based on the above, an AA will be required. Seagreen will therefore submit an HRA for the Development to inform this. This will reflect any outcomes from the legal process, revised guidance and also the development in understanding of the effect of offshore wind farms on seabirds since the original Marine Scotland AA was completed. It will also have regard to methodologies and findings from wind farms AAs published since 2014.

Ornithology

4.25. The HRA for ornithology will focus on the SPAs listed in Table 4.4 and include a 'shadow' assessment of the pSPA. Focal species would be the same as those considered in the previous HRA/AA, revised in line with any new survey findings (see Chapter 5), with the addition of pSPA species where connectivity with the Site can be demonstrated.

4.26. There are a number of questions (see Chapter 5) regarding ornithology HRA which have arisen from:

- Differences between the approach of Statutory Nature Conservation Bodies (SNCBs) and Marine Scotland Science (MSS) to the 2014 AA leading to differing conclusions about adverse effects on site integrity;
- Points raised in the Judicial Review judgement, and the subsequent appeal decision; and
- The pSPA documentation.

4.27. Answers to the following questions are therefore requested from SNCBs and MSS to expedite the HRA/AA process. See also questions raised in Chapter 5.

Marine Mammals

The HRA for marine mammal would focus on the cetacean and pinniped species listed in Table 4.4 and would include a 'shadow' assessment of the relevant SACs. This would take various updates in research and guidance into account, including updates in the modelling of underwater noise. See also Chapter 6.

Questions

4.1 The 2014 AA, on the advice of the SNCBs, considered one over-arching SPA conservation objective (CO) which can be summarised as: ensuring that the population of a species as a viable component of the site is maintained in the long term. Is this approach still correct or should all COs be discussed at HRA?

4.2 The COs of the pSPA differ from standard SPA COs in Scotland. Advice on how they should be interpreted is requested.

4.3 What are the current reference populations of each species at each protected area?

4.4 The pSPA population sizes for some species e.g. gannet, are much smaller than those of the terrestrial breeding seabird SPA which abut the pSPA e.g. Forth Islands SPA. For others e.g. kittiwake, they are much larger. How should any effects, particularly in-combination, be interpreted and apportioned in relation to the pSPA?

4.5 How should connectivity be assigned between pSPA features and wind farm footprints outside the pSPA?

4.6 Are there 'common currency' HRA assessment methods which developers should adopt (see proposed approach to ornithological assessment in Chapter 5:)?

4.7 How should effects on breeding seabirds outside the breeding season be assessed for HRA?

4.8 Are models developed for the 2014 AA still considered valid e.g. Centre for Ecology and Hydrology (CEH) population model and PVAs?

4.9 Should effects be presented as an annual change in population or as a change over the lifetime of the Development, or both?

4.10 Where effects are deemed to be approaching levels considered significant, how should thresholds be established and agreed?

CUMULATIVE AND IN-COMBINATION IMPACTS

4.28. Seagreen previously worked with the Forth and Tay Offshore Wind Developers Group (FTOWDG) to identify a combined strategy for the assessment of potential cumulative impacts resulting from the development of multiple wind farm sites within STW and the Zone. Detailed assessment methodologies were presented in a Discussion Document issued to key stakeholders in autumn 2010 (Royal Haskoning 2010b). Outputs of shared studies were used to inform the 2012 EIA.

4.29. The projects and plans listed in Table 4.5 and shown on Figure 4.1 will be considered for cumulative and in-combination impact assessment. As agreed with MS-LOT in May 2012, due to the uncertainties surrounding subsequent Seagreen phases of development (the design of the wind farms and when they are likely to enter the consenting process) these phases will not be included in the cumulative assessments in the 2017 EIA.

Table 4.5 Projects and Plans Considered for Cumulative and In-Combination Assessment

Project	Description	Location	Status
Inch Cape	Installation of up to 110 WTGs with export capacity of approximately 784 MW.	Approximately 15 km east of the Angus coastline.	Consent application submitted July 2013. Approved by Scottish Government September 2014. Subject to Judicial Review raised by RSPB challenging the consent, which the Court of Session found in favour of in July 2016, and now subject to an appeal by the Scottish Government.
Inch Cape (alternative design	Installation of up to 72 WTGs with export capacity unknown.	Approximately 15 km east of the Angus coastline.	Scoping request submitted May 2017.
Neart na Gaoithe	Installation of up to 64 WTGs with export capacity of approximately 450 MW.	Approximately 15.5 km from Fife Ness on the Fife coastline.	Consent application submitted April 2012. Approved by Scottish Government September 2014. Subject to Judicial Review raised by RSPB challenging the consent, which the Court of Session found in favour of in July 2016, and now subject to an appeal by the Scottish Government.
Beatrice	Installation of up to 140 WTGs with overall generating capacity of up to 750 MW.	Approximately 13.5 km from Caithness coastline. Final wind farm design comprises 84 WTGs	Consent application submitted July 2012. Approved by Scottish Government March 2014. Currently under construction. Completion expected 2019.

Project	Description	Location	Status
Kincardine Offshore Wind Farm	Installation of up to eight floating WTGs with overall generating capacity of up to 50 MW.	Approximately 15.0 km south east of Aberdeen.	Consent application submitted March 2016. Approved by Scottish Government March 2017.
Hywind Scotland Pilot Park	Installation of up to five floating WTGs with overall generating capacity of up to 30 MW.	Approximately 25 km off the coast of Peterhead, Aberdeenshire.	Consent application submitted March 2015. Approved by Scottish Government October 2015. Currently under construction. Completion expected end of 2017
Forthwind Offshore Wind Farm	Installation of two WTGs with overall generating capacity of up to 18 MW.	Approximately 1.5 km southeast of Methil on the Fife coast.	Consent application submitted July 2015. Approved by Scottish Government December 2016.
Forthwind Offshore Wind Demonstration Array	Installation of up to nine WTGs with overall generating capacity of up to 65 MW.	Approximately 1.5 km southeast of Methil on the Fife coast.	Scoping submitted November 2016, application for consent expected 2017 at earliest.
ORE Catapult Levenmouth	Installation of one WTG with overall generating capacity of 7 MW.		Consent application submitted July 2012. Approved by Scottish Government May 2013. Currently operational.
Moray Offshore East development (encompassing Telford, Stevenson and MacColl Offshore Wind Farms)	Installation of up to 186 WTGs with overall generating capacity of up to 1,116 MW (overall).	Outer Moray Firth, approximately 22km from the Caithness coast.	Consent application submitted August 2012. Approved by Scottish Government March 2014.
Moray East (Alternative design)	Installation of up to 137 WTGs with overall generating capacity of up to 1,116 MW.	Outer Moray Firth, approximately 22km from the Caithness coast.	Scoping submitted March 2017.

Project	Description	Location	Status
Moray West (alternative design)	Installation of up to 90 WTGs with overall generating capacity of up to 750 MW.		Scoping submitted May 2016, application for consent expected 2017 at earliest.
Beatrice Demonstrator Project	Two WTGs with max. capacity 10 MW.	Outer Moray Firth.	No longer operational. Due to be decommissioned.
European Offshore Wind Deployment Centre	Include, but not be limited to, 11 three bladed WTGs with a maximum power generation of up to 100 MW.	Approximately 2 km from the coastline of Aberdeenshire at Blackdog.	Consent application submitted March 2013. Approved by Scottish Government August 2014. Currently under construction. Completion expected September 2018.
Dounreay Trì Floating Wind Demonstration Project Determination	Two WTG offshore wind farm with an installed capacity of between 8 to 12 MW.	Approximately 6 km off Dounreay, Caithness.	Consent application submitted October 2016. Approved by Scottish Government March 2017.
Blyth Offshore Wind Farm	Two WTGs with max. capacity 3.8 MW.	1 km off Blyth Harbour, north-east England.	Operational since 2000.
Blyth Array 2	Five WTGs with max. capacity 40 MW	6 km off Blyth Harbour, north-east England.	Consent application submitted March 2012. Approved by Scottish Government October 2013. Currently under construction. Completion expected end 2017.
Edinburgh Waterfront Development	New housing, business, commercial and leisure facilities.	Leith	Ongoing
Dundee Waterfront Development	New housing, business, commercial and leisure facilities	Dundee	Ongoing

GUIDANCE AND BEST PRACTICE

4.30. Current best practice guidelines for methodologies to establish both baseline conditions and assess potential impacts for offshore wind farm development have evolved from experience gained through consenting for previous offshore wind farm projects (including Rounds 1, 2 and 3) and particularly by the 2012 Seagreen Alpha and Seagreen Bravo EIA process. Guidance and best practice documents are

available from a range of sources, such as Marine Scotland consenting guidance, Collaborative Offshore Wind Research into the Environment (COWRIE), RenewableUK, and via the websites of a range of key regulators, for example Scottish Natural Heritage (SNH).

4.31. All published best practice and guidance documents will be used to develop assessment methodologies, to be agreed with key stakeholders.

CONSENTING OPTIONS

4.32. The Development will require both consent under Section 36 of the Electricity Act 1989 and a Marine Licence under the Marine (Scotland) Act 2010 and the Marine and Coastal Access Act 2009. A summary of the consent applications required for the Development is provided in Table 4.6.

Table 4.6 Consent Requirements and Authority

Consent Required	Consenting Authority
Section 36 under Electricity Act 1989	Scottish Ministers supported by MS-LOT
Marine Licence under the Marine and Coastal Access Act 2009	Scottish Ministers supported by MS-LOT
Declaration under Section 36A of the Electricity Act 1989	Scottish Ministers supported by MS-LOT
Safety zone under Section 62 of the Scotland Act 2016, as of 1st April 2017	Scottish Ministers
Decommissioning Plan under Section 62 of the Scotland Act 2016, as of 1st April 2017	Scottish Ministers

APPROACH TO SCOPING

4.33. A review has been undertaken of the 2010 Scoping Report and the 2012 ES, taking account of potential design amendments for the Development, together with changes in legislation and guidance. The process for consideration of effects in this Scoping Report has followed the methodology below:

- Review of 2010 Scoping Report;
- Review of baseline assessed in 2012 ES;
- Review of methodology used in 2012 ES;
- Consideration of required updates resulting from updated baseline and/or methodology;
- Review of changes resulting from amendments to the design envelope and consideration of the Site as a whole; and
- Review of amended cumulative baseline.

4.34. Those environmental topics[4] which have been considered within this scoping exercise are:

- Ornithology;
- Marine mammals;
- Fish and shellfish resources;
- Seascape, landscape and visual amenity;
- Shipping and navigation;
- Military and Civil aviation;
- Physical environment;
- Water and sediment quality;
- Benthic ecology;
- Commercial fisheries;
- Archaeology and cultural heritage;
- Socio-economics, tourism and recreation; and
- Other marine users and activities.

PLEASE NOTE: There are a number of topics where, in relation to the Seagreen Alpha and Seagreen Bravo Wind Farm applications, it was agreed with consultees that effects were not significant. Given the similarity of the Development to these applications, there is a clear opportunity to avoid repeating this exercise to reach the same conclusions. Accordingly, this Scoping Report references the 2012 ES supporting the applications made in 2012 and those discussions, to evidence the basis on which the detailed review of these matters will not be repeated. The same approach is proposed for the forthcoming 2017 ES.

4.35. The following chapters of this Scoping Report provide information on the environmental topics, including a summary of the baseline, whether the assessment methodology has progressed, demonstration of the changes resulting from the proposed design amendments, demonstration of the changes resulting from the updated cumulative baseline, and an analysis of the predicted effects to demonstrate whether significant effects are predicted. Where significant effects are predicted, details of the methodology to be employed in the assessment are provided.

[4] Traffic and access, airborne noise and vibration, and air quality are not considered as they were previously scoped out and it is considered that this is still appropriate.

4.36. A number of questions have been raised within the technical sections. These questions have been posed to focus the scoping response and ensure that the required topics are covered by the EIA. These questions are summarised below.

QUESTIONS FOR CONSULTEES

3.1 Are the policy and legislation documents identified within this chapter considered relevant to the Seagreen Wind Farm?

3.2 Are there any other areas of policy guidance the determining authority would recommend is included within the application?

5.1 Vulnerability to specific offshore wind farm impacts will be based on review for species in Scotland carried out by Furness R. W., Wade, H. M. & Masden E.A., (2013) Assessing vulnerability of marine bird populations to offshore wind farms *Journal of Environmental Management* 119 pp.56-66 and recently updated in Wade, H.M., Masden, E.A., Jackson, A.C. & Furness, R.W. (2016) Incorporating data uncertainty when estimating potential vulnerability of Scottish seabirds to marine renewable energy developments. *Marine Policy*, 70: 108-113.

5.2 General EIA methods will be based on CIEEM (2010) *Marine and Coastal Guidelines for Ecological Impact Assessment in Britain and Ireland* and on project-specific advice received from the SNCBs and Marine Scotland.

5.3 Assessment periods will be based on SNH (2016) Suggested seasonal definitions for birds in the Scottish Marine Environment.

5.4 Sources of data:
International/biogeographic reference populations: Waterbirds Population Estimates 5 Wetlands International. Available at: http://wpe.wetlands.org/Imaps

National reference populations: Musgrove, A.J., Aebischer, N.J., Eaton, M.A., Hearn, R.D., Newsom, S.E., Noble, D.G., Parson, M., Risely, K. & Stroud, D.A. (2013). Population estimates of birds in Great Britain and the United Kingdom. *British Birds,* 106, 64-100. Available at: https://www.britishbirds.co.uk/wp-content/uploads/2010/12/APEP3.pdf

5.5 Apportioning of effects will be based on SNH (2014) Interim Guidance on Apportioning Impacts from Marine Renewable Development to Breeding Seabird Populations in Special Protection Areas. Available at http://www.snh.gov.uk/docs/A1355703.pdf

5.6 Non-breeding season effects will be assessed against wider regional populations as defined in Furness, R.W. (2015). Non-breeding season populations of seabirds in UK waters: Population sizes for Biologically Defined Minimum Population Scales (BDMPS). Natural England

Commissioned Reports, Number 164 and with regard to Joint Nature Conservation Committee (JNCC) and Natural England (2013) JNCC and Natural England interim Advice on Habitats Regulations Assessment (HRA) screening for seabirds in the non-breeding season. February 2013.

5.7.1 CRM modelling will be based on the spreadsheets accompanying Band, B. (2012) *Using a collision risk model to assess bird collision risks for offshore windfarms.* SOSS report, The Crown Estate.

5.7.2 Where Band CRM Options 2 and 3 are applied, the proportion of birds at risk height will be derived from: Johnston, A., Cook, A.S.C.P., Wright, L.J., Humphreys, E.M. & Burton, N.H.K. (2014) Modelling flight heights of marine birds to more accurately assess collision risk with offshore wind turbines. *Journal of Applied Ecology*, 51, 31–41 (Corrigendum).

5.7.3 Avoidance rates will be based on JNCC et al. (2014), Joint Response from the Statutory Nature Conservation Bodies to the Marine Scotland Science Avoidance Rate Review 25th November 2014.

5.7.4 The MSS Avoidance Rate review referred to above is: Cook, A.S.C.P., Humphreys, E.M., Masden, E.A. & Burton, N.H.K. (2014) *The Avoidance Rates of Collision Between Birds and Offshore Turbines*. http://www.gov.scot/Resource/0046/00464979.pdf

5.8 Displacement will be assessed using the SNCB recommended matrix methods:

Joint SNCB Interim Displacement Advice Note Advice on how to present assessment information on the extent and potential consequences of seabird displacement from Offshore Wind Farm (OWF) developments January 2017.

http://jncc.defra.gov.uk/pdf/Joint_SNCB_Interim_Displacement_AdviceNote_2017.pdf

5.9.1 The offshore wind projects with which cumulative/ in-combination effects will be considered.

5.9.2 The projects with which piling effects during construction will be considered cumulatively/in-combination.

5.9.3 Further advice would be welcomed on:

The assessment of projects which have currently submitted alternative designs into the planning system; and

The assessment of offshore wind projects in English waters.

5.10 Demographic rates for population models would be taken from: Horswill, C. & Robinson R. A. 2015. Review of seabird demographic rates and density dependence. *JNCC Report No. 552*. Joint Nature Conservation Committee, Peterborough

6.1 Does MS-LOT agree that the assessment on marine mammals should only consider the effects from underwater noise?

7.1 Does MS-LOT agree that the assessment on fish and shellfish resource should only consider the effects from underwater noise?

7.2 Does MS-LOT agree that, with the exception of the changes to the underwater noise modelling, the assessment methodology for fish and shellfish resources can remain the same as used for the 2012 EIA?

8.1 Does MS-LOT agree that a revised SLVIA is required?

8.2 Does MS-LOT agree with the proposed SLVIA methodology?

8.3 Does MS-LOT agree with the proposed SLVIA viewpoints?

9.1 Does MS-LOT agree with the suggested assessment receptors for the shipping and navigation assessment?

9.2 Does MS-LOT agree that AIS surveys are required?

9.3 Does MS-LOT agree that updated assessment for shipping and navigation will only be required to assess the significance of effects identified in 2012?

10.1 Does MS-LOT agree that the military and civilian aviation should be scoped into the 2017 EIA?

11.1 Does MS-LOT agree that no further work is required for validation of site characterisation in terms of the physical environment?

11.2 Does MS-LOT agree that that no further assessment in the EIA is required in terms of the physical environment?

12.1 Does MS-LOT agree that no further work is required for validation of site characterisation in terms of the water and sediment quality?

12.2 Does MS-LOT agree that that no further assessment in the EIA is required in terms of water and sediment quality?

13.1 Does MS-LOT agree that no further work is required for validation of site characterisation in terms of benthic ecology?

13.2 Does MS-LOT agree that that no further assessment in the EIA is required in terms of benthic ecology?

14.1 Does MS-LOT agree with the suggested assessment receptors for the commercial fisheries assessment?

14.2 Does MS-LOT agree that updated consideration of commercial fisheries will include a supplementary review of contemporary landings data to ensure the most representative baseline is considered?

14.3 Does MS-LOT agree that updated assessment for commercial fisheries will only be required should the review of contemporary landings data identify a significant change to the baseline and to assess the significance of effects on crab and lobster fishery?

15.1 Does MS-LOT agree that cultural heritage can be scoped out of the assessment?

16.1 Does MS-LOT agree that socio-economic, tourism and recreation can be scoped out of the 2017 EIA?

17.1 Does MS-LOT agree that other marine users and activities can be scoped out of the assessment?

CHAPTER 5: ORNITHOLOGY

5.1. A desk based review was undertaken of the baseline, methodology and stated effects in the 2012 ES which could result from the Development on ornithology. The following key points were noted:

- The baseline is expected to remain valid and is summarised below, however update surveys are currently ongoing to confirm this;
- The assessment methodology will be updated to reflect current guidance and best practice;
- Amendments to the Site design could result in effects of a reduced significance;
- The cumulative baseline has changed since 2014.

5.2. In summary, given the availability of new baseline data, alterations to the methodology and to the design of the Development, it is proposed that this topic will be scoped into the 2017 EIA.

INTRODUCTION

5.3. This chapter outlines the ornithology interest of the Site and the proposed approach to the EIA. It also includes a summary of the methods, findings and outcomes of the previous applications within the same Site, namely Seagreen Alpha and Seagreen Bravo Wind Farms (Seagreen 2012, 2013a; MS 2014).

5.4. Where specific guidance or references to be used in the 2017 EIA are named in the text they are included in a text box. Scoping respondents are asked to review these sections in particular and to either confirm that they are appropriate or to recommend alternatives. Specific data gaps and questions are listed at the end of the chapter.

REVIEW OF 2012 EIA

Ornithology Work Completed for 2012 Application

5.5. The Ornithology chapter of the 2012 ES was primarily based on an analysis of boat-based bird survey data collected as part of an intensive survey campaign of the whole Firth of Forth Zone over a two year period between December 2009 and November 2011. During this time, monthly surveys covered transects totalling approximately 23,000 km and are thought to represent the most extensive survey effort yet undertaken for offshore wind development in the UK.

5.6. Survey methods broadly followed those of Camphuysen et al. (2004) with survey transects at 3 km intervals and orientated northwest to southeast to intercept what were anticipated to be the predominant flight lines of birds from the major colonies in the Firth of Forth, specifically those of the Forth Islands SPA.

5.7. Data, specific to the Seagreen Alpha and Seagreen Bravo sites were extracted from the zonal database for calculation of site-specific densities and population sizes for each species, separated into birds on the water and birds in flight, plus other information such as flight height, flight direction and behaviour.

5.8. Secondary sources of information used to inform the 2012 EIA included data from visual aerial surveys of the wider Firth of Forth carried out by Wildfowl & Wetland Trust (WWT) on behalf of the Crown Estate in 2009 and 2010 (unpublished data); tracking studies of key species from the Forth Islands SPA (Isle of May and Bass Rock), Fowlsheugh SPA and St Abb's to Fast Castle SPA carried out by the Centre for Ecology and Hydrology (e.g. CEH 2011), University of Leeds (Hamer et al. 2011) and as part of RSPB's FAME project (RSPB unpublished data) plus a large body of reference information identified through literature review.

5.9. These data, together with advice from the statutory consultees, were used to identify sensitive receptors for the purpose of ornithology EIA and HRA (Seagreen 2012, 2013a, 2013b).

Key Findings of 2012 Application and the Associated Decision by MS-LOT

5.10. The 2012 ES (Table 10.20, page 10.41) identified nine sensitive receptors: Northern gannet *Morus bassanus* (hereafter gannet), black-legged kittiwake *Rissa tridactyla* (hereafter kittiwake), lesser black-backed gull *Larus fuscus*, European herring gull *Larus argentatus* (hereafter herring gull), common guillemot *Uria aalge* (hereafter guillemot), razorbill *Alca torda*, Atlantic puffin *Fratercula arctica* (hereafter puffin), great black backed gull *Larus marinus* and Arctic tern *Sterna paradisaea*.

5.11. When considered at the level of the national population, effects were assessed as not significant for all species during construction, operation and decommissioning of the Seagreen Alpha and Seagreen Bravo wind farms. However, the potential for moderate and significant impacts on auk species: guillemot, razorbill and puffin, as a result of indirect effects on their sandeel prey due to piling during construction was identified at the regional population level During operation, collision risk had the potential to cause significant effects on regional gannet, kittiwake, herring gull and greater black-backed gull populations at one or both projects.

5.12. It is important to note that the impact assessment in the 2012 ES was conducted prior to a design change introduced by Seagreen in 2013 which raised the clearance of the WTG blade tip from 23.5 m to 27.5 m above mean sea level (29.1 m above Lowest Astronomical Tide - LAT). This had a significant, mitigating effect on predicted collision risk. In addition, changes to assessment methodology and reference populations were advised by the (SNCBs) for purposes of the HRA. This means that the conclusions of the 2012 ES were, to some extent, superseded by those of the HRA (Seagreen 2013a) and should be seen in this context.

5.13. Of the nine sensitive receptors identified in the 2012 ES, seven were taken forward for HRA on the advice of the SNCBs and Marine Scotland (MS) with the addition of Northern fulmar *Fulmarus glacialis* (hereafter fulmar). Effects on all eight species at four SPAs (Forth Islands, Fowlsheugh, St. Abb's to Fast Castle and Buchan Ness to Collieston Coast) were assessed as not significant from projects Seagreen Alpha and Seagreen Bravo alone or in-combination with other offshore wind projects in the Firth of Forth. The MS Appropriate Assessment (AA) (MS 2014) agreed with this position, albeit using different methods of assessment. The SNCBs also agreed with the majority of the AA's conclusions however there were unresolved differences of opinion for four species at two SPAs (for details see Appendix 5, MS 2014). The SNCBs maintained that collision risk was significant for gannet and kittiwake from Forth Islands SPA and for kittiwake at Fowlsheugh SPA, and that significant effects

from displacement could not be ruled out for razorbill and puffin at Forth Islands SPA. Seagreen's main contribution to these effects was considered to be that of Seagreen Alpha on the kittiwake population of Fowlsheugh SPA. The greatest magnitude of effect on all other species was from Neart na Gaoithe (on kittiwake, razorbill and puffin at Forth Islands SPA) and Inch Cape (gannet at Forth Islands SPA). In relation to the latter species, in the subsequent AA for the Neart na Gaoithe S36 variation (MS 2016), the SNCBs agreed that in-combination effects on gannet at Forth Islands are no longer significant because of increased population estimates and revised collision risk modelling.

5.14. On the basis of the AA's conclusions, the Scottish Government awarded consent to Seagreen Alpha and Seagreen Bravo in October 2014. However, the RSPB raised a challenge to these consents (and to those of Neart na Gaoithe and Inch Cape) via Judicial Review in 2015. The outcome of the legal process in relation to this challenge and the subsequent appeal in not yet known (see Section 1.1). The Offshore Transmission works consent was not part of this challenge and remains in place. No further reference is therefore made to the export cable route in this chapter.

2017 EIA

Background

5.15. The current Site covers the same area as the Seagreen Alpha and Seagreen Bravo Wind Farm application boundaries. The maximum number of WTGs will be reduced from 150 to 120 with WTG capacity increasing from 7 MW to up to 15 MW with a larger rotor diameter. WTG spacing is therefore likely to increase. The tip clearance will remain a minimum of 29.1 m above LAT. These changes have the potential to reduce impacts on seabirds. Whilst it is not possible to predict the scale of this change, Seagreen confirms that the overall aim of the Development design will be to reduce ornithological impacts as these are acknowledged to be critical to the consent. This is assisted by the large area of the Site and the reduced number of turbines compared to the previous application which gives opportunities to refine and optimise the design of the Development.

5.16. The existing boat-based data will be used as the basis of the revised application. However, it will be supplemented by additional boat-based data collected during the 2017 breeding season (April to September). This is in recognition of the increasing age of the current dataset and potential population changes in a regional environment where some seabird species appear to be declining whilst others, such as gannet, are increasing (JNCC 2016). It will allow the density and population of each species within the Site to be recalculated and the list of sensitive receptors to be reviewed. As before, this data will be supplemented by existing seabird tracking data and literature relevant to the Site plus any which has become available since 2013.

5.17. Impact assessment methodology will be updated in line with current advice and close consultation will be maintained with the SNCBs and Marine Scotland particularly in relation to data gaps (see Table 1), and also with RSPB.

Baseline

5.18. The existing environment of the Site is anticipated to be very similar to that of Seagreen Alpha and Seagreen Bravo and was fully described in the 2012 ES and its Technical Appendices (Seagreen 2012). This is summarised below.

5.19. In total, 39 species were identified in previous boat-based surveys of the Site, plus 10 unidentified taxa. Seasonal patterns recorded the highest densities of birds in June with lower densities during the winter months (December to February). Auk species (guillemot, razorbill and puffin) dominated the assemblage in all seasons and, in general, the western part of the Site sustained higher levels of use than the more easterly areas although, for some species, hotspots of activity occurred throughout.

Breeding species

5.20. The Site is within foraging range of a number of internationally important breeding seabird colonies which are designated as SPAs, plus other colonies of regional and local importance. This is reflected in the seabird assemblage with the most abundant species during the breeding season being guillemot, kittiwake and gannet, plus the six other species previously named as sensitive receptors (in taxonomic order: herring gull, great black-backed gull, lesser black-backed gull, Arctic tern, razorbill, and puffin).

5.21. It is not anticipated that the boat-based surveys being carried out during the 2017 breeding season will reveal many new species. However, the identification of sensitive receptors for the Development will be reviewed based on the revised population estimates and informed, as before, by the species':

- Population size - linked to international, national and regional importance;
- Linkage to SPAs including proposed SPAs (pSPA); and
- Sensitivity to wind farm effects.

5.22. Any additional sensitive receptors will likely arise as a result of the recently proposed Outer Firth of Forth and St Andrew's Bay Complex SPA which has recently been the subject of public consultation (SNH & JNCC 2016 a, b). Although the pSPA does not overlap the Site, it is within 40 km of its boundaries so there is potential connectivity although the means of establishing this are yet to be defined. Breeding features of the pSPA include, in taxonomic order: Manx shearwater *Puffinus puffinus* gannet, European shag *Phalacrocorax aristotelis* (hereafter shag), herring gull, kittiwake, Arctic tern, common tern *Sterna hirundo,* guillemot and puffin.

5.23. All but three of these were identified previously as sensitive receptors, the exceptions being Manx shearwater, shag and common tern. The latter two species are thought unlikely to be raised to the status of sensitive receptors in the forthcoming ES because the AA (MS 2014) concluded that there was no connectivity between breeding common (or Arctic) terns and Seagreen Alpha and Seagreen Bravo. Similarly, tracking data (Daunt et al. 2015) suggest that shag has a relatively inshore distribution and is therefore unlikely to be affected by the Development. Small numbers of Manx shearwaters were recorded during previous surveys with a maximum population estimate of 25 individuals in the 2012 application area in June 2011. Should the species qualify as a sensitive receptor, then advice on how the

assessment should be undertaken will be sought from the SNCBs and MS given that the nearest breeding colony is thought to be on the west coast of Scotland.

Wintering species

5.24. During the non-breeding/ wintering period, surveys indicate that the most abundant seabirds in the Site are similar to those present during the breeding season. Auks including guillemot, razorbill and puffin remain the dominant group although in lower numbers than during the summer. Kittiwakes are also common together with wintering herring gull and great black backed gulls. Fulmar and gannet numbers are present in reduced numbers compared to the summer period.

5.25. Although these are the same species as those recorded in the breeding season they are unlikely to be the same individuals as seabirds disperse widely outside the breeding season, with some species travelling thousands of kilometres (e.g. Kubetzki et al., 2009, Harris et al. 2010, Bogdanova et al. 2011). Thus, in any one particular area the origin of birds may be a mixture of individuals from a large number of breeding colonies from many countries and even geographic regions and many will originate from colonies outside the Firth of Forth. As a result, the reference populations used for assessment in the non-breeding period will differ from those used during the breeding season.

5.26. Nationally important numbers of divers, seaduck and grebe which winter in the Inner Firths of Forth and Tay, some of which are features of the pSPA, are rare in the offshore waters of the Site and previous boat-based surveys only occasionally recorded them in small numbers, e.g. one red throated diver was recorded in the Seagreen Alpha site in December 2010 and two in the Seagreen Bravo site in May 2011 (Seagreen 2012). The boundaries of the pSPA do not overlap the Site (or any other part of the Firth of Forth Zone) and connectivity between the inshore species for which it is designated and the Site is not anticipated.

Passage species

5.27. The SPAs of the Firth of Forth and the Firth of Tay and Eden Estuary support large populations of wintering migrants including geese, seaduck, divers, grebes and waders. These species, together with swans heading to other destinations all have the potential to pass through the Site. Significant passage of seabirds also occurs and large numbers of passerines traverse the area on passage across the North Sea to winter in the UK.

5.28. In order to address the potential risk to these species, MS commissioned a strategic level report to assess collision risk to 27 seabird species and 38 non-seabird species from offshore wind farms in Scottish waters (WWT & Macarthur Green 2014). Seabird modelling was carried out assuming, amongst other things, different migratory corridors and distributions within those corridors and species-specific flight height distributions. The report concluded that '*Overall, birds on migration through Scottish waters are not considered to be at risk of significant levels of additional mortality due to collisions with Scottish offshore wind farms*'. Possible exceptions might be large gulls, cormorant and common tern. The 2017 ES will pay specific attention to these species. However, for the remaining species it is understood that the conclusions of the report are still valid owing to the withdrawal of some offshore wind projects and other emerging information such as the report on pink-footed

geese (WWT Consulting 2015) and is sufficient to screen out potential effects on all other passage seabird and non-seabird species.

Potential Effects

5.29. Potential effects from offshore wind farms on bird populations (e.g. DECC 2011) are summarised below.

Construction

- Disturbance and displacement (habitat loss); and
- Indirect impacts e.g. disruption to habitat function potentially leading to a reduction in prey; impacts on prey species, for example, due to piling.

Operation

- Collision with the rotating blades of the WTGs;
- Disturbance and displacement (habitat loss);
- Barrier impacts causing disruption of flights lines, including migratory flight paths and day to day movements between feeding and breeding or roosting sites; and,
- Indirect impacts e.g. changes to habitat function and impacts on prey distribution and abundance.

Decommissioning

5.30. The potential impacts during the decommissioning of the project are expected to be similar in nature, extent and duration to those arising during construction.

Cumulative and in-combination impacts

5.31. The above impacts have the potential to act cumulatively/in-combination with other constructed offshore wind farm projects, those consented but not yet constructed, or those in planning. As these impacts are specific to wind farms, in-combination impacts with other industries are not predicted. However, there is a lack of information about the impacts of piling on key prey species such as sandeels therefore the in-combination effects of piling from construction projects such as bridges, ports and harbours will also be considered.

Methodology and Approach to the 2017 EIA

Data collection - boat-based surveys

5.32. Boat-based bird (and marine mammal) surveys of the Site were conducted on a monthly basis over a two year period between December 2009 and November 2011. Additional boat-based surveys will be completed during the 2017 breeding season (April to September) and will cover the whole of the Phase 1 area with an additional 2 km buffer

5.33. They will be undertaken aboard the *Eileen May*, a 17 m Severn-class ex-RNLI lifeboat with an observation eye height of approximately 5.2 m. This vessel was previously approved by SNH for bird survey work in the Firth of Forth and provides a stable survey platform.

5.34. Survey methodology will be consistent with that used previously (Seagreen 2012) based on Camphuysen et al (2004) with modifications which can be summarised as follows:

- Both sides of the vessel to be surveyed continuously, with all birds recorded where conditions allow (e.g. glare does not severely hamper viewing along one side);
- All birds observed to be assigned a real time;
- Snapshot counts to be recorded at fixed 500 m intervals;
- Snapshots to be divided into radial distance bands (of the same distance intervals as those on transect) resulting in a 180° arc extending 300 m from the vessel and a snapshot area of 0.141 km^2.

5.35. The surveys will also employ a dedicated observer to determine the precise height of birds in flight using rangefinder binoculars.

5.36. The importance of flight height estimation has been highlighted by the development of offshore collision risk modelling (CRM), particularly the use of various options in Band (2012) using flight height distributions (Johnston et al. 2014). This is because the number of birds at risk may be critical to consent. Consequently, many surveys now confidently place birds into 5 m height bands although the ability of surveyors to estimate flight height of birds accurately by eye remains in question (Cleasby et al. 2015). The use of rangefinders is an important refinement to methodology and will make a significant contribution to reducing levels of uncertainty in this area.

5.37. Full details of the survey method have been provided to MS-LOT.

Data collection - aerial surveys

5.38. No additional aerial survey data have been collected since the WWT visual aerial surveys of May 2009 to April 2010 covering the Site and adjacent STW wind farm sites within the outer Firth of Forth. Data from these surveys, analysed previously, will be included in the ES.

5.39. Aerial survey data collected in support of the pSPA (SNH 2016a, b) to show species distribution, predominantly in the Inner Firth of Forth, are available on request from JNCC and will be utilised if appropriate for the discussion of relevant species.

Data collection - other surveys

5.40. Owing to the number of breeding seabird SPAs within the wider Firth of Forth and North Sea region, a number of organisations including developers groups, the Centre for Ecology and Hydrology (CEH), RSPB and University of Leeds have carried out species-specific studies, as stated previously, to identify the connectivity of the birds within the Firth of Forth region with neighbouring SPAs.

5.41. Species have generally been selected based on their importance within the regional SPAs e.g. the percentage of the UK breeding population represented, and their potential sensitivity to wind farm impacts. Data from some of these studies were included in the 2012 ES; new data published since 2014 will also be considered and include but are not limited to:

- Additional tracking data collected as part of RSPB's Future of the Marine Environment (FAME) project e.g. kittiwake tracking from Fowlsheugh;
- Tracking studies conducted by the University of Leeds as part of UK Department for Business, Energy and Industrial Strategy's (BEIS) Offshore Energy Strategic Environmental Assessment (OESEA) Programme e.g. Hamer et al. (undated); and
- Peer-reviewed papers e.g. on flight heights of tracked gannet (Cleasby et al. 2015).

Data collection - literature review

5.42. To supplement currently available field survey data, a full review of literature, reports and data sets which have become available since the 2012 ES and HRA were published will be carried out. This will include, but is not limited to general ornithology texts describing the abundance, distribution, status and trends of seabird species in UK waters e.g. JNCC 2016; strategic level reports e.g. MS regional locational guidance; national databases such as that of the Seabird Monitoring Programme (SMP); peer-reviewed, scientific papers relating specifically to the distribution and behaviour of key species in the wider Firth of Forth region; and recent AAs and their supporting documentation for offshore wind projects in Scottish and English waters.

Data analysis

5.43. Data collected during the 2017 boat-based surveys will be used to calculate density distributions and derive population estimates for each species within the Site. DISTANCE software (e.g. Buckland *et al.*, 2004) will be used where sample size permits.

5.44. Population estimates for 2017 will be compared with previous data from 2009 to 2011 and the mean of the peak populations for each month and for the breeding and non-breeding periods will be calculated for use in the assessment.

5.45. Impact assessment will be carried out on all age classes of a species i.e. the total population. Where required, e.g. to inform assessment of breeding seabird SPAs where the population count is based on adult birds only, the proportion of adults in the population will be calculated based on survey observations. It is noted that the pSPA species populations are based on all age classes of seabird and any pSPA-specific assessment will be carried out accordingly.

Sensitivity criteria

5.46. The sensitivity of each species will be determined based on the size of its population i.e. whether it is of international, national, regional or local significance, its conservations status and its known sensitivity to offshore wind farms. Sensitive receptors will be subject to full assessment against the impacts to which they are vulnerable.

5.1 Vulnerability to specific offshore wind farm impacts will be based on review for species in Scotland carried out by Furness R. W., Wade, H. M. & Masden E.A., (2013) Assessing vulnerability of marine bird populations to offshore wind farms *Journal of Environmental Management* 119 pp.56-66 and recently updated in Wade, H.M., Masden, E.A., Jackson, A.C. & Furness, R.W. (2016) Incorporating data uncertainty when estimating potential vulnerability of Scottish seabirds to marine renewable energy developments. *Marine Policy*, 70: 108-113.

EIA Guidance

5.2 General EIA methods will be based on CIEEM (2010) Marine and Coastal Guidelines for Ecological Impact Assessment in Britain and Ireland and on project-specific advice received from the SNCBs and Marine Scotland.

5.47. Particular attention will be paid to species which are features of European sites (SPAs and pSPAs) for which a HRA may be required and will focus on those species identified in the recent AA for projects in the Firth of Forth including Seagreen Alpha, Seagreen Bravo, Inch Cape and Neart na Gaoithe (including the latter's S36 variation) (MS 2014, 2016).

5.48. Impact assessment will be carried out, as previously, for the breeding and non-breeding season and for both periods combined. It is noted that SNH has recently produced revised periods for assessment including core and extended-core breeding periods (SNH 2016). Currently, no guidance has been provided as to how these tables should be used for EIA and advice on the exact period for assessment will be sought from the SNCBs and MS.

5.3 Assessment periods will be based on SNH (2016) Suggested seasonal definitions for birds in the Scottish Marine Environment.

5.49. The assessment of each effect on each species will be based on the Site population and its significance judged in relation to international, national and regional breeding and wintering populations, and also discussed in the context of the population of designated colonies (SPA/pSPA). It is noted that population data for seabirds is often outdated and texts often re-iterate information from earlier authors. The references shown below are believed to be the most recent general resources available although for individual species-groups, such as gulls, there may be more current information. Advice is requested from SNCBs and MSS on this matter:

5.4 Sources of data:
International/biogeographic reference populations: Waterbirds Population Estimates 5 Wetlands International. Available at: http://wpe.wetlands.org/Imaps

National reference populations: Musgrove, A.J., Aebischer, N.J., Eaton, M.A., Hearn, R.D., Newsom, S.E., Noble, D.G., Parson, M., Risely, K. & Stroud, D.A. (2013). Population estimates of birds in Great Britain and the United Kingdom. British Birds, 106, 64-100. Available at: https://www.britishbirds.co.uk/wp-content/uploads/2010/12/APEP3.pdf

5.50. To determine the regional breeding population, Seagreen will use the approach applied previously, i.e. the sum of individuals in colonies which are within mean-maximum foraging range (Thaxter et al. 2013) of the Site. Colony sizes will be drawn from the SMP database. Where effects need to be apportioned to designated colonies, SNH recommendations will be followed. It is understood that a Marine Scotland research project on the same topic entitled 'Attributing Seabirds at Sea to Appropriate Breeding Colonies and Populations' is currently underway and any advice arising from this will also be considered.

5.5 Apportioning of effects will be based on SNH (2014) Interim Guidance on Apportioning Impacts from Marine Renewable Development to Breeding Seabird Populations in Special Protection Areas. Available at http://www.snh.gov.uk/docs/A1355703.pdf

5.51. At the time that the 2012 ES was compiled there was no guidance on how to define regional wintering populations. As a result Seagreen developed its own methodology, specifically for the HRA of seabirds outside the breeding season. The Firth of Forth area was defined using marine areas from Scotland's Marine Atlas (Marine Scotland 2013). Those selected were The Forth (1,528 km^2) and The East Scotland Coast (14,987 km^2) giving a total offshore Firth of Forth region of 16,515 km^2. Weighted population densities were assigned to the area based on Skov et al. (1995) and the total population calculated (Seagreen 2013b). Impacts on designated sites were apportioned based on the number of SPA birds deemed to overwinter in the region using information from sources such as Birds of Scotland (Forester et al. 2007).

5.52. Subsequently, although advice is not finally crystallised, the SNCBs have recommended the use of a larger regional area for assessment as defined in Furness (2015).

5.6 Non-breeding season effects will be assessed against wider regional populations as defined in Furness, R.W. (2015). Non-breeding season populations of seabirds in UK waters: Population sizes for Biologically Defined Minimum Population Scales (BDMPS). Natural England Commissioned Reports, Number 164 and with regard to JNCC and Natural England (2013) JNCC and Natural England interim Advice on Habitats Regulations Assessment (HRA) screening for seabirds in the non-breeding season. February 2013.

Impact assessment – General

5.53. Impact assessment will initially be carried out using standard matrix methods to compare the sensitivity of the receptor and the magnitude of the impact based on the realistic worst case scenario (see Section 4.1). Specific details for ornithology can be found in the 2012 ES. Conclusions as to the significance of the effect will be supported by reasoning and expert judgement.

5.54. Since the publication of the 2012 ES methods of impact assessment have changed in an iterative manner as reflected in the 2013HRA and subsequent AA. Different methods are also favoured by different developers and, indeed, advice on methodological preferences may differ between the SNCBs and MSS. The methods below describe what is believed to be the latest guidance on ornithological assessment; however, this is a fast-moving area and advice on alternative methods would be welcomed.

Impact assessment - Collision Risk Modelling

5.55. In line with current best practice, collision risk modelling will be based on the Band offshore model (Band 2012) and presented for Options 1 and 2. Where appropriate, Option 3 will also be used i.e. for those species such as large gulls where avoidance rates have been calculated and agreed (JNCC et al 2014), and potentially Option 4 if site-specific flight height distributions based on range finder data can be agreed. The CRM constructed in R by Masden (2015) to incorporate variability and uncertainty will also be considered.

5.7.1 CRM modelling will be based on the spreadsheets accompanying Band, B. (2012) Using a collision risk model to assess bird collision risks for offshore windfarms. SOSS report, The Crown Estate.

5.7.2 Where Band CRM Options 2 and 3 are applied, the proportion of birds at risk height will be derived from: Johnston, A., Cook, A.S.C.P., Wright, L.J., Humphreys, E.M. & Burton, N.H.K. (2014) Modelling flight heights of marine birds to more accurately assess collision risk with offshore wind turbines. Journal of Applied Ecology, 51, 31–41 (Corrigendum).

5.7.3 Avoidance rates will be based on JNCC et al. (2014), Joint Response from the Statutory Nature Conservation Bodies to the Marine Scotland Science Avoidance Rate Review 25th November 2014.

5.7.4 The MSS Avoidance Rate review referred to above is: Cook, A.S.C.P., Humphreys, E.M., Masden, E.A. & Burton, N.H.K. (2014) The Avoidance Rates of Collision Between Birds and Offshore Turbines. http://www.gov.scot/Resource/0046/00464979.pdf

Displacement

5.56. If appropriate, consideration would also be given to the use of the CEH displacement model (Searle et al. 2014) as utilised in the MS AA (2014).

5.8 Displacement will be assessed using the SNCB recommended matrix methods:

Joint SNCB Interim Displacement Advice Note Advice on how to present assessment information on the extent and potential consequences of seabird displacement from Offshore Wind Farm (OWF) developments January 2017.

http://jncc.defra.gov.uk/pdf/Joint_SNCB_Interim_Displacement_AdviceNote_2017.pdf

Barrier Effects

5.57. These will be assessed in a qualitative way with reference to published literature. As above, reference may be made to the CEH population model (Searle et al. 2014) which incorporates both displacement and barrier effects.

Indirect Effects

5.58. These will be assessed in a qualitative way with reference to published literature. The effects of piling on prey will be cross-referenced to the Chapter 7.

Cumulative/In-combination Assessment

5.59. Cumulative /in-combination assessment methods will broadly follow those outlined in COWRIE guidance (King et al. 2009).

5.9.1 The offshore wind projects with which cumulative/ in-combination effects will be considered are:

Neart na Gaoithe

Inch Cape (original or alternative design)

Forthwind (2 and 9 turbine projects)

Levenmouth Demonstration Turbine

Aberdeen (EOWDC)

Kincardine

Hywind

Beatrice

Moray East (original or alternative design)

Moray West

Blyth Offshore and Blyth Array - gannet only

Dogger Creyke Beck A & B – gannet only

Dogger Teeside A & B – gannet only

5.9.2 The projects with which piling effects during construction will be considered cumulatively/in-combination will include those listed above plus:

Aberdeen Harbour

Re-development at Nigg Bay

Rosyth container port works

5.9.3 Further advice would be welcomed on:

The assessment of projects which have currently submitted alternative designs into the planning system; and

The assessment of offshore wind projects in English waters.

Population modelling

5.60. It is anticipated that effects from individual projects are likely to be not significant. However, when judged in-combination they may approach levels that would be unacceptable. Where thresholds may be approached, Seagreen proposes to use existing population models (Freeman et al. 2014) initially to judge the scale of effect.

Where the outcomes of this process are not clear, best practice will be used in population modelling, in discussion with SNCBs and MSS.

5.10 Demographic rates for population models would be taken from: Horswill, C. & Robinson R. A. 2015. Review of seabird demographic rates and density dependence. *JNCC Report No. 552*. Joint Nature Conservation Committee, Peterborough

Data Gaps and queries for SNCBs and MS

5.61. There are a significant number of data gaps in the information needed for the EIA and even more so for the HRA, although the latter are not included here. It would expedite the consenting process if advice on these gaps could be provided as soon as possible by the SNCBs and/or MSS.

Table 5.1 Data Gaps

Issue	Description
Recent reference population counts for breeding seabird SPAs	Data gaps exist at all levels for seabird populations as described above. At the SPA level it is understood that some more recent count data are available e.g. Fowlsheugh as previously stated by RSPB. It is understood that some colonies have been recounted as part of the repeat of the Seabird 2000 census. Please could SNCBs advise on the most recent counts to be used for all SPA colonies in the Firth of Forth? Other colony data will be taken from the SMP database.
'Common currency' methods to be used in assessment	Previously, Firth of Forth developers used different approached to EIA resulting in difficulties for cumulative/in-combination assessment. The result was that 'common currency' methods were imposed at the HRA/AA stage. Whilst implementing some 'common' methods is fairly straightforward e.g. CRM, others are not e.g. displacement modelling. Confirmation of the preferred impact assessment methods (if not those described here) would be appreciated.
Status of other Forth and Tay offshore wind projects	The parameters of other projects in the Firth of Forth as at October 2014 are included in the recent AA (MS 2014) and could be used for cumulative/in-combination assessment. However, it is possible that, like Seagreen, other developers are revising their project descriptions. This makes cumulative/in-combination assessment difficult. Please can SNCBs/MS advise?
Current/pending MS research projects/SNCB advice	Developers are not always aware of the position of SNCBs in preparing new advice or MSS in commissioning research of relevance to offshore wind projects. Updates on the respective position of these organisations would be helpful.
ORJIP findings	Seagreen is aware that the Offshore Renewables Joint Industry Programme (ORJIP) Bird Collision Avoidance project will be reporting in September 2017. Its findings will be incorporated into the ES/HRA.
Connectivity between pSPA species and other (remote) sea areas	Whilst methods are available to establish the connectivity of birds at sea to breeding seabird SPAs, no similar methods exist for offshore SPAs. A default assumption might be that as the birds are already at sea, there is no connectivity to other sea areas i.e. there is no connectivity between the Site and the pSPA. However, it would be useful to understand the SNCB/MSS approach to this issue

CHAPTER 6: MARINE MAMMALS

6.1. A desk based review was undertaken of the baseline, methodology and stated effects in the 2012 ES which could result from the Development on marine mammals. The following key points are noted:

- The baseline remains valid and is summarised below;
- No changes to the methodology are required;
- Inclusion of a monopile foundation design could increase the effects of underwater noise, especially on harbour seals which were previously assessed to be significantly affected by underwater noise; and
- The cumulative baseline remains as previously assessed.

6.2. It is therefore considered necessary for an assessment of the effects resulting from underwater noise will need to be included in the 2017 EIA of the Development.

BASELINE REVIEW

6.3. A desk based review was undertaken to consider the marine mammals likely to be present within the Site and the surrounding marine environment. This review focused on the results of the marine mammal surveys undertaken from 2009 to 2011, to inform the 2012 ES, which provides detailed and relevant information on the spatial and temporal distribution of marine mammal species in the Site and wider area. As of May 2017 the marine mammal survey data from 2011 is considered valid for use in future assessment, in light of the minimum site condition monitoring requirement of marine SAC requiring reporting on the qualifying features every six years.

6.4. Seagreen recorded marine mammal observations during monthly boat based surveys of the Firth of Forth Zone during 2010 and 2011. In addition, the Crown Estate commissioned a series of aerial surveys of offshore wind farm sites during 2009 and 2010 around the UK. Marine mammal survey data from both the boat based and aerial surveys was considered in the context of wider regional data, from Project specific and regional FTOWDG) studies, using both existing published and grey literature and original data collection. Seagreen will also be recording marine mammal observations during surveys planned for the seabird breeding season in 2017.

6.5. Available boat based and aerial survey data collected across FTOWDG was integrated to provide spatially explicit densities to inform the baseline for harbour porpoise, minke whale and white-beaked dolphin, and also to inform the impact assessment of harbour porpoise. The Sea Mammal Research Unit (SMRU) Ltd was also commissioned to collate baseline information for seals, including aerial surveys at haul out sites, diet, and telemetry data and to generate 'at sea' densities. Baseline information on bottlenose dolphin was also collated by SMRU Ltd for the FTOWDG.

6.6. It is widely accepted that the main potential impact upon marine mammals from offshore wind farm development comes from underwater noise, resulting from pile driving of foundations (Wursig, 2000; Nedwell *et al.*, 2003; Thomsen *et al.*, 2006). Therefore, it is appropriate to assess this factor as robustly as possible through the use of methods such as noise propagation modelling (Nedwell *et al.*, 2007). The approach to investigating the potential impacts of underwater noise is outlined in the 2012 ES, which details the noise propagation modelling work carried out by Subacoustech Environmental Ltd.

6.7. The following definitions for the scale of study areas were considered for marine mammals (see Figure 6.1):

- The Immediate Study Area (ISA): the Site and the potential impact footprint boundaries, as defined by noise modelling outputs.
- The Regional Study Area (RSA): marine mammal connectivity with relevant SACs is considered under RSA and therefore the RSA for each species is dependent on their natural foraging range. The East Coast Management Area (ECMA) for seals is also included in the RSA. The ECMA extends from Fraserburgh to the Scotland–England border, providing the relevant population boundary for harbour seals and grey seals (as used in the impact assessment).
- The Wider Study Area (WSA): the far field study area appropriately defined for the marine mammal species considered (e.g. European populations).

Overview of Results Data: Cetaceans

6.8. Small Cetacean Abundance in the North Sea (SCANS) data showed that harbour porpoise, minke whale and white beaked dolphin have a significant presence within the RSA. Further data is expected to be available shortly from the 2015 SCANS surveys; consideration will be given to any changes to the marine mammals baseline as a result. White-sided dolphin has also been recorded in a small number of locations. Bottlenose dolphin and Risso's dolphin are shown in a low number of locations within the WSA, with rare or occasional visitors to the RSA also including killer whale, common dolphin and pygmy sperm whale (Reid *et al.* 2003). The RSA encompasses haul out sites for both harbour and grey seal, and use of the offshore waters of the ISA and RSA by these species is known from published telemetry data (e.g. Sharples *et al.*, 2008; Thompson & Duck, 2010).

6.9. The boat based surveys in the Firth of Forth Development Zone recorded sightings of grey seal, harbour seal, harbour porpoise, white-beaked dolphin, minke whale and one white-sided dolphin sighting. No bottlenose dolphin were recorded during the boat based surveys; however, evidence shows that bottlenose dolphin from the Moray Firth SAC use the coastal area within the ISA.

6.10. RSA aerial surveys in inshore waters added common dolphin (one individual) and killer whale (one individual) to list of species sighted during the boat based surveys. Offshore sightings added long-finned pilot whale (eight individuals in one sighting) to the species list.

6.11. As only one white sided dolphin was recorded during the boat based surveys, a single killer whale and a single common dolphin during the wider aerial surveys, as

well as one group of eight long-finned pilot whales, these species were not taken forward in the 2012 EIA. Their presence was deemed to be too infrequent for them to be affected by the Development. Due to the low likelihood of occurrence, and no sightings during the surveys, Risso's dolphin and pygmy sperm whale were also not considered.

6.12. Based on the available literature, as well as the RSA specific surveys, harbour porpoise, bottlenose dolphin, minke whale and white-beaked dolphin are considered to be the key cetacean species in the RSA, as agreed during consultation. Further details of these cetacean species and their occurrence and distribution within the study areas are provided below.

Harbour Porpoise

6.13. Harbour porpoise is the most common cetacean in the North Sea (ASCOBANS, 2012) and were the most frequently recorded cetacean during the boat based and aerial surveys. The main diet of porpoise is small fish (usually less than 40 centimetres (cm) length) such as juvenile herring, sprat, sandeel, whiting, saithe, and pollock. Although particularly in winter months, prey such as dab, flounder, sole, and cod are taken (Anderwald & Evans, 2010).

6.14. Sightings of harbour porpoise within the RSA (Anderwald & Evans, 2010) show the species was recorded in all cells surveyed along the coast from the Firth of Forth to the Moray Firth. Results of the boat based surveys show increased sighting rates and some larger pod sizes within the western area of the Site, compared to those identified within the eastern area. However, harbour porpoise sightings were generally widely distributed, with concentrations in the northern part of the ISA around Scalp Bank and in the central and southern parts of Marr Bank. Sightings were most common in the northern part of the ISA in the summer and more central and southerly part of the ISA during the spring.

Bottlenose Dolphin

6.15. Individual bottlenose dolphins on the east coast of Scotland are known to range over large distances (Wilson *et al*., 2004; Cheney *et al*., 2012), but also exhibit some level of residency with many individuals being re-sighted within the same areas both within and between years (Wilson *et al*., 1997, Quick, 2006, Thompson *et al*., 2011). Although the population is often considered resident in the Moray Firth, it is known that animals from this population regularly use other areas (Wilson *et al*., 2004, Quick and Janik, 2008, Thompson *et al*., 2011; Cheney *et al*., 2012).

6.16. Bottlenose dolphin feed on demersal or benthic fish (e.g. eels, flounder, dab, sole, turbot, haddock, hake, mullet, and cod), mid-water fish (e.g. salmon, trout, bass, horse mackerel, herring, blue whiting), and marine invertebrates including cephalopods and shellfish (Anderwald & Evans, 2010).

6.17. Bottlenose dolphins are of particular importance due to the connectivity of bottlenose dolphin in the RSA with the Moray Firth SAC, for which they are a primary reason for the SAC designation. The data from photo-identification surveys in 2009 and 2010 show that estimates of 35 and 31 individuals (respectively) from the Moray Firth use the Firth of Tay area.

6.18. Existing data shows bottlenose dolphin sightings from Montrose to the Firth of Tay, adjacent to the Site. This is supported by the findings of Anderwald & Evans (2010) and suggests a coastal transit route for bottlenose dolphin from the Moray Firth SAC. No bottlenose dolphins were recorded during the boat based surveys.

White-beaked Dolphin

6.19. White-beaked dolphin is the most abundant cetacean after the harbour porpoise in the North Sea (Banhuera-Hinestroza *et al*., 2009), and the waters off the coast of Scotland and north east England are one of the four global centres of peak abundance. The species occurs mainly in waters of 50-100 m in depth (Reid *et al.*, 2003). White-beaked dolphin feed upon mackerel, herring, cod, poor-cod, sandeels, bib, whiting, haddock, and hake, as well as squid, octopus, and benthic crustaceans (Anderwald & Evans, 2010). The region is used both for feeding and breeding. They breed mainly between May and August, although some may occur also in September and October (Anderwald & Evans, 2010).

6.20. During the boat based surveys, white-beaked dolphin was recorded most often during the summer in both 2010 and 2011. This seasonal peak is in line with a previous study that also found white-beaked dolphin to be present in Aberdeenshire waters during June to August with the main peak in August (Weir *et al.*, 2007).

Minke Whale

6.21. Minke whale is widely distributed around Scotland and North East England, with a relatively high sightings rate in the RSA (Reid *et al*., 2003). Minke whale feed upon a variety of fish species, including herring, sandeel, cod, haddock and saithe, as well as on invertebrates (Anderwald & Evans, 2010). The species is most commonly seen singly or, less commonly, in loose groups of up to three. In late summer in northern and northwest Britain, loose feeding aggregations of up to 15 animals may form, however, only very small groups have been seen in the WSA (Moray Firth to St Andrews Bay; Anderwald & Evans, 2010).

6.22. During the boat-based surveys sixty-two minke whales were recorded, with sightings throughout the survey area, including the Site (with eighteen sightings within the Site). A strong seasonal pattern to the sightings data for minke whale was recorded during the boat based surveys, with most encountered during the spring and summer months in 2010 and 2011, with high rates in May 2010 and June 2011. This seasonal pattern is supported by Anderwald and Evans (2010).

Overview of Results Data: Pinnipeds

6.23. Harbour and grey seal are both of particular relevance in the RSA due to the presence of key breeding and haul out sites in the vicinity. These species are considered separately below.

Harbour Seal

6.24. In the RSA, the main haul out sites for harbour seal along the Angus, Fife and Lothian coasts represent approximately 2% of the Scottish population, with the greatest concentrations of harbour seal within the region within the Firth of Tay and Eden Estuary.

6.25. Harbour seal are a primary reason for the selection of the Tay and Eden Estuary SAC (as an Annex II species under Council Directive 92/43/EEC on the conservation of natural habitats and of wild flora and fauna (the 'Habitats Directive')). The SAC is approximately 48 km from the Site. The tracks of tagged harbour seals show strong links between the Firth of Forth Zone and the Tay and Eden Estuary SAC.

6.26. Harbour seal concentrations identified to the north of the ISA represent association with Scalp Bank and the parallel concentrations of sightings running approximately north north-west through the ISA follow the Marr Bank and Wee Bankie, with another slight concentration in the south east corner of the Zone at Berwick Bank. Telemetry data also show that there is variation in areas of high density at sea locations between years. The occurrence of high density areas or low speed locations is associated with foraging, which is predominantly driven by prey availability.

6.27. Sandeels were the dominant prey species found in the diet of harbour seal in the region; however, spatial variation was evident throughout the region with salmonids the dominant prey type in the Tay in spring and summer, while diet in St Andrews Bay harbour seal prey was dominated by sandeels in all seasons (Sharples *et al.*, 2009). The Wee Bankie sandbank is a key habitat for sandeels in the RSA (Daunt *et al.*, 2008). As discussed above, the Wee Bankie area had high densities of harbour seals and is therefore expected to be an important offshore foraging location.

Grey Seal

6.28. There are two major grey seal breeding sites in the ECMA; the Isle of May and Fast Castle (in the Berwickshire and North Northumberland Coast SAC). Grey seals breeding at the Isle of May and Fast Castle represent approximately 10% of the total Scottish population. A small number of pups are also born on other islands within the Firth of Forth. Grey seal also use haul out sites within the RSA throughout the year for resting between foraging trips and moulting.

6.29. Tagging of grey seals from the Farne Islands shows that these animals use both the ISA and RSA. Grey seal are a primary reason for site selection of the Isle of May SAC and Berwickshire and North Northumberland Coast SAC. The Site is approximately 53 km from the Isle of May SAC and 65 km from the Berwickshire and North Northumberland Coast SAC. Grey seals have a foraging range of up to 145 km; therefore these SACs are considered within the RSA.

6.30. Boat based survey results show grey seal sighting rates were lowest over the autumn and winter. Grey seals were observed in every month of the boat based survey, but encounter rates were highly variable between months, with highest encounter rates in June in both years of survey. This may be a result of grey seal spending a period of intense foraging at-sea, to build energy reserves prior to the breeding season.

6.31. Baseline data shows grey seal locations have been recorded over the whole Site, however sightings are most numerous to the west, with fewer sightings further offshore to the east.

6.32. As with harbour seal, grey seal sightings were concentrated to the north of the Zone (Scalp Bank) and on two parallel concentrations of sightings running approximately north north-west through the ISA, following Marr Bank and Wee Bankie, with another concentration in the south east corner of the ISA. These areas are thought to

be important areas for sandeels, an important part of grey seal diet in the region (Hammond & Prime, 1990; Hall *et al*., 2000; Hammond & Grellier, 2006).

6.33. There have been changes to the diet of grey seal in the central North Sea over the last three decades, with increasing reliance on sandeels and a general trend towards the consumption of smaller prey species. As noted, the Wee Bankie sandbank is an important habitat for sandeels and, as with harbour seal, the Wee Bankie has high numbers of grey seals and so is likely to comprise an important foraging area.

Summary

6.34. For 2012 ES marine mammal activity was assessed using data from boat based surveys, seal tracking studies, aerial surveys and existing published sources. A collaborative approach was taken with the other wind farm developers in the Firth of Forth, via the FTOWDG. The key cetacean species are harbour porpoise and bottlenose dolphin. Harbour seal and grey seal are also considered of particular importance, due to the proximity of internationally designated haul out and breeding sites.

6.35. Following a review of the above baseline information, no significant change is expected from the 2012 ES, due to no known marked change in environmental conditions and a continuing commercial fisheries presence, which is likely to have direct implications for the foraging resources available to marine mammal species.

6.36. Further baseline data is currently being collated from ongoing surveys and will be used to clarify the baseline situation and to update the assessment if required.

SUMMARY OF CHANGES TO ASSESSMENT METHODOLOGY

6.37. Following a review of the assessment guidance used, it is noted that the following new documents are now applicable in relation to the measurement, modelling and mapping of underwater noise:

- National Physical Laboratory (2014). Good Practice Guide for Underwater Noise Measurement. NPL, Good Practice Guide, No 133;
- MMO (2015). Modelled Mapping of Continuous Underwater Noise Generated by Activities. MMO Project No: 1097;
- OSPAR Monitoring Strategy for Ambient Underwater Noise, Agreement 2015-05;
- National Oceanic and Atmospheric Administration (2016). Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing, NMFS-OPR-55; and
- JNCC (2016). Marine Noise Registry Information Document. JNCC on behalf of the Marine Noise Registry Steering group, May 2016.

6.38. In addition to the aforementioned documents, the updated Disturbance Effect on the Harbour Porpoise Population in the North Sea (DEPONS) model is expected to be published in the near future and cognisance will be taken of this in the updated assessment.

6.39. In addition to the above guidance, numerous scientific research publications regarding marine mammals have been published since the 2012 ES, with implications for both the baseline and impact assessment:

- Scottish Government (2012), MS Offshore Renewables Research: Work Package A3, Request for advice about the displacement of marine mammals around operational offshore wind farms, October 2012;
- Scottish Government (2012). MS Offshore Renewables Research: Work Package C2, Request for advice on the populations of cetaceans that might be involved in significant interactions with marine renewable energy developments in Scottish marine waters. September, 2012;
- Jones, E., McConnel, B., Sparling, C., Matthiopoulos, J. (2013). Grey and harbour seal density maps, Marine Mammal Scientific Support Research Programme MMSS/001/11, SMRU Report to Scottish Government, Task MR 5 (part);
- Benjamins, S., Harnois, V., Smith, H.C.M., Johanning, L., Greenhill, L., Carter, C. and Wilson, B. (2014). Understanding the potential for marine megafauna entanglement risk from renewable marine energy developments. Scottish Natural Heritage Commissioned Report, No. 791;
- Russel, D.J.F. (2015). Activity classification using state space modelling. Marine Mammal Scientific Support Research Programme MMSS/001/11, SMRU Report to Scottish Government, Task MR 5.2;
- Lonergan, M. & Hammond, P. S. (2015). Review of methodology and main results of the JCP analysis of cetacean densities in the context of marine renewable development. Marine Mammal Scientific Support Research Programme MMSS/001/11, SMRU Report to Scottish Government, Task MR 6.1;
- Gordon, J., Blight, C., Bryant, E. & Thompson, D. (2015). Tests of acoustic signals for aversive sound mitigation with harbour seals. Marine Mammal Scientific Support Research Programme MMSS/001/11, SMRU Report to Scottish Government, Task MR 8.1;
- Macaulay, J. & Gordon, J. (2015). Sound exposure explorer tool. Marine Mammal Scientific Support Research Programme MMSS/001/11, SMRU Report to Scottish Government, Task MR 8.2;
- Thompson, D., Hall, A. J., McConnell, B. J., Northridge, S. P. & Sparling, C. (2015). Current state of knowledge of effects of offshore renewable energy generation devices on marine mammals and research requirements. Sea Mammal Research Unit, University of St Andrews, Report to Scottish Government, no. MR 1 & MR 2, St Andrews, 55pp;
- Russell, D.J.F (2015). Changes in at-sea foraging trips of harbour seals and grey seals in south-east Scotland. . Marine Mammal Scientific Support Research Programme MMSS/001/11, SMRU Report to Scottish Government, Task CSD 5; and
- Duck, C.D. & Morris, C.D. 2016. Surveys of harbour and grey seals on the south-east (border to Aberlady Bay) and south-west (Sound of Jura to Solway Firth) coasts of Scotland, in Shetland, in the Moray Firth and in the

Firth of Tay in August 2015. Scottish Natural Heritage Commissioned Report No. 929.

6.40. Updated methods of underwater noise modelling combined with above contemporary data and research publications regarding the ecology of marine mammals and the potential for their interaction with offshore wind farm development, will change and update the method by which future assessment is undertaken.

SUMMARY OF CHANGES AS RESULT OF AMENDED DESIGN ENVELOPE

Table 6.1 Implications of Design Envelope Change on Marine Mammals

Design Envelope Change	Implications on Effect Significance
Increased size of WTG	No material change
Increased spacing between WTGs	No material change
Reduction in WTG numbers	No material change
Inclusion of monopile foundations	Potential to increase underwater noise effects

6.41. Noise impacts from pile driving have the greatest potential to cause a significant effect to marine mammals; therefore changes in the design and layout of WTG foundations will directly result in a change of effects and impacts to marine mammals. Within the 2012 ES, noise impacts from pile driving were determined to have the greatest potential to cause significant effects to marine mammals and as such updated underwater noise modelling will be necessary to predict the range and area of potential impact on different species.

SUMMARY OF CHANGES FROM CUMULATIVE BASELINE

6.42. The potential cumulative and in-combination impacts for the Development and other projects due to underwater noise from pile driving were predicted as significant for harbour seal, grey seal and harbour porpoise. Significant cumulative impacts were also predicted for harbour seal, grey seal and bottlenose dolphin through changes in prey resources during construction.

6.43. Changes in the impact assessment (as discussed above) will likely result in changes to the cumulative baseline, with potential for significant cumulative impacts to marine mammals in the regional and potentially wider study areas.

PREDICTED EFFECTS AND ASSOCIATED MITIGATION

6.44. Within the 2012 ES, significant impacts (moderate adverse) to harbour seal were predicted from underwater noise (pile driving), during construction. It is possible that changes in design of the Development, particularly in relation to WTG foundations, will result in direct changes in the effects of underwater noise during construction; therefore, impacts of underwater noise will likely change with potential for significant impact to harbour seal and other marine mammal species. This will therefore be scoped into the 2017 EIA.

6.45. To give an overview of the effects to marine mammals as identified and considered in the 2012 ES, the effects summary table is provided below.

Table 6.2 Effects Summary Table from Chapter 13 of the 2012 ES (Combined Project Alpha & Bravo)

Effect	Description of Effect	Potential Mitigation Measures	Residual Effect
Construction Phase			
Underwater Noise (Pile driving)	Death, injury or behavioural disturbance.	MMO or ADDs (if appropriate). 500m mitigation zone around noise source.	Moderate adverse and significant in harbour seal. Minor adverse and not significant all species except negligible and not significant in white-beaked dolphin.
Underwater Noise (Vessels)	Death, injury or behavioural disturbance.	MMMP	Negligible and not significant (all species).
Collision risk (ship hull impact)	Injury or death.	MMMP	Negligible and not significant (all species).
Changes to water quality (accidental release of contaminants)	Illness, injury or death.	SEMP	Negligible and not significant (all species).
Changes to water quality (suspended sediment)	Illness, reduced foraging ability.	SEMP	Negligible and not significant in all cetaceans, minor adverse and not significant in seals.
Changes to prey resource	Individual fitness effect from reduced prey availability or increased foraging costs.	Hearing sensitive fish species will be moderately impacted through pile driving noise, mitigation methods applied to the reduction of noise at source are the same as those applied for marine mammals (soft start and ramp up).	Minor adverse and not significant in harbour seal Negligible and not significant (all other species).
Operation Phase			
Underwater noise (WTGs)	Death, injury or behavioural disturbance.	n/a	Negligible and not significant (all species).
Underwater noise (vessel noise)	Death, injury or behavioural disturbance.	n/a	Negligible and not significant (all species).
Barrier effects	Prevent movement or migration.	n/a	Negligible and not significant (all species).
Collision risk (ship hull impact)	Injury or death.	MMMP	Negligible and not significant (all species).

Effect	Description of Effect	Potential Mitigation Measures	Residual Effect
Changes to water quality (accidental release of contaminants)	Illness, injury or death.	SEMP	Negligible and not significant (all species).
Electromagnetic fields	Behavioural changes.	n/a	Negligible and not significant (all species).
Decommissioning Phase			
Underwater noise (cutting)	Death, injury or behavioural disturbance.	n/a	Minor adverse and not significant all species.
Underwater noise (vessels)	Death, injury or behavioural disturbance.	n/a	Negligible and not significant (all species).
Collision risk (ship hull impact)	Injury or death.	MMMP	Negligible and not significant (all species).
Changes to water quality (accidental release of contaminants)	Illness, injury or death.	SEMP	Negligible and not significant (all species).
Changes to water quality (suspended sediment)	Illness, reduced foraging ability.	SEMP	Minor adverse and not significant in seals. Negligible and not significant in all cetacean species.
Changes to prey resource	Individual fitness effect from reduced prey availability or increased foraging costs.	n/a	Alpha only - Minor adverse and not significant in harbour seal Both - Negligible and not significant (all other species).

ASSESSMENT METHODOLOGY

6.46. Baseline data for the 2012 ES, obtained from the boat-based surveys, updated with 2017 survey data, and literature review, is considered valid for use in 2017, in light of the JNCC minimum requirement of monitoring marine protected areas and SACs every six years. Where an updated assessment is deemed necessary, further data will be obtained from publicly available resources and updated scientific research, to ensure a robust and contemporary baseline.

6.47. An updated impact assessment would focus on identifying the effects of underwater noise to marine mammals, on the basis of updated noise modelling results from the revised design of the Development. This would include incorporation of an updated evaluation of cumulative impacts, using the JNCC Marine Noise Registry to improve the confidence of cumulative assessment.

6.48. In addition, current guidance for the measurement, modelling and mapping of underwater noise will be applied to any changes in the proposal design, to accurately

determine effects and impacts to marine mammals, utilising a precautionary approach where deemed necessary.

Questions

6.1 Does MS-LOT agree that the assessment on marine mammals should only consider the effects from underwater noise?

CHAPTER 7: FISH AND SHELLFISH RESOURCE

7.1. A desk based review was undertaken of the baseline, methodology and stated effects in the 2012 ES which could result from the Development on fish and shellfish resources. The following key points are noted:

- The baseline remains valid and is summarised below;
- No changes to the methodology are required;
- Inclusion of a monopile foundation design could increase the effects of underwater noise, especially on herring which was previously assessed to be significantly affected by underwater noise; and
- The cumulative baseline remains as previously assessed.

7.2. It is therefore considered necessary that an assessment of the effects resulting from underwater noise on noise sensitive fish species will need to be included in the 2017 EIA of the Development.

BASELINE REVIEW

7.3. A desk based review was undertaken to consider the fish and shellfish resources present within the Site shown in Figures 7.1 to 7.5. This review focused on the results of the marine ecology surveys undertaken in 2011, to inform the 2012 ES, supplemented by publicly available commercial fisheries landings data. As of May 2017, the marine ecology survey data from 2011 is considered valid, in light of the site condition monitoring requirement of marine SAC requiring reporting on the qualifying features every six years.

7.4. Several marine ecology surveys were undertaken to characterise the benthic environment within the Site, including seabed trawls, towed video trawls and grab sampling. The marine ecology surveys found benthic habitats within the Site to comprise of expansive areas of featureless sediment dominated by patchy communities of worms and shellfish.

7.5. Analysis of commercial fisheries landing data utilised statistical data from the International Council for Exploration of the Sea (ICES) rectangles, which are used for the gridding of data to make simplified analysis and visualization). This focussed on three separate areas: the Site, the regional study area (the Site and surrounding environment defined by ICES rectangles 42E7, 41E7 and 41E8 and 42E8) and the wider study area (encompassing the regional study area, defined by 12 ICES rectangles). This approach was required to take account of the large variation in mobility of the species and the likelihood of their presence within the Site at any one time.

7.6. The Site is characterised by water depths ranging between 40 m and 60 m, with substrates ranging from gravelly sand and sandy gravel, to slightly gravelly sand.

7.7. Fish distribution patterns are determined by a number of factors including abiotic factors such as water temperature, salinity, depth, local-scale habitat features and substrate type and biotic factors including predator-prey interactions, competition and anthropogenic factors (e.g. the presence of artificial structures in the marine

environment and type and intensity of commercial fisheries). It is recognised that the marine ecology surveys were carried out over a relatively short time period and sampled only demersal (bottom dwelling) fish species; therefore it is assumed that other fish species are also present within the Site and surrounding marine environment.

7.8. Twenty eight fish species were identified during seabed trawls, with sandeels most abundant. Pogge, dab, goby, lesser or Raitts sandeel, and butterfish were present in over 70% of the benthic trawls, with dab, goby, and lesser sandeel the most frequently recorded species. Other species of sandeel such as the smooth and the greater sandeel were also present, but at lower frequency and abundance.

Commercial Fish Species

7.9. Commercially exploited species such as dab, plaice, whiting, cod and scallop were identified within the Site. Notably, there is little commercial finfish fishing within the Site; however, based on the ICES rectangle data from 2006-2010, the Site (Rectangle 42E8) is considered of moderate to low national importance and of moderate local importance for king scallop, haddock and squid (by value). Within the regional study area, nephrops, scallops, edible crab, lobster and velvet swimming crab form the majority (92 %) of total landings, with the area within ICES rectangle 41E7 being of particular importance (the majority of commercial landings came from this rectangle, with 41 more species landed than from any other rectangle of those considered). Rectangle 42E8 was found to support the least diverse landings, with only 22 different species recorded.

Fish Spawning & Nursery Areas

7.10. Several fish species of commercial importance are known to use all or part of the wider study area for spawning and/or nursery grounds (Coull *et al.*, 1998), including; cod, lemon sole, herring, nephrops, mackerel, plaice, sandeel, saithe, sprat, spotted ray, spurdog, tope, and whiting. Further data sources from both CEFAS and Marine Scotland were consulted to provide an understanding of the distribution and abundance of key species of fish and shellfish within the Site and surrounding study areas. Details are outlined below:

Finfish

- **Herring**: data indicated that although spawning activity was not identified within the Site, the herring larvae present may have originated in the more northern spawning areas (approximately 6.3 km north). The Site and much of the wider study area are located within herring nursery grounds, with the Firth of Forth considered to be a nursery ground of high intensity.
- **Sandeel**: three species of sandeel were identified within the Site, with the lesser or Raitts sandeel most abundant. Particle Size Analysis (PSA) undertaken as part of the benthic mapping work confirmed that majority of benthic habitats within the Site are Prime or Subprime habitat for sandeel. Localised areas mainly located around the western perimeter of the Site and across Scalp Bank were considered Unsuitable. The wider Firth of Forth region supports important sandeel populations, with the highest population density found on the Wee Bankie, approximately 30 km south of the Site.

- **Cod**: cod was identified within the Site and is present across both the regional and wider study areas. Both the Site and regional study area are located within low intensity spawning grounds; however these are also classified as high intensity nursery grounds. Data indicated that cod eggs were present within the Site and regional study area. Juvenile cod (less than one year old) were also present within the Site and occurred in relatively high abundances (between 0.11 and 0.2 per km^2). Areas of high juvenile abundance were also identified in the regional study area, specifically the outer Firth of Tay, to the south west of the Site. The regional study area may be used by cod for spawning; however in the wider context of the North Sea, it is less intense than seen elsewhere.
- **Sprat**: sprat is not landed in great quantities from either the regional or wider study area. The eastern section of the Site and the majority of the regional study area comprise sprat spawning grounds, with the entire Site and majority of the regional study area providing sprat nursery grounds.
- **Whiting**: whiting was recorded within the Site and is widely distributed throughout the North Sea. Landings data shows that whiting is a commercially import species across both the regional and wider study areas.
- **Mackerel**: mackerel is widespread throughout the North Sea. No mackerel spawning grounds were identified within the regional study area; however the majority of this area is located within low intensity mackerel nursery grounds. Mackerel was landed from both the regional and wider study areas, indicating it is an important commercial resource for the area. Previously the Firth of Forth was considered to support a low abundance of mackerel in comparison to the central North Sea; however recent landings have increased relative to the rest of the North Sea, with landings data for the regional study area suggesting the trend is one of steady increase.
- **Plaice**: plaice was identified throughout much of the Site and is a feature of commercial landings from both the regional and wider study areas.
- **Saithe**: part of the Site lies within a lower intensity nursery area for the species; however it is recognised that saithe uses much of the coastal waters of Scotland for nursery grounds. In the regional and wider study areas saithe hold the same relative commercial importance, with International Bottom Trawl Survey (IBTS) data indicating that this species generally occurs in higher abundances in the eastern North Sea than the west.
- **Lemon sole**: lemon sole was identified within the Site at several locations. Both the Site and regional survey area comprise a large spawning and nursery ground for the species. Within the regional and wider study areas lemon sole is a commercially important species.

Elasmobranchs

- **Spotted ray**: within the regional study area, the spotted ray has nursery grounds of low intensity.
- **Spurdog**: spurdog is a relatively abundant species in both the regional and wider study areas. IBTS data indicates that spurdog is present across much of the North Sea with highest abundances found in the centre of the North Sea and offshore from the Moray Firth.

- **Tope**: the Site and western part of the regional study area is situated within nursery grounds of low intensity for tope.

Shellfish

- **King and queen scallop**: king scallops were identified across the Site and comprise the most landed species from much of the regional study area. Queen scallops were more numerous, with both species abundant in the northern and southern areas of the Site.
- **Nephrops**: nephrops was not recorded in any of the marine surveys undertaken within the Site; however within the regional study area this is a commercially important species with the majority of landings to the south-east of the Site. Within the wider study area, nephrops is the most landed species, accounting for over 24% of the entire landings for this area of sea. Nephops spawning and nursery grounds are present in much of the regional study area, including in the northern section of the Site.
- **Edible brown crab**: within the regional study area, edible brown crab is the third most landed species. Edible brown crab is present within the Site; however no clear pattern in its distribution was evident from the survey data. With the wider study area edible crab is an important commercial resource, reflected by its status as the fifth most landed species.
- **Lobster**: lobster was recorded at one location within the Site during the marine ecology surveys. Within the regional study area it is the fourth most landed species and sixth most landed species in the wider study area, making it an important commercial resource.
- **Velvet swimming crab**: one velvet swimming crab was recorded in the western section of the Site during the marine ecology surveys. Within the regional study area is it the fifth most landed species, with the majority of landings coming from the inshore areas. Within the wider survey area, it is the seventh most landed species.
- **Whelk**: whelks were recorded at six locations within the Site during the marine ecology surveys. Landings data indicate that whelks are a relatively important resource in the inshore areas of the regional study area and wider study area respectively.
- **Squid**: landings data confirms that squid is the most important cephalopod in Scottish waters and the only cephalopod for which there is a reliable commercial market. Squid are the sixth most landed species from the regional study area and the ninth most landed species from the wider study area.

Migratory Fish

- **Atlantic salmon**: salmon was not recorded during the marine ecology surveys or included in the commercial landings data. Salmon are rarely caught at sea, especially in the offshore environment. Studies suggest that salmon populations across Scotland have been declining, with such downwards trends evident of spring running salmon in east coast rivers. Analyses of rod catch data from east coast rivers illustrate that salmon migrate to a number of rivers in the vicinity of the Site and therefore may

pass through the Site. Catch rates from rivers within the regional study area fluctuate, with no obvious decline apparent.

- **Sea trout**: sea trout was not recorded during the marine ecology surveys; however, as this species is migratory it can be assumed that a proportion of the species will cross the Site.
- **European eel**: no eels were recorded during the marine ecology surveys; however it is possible that the species will pass through the Site during their seaward migrations and on return to the coastline as elvers.
- **Sea lamprey**: sea lamprey was not recorded during the marine ecology surveys; however, it is present within east coast rivers and therefore may cross the Site during migration.
- **River lamprey**: river lamprey was not recorded during the marine ecology surveys; however, it is present within east coast rivers and therefore may cross the Site during migration.
- **Allis and twaite shad**: neither species was identified or are expected to be found in any of the study areas; therefore it is not thought that the Development poses a risk to their populations or habitat.
- **Sparling**: sparling was not identified in any of the study areas; therefore it is not thought that the Development poses a risk to their populations or habitat.

Summary

7.11. Data from marine ecology surveys confirmed the lesser sandeel was the most numerous species caught within the Site, followed by dab, goby, pogge and butterfish. Commercial fish landings data indicated the commercial importance regionally of scallops, crab, lobster and nephrops.

7.12. Following a review of the above baseline information no change in the fish and shellfish baseline is expected from the fish and shellfish baseline presented in the 2012 ES, due to no known marked changes in environmental conditions and a continuing commercial fisheries presence.

SUMMARY OF CHANGES TO ASSESSMENT METHODOLOGY

7.13. Following a review of the assessment guidance used, it is noted that the following new documents are now applicable:

- Scottish Government (2014), Collation of Available Datasets on Smolt Populations in Scotland to Assess Migration Run Times. Scottish Marine and Freshwater Science. Vol 5; No. 6 Marine Scotland
- Scottish Government (2014), Identifying a Panel of Single Nucleotide Genetic Markers for River Level Assignments of Salmon in Scotland. Scottish Marine and Freshwater Science. Vol 5; No. 5, Marine Scotland
- Scottish Government and Marine Scotland Science: various on-going scientific research into fisheries.

7.14. None of these documents change the method by which the assessment is undertaken.

SUMMARY OF CHANGES AS RESULT OF AMENDED DESIGN ENVELOPE

Table 7.1 Implications of Design Envelope Change on Fish and Shellfish Resource

Design Envelope Change	Implications on Effect Significance
Increased size of WTG	No material change
Increased spacing between WTGs	No material change
Reduction in WTG numbers	No material change
Inclusion of monopile foundations	Potential to increase underwater noise effects

7.15. It is expected that the inclusion of monopiles has the potential to increase underwater noise effects, in particular on herring.

SUMMARY OF CHANGES FROM CUMULATIVE BASELINE

7.16. As outlined in the 2012 ES, significant cumulative impacts on herring from underwater noise generated by construction of the Development are predicted and cumulatively with other projects. The cumulative impacts on all other fish and shellfish species are predicted to be not significant. Consideration will be given to an updated cumulative assessment based on the amended underwater noise assessment.

PREDICTED EFFECTS AND ASSOCIATED MITIGATION

7.17. The effects summary table from the 2012 ES is included below. It is expected that the effects will remain as previously assessed. Therefore it is proposed that this topic will be scoped out of the 2017 EIA, with the exception of the assessment of the effects from underwater noise.

Table 7.2 Fish and Shellfish Resource Effects Summary Table from the 2012 ES

Description of Effect	Effect	Potential Mitigation Measures	Residual Effect
Construction Phase			
Effect of noise – death or injury	Minor adverse	Use of non-piled substructures/foundations would significantly reduce noise impacts. Energy needed to drive piles should be minimised to reduce peak noise impacts. Soft start piling (in which the energy used to drive the piles into the sediment is slowly ramped up) creates an increasing level of noise from low levels and will allow noise	If non-piled foundations are used then impact would be negligible. The use of the mitigation methods suggested for piling may reduce the impact on high sensitivity species such as herring however at this stage it is not possible to determine what this reduction may be. Therefore on a precautionary basis the impact remains minor adverse and not significant.

Description of Effect	Effect	Potential Mitigation Measures	Residual Effect
		sensitive species such as herring and sprat to vacate the area and can reduce the risk to injury. This is an industry standard mitigation. Physical mitigation methods may lead to a modest reduction in source level although this is untested in deeper water or tidal conditions. Investigation will continue regarding other technical mitigation solutions to reduce noise impacts.	
Effect of noise – behaviour	Moderate adverse (herring)	Use of non-piled substructure/foundations would significantly reduce noise impacts. Energy needed to drive piles should be minimised to reduce peak noise impacts. Soft start piling (in which the energy used to drive the piles into the sediment is slowly ramped up) creates an increasing level of noise from low levels and will allow noise sensitive species such as herring and sprat to vacate the area and can reduce the risk to injury. This is an industry standard mitigation. Physical mitigation methods may lead to a modest reduction in source level although this is untested in deeper water or tidal conditions. Investigation will continue regarding other technical mitigation solutions to reduce noise impacts.	If non-piled substructures/foundations are used then impact would be negligible. The use of the mitigation methods suggested for piling may reduce the impact on high sensitivity species such as herring however at this stage it is not possible to determine what this reduction may be. Therefore on a precautionary basis the impact remains moderate adverse and significant.
Seabed habitat disturbance	Negligible	No mitigation methods advised for this impact	Not significant.
Permanent loss of habitat	Negligible	Use of piled jacket structures would reduce the overall footprint and the consequent habitat loss	If prime sandeel habitats are avoided or use of them minimised and jacket substructure/foundations used then the impact could be reduced but given the high sensitivity of the receptor the impact will remain Negligible and not significant

Description of Effect	Effect	Potential Mitigation Measures	Residual Effect
Increased of suspended sediments and remobilisation of contaminants	Negligible	No mitigation methods advised for this impact	Not significant.
Operation Phase			
Disturbance effects of Electromagnetic Fields (EMF)	Minor adverse	The effects of EMF are poorly understood mitigation measures are difficult to recommend. However burial depths of 0.5m to 2.1m are estimated and the arrangement of the array cable layout will be considered with respect to mitigating the effect of EMF.	With appropriate burial depth and intelligent array cable layouts it may be possible to reduce the impacts of EMF, however given the uncertainties around this impact from a precautionary standpoint this will remain minor adverse for the most sensitive species and not significant.
Operational noise	Negligible	No mitigation methods advised for this impact	Not significant.
Disturbance of seabed habitats	Negligible	No mitigation methods advised for this impact	Not significant.
Creation of new habitats – fish aggregation	Negligible/beneficial	No mitigation methods advised for this impact	Not significant.
Increased of suspended sediments and remobilisation of contaminants	Minor adverse	Where scour protection is used for conical GBS to ensure structural stability, visual dive surveys or bathymetric surveys will be undertaken at selected locations with Project Alpha to assess the effectiveness of scour protection on reducing scour and resultant sediment release (see Chapter 7 Physical Environment) Site selection or the use of smaller diameter foundations for conical GBS will aim to reduce the requirement for ground preparation and thus reduce the volume of re-suspended sediments and remobilised contaminants.	Not significant.
Decommissioning Phase			
Seabed habitat disturbance and loss	Negligible	No mitigation methods advised for this impact.	Not significant.

METHODOLOGY AND APPROACH TO THE 2017 EIA

7.18. Baseline data used for the 2012 ES, obtained from the surveys and literature review, is considered valid for use in 2017, in light of the JNCC minimum requirement of monitoring MPAs and SACs every six years. Where an updated assessment is deemed necessary, further data will be obtained from publicly available resources and updated scientific research, to ensure a robust and contemporary baseline.

7.19. An updated impact assessment would focus on identifying the effects of underwater noise to fish and shellfish, on the basis of updated noise modelling results from the revised design of the Development. This would include incorporation of an updated evaluation of cumulative impacts, using the JNCC Marine Noise Registry to improve the confidence of cumulative assessment.

7.20. In addition, current guidance for the measurement, modelling and mapping of underwater noise will be applied to any changes in the design of the Development, to accurately determine effects on fish and shellfish resources, utilising a precautionary approach where deemed necessary.

Questions

7.1 Does MS-LOT agree that the assessment on fish and shellfish resource should only consider the effects from underwater noise?

7.2 Does MS-LOT agree that, with the exception of the changes to the underwater noise modelling, the assessment methodology for fish and shellfish resources can remain the same as used for the 2012 EIA?

CHAPTER 8: SEASCAPE, LANDSCAPE AND VISUAL AMENITY

8.1. A desk based review has been undertaken of the baseline, methodology and stated effects in the 2012 ES which could result from the Development on seascape, landscape and visual amenity. The following key points are noted:

- The baseline remains valid and is summarised below;
- Changes to the methodology are required resulting from new guidelines;
- Amendments to the design will result in changes to the impacts but are not expected to result in significant effects; and
- The cumulative baseline is update and will be assessed once more.

8.2. Given the changes in methodology and to the cumulative baseline, in addition to the significant effects predicted during the 2012 EIA process, it is considered necessary for a new assessment to be undertaken. Therefore this topic will be scoped into the 2017 EIA of the Development.

BASELINE REVIEW

8.3. A desk based review was undertaken to consider the seascape, landscape and visual receptors likely to be to be affected by the Development. This review focused on the results of the baseline surveys undertaken to inform the 2012 ES and any other available datasets. As of May 2017, the seascape, landscape and visual baseline data is considered valid. The following sections summarise the baseline.

8.4. Consideration is given to seascape, landscape and visual effects across a 50 kilometre (km) area from the Site as this is the area within which the majority of effects will be experienced. This 50 km Study Area does not preclude effects being experienced further afield, however at distances of greater than 50 km effects are expected to be insignificant. Figures 8.1 to 8.3 show the receptors considered within this chapter.

Seascape

8.5. Scottish Natural Heritage (SNH) commissioned a study to contribute to strategic guidance on areas where the impact of offshore wind energy development on Scottish seascapes is likely to be of least significance (Scott *et al*, 2005). In general, the east coast of Scotland was found to have a higher relative capacity for wind farm development than the west coast, as a result of its lower visibility ratings, open coastlines, and fewer designated landscapes. The seascape is relatively busy, traversed by commercial and recreational vessels, many of which are associated with ports and harbours in the Firths of Tay and Forth.

Landscape

8.6. The western boundary of the Site lies approximately 25 km from the nearest shoreline at Arbroath.

8.7. The north-west of the Study Area gently slopes towards the coastal edge, where it generally gives way to low-lying cliffs or steep slopes above the sea. The shoreline is

rocky and there are no areas of sandy foreshore exposed at low tide, aside from the small shingle beach at Cove Bay to the south of Aberdeen. Beyond the immediate coastline, the land is predominantly agricultural with a focus on grazing. The Grampian foothills to the north-west form a distant backdrop to the coastal zone, which gently slopes to the coastline. Tree cover is largely restricted to the occasional shelterbelt, as well as wooded areas around farmhouses and small settlements. Intensively managed farmland extends to the coastal edge, thus limiting the sense of naturalness. This contrasts with the coastline and sea itself, which has a strong sense of the natural environment, particularly where the waves crash against rugged cliffs.

8.8. The west of the Study Area is a predominantly gently sloping and low-lying seascape, and is mostly flat around Montrose Bay, where there is a strong horizontal emphasis. Vertical elements are provided by the dunes, the cliffs and coniferous plantations in some areas. South of Usan, the coastal edge gains in height with steep slopes between the shoreline and the fields above. The cliffs of Rickle Craig are approximately 50 m high, although sloping down to the natural harbour at Boddin and the promontory of Boddin Point. The low lying coastline between Arbroath and Monifieth has a strong horizontal emphasis, heightened on the coastal edge by extensive rocky platforms, interspersed with lengths of sandy beach. The west of the Study Area is a contrast of flat and gently sloping agricultural hinterland with rocks, small beaches, dunes and grassland. Coniferous plantations extend to the south of the River North Esk. Woodland and shelterbelts surround the village of Lunan. There are limited areas of grassland at the top of cliffs supporting rare plant species.

8.9. The south-west of the Study Area includes a mix of relatively straight, but indented coastal edge, marked by low cliffs, rocky platforms and the occasional sandy bay, giving way to an undulating agricultural hinterland. The diverse coastal edge comprises small sandy bays, extensive wave-cut rock platforms, low cliffs and narrow, wooded dens with gently undulating agricultural landscape sloping down to the coastal edge. Landward areas of agricultural fields are intensively managed but field boundaries and features are poorly maintained.

Visual Receptors

8.10. Within the Study Area a number of visual receptors are present and a summary of these are provided below.

Statutory Designations

8.11. No statutory designated areas (National Parks and National Scenic Areas).

Historic Gardens and Designed Landscapes

- Arbuthnott House (closest at ~34 km west);
- Glenbervie House;
- Fasque House;
- The Burn;
- Dunninald;
- Carig House;
- House of Dun;
- Kinnard Castle;
- Brechin Castle;
- House of Pitmuies;
- Guthrie Castle;
- The Guynd;
- Edzell Castle; and

- Cambo.

Special Landscape Areas (SLAs)

8.12. Area of Great Landscape Value in Fife (closest at approximately 27km north-west) and three Areas of Landscape Significance in Aberdeenshire.

Landscape Character Types and Areas

Aberdeenshire:

- Area 8: Howe of The Mearns;
- Area 9: Garvock and Glenbervie;
- Area 12: Central Wooded Estates;
- Area 13: Kincardine Plateau; and
- Area 18: The Mounth.

Aberdeen City:

- Area 21: Countesswells/ Milltimber/ Kennerty;
- Area 22: Dee Valley;
- Area 24: Kincorth and Tullos Hills;
- Area 26: Den of Leggart; and
- Area 27: Loirston.

Angus:

- Type 1: Highland Glens (1b: Mid Highland Glens);
- Type 3: Highland Summits and Plateaux;
- Type 5: Highland Foothills;
- Type 10: Broad Valley Lowland;
- Type 12: Low Moorland Hills;
- Type 13: Dipslope Farmland; and
- Type 15: Lowland Loch Basin.

Fife:

- Type C6: Lowland Open Sloping Farmland.

8.13. The coastal edges of the Study Area have been separated out as Regional Seascape Units and are assessed separately. Therefore the coastal elements of the landscape character types and areas are reduced accordingly and their sensitivity to offshore development is potentially reduced.

National Seascape Units

- Area 2: Firth of Forth;
- Area 3: East Fife/ Firth of Tay; and

- Area 4: North East Coast.

Regional Seascape Units

- SA2: Greg Ness to Cove Bay;
- SA3: Cove Bay to Milton Ness;
- SA4: Montrose Bay;
- SA5: Long Craig;
- SA6: Lunan Bay;
- SA7: Lang Craig to The Deil's Heid;
- SA8: Arbroath to Monifieth;
- SA12: St Andrews to Fife Ness; and
- SA13: East Neuk of Fife.

Settlements

- Aberdeen;
- Brechin
- Carnoustie;
- Arbroath;
- Montrose;
- Stonehaven;
- Portlethen;
- Newtonhill;
- Stonehaven;
- St Cyrus;
- Lunan;
- Auchmithie;
- Kingbarns;
- Inverbervie;
- Laurencekirk;
- Glenbervie;
- Gourdon;
- Fettercairn;
- Johnshaven;
- Hillside;
- Inverkeilor;
- Friockheim.

Infrastructure

- East Coast Mainline Railway;
- Two major roads - A92 and A90;
- Other key routes include A957, A935, A934, A933, A937, A930, B979, B9077, B967, B966, B974, B9120, B9134, B9113, B965, B961, B9127 and B9128;
- Coastal road between Aberdeen and Cove Bay;
- Aberdeen harbour – shipping movements; and
- Aberdeen Airport – planes and helicopters.

Cycle Routes and Footpaths

- National Cycle Network 1 (NCN1), which extends along the Angus and Aberdeenshire coastline to Aberdeen; and
- Fife Coastal Path.

Recognised Vantage Points

- Elevated locations along the coast act as formal vantage points which have a good view out to sea; Fife Ness, Newtonhill and St Cyrus (Beach Road);
- Beach level locations at Arbroath, Montrose, Carnoustie, Stonehaven, Lunan, Johnshaven and Inverbervie which act as informal vantage points out to sea;
- Various car parks off the A92, which are located on top of cliffs and act as informal vantage points out to sea; and
- Hilltop viewpoints at Drumtochy Forest and Durris Forest, and other locations which enable coastal and marine views.

Recreational receptors

- Informal recreational activities such as walking and cycling;
- There are several golf courses including Stonehaven Golf Club, Montrose Golf Links, Arbroath Golf Links, Carnoustie Golf Links, Crail Golfing Society in Fife; and
- There are no country parks within the Study Area.

Tourist attractions

- Many of the tourist attractions within the Study Area are located in the settlements of the Study Area;
- Within these settlements there are numerous hotels, cafes, bars and tourist shops as well as specialist attractions such as museums and visitor centres;
- One of the other attractions for tourists is the coast's beaches that allow direct views out to sea; these include the beaches of St Cyrus, Montrose, Lunan Bay, Arbroath, Elliot, East Haven, Carnoustie, Barry Sands North, Buddon Sands, Cambo and Balcomie; and
- Numerous camp sites and caravan parks, many of which are oriented towards the sea; key ones include Wairds Park Caravan Site and East Bowstrips Caravan Park to the north of Montrose and Seaton Estate Holiday Village in Arbroath.

Marine receptors

8.14. As mentioned the seascape is relatively busy, traversed by commercial and recreational vessels, many of which are associated with ports and harbours in the Firths of Tay and Forth outside the Study Area. No commercially operated pleasure cruises have been identified along this section of the coast.

8.15. The Bell Rock Lighthouse is situated approximately 17.5 km from Arbroath, and 22.5 km from St Andrews on the Fife coast and approximately 28 km from the Site. It

is approximately 35 m in height. It is a well-preserved and operational lighthouse built between 1806 and 1811, and is the oldest surviving rock built lighthouse in Britain. From its location there are wide views over the surrounding seascape with the coasts of Angus, Fife, the Lothians and the Scottish Borders in the distance. However, due to the distance from the shore, the Bell Rock Lighthouse is rarely seen from the land, as anything more than a small white feature or as an intermittent light during the night. In anything but clear weather conditions, the Bell Rock Lighthouse is not visible from the land. Although, there are a limited number of boat trips a year to the lighthouse, landing is unlikely as it is automated and unmanned.

SUMMARY OF CHANGES TO ASSESSMENT METHODOLOGY

8.16. The assessment methodology will be updated to reflect the new guidance documents. Whilst the new guidance will affect the process, the overall methodology will not change. New guidance documents include:

- SNH (2012) Offshore Renewables – guidance on assessing the impact on coastal landscape and seascape;
- SNH, (2012), Assessing the Cumulative Impact of Onshore Wind Energy Developments;
- Landscape Institute & IEMA (2013) Guidelines for Landscape and Visual Impact Assessment, 3rd Edition (GLVIA3);
- SNH, (2016), Guidance on Coastal Character Assessment, Consultation Draft; and
- SNH (2017) Visual Representation of Wind Farms Guidance, Version 2.2.

Offshore Renewables – Guidance on Assessing the Impact on Coastal Landscape and Seascape

8.17. This guidance describes the factors that should be taken into account when assessing the effects of offshore wind energy development on coastal locations.

Assessing the Cumulative Impact of Onshore Wind Energy Developments

8.18. This guidance sets out how the cumulative effects of onshore wind energy development should be assessed; although there is no specific guidance in relation to assessing the cumulative impacts of offshore wind energy developments, this SNH guidance remains applicable to this form of development. The main difference from the methodology used in the 2012 ES is the use of two cumulative baseline scenarios:

- Scenario 1 whereby the effects of the addition of the Development to all operational and consented wind energy development within the Study Area are assessed. Scenario 1 assumes that all consented wind energy development will be built.
- Scenario 2 whereby the effects of the addition of the Development to all operational, consented wind energy development and wind energy development for which there is a valid planning application within the Study Area are assessed. Scenario 2 assumes that all consented wind energy development will be built and all wind energy development in planning will be consented and built.

8.19. In addition the guidance requires preparation of a 60 km radius ZTV showing all cumulative wind farms sites to inform scope of the cumulative assessment.

8.20. The cumulative assessment for the Seascape, Landscape and Visual Impact Assessment (SLVIA) will follow the two scenario approach in assessing cumulative effects.

Guidelines for Landscape and Visual Impact Assessment, 3rd Edition, 2013 (GLVIA3)

8.21. GLVIA3 advocates a proportionate approach to SLVIA and in this case, as significant assessment works have already been undertaken, such guidance is particularly relevant in refining the scope of the SLVIA.

Visual Representation of Wind Farms

8.22. The 2012 ES preceded publication of this guidance and therefore the visualisations prepared for the 2012 ES do not comply with current guidance. New photography and visualisations will be required for the Development and will be prepared in accordance with this document.

SUMMARY OF CHANGES AS RESULT OF AMENDED DESIGN ENVELOPE

Table 8.1 Implications of Design Envelope Change on Seascape, Landscape and Visual Amenity

Design Envelope Change	Implications on Effect Significance
Increased size of WTG	Increased impact; no increase in effect
Increased spacing between WTGs	Altered impact; effect to be assessed on final design
Reduction in WTG numbers	Reduced impact; no reduction in effect
Inclusion of monopile foundations	Reduced impact; no reduction in effect.

8.23. Changes to the design envelope have the potential to increase the visual impact of the Development; however it is not expected that the effect will increase.

8.24. As larger WTGs are proposed there will be an associated reduction in the number of WTGs and an increase in spacing between them. As the Development can only be located within the Site, the horizontal visual extent will remain the same.

SUMMARY OF CHANGES FROM CUMULATIVE BASELINE

8.25. Changes in the cumulative baseline have occurred since the original assessment was undertaken. Consultation will be undertaken with MS-LOT and SNH to determine the cumulative baseline to be included within the assessment. It is expected that the cumulative schemes to be considered will include as a minimum Inch Cape and Neart na Gaoithe.

PREDICTED EFFECTS AND ASSOCIATED MITIGATION

8.26. The effects summary table from the 2012 ES has not been included for this topic as an updated assessment is proposed to be undertaken. It is expected that the effects will broadly remain the same, however some impacts may increase due to the distance to shore and the increase in WTG dimensions.

METHODOLOGY AND APPROACH TO THE 2017 EIA

8.27. An SLVIA will be undertaken by Chartered Landscape Architects using GLVIA3.

8.28. The SLVIA as reported in the 2012 ES will be reviewed through desk and fieldwork. A summary of the effects will be provided and if there are any noticeable discrepancies between the effects assessed in 2012 and any new effects will be described.

8.29. It is anticipated that the SLVIA will focus upon the receptors highlighted in the baseline section above. The offshore components of the Development will have no direct impact on any landscape features and therefore this will not be included in the assessment.

8.30. The cumulative baseline will be updated during the SLVIA and no new cumulative sites will be added to the assessment within eight weeks of the proposed submission date of the application. The cumulative assessment methodology will draw on that which was previously developed by specialist landscape consultants (SLR Consulting, Land Use Consultants and Pegasus Planning Group) as part of the original assessments for Seagreen, Inch Cape and Neart na Gaoithe.

8.31. It is proposed that the SLVIA will use the same eight viewpoints as presented in the 2012 ES; however where required new photography will be undertaken and visualisations prepared at the viewpoints. Details of the viewpoints are given in the table below and are shown on Figure 8.4.

Table 8.2 SLVIA Viewpoints

No.	Viewpoint Name	Easting	Northing	Distance to Site (km)	Receptor	Reason for inclusion
1	Garron Point (Stonehaven Golf Club)	388587	787597	38	Golfers	A links golf course, located on a headland which enables unobscured views south along the coast
2	Beach Road, Kirkton, St Cyrus	375195	764644	32	Visitors, walkers	Car park offering beach access, and wide elevated views over Montrose Bay, on a coastal footpath
3	White Caterthun Hill Fort	354818	766084	52	Visitors	Inland location, offering views over Strathmore and the Angus coast beyond, signposted and interpreted historic site
4	Montrose	372689	757962	33	Residents, visitors	Main car park/access point for the Montrose Bay beach and

No.	Viewpoint Name	Easting	Northing	Distance to Site (km)	Receptor	Reason for inclusion
						coast, promenade enables views across the seascape
5	Braehead of Lunan	368987	752602	35	Cyclists, residents, road users	Representative of views from a hamlet, located on NCN1, enabling views south over Red Head
6	Arbroath	365910	741080	40	Walkers, residents	Elevated location above car park, on way marked coastal footpath
7	Carnoustie	356249	734093	49	Residents, visitors	Upgraded promenade with car parking and beach access.
8	Fife Ness, Lochaber Rock	363842	709766	50	Walkers, visitors	Easternmost point of Fife, unobstructed views across the outer Firth and Tay, on the Fife Coastal Path

8.32. The SLVIA will be undertaken in accordance with GLVIA3. In summary it will consist of the following key stages:

- Desk study including review of the 2012 ES;
- Consultation;
- Baseline and verification fieldwork;
- Viewpoint photography;
- Preparation of visualisations;
- Assessment fieldwork; and
- Assessment reporting.

8.33. The SLVIA methodology will evaluate the sensitivity or nature of receptors through analysis of susceptibility and value. In the case of seascape receptors sensitivity will be evaluated during the assessment stage of the SLVIA using defined criteria. The nature or magnitude of impact to receptors will be evaluated using current best practice guidelines. Significance of effects will be assessed through a combination of sensitivity and magnitude to establish which are significant.

8.34. GLVIA3 advises a narrative approach rather than reliance on tables or matrices to evaluate effects. The SLVIA will provide narrative regarding the judgements made when evaluating sensitivity, magnitude and significance.

8.35. Below provides an indication of how the sensitivity and magnitude are defined.

Sensitivity of Receptor

Sensitivity of Landscape Character

8.36. The sensitivity of a landscape character receptor is an expression of its ability to accommodate the development. This is dependent on the value, quality and existing landscape character of the receptor, which is summarised as follows:

- The value of a landscape character receptor is a reflection of its importance in terms of any designations that may apply, or as a landscape resource. The higher the value of a receptor the greater its sensitivity to the development.
- The quality of a landscape character receptor is a reflection of its attributes, such as sense of place and scenic quality, and the extent to which these attributes have remained intact.
- The existing landscape character of the receptor is considered in the evaluation of sensitivity as it determines the degree to which the receptor may accommodate the influence of the development.

Seascape Sensitivity

8.37. Department of Trade and Industry (DTI) guidance on SVIA sets out a procedure for determining the overall sensitivity of seascape units as defined during baseline studies. The procedure dictates that seascape sensitivity is determined by a combination of factors including seascape quality and value, the sensitivity of the seascape unit to a particular type of change (in this case an offshore wind farm and its transmission assets) and the seascape's capacity to accommodate this type of change.

Visual Receptor Sensitivity

8.38. Visual receptor sensitivity cannot be easily quantified, as different people, even within a single receptor type or group, have different viewing expectations. The sensitivity of an individual receptor to an offshore wind farm depends on a number of factors such as the nature of the viewer (e.g. resident, tourist, someone at work), their viewing expectations and the duration of view. It is acknowledged that some viewers may consider WTGs to be unattractive, while others are consider WTGs as a crucial part of a progressive renewable energy landscape.

Magnitude of Impact

Magnitude of Change on Landscape Character

8.39. Professional judgement, informed by best practice guidance and consultation, has been used as appropriate to determine the magnitude of change on existing landscape character.

Magnitude of Change on Seascape Character

8.40. Seascape impacts arise out of a change in the character or quality of the seascape and the resulting perception of the seascape. The magnitude of change in the seascape as a result of an offshore wind farm is inextricably linked to how visible the WTGs are in the seascape. Determining the magnitude of change on seascape units requires an understanding of how prominent the WTGs are likely to be.

Magnitude of Change on Visual Amenity

8.41. Visual impacts are caused by the introduction of new elements into the views of a landscape or the removal of elements in the existing view. Clearly justified professional judgement has been used to determine the magnitude of change.

Significance of Effect

8.42. The ultimate purpose of the SLVIA is to evaluate the significance of impact on the seascape, landscape and visual amenity within the Study Area. The significance of the seascape, landscape and visual impacts are determined by considering the sensitivity of the seascape, landscape or view with the magnitude of change. In determining the significance of residual impacts all mitigation measures are taken into account. Mitigation would usually include the model of WTGs used and their arrangement within the views.

Questions

8.1 Does MS-LOT agree that a revised SLVIA is required?

8.2 Does MS-LOT agree with the proposed SLVIA methodology?

8.3 Does MS-LOT agree with the proposed SLVIA viewpoints?

CHAPTER 9: SHIPPING AND NAVIGATION

9.1. A desk based review was undertaken of the baseline, methodology and stated effects in the 2012 ES which could result from the Development on shipping and navigation. The following key points are noted:

- The baseline surveys are now considered outdated in line with current guidance documents;
- No changes to the methodology are required; and
- The cumulative baseline remains as previously assessed.

9.2. Whilst it is not expected that the revised parameters and methodology will increase the significance of effects associated with shipping and navigation; the prediction of significant effects in the 2012 EIA mean these will require consideration once more in the 2017 EIA.

BASELINE REVIEW

9.3. A desk based review was undertaken to consider the shipping and navigation likely to be affected by the Development. This review focused on the results of the baseline surveys undertaken to inform the 2012 ES and any other available datasets.

9.4. Baseline shipping activity was assessed using Automatic Identification System (AIS) and radar track data recorded for a 40 day period from two site specific vessel based surveys during 2011 (March 2011 and June/July 2011) covering the Site. This was supplemented by long term coastal survey data, fishing data, maritime incident data, recreation data and charts and sail directions (Figure 9.1).

Maritime Traffic

9.5. Shipping surveys showed that the majority of shipping passes through the Site in a north-south direction. Vessels are mainly composed of tankers headed between northern Scottish ports including Aberdeen and Peterhead and other eastern UK ports. In addition, small to medium sized general cargo vessels were recorded passing through the Site in an east-west direction on passage between the River Tay (Dundee and Perth) and Northern Europe/Scandinavia.

9.6. An average of four to six unique vessels was recorded intersecting the Site per day during the 40 day survey period. The majority of tracks were recorded on AIS (91%), with a minority of non-AIS vessels recorded on radar (9%). The results matched those of the coastal survey data.

Other Traffic

9.7. A limited number of fishing vessels were recorded within the Site, the greatest density of activity is in the western half of the Site generally in shallower waters. The majority of activity was engaged in fishing rather than transiting. Further information on commercial fisheries is contained within Chapter 14.

9.8. In addition limited recreational vessel activity was recorded during the summer survey period. In total there were 14 vessel tracks intersecting the Site, the majority of which are clustered in the west of the Site, closest to shore.

Maritime Incidents

9.9. The 2012 incidents over a ten year period from January 2001 to December 2010 covering the Site, with information from Marine Accident Investigation Branch (MAIB) and Royal National Lifeboat Institution (RNLI). No incidents were recorded within the Site.

Search and Rescue (SAR)

9.10. The UK SAR helicopter service is now being provided by Bristow Helicopters with services operating from 10 strategically located bases across the UK. The closest bases to the Site are located Prestwick and Inverness.

9.11. There are a number of RNLI bases along the east coast of Scotland, the bases at Arbroath or Montrose would respond to an incident within the Site.

SUMMARY OF CHANGES TO ASSESSMENT METHODOLOGY

9.12. Following a review of the assessment guidance used, it is noted that the new Maritime Coastal Agency (MCA) Marine Guidance Notice 543 (MGN 543 (M+F) Safety of Navigation: Offshore Renewable Energy Installations (OREIs) (2016) is now applicable.

9.13. Since the 2012 ES was submitted the MCA requirements as detailed within MGN 371 have been revised and replaced by MGN 543. Due to the age of the baseline survey data gathered, it would not comply with MGN 543, and therefore a data validation exercise needs to be undertaken.

SUMMARY OF CHANGES AS A RESULT OF AMENDED DESIGN ENVELOPE

Table 9.1 Implications of Design Envelope Change on Shipping and Navigation

Design Envelope Change	Implications on Effect Significance
Increased size of WTG	No material change
Increased spacing between WTGs	No material change
Reduction in WTG numbers	No material change
Inclusion of monopile foundations	No material change

9.14. The amended design envelope will most likely lead to fewer WTGs than considered in the 2012 EIA. There will be no change to the expected maximum number of construction vessels and expected dimensions of any topside structure, therefore the effects on shipping and navigation presented within the 2012 ES remain valid.

9.15. Depending on the final placement of WTGs within the Site, it may be necessary to undertake an updated Navigation Risk Assessment.

SUMMARY OF CHANGES FROM CUMULATIVE BASELINE

9.16. Changes to the cumulative baseline are not expected to alter the cumulative assessment as the key cumulative sites consisting of Inch Cape and Neart na Gaoithe offshore wind farms are still relevant.

PREDICTED EFFECTS AND ASSOCIATED MITIGATION

9.17. The 2012 ES concluded that risk to vessels associated with collision are predicted to increase as a result of construction related activities; however with temporary closures and exclusions zones the risk is assessed as being acceptable and not significant. Although some significant risks were predicted during the operational phase, most of these relate to an indicative worst case shipping and navigation layout plan in which a gap was left within the Site. After the application of appropriate mitigation, including of vessel tracking, warning notices, publication of locational data on charts, no significant residual effects are predicted.

9.18. The effects summary table from the 2012 ES is included below. It is expected that the effects will remain the same. Given that significant effects were identified, this topic will be scoped into the 2017 EIA.

Table 9.2 Shipping and Navigation Effects Summary Table from the 2012 ES

Description of Effect	Effect	Potential Significance before Mitigation	Residual Effect
Construction Phase			
Impact of OWF construction on Commercial Vessels	Route deviations and potential increase in vessel-to-vessel encounters and collision risk for commercial vessels	Not significant	Not significant
Impact of OWF construction on Fishing Vessels	Route deviations and potential increase in encounters and collision risk for fishing vessels	Not significant	Not significant
Impact of OWF construction on Recreational Vessels	Potential increase in encounters and collision risk for recreational vessels	Not significant	Not significant
Operation Phase			
Impact of OWF on Commercial Vessel Routing	Vessel displacement and route deviations for commercial vessels	Not significant	Not significant
Impact of OWF on Commercial Vessel Collision Risk	Potential increase in vessel-to-vessel and vessel-to-structure collisions for commercial vessels	Significant	Not significant
Impact of OWF on Fishing Vessels	Potential increase in vessel-to-vessel and vessel-to-structure collisions. See Chapter 14: Commercial Fisheries for further details.	Not significant	Not significant
Impact of OWF on Recreational Vessels	Potential loss of recreational routes and potential increase in vessel-to-	Not significant	Not significant

Description of Effect	Effect	Potential Significance before Mitigation	Residual Effect
	vessel and vessel-to-structure collisions for recreational vessels		
Impact of OWF on Search and Rescue (SAR) Operations	Increased requirement for search and rescue operations and restricted access to casualties within the Project Alpha and Project Bravo Sites	Significant	Not significant
Impact of OWF on Marine Radar Systems	Radar interference within 1.5NM range of WTGs.	Not significant	Not significant
Decommissioning Phase			
The impacts associated with decommissioning the Seagreen Project are anticipated to be similar in nature and extent to those described above for the construction phase.			
Seagreen Project Cumulative Impacts			
Cumulative Impact of Seagreen Project on Commercial Vessel Routing	Vessel displacement and route deviations.	Significant	Not significant
Cumulative Impact of Seagreen Project on Commercial Vessel Collision Risk	Potential increase in vessel to vessel and vessel to structure collision.	Not significant – without a layout gap between Project Alpha and Project Bravo Significant – with a layout gap between Project Alpha and Project Bravo	Not significant
Cumulative Impact of Seagreen Project on Fishing Vessels	Potential increase in vessel to vessel and vessel to structure collision. See Chapter 14: Commercial Fisheries for further details.	Not significant – without a layout gap between Project Alpha and Project Bravo Significant – with a layout gap between Project Alpha and Project Bravo	Not significant
Cumulative Impact of Seagreen Project on Recreational Vessels	Potential increase in vessel to vessel and vessel to structure collision and loss of recreational routes.	Not significant – without a layout gap between Project Alpha and Project Bravo Significant – with a layout gap between Project Alpha and Project Bravo	Not significant
Cumulative Impact of Seagreen Project on	Radar interference within 1.5NM range of WTGs.	Not significant – without a layout	Not significant

Description of Effect	Effect	Potential Significance before Mitigation	Residual Effect
Marine Radar Systems		gap between Project Alpha and Project Bravo Significant – with a layout gap between Project Alpha and Project Bravo	
Seagreen Project Cumulative Impact with Other Schemes			
Cumulative Impact of Seagreen Project with Other Schemes on Commercial Vessels	Vessel displacement and route deviations and potential increase in collision risk.	Significant	Not significant
Cumulative Impact of Seagreen Project with Other Schemes on Fishing Vessels	Potential increase in collision risk with displaced fishing vessels and structures and snagging hazard. See Chapter 14: Commercial Fisheries for further details.	Not significant	Not significant
Cumulative Impact of Seagreen Project with Other Schemes on Recreational Vessels	Potential increase in collision risk with displaced recreational vessels and structures.	Not significant	Not significant

METHODOLOGY AND APPROACH TO THE 2017 EIA

9.19. Additional AIS surveys will be undertaken within one year preceding to submission of the ES for the Development covering 28 days over winter and summer months to ascertain whether the site characteristics have changed and therefore potentially the impact assessment previously undertaken. It is not considered necessary to undertake further radar and visual data collection, as it is conserved that sufficient consultation was undertaken and data gathered including for fishing and recreational vessels which may not carry AIS equipment.

9.20. Should WTGs be located in an area of perceived risk, it may be necessary to undertake further Navigation Risk Assessment. Under this scenario a Navigation Assessment and a Navigational Risk Assessment will be undertaken in accordance with MCA guidance to assess impacts on both navigational safety and emergency response (i.e. rescue and counter pollution).

Questions

9.1 Does MS-LOT agree with the suggested assessment receptors for the shipping and navigation assessment?

9.2 Does MS-LOT agree that AIS surveys are required?

9.3 Does MS-LOT agree that updated assessment for shipping and navigation will only be required to assess the significance of effects identified in 2012?

CHAPTER 10: MILITARY AND CIVIL AVIATION

10.1. A desk based review has been undertaken of the baseline, methodology and stated effects in the 2012 ES which could result from the Development on military aviation. The following key points are noted:

- The baseline has been updated and is summarised below;
- No changes to the methodology are required;
- Amendments to the design could result in more WTGs becoming visible; and
- The cumulative baseline remains as previously assessed.

10.2. In summary, given the amendments to the design of the Development and consideration of the entire Site an assessment will need to be undertaken of the effects of the Development on military and civil aviation. Therefore it is proposed that this topic will be scoped into the 2017 EIA.

BASELINE REVIEW

10.3. A desk based review was undertaken to consider the aviation aspects likely to be affected by the Development. This review focused on the results of the baseline surveys and data collection undertaken to inform the 2012 ES and any other available datasets. The following sections summarise the updated baseline.

10.4. There are a number of military and civilian aviation interests which the Development has the potential to impact upon; there is a potential safety risk as a result and the Development may proceed only once all parties are content that any safety risks are resolved.

Radar

10.5. Ministry of Defence (MOD) radar visibility was observed in the 2012 ES, and is expected to remain across the Site, for three MOD assets. This includes the Air Traffic Control (ATC) radar at Leuchars Station (formerly RAF Leuchars); Air Defence at Remote Radar Head Buchan (RRH) and the Air Defence Radar at RRH Brizlee Wood. It should be noted that the MOD site at Leuchars, no longer operates as an RAF base and is now known as Leuchars Station. Despite this it is understood that aviation infrastructure has been retained, in particular the ATC Radar, as such effects on the radar will remain, and mitigation as previously outlined will need to be adopted as necessary.

10.6. National Air Traffic Systems (NATS) radar visibility is present from Perwinnes Primary Surveillance Radar (PSR) and other PSRs. Discussions and trials will be continued to ensure a solution can be achieved which allows safe operation of the PSRs during operation of the Development.

10.7. Edinburgh Airport is over 30 km from the Site and no interference with the radar systems is expected.

MOD Low Flying and Danger Area Operations

10.8. The Site is not within any MOD low flying areas or Danger Areas.

Helicopter Main Routes

10.9. Helicopter Main Routes (HMRs) as defined in the UK Aeronautical Information Publication (AIP), have been established over the North Sea in support of the North Sea oil industry; however these are sufficiently distant from the Site.

SUMMARY OF CHANGES TO ASSESSMENT METHODOLOGY

10.10. The Civil Aviation Authority (CAA) have released updated guidance on the assessment of wind WTGs on aviation and radar; however this will not affect the process by which the assessment is undertaken, namely the CAA (2016) Policy and Guidelines on Wind Turbines

SUMMARY OF CHANGES AS A RESULT OF AMENDED DESIGN ENVELOPE

Table 10.1 Implications of Design Envelope Change on Military and Civil Aviation

Design Envelope Change	Implications on Effect Significance
Increased size of WTG	Increased potential for visibility to radar and obstacle obstruction
Increased spacing between WTGs	No material change
Reduction in WTG numbers	No material change
Inclusion of monopile foundations	No material change

10.11. The increase in WTG dimensions, in particular the increased blade tip height, has the potential to increase visibility to radar systems and creates a larger obstacle. However the reduction in WTG numbers and density has the potential to reduce adverse effects.

SUMMARY OF CHANGES FROM CUMULATIVE BASELINE

10.12. Changes to the cumulative baseline are not expected to alter the cumulative assessment as the key cumulative sites consisting of Inch Cape and Neart na Gaoithe offshore wind farms are still relevant,.

PREDICTED EFFECTS AND ASSOCIATED MITIGATION

10.13. Following mitigation no significant effects or objections from aviation and radar stakeholders were present. NATS initially objected due to impacts on Perwinnes PSR; however this was removed following agreement between Seagreen and NATS; further investigations is considered necessary to ensure that a workable solution is achieved. Also the MOD initially objected due to concerns with the ATC at RAF Leuchars, the Air Defence Radar at RRH Buchan and the Air Defence Radar at RRH Brizlee Wood. Following discussions with the MOD, and further consideration of the technical mitigation proposals submitted by Seagreen, the MOD withdrew their objection subject to conditions being attached to any consent. Given increased

visibility to radar and that discussions regarding a workable solution to radar interference are still ongoing it is proposed that this topic is scoped into the 2017 EIA.

Table 10.2 Military and Civil Aviation Effects Summary Table from 2012 ES

Description of Effect	Effect	Potential Mitigation Measures	Residual Impact
Construction Phase			
Presence of cranes and stationary turbines	Acceptable	None required	Not significant
Operation Phase			
Civil radar	Acceptable	None required	Not significant
Military radar	If RAF Leuchars and associated radar is decommissioned – Acceptable If RAF Leuchars radar is retained - Unacceptable	In the event the RAF Leuchars radar is retained a technical mitigation solution will be developed and implemented	Not significant
En-route radar	Acceptable	None required	Not significant
MOD air defence radar	Unacceptable	A technical mitigation solution will be developed and implemented	Not significant
MOD low flying and danger area operations	Acceptable	None required	Not significant
Helicopter Main Routes (HMR)	Acceptable	None required	Not significant
CAA	Acceptable	None required	Not significant
10.14. Decommissioning Phase			
Presence of cranes and stationary turbines	Acceptable	None required	Not significant

METHODOLOGY AND APPROACH TO THE 2017 EIA

10.15. The assessment for effects on military and civil aviation will predominantly be reliant on modelling and consultation. Line of Sight assessments will first be produced for the Development and the relevant radars. This will then form the basis of the consultation process to ensure that a solution can be achieved which ensure safe operation of radars alongside the Development.

Questions

10.1 Does MS-LOT agree that the military and civilian aviation should be scoped into the 2017 EIA?

CHAPTER 11: PHYSICAL ENVIRONMENT

11.1. A desk based review was undertaken of the baseline, methodology and in the 2012 Seagreen offshore ES which could result from the Development The following key points are noted:

- The baseline remains valid and is summarised below;
- No changes to the methodology are required;
- Amendments to the design will result in no material change to the predicted effects; and
- The cumulative baseline remains as previously assessed.

11.2. In summary, **no significant effects** were predicted during the 2012 EIA process and it is expected that this will remain the case. Therefore this topic can be scoped out of the 2017 EIA of the Development.

BASELINE REVIEW

11.3. A desk based review was undertaken to consider the physical aspects likely to be present within the Site. This review focused on the results of the baseline surveys undertaken to inform the 2012 ES and any other available datasets. As of May 2017, the physical environment survey data is considered valid.

11.4. Baseline characterisation surveys for physical processes were undertaken across the Site as well as for the export cable route and the wider Firth of Forth Zone, consisting of the key surveys outlined in Table 11.1. The baseline data wholly covers the Site, no additional site specific studies are required with respect to the physical environment and the baseline remains valid.

Table 11.1 Summary of Key Survey Data

Title	Source	Year
Firth of Forth Offshore Wind Farm ECR: Geophysical survey	Osiris Projects	2011
Firth of Forth Offshore Wind Farm Development: Benthic survey	IECS	2011
Firth of Forth Zone Development: Metocean survey	Fugro GEOS	2011
Seagreen Inshore Metocean Survey Final Report	Partrac	2012
Geophysical Results Report Phase 1	GEMS	2010
Wave Height Spells for Survey Operability	Metoc	2010
Summary of Seagreen Firth of Forth Metocean Surveys to Date	Interek Metoc	2012

11.5. The Firth of Forth Zone wide metocean survey undertaken by Seagreen collected the following data:

- 17 months waverider buoy from December 2010 to mid-May 2012;
- 74 days wave and current data at five other sites;
- 6 months wave and current data at the two near shore sites from December 2011 to mid- June 2012; and

- Seawater properties data collected at mooring locations including limited coverage of turbidity data.

11.6. The data collected was considered appropriate to support the 2012 EIA and was included in the 2012 ES.

11.7. The following sections summarise the baseline.

Wind and Waves

11.8. Strong winds can occur throughout the North Sea, 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). In the stormiest event over the 18 month wave buoy deployment as part of the Seagreen metocean survey, a significant wave height of 6.7 m was recorded on 03 January 2012 which correlates with a 1 in 1 year sea wave climate return period event.

11.9. A long-term (10-year) wind and wave record was obtained from the Met Office wave model for UK Waters. Forecast data for two grid points, referred to as East (southeast corner of the Zone) and West (southwest corner of the Zone), have been interpolated for the period June 2000 to February 2010. The parameters include wind (speed and direction), sea wave, swell and resultant wave (height, period and direction). Wind conditions at the West Point are influenced by the Firth of Forth corridor, leading to a predominant south westerly wind. The East Point displays more of a spread of wind directions across the south to western sectors. The wind climate is predominantly offshore.

Water Levels

11.10. Tidal measurements demonstrated a strong semi-diurnal signal throughout the duration of metocean deployment. The greatest Highest Astronomical Tide (HAT) and Lowest Astronomical Tide (LAT), relative to Mean Sea-Level (MSL) were with levels of 2.6 m and -2.6 m, respectively.

Tidal Currents

11.11. The tidal regime within the Site is semi-diurnal in nature and characterised by a variable mean spring tidal range. Currents are primarily driven by tides with a residual component generally dominated by storm driven currents (Ramsay & Brampton, 2000). The pattern of tidal elevations across the outer Firth of Forth is governed by a southerly directed flood tide that moves along the eastern coastline of Scotland into the Firth of Forth and around Fife Ness. 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.

11.12. The strongest current flows during the survey period recorded a maximum current of 0.91 metres per second (m/s) on 18 April 2011 during a period of spring tides that correlated with the maximum water level at most sites. Current directions within the Site were characterised by current directions along a north-northeast to south-southwest axis.

Bathymetry

11.13. The Site lies to the east of an area known as the Scalp Bank, an area of locally elevated seabed. The sea bed topography in the Site is undulating, with the water depth varying between 40 m and 60 m LAT.

Geology

11.14. The geology is complex with a well-defined boundary between bedrock and Quaternary sediments across the Site (GEMS, 2010). However, the western periphery of the Site is marked by a more chaotic internal structure, resulting in difficulty distinguishing the boundary between bedrock and overlying Quaternary stratigraphic units. Where it was not possible to distinguish between the Quaternary units, sediments have been treated as undifferentiated Quaternary sediments.

Seabed Substrate

11.15. Megaripples are the predominant feature across the seabed, with isolated sand waves in the western half of the Site. Boulders are prevalent across the area and are either represented as isolated boulders or as clusters. All of the features are characteristic of various stages of sediment erosion and transportation produced by fluid movement (waves and currents) over sediments.

Sediment Transport

11.16. Bedform morphology is in general symmetrical and Historical Trend Analysis indicates that crest positions have not changed significantly over time, suggesting limited migration of the bedforms and hence limited sediment transport. Analysis of spatial shifts in the bathymetric contours between 2006 and 2010 indicate that the Site is characterised by an overall accreting environment, with vertical changes in the seabed not exceeding ±0.25 metres per year (m/yr).

Suspended Sediment

11.17. Results from water sampling carried out from an offshore station within the Site during two sampling events, in March and June 2011, showed total suspended solids (TSS) to be low. The samples had TSS of <5 milligrams per litre (mg/l) with a maximum reading during March of 10 mg/l.

11.18. Tidal currents are the principal mechanism governing suspended sediment concentrations in the water column, with fluctuations across the spring-neap cycle and throughout different stages of the tide (high water, peak ebb, low water, peak flood) observed throughout both datasets. However, suspended sediment concentrations can temporarily be elevated by wave-driven currents during storm events.

SUMMARY OF CHANGES TO ASSESSMENT METHODOLOGY

11.19. No new or updated legislation or guidance has been identified which could affect the methodology previously used.

SUMMARY OF CHANGES AS RESULT OF AMENDED DESIGN ENVELOPE

Table 11.2 Implications of Design Envelope Change on Physical Environment

Design Envelope Change	Implications on Effect Significance
Increased size of WTG	No material change
Increased spacing between WTG	No material change
Reduction in WTG numbers	Reduced footprint, reduced potential effect.
Inclusion of monopile foundations	No material change

11.20. The increased WTG dimensions and subsequent increased spacing between the WTGs will have no effect to the findings of the 2012 ES. The use of monopile foundations will not affect the findings of the 2012 ES, which considered Gravity Based System (GBS) foundations as the worst case scenario parameter, which would remain the case.

SUMMARY OF CHANGES FROM CUMULATIVE BASELINE

11.21. Changes to the cumulative baseline are not expected to alter the cumulative assessment as the key cumulative sites consisting of Inch Cape and Neart na Gaoithe offshore wind farms are still relevant.

PREDICTED EFFECTS AND ASSOCIATED MITIGATION

11.22. The effects summary table from the 2012 ES is included below. It is expected that the effects will remain as previously assessed and no significant effects are predicted with regards to the physical environment. It is therefore proposed that this can be scoped out of the 2017 EIA.

Table 11.3 Physical Environment Effects Summary Table from the 2012 ES

Description of Effect	Effect	Proposed Mitigation Measures	Residual Effect
Construction Phase			
Effects on hydrodynamic regime	Negligible	None	N/A
Effects on sediments and sedimentary structures	Installation plant: No change (anchored vessels) or negligible effect (jack-up barges)	None	N/A
	Seabed preparation: Negligible effect in areas devoid of mobile bedforms, low effect in areas with mobile bedforms	Design optimisation to minimise the quantity of worst case substructures / foundations required and depths of seabed preparation required	Low effect in areas of mobile bedforms if only industry best practice guidance is used as mitigation, but if alternative foundation types are selected, the effect reduces to negligible (for other GBS) or no change

Description of Effect	Effect	Proposed Mitigation Measures	Residual Effect
			(for jackets with piles or suction piles)
Effects on suspended sediment concentration and transport	Substructures / Foundations: Low effect	Design optimisation to minimise the quantity of worst case substructures / foundations required and depths of seabed preparation required	Negligible (for 52m baseplate diameter conical GBS) or negligible (for jackets with piles or suction piles)
	Array cables: Low effect	Design optimisation to select preferred cable trenching technique and minimise areas where jetting is used	Negligible (for ploughing or cutting)
Operation Phase			
Effects on hydrodynamic regime	Waves: Negligible Tides: Low	Design optimisation to minimise the quantity of worst case substructures / foundations required	Waves: N/A Tides: Low (for 52m baseplate diameter conical GBS) or negligible (for jackets with piles or suction piles)
Effects on sediments and sediment structures	Substructures / Foundations: Low effect	Design optimisation to minimise the quantity of worst case substructures / foundations required and scour protection likely to be needed to ensure integrity of substructures / foundations.	Low effect (conical GBS) or negligible effect (jackets)
	Array cables: Negligible effect in areas devoid of mobile bedforms, low effect in areas with mobile bedforms	Design optimisation to minimise the length of cable where protection is required	No change if all cable is buried to target depth.
Effects on suspended sediment concentration and transport	Substructures / Foundations: Low effect	Design optimisation to minimise the quantity of worst case substructures / foundations required and scour protection likely to be needed to ensure engineering integrity of substructures / foundations.	Low effect (conical GBS) or negligible effect (jackets). No change if scour protection used.
Decommissioning Phase			
Effects as for construction phase.			

Questions

11.1 Does MS-LOT agree that no further work is required for validation of site characterisation in terms of the physical environment?

11.2 Does MS-LOT agree that that no further assessment in the EIA is required in terms of the physical environment?

CHAPTER 12: WATER AND SEDIMENT QUALITY

12.1. A desk based review was undertaken of the baseline, methodology and stated effects in the 2012 ES which could result from the Development on water and sediment quality. It is noted from the 2012 ES that primary effects relating to water and sediment quality were expected to occur in the nearshore environment as a result of the Offshore Transmission Works. As the Development only relates directly to the wind farm nearshore effects are not considered as they do not relate directly to the Development. The following key points are noted:

- The baseline remains valid and is summarised below;
- No changes to the methodology are required;
- Amendments to the design will result in no material change to the predicted effects; and
- The cumulative baseline remains as previously assessed.

12.2. In summary, **no significant effects** were predicted during the 2012 EIA process and it is expected that this will remain the case. Therefore this topic can be scoped out of the 2017 EIA of the Development.

BASELINE REVIEW

12.3. A desk based review was undertaken to consider the water and sediment quality within the Site. This review focused on the results of the baseline surveys undertaken to inform the 2012 ES and any other available datasets. As of May 2017, the water and sediment quality data is considered valid. The following sections provide a summary of the baseline.

Water quality

12.4. Baseline water quality was considered to be good with contaminant levels generally below those at which adverse effects on the benthos are seen. Elevated arsenic levels were observed and whilst there are a number of potential origins the source remains unknown. Whilst elevated, the levels are still below the CEFAS Action 1 Levels which means they are not a significant concern.

Protected areas

12.5. The Firth of Forth Banks Complex Marine Protection Area (MPA) is located within the offshore waters to the east of Scotland and includes the Berwick, Scalp and Montrose Banks and the Wee Bankie shelf banks and mounds. The MPA is strongly influenced by water currents and the mosaic of different types of sands and gravels which create a unique mixture of habitats. The MPA has been designated to conserve the ocean quahog aggregations, offshore subtidal sands and gravels, and shelf banks and mounds. Part of the Site is located within the MPA.

Sediment quality

12.6. The seabed across much of the Site is composed predominantly of gravelly sand. In the absence of any anthropogenic activity such as dredging and disposal, it is unlikely that seabed sediments are contaminated above the natural background threshold for contaminants. However, there is a disposal ground located to the south

west of the Site which was utilised historically for the disposal of sewage sludge between 1978 and 1998. Sediment sampling was regularly undertaken at the disposal site up to cessation of dumping activity, with sample analysis considering metal and organic determinants.

12.7. Sampling results from monitoring of the disposal site indicated that seabed sediments displayed no signs of serious organic or heavy metal contamination (CEFAS, 1997). Due to the majority of the seabed being composed of gravelly sand there is limited scope for particulate material to be adsorbed onto the surface of coarse-grained substrates or associated organic material and it is further expected that potential pollutants would be widely dispersed from the site of disposal. Additionally, benthic fauna have also been monitored. Sampling results suggest a mild impact of sludge disposal but show that seabed sediments display no signs of serious organic or heavy metal contamination.

SUMMARY OF CHANGES TO ASSESSMENT METHODOLOGY

12.8. A review of the assessment guidance used has confirmed that no changes to the guidance or legislation have occurred since the submission of the 2012 ES and therefore no changes to the assessment methodology are required for the 2017 EIA.

SUMMARY OF CHANGES AS RESULT OF AMENDED DESIGN ENVELOPE

Table 12.1 Implications of Design Envelope Change on Water and Sediment Quality

Design Envelope Change	Implications on Effect Significance
Increased size of WTGs	No material change
Increased spacing between WTGs	Potential decrease in effects
Reduction in WTG numbers	Reduced footprint, reduced potential effects
Inclusion of monopile foundations	No material change

12.9. Given the expected decrease in WTG numbers and increased spacing between WTGs within the Site, it is anticipated that potential effects on water and sediment quality will decrease. The use of monopile foundations will not affect the conclusions of the 2012 ES.

SUMMARY OF CHANGES FROM CUMULATIVE BASELINE

12.10. Changes to the cumulative baseline are not expected to alter the cumulative assessment as the key cumulative sites consisting of Inch Cape and Neart na Gaoithe offshore wind farms are still relevant.

PREDICTED EFFECTS AND ASSOCIATED MITIGATION

12.11. The effects summary table from the 2012 ES is included below. It is expected that the effects will remain as previously assessed and no significant effects are predicted with regards to water and sediment quality. Therefore it is proposed that this topic can be scoped out of the 2017 EIA.

Table 12.2 Water and Sediment Quality Effects Summary Table from the 2012 ES

Description of Effect	Effect	Potential Mitigation Measures	Residual Effect
Construction Phase			
Deterioration in water quality due to re-suspension of sediments	Negligible	If the need for seabed preparation is determined, a licence will be applied for under the Marine (Scotland) Act 2010 for Dredging and Deposit of Solid Waste in the Territorial Sea and UK Controlled Waters Adjacent to Scotland. This will necessarily consider details of the areas and materials to be dredged and a BPEO Assessment for deposit of the materials, including consideration of re-use of material as foundation ballast, beneficial use and disposal at sea.	Negligible Not significant
Deterioration in water quality due to re-suspension of contaminants	Negligible	No mitigation is proposed	Negligible Not significant
Deterioration in water and / or sediment quality due to accidental spillage of construction materials	Minor adverse	Construction Environmental Management Plans (CEMP) and Pollution Control and Spillage Response Plans will be agreed with the Regulatory Authorities prior to offshore construction activities commencing.	Negligible Not significant
Introduction of marine non-native / alien species	Minor adverse	Once the vessels for construction are confirmed, a risk assessment will be conducted. The assessment and measures indicated by the assessment will be agreed with Marine Scotland. Further consultation with SNH and SEPA may be required	Negligible Not significant
Operation Phase			
Deterioration of water and sediment quality as a result of scour impacts at WTG structures	Negligible	As a matter of good practice, the detailed design of the project will consider scour protection Visual or bathymetric surveys will be undertaken at selected locations within the OWF site Further monitoring requirements will be determined through consultation with Marine Scotland and other key stakeholders.	Negligible Not significant
Deterioration in water quality due to accidental spillages	Minor adverse	Best practice for pollution prevention will be considered during the operational phases to mitigate the risk from accidental spillages.	Negligible Not significant
Introduction of marine non-native / alien species	Minor adverse	Once the vessels for operation are confirmed, a risk assessment will be conducted. The assessment and measures indicated by the assessment will be agreed with Marine Scotland. Further consultation with SNH and SEPA may be required	Negligible Not significant
Decommissioning Phase			
Impacts due to re-suspension of sediments and contaminants	Negligible	As detailed in Chapter 5: Project Description, a decommissioning plan will be established and agreed with the regulators	Negligible Not significant

Description of Effect	Effect	Potential Mitigation Measures	Residual Effect
Introduction of marine non-native / alien species	Minor adverse	Once the vessels for construction are confirmed, a risk assessment will be conducted. The assessment and measures indicated by the assessment will be agreed with Marine Scotland. Further consultation with SNH and SEPA may be required	Negligible Not significant

Questions

12.1 Does MS-LOT agree that no further work is required for validation of site characterisation in terms of the water and sediment quality?

12.2 Does MS-LOT agree that that no further assessment in the EIA is required in terms of water and sediment quality?

CHAPTER 13: BENTHIC ECOLOGY

13.1. A desk based review was undertaken of the baseline, methodology and stated effects in the 2012 ES which could result from the Development on benthic ecology; there is no requirement to consider terrestrial or intertidal ecology as the Site is located approximately 25 km offshore. The following key points are noted:

- The baseline remains valid and is summarised below;
- No changes to the methodology are required;
- Amendments to the design will result in no material change to the predicted effects; and
- The cumulative baseline remains as previously assessed.

13.2. In summary, **no significant effects** were predicted during the 2012 EIA process and it is expected that this will remain the case. Therefore this topic can be scoped out of the 2017 EIA of the Development.

BASELINE REVIEW

13.3. A desk based review was undertaken to consider the benthic ecology aspects (habitats and species) likely to be present within the Site. This review focused on the results of the benthic surveys undertaken in 2011 to inform the 2012 ES, which provide detailed and relevant information on the benthic habitats and species present within the Site and wider area. As of May 2017 the benthic survey data from 2011 is considered valid, in light of the site condition monitoring requirement of marine SAC requiring reporting on the qualifying features every six years.

13.4. A number of marine ecology surveys were undertaken in 2011 to characterise the benthic environment within the Site, including seabed trawls, towed video trawls and grab sampling. The marine ecology surveys found benthic habitats within the Site to comprise expansive areas of featureless sediment dominated by patchy communities of worms and shellfish.

13.5. The distribution of epifauna within the Site is related to sediment type, with sandy gravels and gravelly sands supporting a rich epifauna, whilst slightly gravelly sands were generally low in epifauna (Figure 13.1). Most of the epifauna species recorded were opportunistic, with bryozoans / hydroid turf (especially *Flustra foliacea*) and the tube worm *Hydroides norvegica* present. The pea urchin *Echinocyamus pusillus* and the sea squirt A*scidiella scabra* were identified only at a few locations. Of particular note within the western area are the *Sabellaria* habitats, located mainly in the western area. These habitats support diverse infauna and epifauna, in marked contrast to the sparse polychaete communities which support generally low infaunal species richness.

13.6. The benthic communities present across the Site are considered typical of the wider environment (outer Firth of Forth and northwest North Sea) and are representative of habitats which have been subject to fishing with bottom contacting gears for numerous years. It should be noted that the majority of the western area has been heavily fished and continues to be fished by bottom contacting gears, particularly by scallop dredges. This is the only major anthropogenic impact observed upon the

benthos to date; however as the benthic habitats have been widely impacted by fishing they are not considered to be either natural, or particularly sensitive to physical impacts.

Notable Features

13.7. One species of conservation importance was identified within the Site, the ocean quahog (*Artica islandica*), a burrowing bivalve mollusc which can live over 400 years. The marine ecology surveys identified only juveniles within the Site, suggesting that on-going disturbance is preventing the species from maturing. This is likely due to commercial fishing activities involving seabed operating mobile gear such as trawls and dredges. This is discussed further in the commercial fisheries section, Chapter 14. Aggregations of ocean quahog are also a protected feature of the Firth of Forth Banks Complex MPA.

13.8. Other notable benthic species identified within the Site include:

- Ross worm (*Sabellaria spinulosa*): this is a common and widely distributed tube-building polychaete worm species, identified across the Site. This species is of high conservation value when found growing in reef structures (classified as a biogenic reef under the Annex I Reef Description, Habitats Directive); however there was no evidence to suggest reef structures are present within the Site.
- Horse mussel (*Modiolus modiolus*): this is a common and widespread species; however horse mussel beds are more limited in their distribution, resulting in classification as a 'threatened or declining habitat' by OPSAR and listed as a habitat of conservation importance, with regards to Priority Marine Features (PMFs) in Scottish territorial waters (Marine Scotland 2011). Individual horse mussels were identified within the Site; however no horse mussel beds were identified.
- Polychaete worm *Capitella capitata*: this is an opportunistic species tolerant of stressful conditions, often found in polluted waters where it out-competes less tolerant species. This species was identified at low densities (expected for non-polluted sediments) across several locations within the Site, with one location showing elevated numbers, but with no obvious source of pollution.
- *Ammodytes spp*. (sandeels): sandy sediments across the outer Firth of Forth and northwest North Sea support important sandeel (*Ammodytes spp*.) populations, with the highest regional density found at the Wee Bankie, approximately 30 km south of the Site. Sandeels spend a large proportion of their lifecycles buried within sediments, therefore are also likely to be affected by impacts to benthic ecology. Sandeels are discussed further in the fish ecology section (Chapter 7).
- Scallops: both king scallop (*Pectin maximus*) and queen scallop *(Aequipecten opercularis*) were identified within benthic habitats across the Site. These species are likely to be affected by impacts to benthic ecology and are discussed further in the fish ecology section (Chapter 7).

13.9. Notable species recorded during the benthic survey are shown on Figure 13.2.

Summary

13.10. Following the above review of the benthic ecology baseline information, it is considered unlikely that there have been any marked changes in the occurrence, distribution and extent of benthic habitats and associated species since the marine ecology surveys were undertaken in 2011 to inform the 2012 ES. The benthic environment within the Site is characterised by water depths of approximately 40 m to 60 m and is dominated by cobble with sand, gravelly sand and sandy gravel substrates. These sedimentary habitats are dynamic in nature and are generally species poor, characterised by a mobile fauna of polychaete worms, bivalve molluscs, crustaceans and starfish. It is not anticipated that the benthos within the Site would vary greatly from this typical assemblage, widespread throughout the wider environment. Additionally, there has been no known change in the intensity or type of commercial fishing practised within the Site; therefore the presence of additional benthic communities of conservation interest is deemed unlikely.

SUMMARY OF CHANGES TO ASSESSMENT METHODOLOGY

13.11. Following a review of the assessment guidance used, it is noted that the following new documents are now applicable:

- Scottish Government (2013), Offshore Wind Energy in Scottish Waters, Draft Initial Plan Framework.
- JNCC (2014), Firth of Forth Banks Complex, Marine Protected Area (MPA);
- JNCC (2014), Scottish MPA Project, Data Confidence Assessments, Firth of Forth Banks Complex Nature Conservation MPA, July 2014; and
- SNH (2014), Priority Marine Features Guidance. A2086517.

13.12. None of these documents change the method by which the assessment is undertaken.

SUMMARY OF CHANGES AS RESULT OF AMENDED DESIGN ENVELOPE

Table 13.1 Implications of Design Envelope Change on Benthic Ecology

Design Envelope Change	Implications on Effect Significance
Increased size of WTGs	No material change
Increased spacing between WTGs	Potential decrease in effects
Reduction in WTGs numbers	Reduced footprint, reduced potential effects
Inclusion of monopile foundations	No material change

SUMMARY OF CHANGES FROM CUMULATIVE BASELINE

13.13. Changes to the cumulative baseline are not expected to alter the cumulative assessment as the key cumulative sites consisting of Inch Cape and Neart na Gaoithe offshore wind farms are still relevant.

13.14. The cumulative situation has not significantly changed and therefore there will be no amended benthic ecology assessment.

PREDICTED EFFECTS AND ASSOCIATED MITIGATION

13.15. The effects summary table from the 2012 ES is included below and due to there being no changes in the benthic ecology baseline, it is assumed that the effects will remain as previously assessed, i.e. not significant.

13.16. It is recognised that during operation of the Development, some benefits for enhancing biodiversity may arise from inadvertent creation of artificial reef habitats from offshore infrastructure. It is acknowledged that such potential benefits to benthic ecology are unlikely to be significant and may not be permanent, as offshore infrastructure may be removed during decommissioning.

13.17. The installation of offshore WTGs will involve the loss of some natural seabed habitat; however, new habitat will be created, with potential for some mitigation of habitat loss if new substrates are suitable and well designed. 'Artificial reef' habitats within the Site may act as a reproductive reservoir that enhances recruitment to stocks in adjacent areas, with potential (positive) implications for the adjacent Firth of Forth Banks Complex MPA.

13.18. On the basis of the above that there are **no significant effects**, it is proposed that benthic ecology will be scoped out of the 2017 EIA.

Table 13.2 Benthic Ecology Effects Summary Table from the 2012 ES

Description of Effect	Effect	Potential Mitigation Measures	Residual Effect
Construction Phase			
Direct impact on benthos due to physical disturbance	Negligible and not significant	Siting of WTG, array cables and ancillary structures to avoid the areas of sensitive habitat where ever practicable. As part of the pre-construction survey (which will be agreed with Marine Scotland) data will be analysed to ascertain the presences of any rare or important habitats, such as *Sabellaria* or *Modiolus* reefs and microsite infrastructure if necessary	Negligible and not significant
Direct impact on benthos due to the loss of habitat	Minor adverse and not significant (Alpha) Negligible and not significant (Bravo)	Mitigation measures Siting of WTG, array cables and ancillary structures to avoid the areas of sensitive habitat where ever practicable. As part of the pre-construction survey (which will be agreed with Marine Scotland) data will be analysed to ascertain the presences of any rare or important habitats, such as *Sabellaria* or Modiolus reefs and microsite infrastructure if necessary	Negligible and not significant

Indirect impacts on benthos due to increased suspended sediments	Negligible and not significant	No mitigation measures are advised for this impact	Negligible and not significant
Indirect impacts on benthos through re-mobilisation of contaminated sediments	Negligible and not significant	No mitigation measures are advised for this impact	Negligible and not significant
Operation Phase			
Direct impact on benthos due to physical disturbance caused by maintenance activities	Negligible and not significant	No mitigation measures are advised for this impact	Negligible and not significant
Direct impacts on subtidal benthos due to creation of new habitat	Negligible and not significant	No mitigation measures are advised for this impact	Negligible and not significant
Indirect impacts on benthos due to changes in current regime and coastal processes	Negligible and not significant	No mitigation measures are advised for this impact	Negligible and not significant
Indirect impacts on subtidal benthos due to alteration to existing human activity	Negligible and not significant	No mitigation measures are advised for this impact	Negligible and not significant
Decommissioning Phase			
Impacts on benthos	Minor adverse and not significant	It is anticipated that surveying for Annex I habitat will be undertaken prior to decommissioning in line with surveys anticipated as part of the pre-construction activities (see Assessment of Impacts – Worst Case Scenario). Should these surveys indicate the presence of any sensitive habitats. Seagreen will discuss how to decommission the wind farm with the regulators to avoid, where possible, impacts upon such habitats.	Negligible and not significant

Questions

13.1 Does MS-LOT agree that no further work is required for validation of site characterisation in terms of benthic ecology?

13.2 Does MS-LOT agree that that no further assessment in the EIA is required in terms of benthic ecology?

CHAPTER 14: COMMERCIAL FISHERIES

14.1. A desk based review has been undertaken of the baseline, methodology and stated effects in the 2012 ES which could result from the Development on commercial fisheries. The following key points are noted:

- The baseline remains valid and is summarised below;
- No changes to the methodology are required;
- Amendments to the design will result in no material change to the predicted effects; and
- The cumulative baseline remains as previously assessed.

14.2. Significant effects were predicted on crab and lobster fisheries in the 2012 ES, however these were directly related to the Offshore Transmission works. Therefore as **no significant effects** are expected as a result of the Development it is proposed that this topic will be scoped out of the 2017 EIA of the Development.

BASELINE REVIEW

14.3. A desk based review was undertaken to consider the commercial fishing activities taking place within the Site (Figures 14.1 and 14.2). This review focused on the results of the consultation, data collation and analyses undertaken to inform the 2012 ES, supplemented by publicly available commercial fisheries landings data.

14.4. Within the 2012 ES, and for the purposes of this scoping report, commercial fishing is defined as any legal fishing activity undertaken for declared taxable profit. Salmon and sea trout fisheries are addressed separately to other commercial fisheries, as a result of these fisheries being largely located in-river and different in nature to the majority of marine commercial fishing activities.

14.5. Consultation with relevant stakeholders was central to the previous assessment of commercial fisheries and a regional Commercial Fisheries Working Group was proposed to facilitate future engagement with the fishing industry; this was be taken forward to facilitate further consultation during the assessment process. In addition, previous discussions with commercial fishing interests were undertaken with through FTOWDG. Salmon and sea trout fisheries consultation was undertaken with various District Salmon Fisheries Boards (DSFBs), including joint discussions with the FTOWDG. Where possible, a collaborative approach to consultation with the commercial fishing industry will be continued with regards to future development.

14.6. To determine baseline conditions, fishing activities within the Site were described, with the regional study area comprising the Site and the Outer Forth and Tay areas (encompassing the Scottish Territorial Water (STW) sites, extending from 56° N in the south to 57° 30'N in the north and seawards out to 0° W). To provide context for the fishing activities within the regional study area, a brief national overview representing a wider study area was also considered.

14.7. For salmon and sea trout fisheries, the area of study was defined at an immediate Site, regional and wider level. The immediate study area focuses on the salmon fishery districts located in closest proximity to the Site, principally the Tay and Esk

fisheries. The regional study area focusses on the salmon fisheries located in the vicinity of the Site, including the East and North regions. To provide context to the immediate and regional study areas, and to account for the migratory behaviour of salmon and sea trout, salmon fisheries at a national (Scottish) level were also considered.

14.8. The commercial fisheries baseline incorporated various different data and information sources, each subject to varying sensitivities and limitations. This was considered in conjunction with commercial landings statistics and data obtained from consultation, to provide comprehensive baselines for both commercial and salmon and trout fisheries.

14.9. ICES rectangle 42E8, within which the Site is located, recorded landings values of moderate to low importance on a national scale. Within the regional study area, landings were considered of moderate importance. The species composition of landings (percentage values) from rectangle 42E8 is: king scallops (78.6%), haddock (13.5%) and squid (3.0%) (based on ICES data averaged from 2001-2010). Fishing methods include boat dredging for scallops, demersal trawling or seine netting for haddock, and demersal trawling for squid. Landings values for all species from rectangle 42E8 are broadly highest in spring and early summer (April to June), although there are also moderate catches recorded in March, July and August.

14.10. The majority of fishing vessels operating in rectangle 42E8 are over 15 m in length; therefore the majority of vessel activity within the Site and regional study area are included within satellite tracking (VMS) datasets. Vessels between 10 and 15 m in length account for a lower percentage of the vessels operating in 42E8 (2.8%), with under-10m vessels recording negligible levels (0.3%). The remainder of activity (3%) has been recorded by non-UK vessels.

14.11. Aberdeen is the principal port recording the majority of landings from rectangle 42E8 (57.5%), although this only represents 5.1% of the port's total annual income. In contrast, smaller east coast ports such as Arbroath (11.0%) and Montrose (5.0%) record relatively smaller proportions of the landings values from the local area, but which represent a larger proportion of each port's total value (11.7% and 16.5%, respectively).

14.12. An overview of the commercial fishing activity which takes place within the Site and regional study area is provided below.

Scallop Fishery

14.13. ICES rectangle 42E8 records the second highest scallop landings in the regional study area, (£742,549, averaged 2001-2010), which are moderately important on a UK scale. King scallops are principally targeted by boat dredges, with vessels generally towing either one or two beams, onto which a number of dredges are attached (depending upon vessel size, engine power and winch capacity). The principal type of dredge used is the English 'Springer' type, whereby the scallops are raked from the seabed by steel teeth that are attached along the leading edge of the dredges and which can penetrate the seabed to a depth of approximately 20 cm.

14.14. The majority of vessels targeting scallops within the Site are over 15 m in length and as a result, analysis of VMS data is accurate in further describing their activities.

Scallop activity, as illustrated by Marine Scotland data from 2008, indicates that scallop dredging occurs in areas along the north east coast, including the Scalp Bank and in the vicinity of the Site. This fishery demonstrates annual fluctuations in activity.

Whitefish Fishery

14.15. Whitefish is principally targeted by the over 15 m fleet and VMS data indicate that landings are moderate in north-eastern areas of the regional study area and negligible within the Site.

14.16. Whitefish, principally haddock within the regional study area, is targeted by Scottish seine netters and demersal trawlers offshore of the Site, predominantly in areas to the east and north-east. Haddock is targeted throughout the year, although activity peaks in the summer months (May to August, inclusive).

14.17. Historically, there was a whitefish fishery in the region; however, fisheries management policies and availability of resource have had the effect of making the fishery unviable. It is not it considered likely that whitefish vessels will resume the fishery in the area in the future, largely due to ongoing restrictions on cod and other whitefish species. There are currently no whitefish vessels based at local east coast ports and whitefish landings are either by visiting vessels or by-catch from another fishery.

Squid Fishery

14.18. Squid is reported to be an increasingly important fishery in the Forth and Tay area. It is currently unregulated and demersal vessels constrained by restrictions on other stocks can reconfigure gear to target the species. Annual landings values vary significantly as the fishery is dependent upon the arrival of the species in the area. Peak landings for squid occur between June and September.

14.19. The fishery is targeted by vessels with home ports in the regional and wider study area. Bottom otter trawlers targeting nephrops or whitefish will reconfigure gear to operate nets with a smaller mesh size and higher headline. Consultation with squid fishermen within the regional study area suggests that squid fishing grounds are found throughout the Forth and Tay area, including, to a degree, areas within the Site.

Nephrops Fishery

14.20. Nephrops is an important shellfish species in the Forth and Tay area, with the highest recorded landings in rectangles 41E7 and 41E6. Nephrops constitute £3,854 (0.4%) of the total value of 42E8, which are of negligible importance on a regional scale. The majority of vessels in 42E8 are over 15 m and VMS data (2009) shows that nephrops activity is out with the Site, predominantly recorded in areas further south and north. Nephrops is targeted year round although there are seasonal fluctuations in landings, with a marked peak recorded during the summer months (July and August) within the regional study area.

Crab and Lobster Fishery

14.21. Landing values for crab and lobster within 42E8 are of negligible value, with crab and lobster landings higher in inshore areas. Crab and lobster are principally

targeted by full time static gear vessels setting pots/creels. Creel fishing grounds are predominantly inshore of the Site and are generally concentrated several miles from the shore along the north and south coasts of the regional study area. Several creel vessels were identified operating in deeper waters offshore and in the vicinity of the Site.

Other Commercial Fisheries

14.22. A summer fishery exists in the Forth and Tay area for mackerel, targeted by small, inshore vessels operating hand lines and jiggers. Local creel vessels may also target mackerel during the summer months whilst also setting creels for lobster and crab.

14.23. Within the Site, dredging for scallops is the principal fishing activity, with the activity of this fishery fluctuating and demonstrating a cyclical nature. ICES data over the study period does not indicate activity from the squid fishery within the Site; however consultation identified active grounds within the Site, although the variation in productivity and distribution of squid fishing activity is recognised.

14.24. In addition to the principal fisheries identified in ICES rectangles 42E8 and regional study area, the following fishing activities take place in the wider study area; bottom trawling for nephrops, and creeling for lobster and crab.

Salmon and Trout: Rod-and-Line Fishery

14.25. Within the regional study area rod-and-line salmon catches peak in September and October, with the Tweed also recording high catches in November. Lower salmon catches are also of importance from March to August, particularly in the Dee, Tay and Tweed, reflecting the diversity of salmon runs in the regional study area. In most districts, grilse (one-sea-winter salmon) are principally caught from July to October, with peak catches recorded from August to October. In the Tweed, as for salmon, relatively high grilse catches are also recorded in November. Within the regional study area, catches vary annually.

Salmon and Trout: Net Fishery

14.26. Net fishing for salmon and sea trout is generally in decline, as fishing rights have been bought or leased by conservation interests for the purposes of stopping netting operations. Net-and coble principally takes place in the North Esk and the Tweed districts, and to a much lesser extent in the Forth, Ugie and Tay. The majority of the catch by the fixed engines fishery within the regional study area comes from the Esk district (North and South Esk), and to a lesser extent the Tweed. The Don, Ythan and Ugie also record comparatively low catches by this method. Within the regional study area, annual variations exist in catches by the net-and-coble and fixed engine fisheries.

14.27. Within a national context, the north east is the principal region in terms of netting activity, with the majority of the catches in this region concentrating in the Esk district (North and South Esk). The North Esk's coastal netting stations were bought out by the Esk District Salmon Fishery Board in 2007. Fixed engines are still commercially operational in the South Esk, with Usan Salmon Fishery (Montrose) constituting the principal fishery in the South Esk area.

Summary

14.28. The main commercial fisheries within the Site are dredging for scallops, trawling or netting for haddock, and trawling for squid. Of these, the scallop fishery is the most valuable.

14.29. Fishing activity is expected to be excluded from certain areas, or access restricted, during construction and operation of the Development. Impacts on both the squid and scallop fisheries are predicted due to potential increased steaming time to fishing grounds, displacement of fishing activity or navigational conflict with other vessels; however these were not previously assessed as significant. The impact on the scallop, squid and nephrops fisheries that use mobile gear was assessed as not significant.

14.30. Limitations relating to the potential for change to the commercial fisheries baseline over time are recognised. This may be for a number of reasons, for example fluctuations in landings, changes in legislation and management policies, economic constraints such as fuel costs and crew availability or environmental restrictions such as weather. As a result, the assessment undertaken within the 2012 ES is limited by the baseline identified: due to the nature of commercial fisheries data, this limitation would also be apparent in any future assessment undertaken.

14.31. Following a review of the above baseline information no change in the commercial fisheries baseline is anticipated from the 2012 ES, due to no known marked changes in environmental conditions and a continuing commercial fisheries presence likely to be of a similar nature to fishing activities experienced over previous years.

SUMMARY OF CHANGES TO ASSESSMENT METHODOLOGY

14.32. Guidance for fisheries liaison has been updated since the 2012 ES, with both updated research (particularly for migratory fish species) and contemporary commercial data available as follows:

- FLOWW (2014), FLOWW Best Practice Guidance for Offshore Renewable Developments: Recommendations for Fisheries Liaison. January 2014
- Scottish Government (2014), Collation of Available Datasets on Smolt Populations in Scotland to Assess Migration Run Times. Scottish Marine and Freshwater Science. Vol 5; No. 6 Marine Scotland
- Scottish Government (2014), Identifying a Panel of Single Nucleotide Genetic Markers for River Level Assignments of Salmon in Scotland. Scottish Marine and Freshwater Science. Vol 5; No. 5, Marine Scotland
- Scottish Government (2016), Scottish Sea Fisheries Statistics 2015
- Scottish Government (2016), Fish and Shellfish Stocks, 2016 Edition. Marine Scotland Science
- Marine Scotland Science (on-going research): National Research and Monitoring Strategy for Diadromous Fish (NRMSD): to investigate the potential for interactions between diadromous fish and wind, wave and tidal renewable energy developments

14.33. None of the above documents change the method by which the assessment is undertaken; however contemporary landings data and research publications would enable an updated baseline on which to undertake future assessment.

SUMMARY OF CHANGES AS RESULT OF AMENDED DESIGN ENVELOPE

Table 14.1 Implications of Design Envelope Change on Commercial Fisheries

Design Envelope Change	Implications on Effect Significance
Increased size of WTG	No material change
Increased spacing between WTGs	Potential decrease in effects
Reduction in WTG numbers	Reduced footprint, reduced potential effects
Inclusion of monopile foundations	No material change

SUMMARY OF CHANGES FROM CUMULATIVE BASELINE

14.34. Within the 2012 ES, it was predicted that the Seagreen development would act cumulatively with other offshore wind farms to produce potentially significant effects on the scallop, squid, nephrops, crab and lobster fisheries during construction, and on the squid and scallop fisheries during operation.

14.35. In line with the fish and shellfish resources assessment, a possible significant effect on herring was assessed at both project and cumulative levels during construction. Potential significant cumulative impacts were also been assessed with regards to safety, displacement and interference with fishing vessels, both at a Site and regional study area level.

14.36. There have been no marked changes in the fish and shellfish or commercial fisheries baseline since the 2012 Seagreen Offshore ES; therefore it is anticipated that the cumulative situation has not significantly changed.

PREDICTED EFFECTS AND ASSOCIATED MITIGATION

14.37. The effects summary table from the 2012 ES is included below and it is assumed that the effects will remain as previously assessed. Therefore it is proposed that this topic will be generally scoped out of the 2017 EIA, with the exception of a review of contemporary landings data reflective of more recent fishing activities within the Site and regional study.

Table 14.2 Commercial Fisheries Effects Summary Table from the 2012 ES

Description of Effect	Effect	Potential Mitigation Measures	Residual Effect
Construction Phase			
Temporary Loss or Restricted Access to Fishing Grounds	Minor Adverse	Ongoing engagement through the forum of the Working Group to enable construction and installation procedures which allow normal fishing activities to safely resume	Not significant

Safety Issues for Fishing Vessels (all fishing vessels)	Within acceptable limits for aspects with applied safety zones Outside of acceptable limits for array cable installation	Protocol for the removal of seabed obstacles Completion of post installation survey of array cables to ensure fishing activities can be safely resumed Consultation with fishing interests to ensure that all safety risks are brought within acceptable limits	Residual impacts will be reduced to within acceptable limits and therefore not significant
Increased Steaming Times for Fishing Vessels	Minor Adverse		Not significant
Displacement of Fishing Vessels into other Areas	Minor Adverse	Ongoing engagement through the forum of the Working Group to enable construction and installation procedures which allow normal fishing activities to safely resume	Not significant
Interference to Fishing Activities (navigational conflict)	Minor Adverse – all fisheries exception crab and lobster Moderate Adverse – crab and lobster fishery	Development of protocols, including vessel transit lanes, in consultation with fishing interests to ensure that possible reductions in interference are achieved	Not significant
Operation Phase			
Loss or Restricted Access to Fishing Grounds	Minor Adverse	Ongoing engagement through the forum of the Working Group to enable operational procedures which allow normal fishing activities to safely be undertaken Investigations are ongoing within the offshore renewables industry to explore potential modifications to bottom towed gear which may better enable fishing activities within and around operational wind farms. These investigations may result in mitigating the impact identified.	Not significant
Safety Issues for Fishing Vessels (all fishing vessels)	Within acceptable limits for infrastructure and array cables	All infrastructures will be marked and lit Application of 50m safety zones around infrastructure	N/A
Increased Steaming Times for Fishing Vessels	Minor Adverse	N/A	Not significant
Displacement of Fishing Vessels into other Areas	Minor Adverse	N/A	Not significant
Interference to Fishing Activities (navigational conflict)	Minor Adverse	N/A	Not significant

Questions

14.1 Does MS-LOT agree with the suggested assessment receptors for the commercial fisheries assessment?

14.2 Does MS-LOT agree that updated consideration of commercial fisheries will include a supplementary review of contemporary landings data to ensure the most representative baseline is considered?

14.3 Does MS-LOT agree that updated assessment for commercial fisheries will only be required should the review of contemporary landings data identify a significant change to the baseline and to assess the significance of effects on crab and lobster fishery?

CHAPTER 15: ARCHAEOLOGY AND CULTURAL HERITAGE

15.1. A desk based review was undertaken of the baseline, methodology and stated effects in the 2012 ES which could result from the Development on archaeology and cultural heritage. The following key points are noted:

- The baseline remains valid and is summarised below;
- No changes to the methodology are required;
- Amendments to the design may result in an increased impact but are not expected to will result in a material change to the predicted effects or increase the significance; and
- The cumulative baseline remains as previously assessed.

15.2. In summary, **no significant residual effects** were predicted during the 2012 EIA process and it is expected that this will remain the case. Therefore this topic can be scoped out of the 2017 EIA of the Development.

BASELINE REVIEW

15.3. A desk based review was undertaken to consider the archaeological and cultural heritage aspects likely to be present within the Site. This review focused on the results of the baseline surveys and data collection undertaken to inform the 2012 ES and any other available datasets. As of May 2017, the archaeological and cultural heritage data is considered valid. The following sections summarise the baseline.

Offshore Assets

15.4. A desk-based review has examined the prehistoric archaeological resource within the northern North Sea (Flemming, 2004), and concluded that remains 'could occur with low probability anywhere in the studied area. This is a direct consequence of parts of the Marr Bank being exposed during periods of lower than present sea-level during the early Holocene (~10,000 yrs B.P.).

15.5. The geoarchaeological and geotechnical assessment of the geotechnical survey borehole logs from within the ISA, which covers the Site and a 1 km buffer, has established that the Site was either under ice or submerged throughout the late Glacial/early Holocene. This has resulted in a lack of organic sediments of palaeoenvironmental interest from this period, such as peats, as these have not had the opportunity to form. The potential for the discovery of relict land surface deposits and features of archaeological interest therefore is regarded as low. Despite this, there is limited potential for the discovery of residual artefacts in the marine sediments such as lithics.

15.6. In terms of more recent history, no Designated Wrecks or other cultural heritage assets with legal designations were located within the ISA. Eight charted wrecks are located within the Site, with one further wreck along the southern Site boundary (see Figure 15.1). The positions of known wrecks were determined through a desk based review of Admiralty Chart 1407 and marine geophysical data; none of the wrecks identified are afforded designated protection. The majority of the wreck sites lie

within the central eastern and southern areas of the Zone. It is possible that undiscovered wrecks are present within the Site.

Table 15.1 Offshore Cultural Heritage Assets within the Site with Known Locations

HANo.	Name	UKHO No.	NMRS No.	UTM30NmE	UTM30NmN	Status
1001	HMS St Briac	070459	-	588376	6268388	Live
1002	HMS Exmouth (possibly)	065549	-	584999	6268185	Dead
1003	Michael Scott	03164	-	580593	6281041	Dead
1004	Unknown	070465	-	577240	6264891	Live
1005	Eskedene	065458	-	571402	6280874	Lift
1008	Unknown	03161	-	572132	6264185	Live
1040	Obstruction / Aircraft	03179	-	561854	6270709	Dead

15.7. Those wrecks which are classified as 'Dead' (wreck is known to have been lost in this general area but has not been identified in its recorded location despite repeated surveys) or 'Lift' (vessel has been recovered or salvaged) are not considered further.

15.8. A number of anomalies or targets were identified during the archaeological assessment of the Seagreen 2010 survey marine geophysical data as detailed in Table 15.2.

Table 15.2 Offshore Cultural Heritage Assets within the Site from Marine Geophysical Data

HANo.	Site Description	Sidescan Potential	UTM30NmE	UTM30NmN
14	Group possible debris	Medium	567478	6282036
25	Debris	Medium	565719	6281505
43	Buried debris	Medium	567247	6280890
14	Group possible debris	Medium	567478.	6282036
25	Debris	Medium	565719	6281505
43	Buried debris	Medium	567247	6280890
47	Possible debris	Medium	569961	6281211
64	Depression/buried object	Medium	580680	6280616
77	Debris on seabed	Medium	569723	6277631
81	Curvilinear feature	Medium	587742	6280533
88	Aircraft?	High	589108	6277960
101	Debris	Medium	585929	6276473
106	Debris	Medium	566229	6271993

HANo.	Site Description	Sidescan Potential	UTM30NmE	UTM30NmN
112	Linear Debris	Medium	556104	6276065
118	Debris	Medium	579224	6272921
132	Debris	Medium	573786	6270058
133	Debris	Medium	575865	6270475
175	Wreck	High	588375	6268388
176	Wreck	High	588437	6268346
177	Wreck debris	High	588437	6268287
225	Linear debris	Medium	568335	6279641
230	Linear debris	Medium	583236	6282260
248	Linear debris	Medium	564456	6278244
268	Debris	Medium	583479	6281600
365	Linear debris	Medium	567112	6274882
409	Wreck	High	577240	6264891

15.9. It is possible that target HA64 may be related to or indicate the correct location of the recorded 'Dead' wreck HA1003. Of note is also the correlation between targets HA175, HA176 and HA177 and the 'Live' wreck HA1001, and between target HA409 and 'Live' wreck HA1004.

15.10. In addition to the assets identified above, a significant number of maritime loss events, both vessels and aircraft, are recorded within 5 km of the Site, which means that the potential for the discovery of unrecorded cultural heritage assets within the Site is moderate.

Onshore Assets

15.11. In 2012, it was agreed with the consultees that there would be no significant impacts on the setting of any onshore cultural heritage assets identified in the baseline assessment and that the potential for indirect impacts would not be taken forward to impact assessment.

15.12. Following a desk-based review of the baseline information and cultural heritage datasets, no additional offshore receptors have been identified from those which were identified in the 2012 ES. A number of additional onshore receptors have been identified, although these are all located inshore from the Site.

SUMMARY OF CHANGES TO ASSESSMENT METHODOLOGY

15.13. Following a review of the assessment guidance used, it is noted that the following new documents are now applicable:

- Scottish Planning Policy;
- Historic Environment Scotland Act 2014;
- Chartered Institute for Archaeologists (2014) Standard and guidance for historic environment desk-based assessment;

- Historic Scotland (2016) Managing Change in the Historic Environment – Setting;
- Scottish Government (2016) Scottish National Marine Plan; and
- Historic Environment Scotland (2016) Scottish Historic Environment Policy.

15.14. None of the aforementioned documents require a change to the archaeology and cultural heritage assessment methodology implemented within the 2012 ES. It is therefore proposed that the same methodology be used for the updated assessment.

SUMMARY OF CHANGES AS RESULT OF AMENDED DESIGN ENVELOPE

Table 15.3 Implications of Design Envelope Change on Archaeology and Cultural Heritage

Design Envelope Change	Implications on Effect Significance
Increased size of WTG	Increased impact; no increase in effect
Increased spacing between WTGs	Altered impact; effect to be assessed on final design
Reduction in WTG numbers	Reduced impact; no reduction in effect
Inclusion of monopile foundations	Reduced impact; no reduction in effect

15.15. The WTGs proposed as part of the Development are likely to be larger than those assessed within the 2012 ES however, the total number of WTGs will reduce from the previous assessment, resulting in a decrease of the overall development footprint. The placement of WTGs within the Site may change from the 2012 ES due to the increased separation distance required between WTGs as a result of the increased rotor diameter.

15.16. Despite these changes, the same design principles detailed within the 2012 ES will apply; careful positioning of the WTGs and adherence to the Archaeological WSI will ensure that effects in the first instance are avoided and secondly minimised, where possible.

15.17. Given the expected increase in tip height of the WTGs there is an expected increase to the magnitude of the impact however it is anticipated that this will not increase the effect or result in any significant effects on receptors. Therefore, as agreed in 2012 it is proposed that a visual assessment is not required.

15.18. Changes to the cumulative baseline are not expected to alter the cumulative assessment as the key cumulative sites consisting of Inch Cape and Neart na Gaoithe offshore wind farms are still relevant.

PREDICTED EFFECTS AND ASSOCIATED MITIGATION

15.19. The effects summary table from the 2012 ES is included below; whilst some changes to the design envelope are considered likely to increase the visual impact of the Development, it is expected that the effects will remain as previously assessed; i.e. **not significant**. Therefore it is proposed that this topic will be scoped out of the 2017 EIA.

Table 15.4 Archaeology and Cultural Heritage Effects Summary Table from 2012 ES

Description of Effect	Impact	Potential Mitigation Measures	Residual Impact
Construction phase			
Direct impact on archaeology and cultural heritage due to installation of infrastructure	Moderate to major adverse	All sites of cultural heritage interest included in this assessment will be avoided where possible. Written Scheme of Investigation (WSI) and Protocol for Archaeological Discoveries (PAD) will be prepared for the approval of Historic Scotland and Aberdeenshire Council Heritage Advisor to mitigate construction effects in the event of any unexpected archaeological discoveries during installation. Infrastructure will be micro-sited and temporary exclusion zones will be implemented to prevent invasive activities. These measures will form part of the CEMP.	Negligible (Not Significant)
Indirect impact on archaeology and cultural heritage due to physical processes	Minor adverse	Written Scheme of Investigation (WSI) and Protocol for Archaeological Discoveries (PAD) will be prepared for the approval of Historic Scotland and Aberdeenshire Council Heritage Advisor to mitigate construction effects in the event of any unexpected archaeological discoveries during installation.	Negligible (Not Significant)
Operational Phase			
Indirect impact on archaeology and cultural heritage	Negligible	Same as Construction	Negligible (Not Significant)
Decommissioning			
Impacts on archaeology and cultural heritage	Moderate to major adverse	Same as Construction	Negligible (Not Significant)

Questions

15.1 Does MS-LOT agree that cultural heritage can be scoped out of the assessment?

CHAPTER 16: SOCIO-ECONOMICS, TOURISM AND RECREATION

16.1. A desk based review has been undertaken of the baseline, methodology and stated effects in the 2012 ES which could result from the Development on socio-economics, tourism and recreation. The following key points are noted:

- The baseline remains valid and is summarised below;
- No changes to the methodology are required;
- Amendments to the design will result in no material change to the predicted effects; and
- The cumulative baseline remains as previously assessed.

16.2. It is not expected that the revised parameters and methodology will alter the conclusions of the significant positive effects associated with socio-economics, tourism and recreation. As there is no change to the significance of the effects it is proposed that this topic is scoped out of the 2017 EIA.

BASELINE

16.3. A desk based review was undertaken to consider the socio-economic, tourism and recreational aspects likely to be affected by the Development. This review focused on the results of the baseline surveys and data collection undertaken to inform the 2012 ES and any other available datasets. As of May 2017, the baseline data is considered valid. The following sections summarise the baseline.

Socio-Economics

16.4. Much of the open coastline between Aberdeen and Eyemouth is relatively sparsely populated although the Firths of Forth and Tay support major population centres (Edinburgh and Dundee conurbations respectively).

16.5. Industries such as agriculture, fishing and ship building have traditionally been important in the Fife and Angus regions. In common with most other advanced industrialised economies, Scotland has seen a decline in the importance of the manufacturing industries and primary-based extractive industries. Locally, Dundee has particularly suffered for example, with the demise of the jute industry. However this has been partially compensated with a rise in the service sector of the economy, with growth in engineering and new technology serving the offshore industry, and tourism replacing declining traditional industries.

16.6. In 2016, the proportion of economically active people in employment in Angus stood at approximately 81%. The unemployment rate in Angus is lower than the Scottish and UK averages at 4.1%.

16.7. The Gross Value Added (GVA) is a key indicator used to measure economic performance. The total GVA for the UK is £1,666 billion and in Scotland it is £127 billion.

Tourism and Recreation

16.8. The Site supports minimal recreational activity. The western boundary is approximately 25 km from the nearest coastline, and approximately 40 km from the recognised Royal Yachting Association (RYA) sailing area around the inner Firth of Forth and the Firth of Tay. Two medium-use RYA vessel cruising routes (i.e. popular routes on which some recreational craft will be seen at most times during summer daylight hours) pass approximately north-south through the Site. There are a number of local sailing clubs and associations, including the Royal Tay Yacht Club (Broughty Ferry) and the Forth Yacht Clubs Association.

16.9. Several charted wrecks lie within the Site; however their depth exceeds that attained by most recreational divers and the otherwise featureless seabed is not likely to prove attractive.

16.10. It may be expected that some recreational sea angling may take place across the Site as survey data indicates that waters off the Firths of Forth and Tay are heavily utilised by anglers (Land Use Consultants, 2007).

SUMMARY OF CHANGES TO ASSESSMENT METHODOLOGY

16.11. No change to the assessment methodology is proposed.

SUMMARY OF CHANGES AS RESULT OF AMENDED DESIGN ENVELOPE

Table 16.1 Implications of Design Envelope Change on Socio-Economics, Tourism and Recreation

Design Envelope Change	Implications on Effect Significance
Increased size of WTGs	Increased cost of WTGs, increased expenditure, significance of effect expected to remain the same
Increased spacing between WTGs	No material change
Reduction in WTG numbers	Potential decrease in expenditure, however combined with the increased cost of WTGs, expected that the significance of the effect will remain the same
Inclusion of monopile foundations	No material change

16.12. The construction of larger WTGs may increase expenditure relating to the project; however the reduction in WTG numbers could reduce expenditure. It is not expected that this will alter the effect significance or the conclusions of the 2012 ES.

SUMMARY OF CHANGES FROM CUMULATIVE BASELINE

16.13. Changes to the cumulative baseline are not expected to alter the cumulative assessment as the key cumulative sites consisting of Inch Cape and Neart na Gaoithe offshore wind farms are still relevant. The effects of these wind farms in conjunction with the Development will increase the expenditure and job opportunities.

16.14. The increased cumulative presence could exacerbate the visual impacts on tourist and recreational features; however it is not expected to increase the significance of the effect.

PREDICTED EFFECTS AND ASSOCIATED MITIGATION

16.15. The summary table from the 2012 ES is included below. It is expected that the effects will remain as previously assessed. It is therefore proposed that this can be scoped out of the 2017 EIA.

Table 16.2 Socio-Economics, Tourism and Recreation Effects Summary Table from the 2012 ES

Effect	Nature of Effect	Significance*	Significant in terms of EIA Regulations*	Mitigation	Residual Effect
CAPEX: Construction Phase Effects in Scotland	Beneficial, short term, direct	Low – Minor High - Moderate	Low – No High – Yes	None proposed	Low – Minor High – Moderate (significant beneficial)
CAPEX: Construction Phase Effects in Rest of Great Britain	Beneficial, short term, direct	Low – No Change High - Minor	Low – No High – No	None proposed	Low – No Change High – Minor
OPEX: Operational Phase Effects in Scotland	Beneficial, long term, direct	Low – Moderate High - Moderate	Low – Yes High – Yes	None proposed	Low – Moderate High – Moderate (significant beneficial)
OPEX: Operational Phase Effects in Rest of Great Britain	Beneficial, long term, direct	Low – No change High – Negligible	Low – No High – No	None proposed	Low – No change High – Negligible
Employment: Construction Effects in Scotland	Beneficial, short term, direct	Low – Moderate/ Major High - Major	Low – Yes High – Yes	None proposed	Low – Moderate/ Major High – Major (significant beneficial)
Employment: Construction Effects in Rest of Great Britain	Beneficial, short term, direct	Low – No change High - Minor	Low – No High – No	None proposed	Low – No change High – Minor
Employment: Direct Operational	Beneficial, long term, direct	Moderate	Yes	None proposed	Moderate (significant beneficial)
Tourism and Recreation: Direct Effects	Adverse, short term, direct, temporary	Negligible	No	None proposed	Negligible
Tourism and	Adverse, long term,	Negligible to	No	None	Negligible to

Effect	Nature of Effect	Significance*	Significant in terms of EIA Regulations*	Mitigation	Residual Effect
Recreation: Indirect Effects	indirect, permanent	Minor		proposed	Minor

*High – Expenditure relating to Scotland only

Low – Expenditure relating to Great Britain

Questions

16.1 Does MS-LOT agree that socio-economic, tourism and recreation can be scoped out of the 2017 EIA?

CHAPTER 17: OTHER MARINE USERS AND ACTIVITIES

17.1. A desk based review was undertaken of the baseline, methodology and stated effects in the 2012 ES which could result from the Development on the other marine users and activities. The following key points are noted:

- The baseline remains valid and is summarised below;
- No changes to the methodology are required;
- Amendments to the design will result in no material change to the predicted effects; and
- The cumulative baseline remains as previously assessed.

17.2. In summary, **no significant effects** were predicted during the 2012 EIA process on other marine users and activities and it is expected that this will remain the case. Therefore this topic can be scoped out of the 2017 EIA of the Development.

BASELINE

17.3. A desk based review was undertaken to consider the other marine users likely to be affected by the Development. This review focused on the results of the data collection exercise undertaken to inform the 2012 ES and any other available datasets. As of May 2017, the data for other marine users is considered valid. The following sections summarise the baseline.

Offshore Wind Farms

17.4. The below table provides details of the offshore wind farms within the vicinity of the Site. Two additional wind farms have been highlighted and the status of others has been updated to reflect the current situation.

Table 17.1 Offshore Wind Farms

Project	Developer / Owner	Distance and direction	Capacity	Status/timescale
Inch Cape	Inch Cape Offshore Wind Limited (Repsol Nuevas Energias)	8.67 km- west	784 MW	Consent granted October 2014. Legal challenges ongoing. Timescales unknown.
Neart na Gaoithe	Mainstream Renewable Power	27.42 km south-west	450 MW	Consent granted October 2014. Legal challenges ongoing. Timescales unknown.
Hywind Demonstration Site (Hywind II)	Statoil	48.15 km - north	30 MW	Consent granted October 2015. Construction commenced March 2017 and expected to be completed by the end of 2017.
Kincardine Offshore Wind Farm Project	Pilot Offshore Renewables Ltd and Atkins		50 MW	Consent granted in March 2017. Construction is expected to begin in 2017 and be completed by the end of

Project	Developer / Owner	Distance and direction	Capacity	Status/timescale
	Ltd			2019.
European Offshore Wind Development Centre	Aberdeen Offshore Wind Limited	58.24 km - north	92.4 MW	Consent granted in 2014. Construction is ongoing and is expected to be completed in 2019.
Levenmouth Demonstration Turbine	ORE Catapult	76.76 km - west	7 MW	Consent granted in 2013. WTG is now operational and an application is in the process of being submitted to extend the operational phase.
Forthwind Offshore Wind Farm	Forthwind Ltd		18 MW	Consent granted in 2016. Construction to be undertaken and completed in 2017.

Military Practice and Exercise Areas

17.5. Military Practice and Exercise Areas (PEXAs) are areas available for training used by the MOD and, in many cases, involve the firing of live ammunition. To the east of the Site, PEXA D613a/b was used for air combat training. There was previously an overlap of approximately 316 hectares (ha) between D613b and the Site; however as this is no longer designated it is not relevant to the assessment. PEXA D604 is located at Barry Buddon and is utilised for firing and parachute dropping. Whilst it overlaps with the proposed landfall at Carnoustie, this area will not be affected by the Development.

17.6. Please also note that whilst the south-east corner of the Site previously overlapped with PEXA DA609, this PEXA site has now been completely withdrawn from use (NATS, 2012).

Marine Disposal Sites

17.7. There are no active or disused marine disposal sites within the Site. There are several currently licensed sea disposal sites in coastal waters inshore of the Site receiving material arising from port and harbour dredging activities. There are four active disposal sites situated within 50 km of the Site (at the closest point) (Middle Bank, Montrose, Pittenweem and Anstruther). Three closed disposal sites are situated 15 km, 47 km and 60 km from the Site (Bell Rock, St Abbs Head and Dunbar, respectively).

17.8. In addition there are two closed offshore sewage sludge disposal sites located approximately 17 km and 50 km to the south-west of the Site. The sites were used intermittently for disposal between 1978 and 1998.

Oil and Gas Operations and Ancillary Structures

17.9. There are currently no active licence blocks located within or in close proximity to the ISA. The majority of blocks surrounding the ISA are open but have never previously been licensed. The blocks at the northwest boundary of the ISA, are open and were previously licensed. A single historical exploratory well (found to be dry,

which was plugged and abandoned in 1985) is present within the Site, and three other exploratory wells are located between 8 km and 12 km to the north-east of the ISA. No other oil or gas infrastructure is present in the ISA.

17.10. On 23 March 2017 the Oil and Gas Authority (OAG) awarded 25 licences for 111 blocks or part blocks in the 29th Offshore Licencing Round, none of which are located within or close to the Site. Applications for Licenses under the 2016 Supplementary Round were accepted up until the 07 May 2017; at the time of writing licenses have not been awarded (OGA, 2017). However, given the lack of existing activity and the limited historical oil and gas activity in this part of the North Sea, it is considered that there is limited potential for exploration within the ISA. Indicative areas for the 30th Offshore Licencing Round are further offshore than the Site, covering areas where licences have already been awarded and should not be impacted by the Development.

17.11. There are no oil or gas pipelines located within the ISA. The nearest marine gas pipeline is located approximately 7.5 km east of the Offshore Transmission works in the mouth of the River Tay. This pipeline is known as FM13 and a section crosses the River Tay between Monifieth and Tayport. The next closest gas pipeline is over 100 km from the Site (St Fergus) and the nearest oil pipeline is 75 km from the Site (Cruden Bay) (UK DEALL, 2012).

Subsea Cables

17.12. There are no active or disused subsea cables located in the Site. The nearest active cables are Cantat 3 and Pangea North (both telecommunications cables) located over 200 km south of the Site (Kingfisher, 2012).

Unexploded Ordnance

17.13. Much of the UK coast and adjacent sea area has been subject to military activity in the past, in particular from activities during World War II. Therefore, there is the potential for wreckage and Unexploded Ordnance (UXO) to be encountered on the seabed, including such items as sunken sea mines, air delivered bombs, naval ammunition (including torpedoes and depth charges), munitions from wrecks and land based defence ammunition.

17.14. Although there are potential health and safety impacts associated with the presence of UXO during all phases of development, these were not assessed within the 2012 ES. Potential health and safety impacts will be fully assessed as part of a UXO specific risk assessment which will be informed by geophysical survey data pre-construction. UXO risk and response will be factored into the detailed design process and in the development of method statements and their associated health and safety risk assessments.

Aggregate Extraction

17.15. No licensed aggregate extraction currently takes place within the Site; the closest site is 58 km from the Site. It should be noted that there are a number of historic aggregate licence areas within the Firth of Forth and the Firth of Tay and there is potential for these to be re-opened for extraction in the future. The nearest historic aggregate licence area is located 16 km from the Site. No further information (including spatial locations for mapping) regarding these sites is available.

Capital and Maintenance Dredging

17.16. No licensed dredging activities are currently take place within the Site. Maintenance and capital dredging activity is concentrated in estuarine and coastal waters associated with the harbours and ports within the Firth of Forth and the Firth of Tay. The closest dredging activity to the ISA takes place over 80 km away, near Edinburgh, and it is considered to be too far to be influenced by, or have influence on, the Development.

Other Relevant Marine Activities

17.17. The Dundee Waterfront Development is located approximately 50 km from the ISA, within the Firth of Tay. In 1998, the Dundee Partnership assessed potential options for re-integrating the Central Waterfront with Dundee City Centre. The resultant master plan extends into 2030 and includes the extension of the city centre down to the waterfront, improved transport, amenities waterside development and development of land at the port for renewable energy manufacturing (Dundee Waterfront, 2012). The port extension is however considered to be too distant from the ISA to be directly adversely influenced by, or have influence on, any phase of development of the Seagreen Project. Depending on the supply chain decisions made for the Seagreen Project, there are potential positive indirect impacts of the Seagreen Project on the port of Dundee.

17.18. No other on-going or planned coastal developments are considered to be of relevance to the Seagreen Project.

SUMMARY OF CHANGES TO ASSESSMENT METHODOLOGY

17.19. No changes to the methodology are proposed.

SUMMARY OF CHANGES AS RESULT OF AMENDED DESIGN ENVELOPE

Table 17.2 Implications of Design Envelope Change on Other Marine Users

Design Envelope Change	Implications on Effect Significance
Increased size of WTGs	No material change
Increased spacing between WTGs	No material change
Reduction in WTG numbers	No material change
Inclusion of monopile foundations	No material change

17.20. Whilst changes to the layout of the Development are expected, these will be located within the Site and given that no features were identified within this area there will be no impacts.

SUMMARY OF CHANGES FROM CUMULATIVE BASELINE

17.21. Not assessed in original application and this will not be required for the new application.

PREDICTED EFFECTS AND ASSOCIATED MITIGATION

17.22. The effects summary table from the 2012 ES is included below. It is expected that the effects will remain the same as previously assessed and predicted effects with regards to other marine users and activities are not significant. It is therefore proposed that this topic can be scoped out of the 2017 EIA.

Table 17.3 Other Marine Users and Activities Effects Summary Table from the 2012 ES

Description of Impact	Impact	Potential Mitigation Measures	Residual Impact
Construction Phase			
Impacts on other offshore wind farm projects	Negligible to minor adverse	Consultation	Not significant
Impacts on military PEXAs	Alpha – No impact Bravo – Minor adverse	Consultation	Not significant
Impacts on marine disposal sites	No impact	N/A	Not significant
Impact on other non-wind farm marine activities	No impact	N/A	Not significant
Operation Phase			
Impacts on other offshore wind farm projects	Negligible	Consultation	Not significant
Impacts on PEXAs	Alpha – No impact Bravo – Minor adverse	Consultation	Not significant
Impacts on marine disposal sites	No impact	Consultation	Not significant
Impact on other non-wind farm marine activities	No impact	N/A	Not significant
Decommissioning Phase			
As per construction	Minor Adverse (dependant on activity levels at time of decommissioning)	Consultation	Not significant

Questions

17.1 Does MS-LOT agree that other marine users and activities can be scoped out of the assessment?

CHAPTER 18: SUMMARY

18.1. **Table 18.1**provides a summary of the technical topics considered in the previous chapters.

Table 18.1 Review Summary

2012 Baseline Characteristics	2012 Assessment Methodology	2012 Significant Effects	2017 Baseline Characteristics	2017 Assessment Methodology	Impact of Design Changes	Impact of Cumulative Baseline	2017 Significant Effects	Scope in to Assessment
Ornithology								
Nine sensitive receptors identified. Of the nine sensitive receptors identified in the 2012 ES, seven were taken forward for HRA with the addition of Northern fulmar.	Survey methods broadly followed those of Camphuysen et al. (2004) with survey transects at 3 km intervals and orientated northwest to southeast. Data were extracted from the zonal database for calculation of site-specific densities and population sizes for each species. Secondary sources of information used to inform the 2012 EIA included data from visual aerial surveys of the wider Firth of Forth; tracking studies plus a large body of reference	Effects were assessed as not significant for all species during construction, operation and decommissioning. The potential for moderate and significant impacts on auk species: guillemot, razorbill and puffin, as a result of indirect effects on their sandeel prey due to piling during construction	The existing boat-based data will be used, supplemented by additional boat-based data collected during the 2017 breeding season (April to September). Data will be supplemented by existing seabird tracking data and literature relevant to the Site plus any which has become available since 2013.	Impact assessment methodology will be updated in line with current advice and close consultation will be maintained with the SNCBs and Marine Scotland particularly in relation to data gaps and also with RSPB.	The design changes have the potential to reduce impacts on seabirds and whilst it is not possible to predict the scale of this change, Seagreen confirms that the overall aim of the Development design would be to reduce ornithological impacts.	The cumulative and in-combination assessment will be updated to reflect the cumulative baseline at the time of assessment.	Potential effects include collision risk, disturbance and displacement, barrier impacts, indirect impacts.	Yes: due to updated data, assessment methodology and potential for significant effects.

2012 Baseline Characteristics	2012 Assessment Methodology	2012 Significant Effects	2017 Baseline Characteristics	2017 Assessment Methodology	Impact of Design Changes	Impact of Cumulative Baseline	2017 Significant Effects	Scope in to Assessment
	information identified through literature review.	were identified. During operation, collision risk had the potential to cause significant effects on regional gannet, kittiwake, herring gull and greater black-backed gull populations at one or both projects.						
Marine Mammals								
Key marine mammals species using habitats within the Site and surrounding marine environment include harbour porpoise, bottlenose dolphin, harbour seal and grey seal. Seal species are also considered of	Construction phase impacts of underwater noise (pile driving), changes to water quality (suspended sediment), changes to prey resource and decommissioning phase impacts of underwater noise	Moderate adverse and significant in harbour seal from underwater noise (piling).	Changes to baseline resulting from contemporary data and recently published scientific literature.	Assessment methodology to include changes in the modelling of underwater noise.	Potential for changes in the effects and significance of impacts of underwater noise to both cetaceans and pinnipeds.	Should project level significant impacts from underwater noise be identified, potential exists for significant cumulative effect.	Potential for moderate, adverse and significant in harbour seal from underwater noise (piling).	Yes: updates in both the baseline and assessment methodology are required for underwater noise only.

2012 Baseline Characteristics	2012 Assessment Methodology	2012 Significant Effects	2017 Baseline Characteristics	2017 Assessment Methodology	Impact of Design Changes	Impact of Cumulative Baseline	2017 Significant Effects	Scope in to Assessment
particular importance due to the proximity of internationally designated haul out and breeding sites.	(cutting) and changes to water quality (suspended sediment) identified as minor adverse or moderate adverse.							
Fish and Shellfish								
Lesser sandeel was the most numerous species within the Site, followed by dab, goby, pogge and butterfish. Scallops, crab, lobster and nephrops are of commercial importance at a regional level	Potential for effects from construction phase underwater noise (direct injury/death/avoidance behaviour), seabed habitat disturbance and loss, increase in suspended sediments and remobilisation of contaminants. Potential for operational effects of disturbance from electromagnetic fields (EMF), operational noise, disturbance of seabed habitats, creation of new habitats (resulting in fish aggregation), increase in suspended	Pre-mitigation significant effects from noise on the behaviour of herring.	No material change to baseline.	No material change to assessment methodology.	Updated assessment of direct impacts of construction phase underwater noise and habitat loss may be required due to amended WTG foundation design and layout, particularly if design envelope is increased.	Increased potential for cumulative impacts to herring from underwater noise (due to increase in design envelope and increase in number of developments in the region and wider study area).	If piling for sub-structures is used, there is potential for a moderate, adverse significant impact to occur on behaviour of herring, pre-mitigation.	Yes – an updated assessment is required to confirm the impact on herring behaviour.

2012 Baseline Characteristics	2012 Assessment Methodology	2012 Significant Effects	2017 Baseline Characteristics	2017 Assessment Methodology	Impact of Design Changes	Impact of Cumulative Baseline	2017 Significant Effects	Scope in to Assessment
	sediments and remobilisation of contaminants. Decommissioning impacts of seabed disturbance and loss.							
Seascape, Landscape and Visual Amenity								
No statutory designated sites within 50km 14 Historic Gardens and Designed Landscapes Four Special Landscape Areas Eighteen Landscape Character Areas Three National Seascape Units Nine regional units Likely viewers: residents, tourists, recreational users of marine environment, travellers, workers	Effects on physical and perceptual characteristics of the landscape, its character and quality. Effects on physical and perceptual characteristics of the seascape, its character and quality. Effects on views experienced by visual receptors and on visual amenity. Assessment tools included ZTV, wireframes and photomontages.	Potentially significant effects on: Regional Character Areas (SA3, SA4) Visual Amenity (VP2, VP5) Settlements within 35 km Sustrans NCN1 Local vantage points and car parks within 35 km Recreational boats and yachts Bell Rock Lighthouse	Baseline remains unchanged from 2012.	In essence the methodology will focus on the same effects however the process will be updated to reflect current guidance.	Placement of WTGs closer to the shore could increase visibility. Installation of large WTGs could increase visibility. Reduction in WTG numbers could reduce visibility, however not substantially given the increase in WTG dimensions. Increased spacing between WTGs is not expected to	The cumulative assessment will be updated to reflect the cumulative baseline at the time of assessment.	Whilst the magnitude of the impact is expected to increase, the overall significance of the effect is not expected to increase. The significance of effects determined through the 2012 ES will be analysed to ensure their significance still remains relevant.	Yes – the updated guidance will require a new assessment to be undertaken. The assessment will also require consideration of revised placement of WTGs of greater dimensions which could increase visibility.

2012 Baseline Characteristics	2012 Assessment Methodology	2012 Significant Effects	2017 Baseline Characteristics	2017 Assessment Methodology	Impact of Design Changes	Impact of Cumulative Baseline	2017 Significant Effects	Scope in to Assessment
		Cumulative on: National Seascape Area 4 Regional Character Area (SA3, SA4, SA5, SA6) Visual amenity (VP2, VP5) Settlements within 35 km, especially St Cyrus Sustrans NCN1 Local vantage points and car parks Recreational boats and yachts Bell Rock Lighthouse			substantially alter visibility given that the extent of WTGs will remain the same. Inclusion of monopoles will have no effect on the visibility.			
Shipping & Navigation								
4 – 6 unique vessels recorded intersecting the site during the AIS survey.	Baseline shipping activity was assessed using Automatic Identification System	No significant effects following mitigation.	No change anticipated, dependent on data validation	Following 2012 ES methodology with exception of MGN 543	No material change.	No material change.	Potential increase in vessel-to-vessel and	Yes: potential for significant effects to occur, pre-

2012 Baseline Characteristics	2012 Assessment Methodology	2012 Significant Effects	2017 Baseline Characteristics	2017 Assessment Methodology	Impact of Design Changes	Impact of Cumulative Baseline	2017 Significant Effects	Scope in to Assessment
Limited degree of fishing vessel activity, the majority of which is in the west of the Site. Low level of recreational vessel activity.	(AIS) and radar track data recorded for a 40 day period from two site specific vessel based surveys covering the Site. This was supplemented by long term coastal survey data, fishing data, maritime incident data, recreation data and charts and sail directions.		exercise.	replacing MGN 371.			vessel-to-structure collisions for commercial vessels, resulting in significant effect. Increased requirement for search and rescue operations and restricted access to casualties within the Project Alpha and Project Bravo Sites.	mitigation.
Civil Military and Aviation								
MOD radar visibility including RAF Leuchars, Air Defence at Remote Radar Head Buchan and Air Defence at Remote Radar Brizlee Wood. NATS radar visibility	Consultation and assessment to identify effects. Unacceptable effects on radar identified and technical mitigation sought.	None following technical mitigation proposed.	No change anticipated, dependent on data validation exercise.	In line with 2012 ES.	Potential to increase radar visibility. Increase in obstacle height.	No material change.	No significant effects anticipated.	Further assessment required to establish effects and necessary mitigation.

2012 Baseline Characteristics	2012 Assessment Methodology	2012 Significant Effects	2017 Baseline Characteristics	2017 Assessment Methodology	Impact of Design Changes	Impact of Cumulative Baseline	2017 Significant Effects	Scope in to Assessment
was present from Perwinnes PSR.								
Physical Environment								
Baseline characteristic surveys were undertaken across the Site including: water levels, tidal currents, bathymetry, geology, seabed substrate, sediment transport and suspended sediment.	Effects on hydrodynamic regime. Effects on sediments and sedimentary structures. Effects on suspended sediment concentration and transport.	No significant effects.	No change to the baseline characteristics.	No change to methodology.	No change.	N/A.	No significant effects.	No.
Water and Sediment Quality								
Several geophysical surveys undertaken in 2012. Arsenic was the only contaminant found at high levels in sediments, however this metal is known to be present naturally in Firth of Forth sediments. Landfall lies within the Deil's Heid to Carnoustie RBMP, which has an overall status of Good with High confidence in	Deterioration in water and / or sediment quality due to accidental spillage of construction materials. Introduction of non-native or alien marine species by construction vessels. Deterioration in water quality due to re-suspension of contaminants and sediments.	No significant effects.	No material change to baseline anticipated.	No material change to assessment methodology.	Updated assessment based on fewer WTGs and consideration of the full Site.	No significant change since 2012.	No significant effects.	No.

2012 Baseline Characteristics	2012 Assessment Methodology	2012 Significant Effects	2017 Baseline Characteristics	2017 Assessment Methodology	Impact of Design Changes	Impact of Cumulative Baseline	2017 Significant Effects	Scope in to Assessment
2008. No shellfish growing waters or bathing waters are located within the Immediate Study Area (ISA).								
Benthic Ecology								
Benthic communities identified within the Site are typical of the wider environment and representative of habitats which have been subject to long term demersal fishing pressures. Gravel and sandy sediments dominate, with an overall low species diversity, characterised by a mobile fauna of polychaete worms, bivalve molluscs, crustaceans and starfish. Notable marine features include ocean quahog (only juveniles were recorded, with no aggregations	Direct impacts to benthos from physical disturbance of the seabed, loss of habitat, creation of new habitat. Indirect impacts to benthos from an increase in suspended sediments, re-mobilisation of contaminated sediments, change in current coastal processes and alteration in levels of human activity.	No significant effects.	No material change to baseline.	No material change to assessment methodology; however potential for benefits to benthic fauna from 'artificial reef' effects to be included.	Updated assessment of direct impacts of habitat loss may be required due to amended WTG foundation design and layout, particularly if design envelope is increased.	As for 2012 ES: no significant impacts anticipated.	No significant effects.	No.

2012 Baseline Characteristics	2012 Assessment Methodology	2012 Significant Effects	2017 Baseline Characteristics	2017 Assessment Methodology	Impact of Design Changes	Impact of Cumulative Baseline	2017 Significant Effects	Scope in to Assessment
identified), ross worm, horse mussel, polychaete worm *Capitella capitata*, sandeels and scallops.								
Commercial Fisheries								
ICES rectangle 42E8, within which the Site is located, recorded landings values are of moderate to low importance on a national scale. Key commercial species include king scallop, haddock and squid. Of these, the scallop fishery is the most valuable. Fishing methods include boat dredging for scallops, demersal trawling or seine netting for haddock, and demersal trawling for squid.	Fishing activity is expected to be excluded from certain areas during construction and operation of the Development. Impacts on both the squid and scallop fisheries are predicted due to potential increased steaming time to fishing grounds, displacement of fishing activity or navigational conflict with other vessels.	Pre-mitigation significant effects on crab and lobster fishery activities during construction only.	No material change to baseline.	No material change to assessment methodology.	Updated assessment may be required due to amended WTG foundation design and layout, particularly if design envelope is increased or the construction phase is extended.	As for 2012 ES: no significant impacts anticipated.	As for 2012 ES: no significant impacts anticipated.	No, with the exception of a review of contemporary landings data and any necessary updates.
Archaeology and Cultural Heritage								
No designated wrecks or cultural	Damage or destruction from	No significant effects	No change to	No material change to	Increase in WTG heights	No material	No significant	No.

2012 Baseline Characteristics	2012 Assessment Methodology	2012 Significant Effects	2017 Baseline Characteristics	2017 Assessment Methodology	Impact of Design Changes	Impact of Cumulative Baseline	2017 Significant Effects	Scope in to Assessment
heritage assets within site. Four 'Live' wrecks; two dead wrecks; four lift wrecks. Five targets high archaeological potential; 21 target medium archaeological potential. Seven scheduled monuments – all Iron Age forts along Angus coast. One A Listed Building – Bell Rock Lighthouse.	construction and associated vessels – direct and indirect. 35 km buffer zone for visibility – indirect effect. Effects from foundations; array cabling; size and layout of Wind Farm.	following application of mitigation.	baseline.	assessment methodology.	and altered placement of WTGs within the Site may increase the visual impact, however the effects will not increase. Alterations of the placement of WTGs within the Site also has the potential to directly and indirectly affect cultural heritage assets, however these will be minimised and avoided through application of the WSI.	change.	effects.	
Socio-Economics, Tourism and Recreation								
Angus Local Authority Area – 110,630 Dundee City Local Authority Area –	Desk-based data collation, assessment and consultation. Effects of construction and operation on	Significant beneficial effects on: expenditure in Scotland	Populations across all local authority areas have increased. Percentage of	No material change.	No material change.	No material change.	Significant effects on expenditure and employment	No – as the positive effect remains as the 2012 ES, it is proposed to be

2012 Baseline Characteristics	2012 Assessment Methodology	2012 Significant Effects	2017 Baseline Characteristics	2017 Assessment Methodology	Impact of Design Changes	Impact of Cumulative Baseline	2017 Significant Effects	Scope in to Assessment
145,570 Fife Local Authority Area – 367,370 East Lothian Local Authority Area – 98,170 Economically active population – 79% Angus unemployment rate is lower than the Scottish and UK averages. GVA in Scotland - £102B GVA in UK - £1,255B	local economy and employment.	during construction and operation Employment in Scotland during construction and operation	economically active population has increased. Angus unemployment rate remains lower than the Scottish and UK averages. GVA in both Scotland and the UK has risen.				are expected during construction.	scoped out of the 2017 EIA.
Other Marine Users and Activities								
Five offshore wind farms. PEXA D613a&b, D604 No active or disused marine disposal sites within the site. No licenced oil or gas operations within the site. No subsea cables within the site.	Focused on the Immediate Study Area and the Wider Study Area (60 km from the ISA). Qualitative discussion based on expert judgement used to determine how other projects or activities may influence or be influenced by the Development.	No significant effects.	Two additional offshore wind farms PEXA D316 is no longer designated and PEXA D604 is not relevant for the Wind Farm assessment All other characteristics remain the	No change to methodology	No change.	N/A	No significant effects	No.

2012 Baseline Characteristics	2012 Assessment Methodology	2012 Significant Effects	2017 Baseline Characteristics	2017 Assessment Methodology	Impact of Design Changes	Impact of Cumulative Baseline	2017 Significant Effects	Scope in to Assessment
No aggregate extraction within the site. No dredging within the site.			same.					

CHAPTER 19: CONCLUSION

19.1. The information in this Scoping Request has been provided to support Seagreen's formal request for a Scoping Opinion in relation to the potential effects of the Development.

19.2. It has been demonstrated that there are a number of areas which it is considered can be scoped out of detailed assessment given their lack of significant effects. It is therefore proposed that to ensure the EIA is compliant with the EIA Regulations the following topics are assessed:

- Ornithology;
- Fish and shellfish resource – underwater noise only;
- Marine mammals – underwater noise only;
- Shipping and navigation;
- Seascape, landscape and visual amenity; and
- Military and Civil Aviation.

19.3. MS-LOT and the relevant consultees are respectfully requested to confirm that the aforementioned environmental topics and detailed assessment methodologies are acceptable.

APPENDIX A

Authorities, Groups and Organisations to be consulted at Scoping Stage (as agreed with MS-LOT)

Scoping Consultee List
Angus Council
Fisheries Management Scotland
Atlantic Salmon Trust
Babcock MCS Offshore
Bristows Helicopters Limited
British Telecom (Radio Network Protection Team)
CAA
CHC Helicopter
Cockenzie & Port Seton Community Council
Defence Infrastructure Organisation
Dunbar Community Council
Dundee Council
Dunpender Community Council
East Lammermuir Community Council
East Lothian Council
Fife Council
Forth Ports
Gullane Community Council
Heathrow Airport Holdings Limited
Historic Environment Scotland
Joint Radio Company
Longniddry Community Council
Macmerry & Gladsmuir Community Council
Mainstream Renewable Power Ltd
Marine Safety Forum
Marine Scotland Compliance (Aberdeen)
Marine Scotland Compliance (Anstruther)
Marine Scotland Compliance (Eyemouth)
Maritime and Coastguard Agency
Musselburgh & Inveresk Community Council
National Trust for Scotland
NATS
North Berwick Community Council
North East Regional Inshore Fishery Groups

Scoping Consultee List
Northern Lighthouse Board (NLB)
Planning
Prestonpans Community Council
Red Rock Power Limited
Royal Yachting Association
RSPB
Salmon Net Fishing Association of Scotland
Scottish Borders Council
Scottish Canoe Association
Scottish Creel fishermen association
Scottish Fisherman's Federation
Scottish Fisherman's Organisation
Scottish Surfing Federation
Scottish Wildlife Trust
SEPA
SNH (Within 12nm)
Sport Scotland
Surfers Against Sewage
The Crown Estate Scotland
Tranent & Elphinstone Community Council
Transport Scotland
Transport Scotland - Ports and Harbours
UK Chamber of Shipping
VisitScotland
West Barns Community Council
Whale & Dolphin Conservation Society

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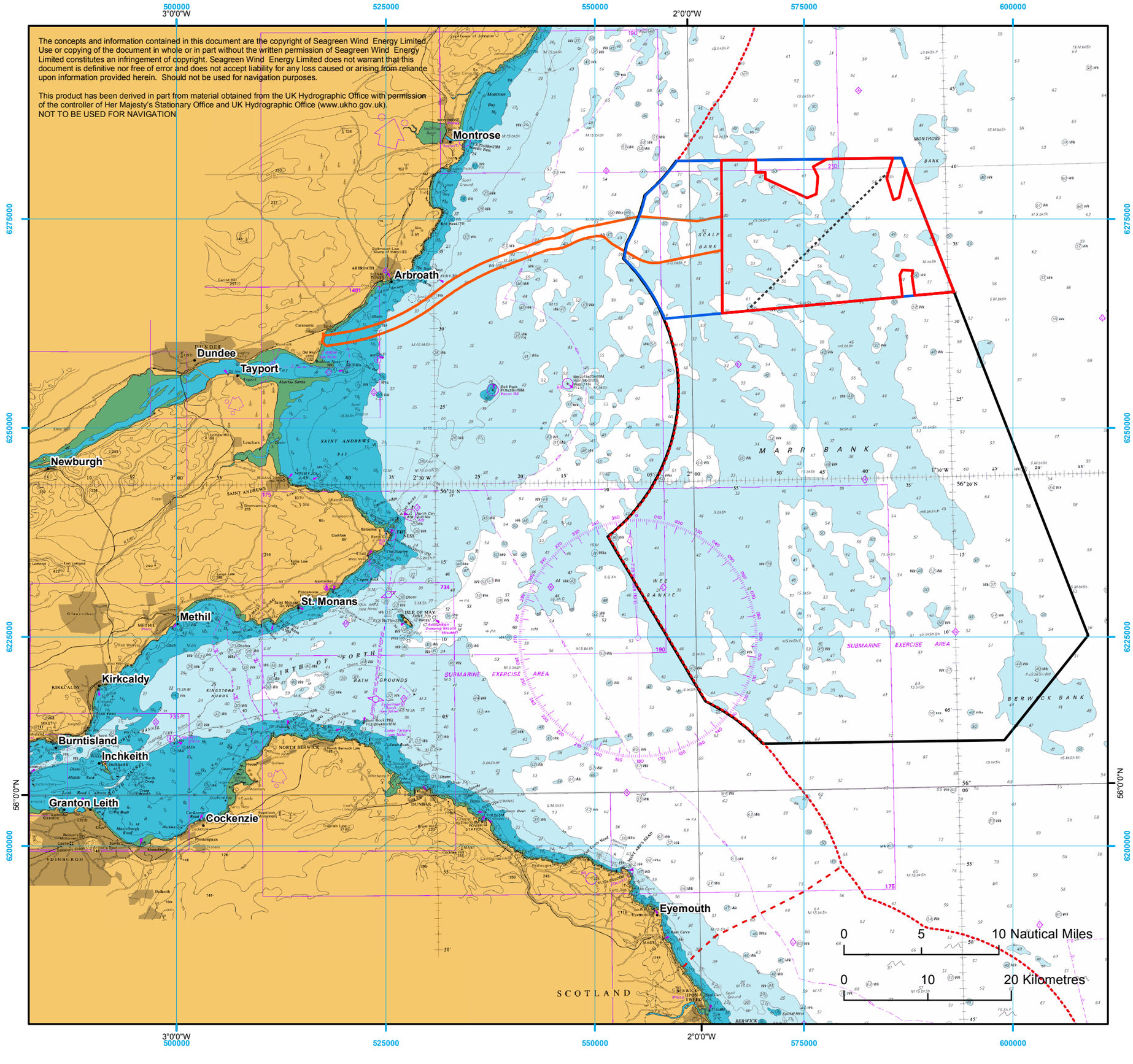
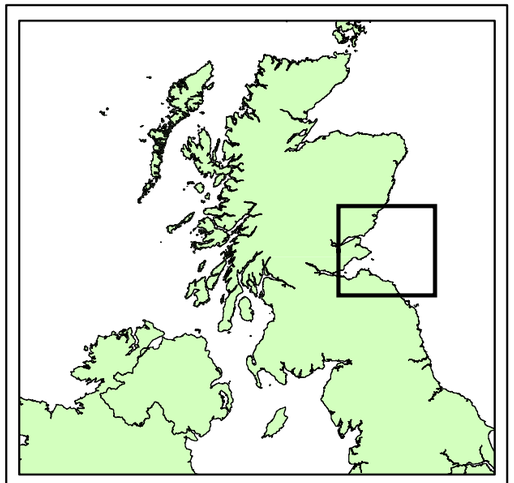




Legend

- The Site
- Firth of Forth Round 3 Zone
- Phase 1 Boundary
- Consented Export Cable Route Corridor
- 12nm Limit
- Scottish/English Waters Boundary

Coordinate System
UTM Zone 30 North (WGS84)
Projection: Transverse Mercator
Central Meridian: -3° East
Scale Factor: 0.9996
Latitude of Origin: 0° North
False Easting: 500000.0
False Northing: 0.0
Reference Spheroid: WGS84
Semi-major Axis: 6378137.0
Inverse Flattening: 298.2572236

N W E S

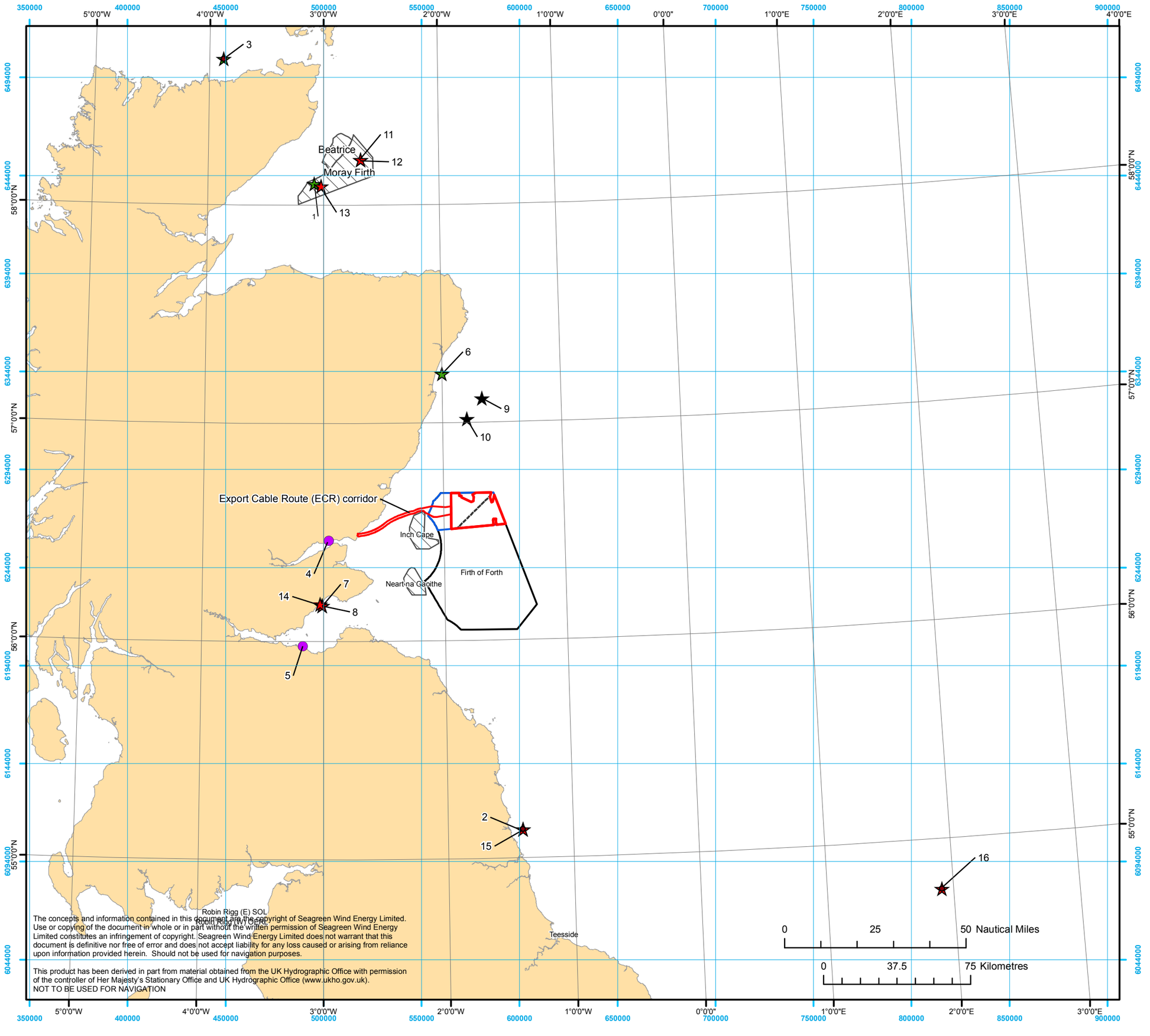
Project:
Firth of Forth Offshore Wind Farm

Figure / Drawing Title:
ROUND 3 FIRTH OF FORTH ZONE, PHASES AND CONSENTED EXPORT CABLE ROUTE

Figure/Drawing Number: FIGURE 2.1

UNLESS THE REVISION IS **B** OR HIGHER THE DRAWING IS **NOT TO BE USED FOR DESIGN OR CONSTRUCTION**

REV	DATE	DESCRIPTION	BY	CKD	APPR DEV	APPR ENG
A1	11 MAY 17	FOR FORMAL SUBMISSION	LH	KM	NB	MS
A0	04 MAY 17	DRAFT	LH	KM	NB	MS



Legend

temp

Key Development Sites

- Offshore Wind Farm
- Wind Turbine Demonstrator Site
- Floating Wind Farm
- Non-Wind Farm Cumulative Development
- The Site
- Consented Export Cable Route Corridor
- Phase 1 Boundary
- Firth of Forth Round 3 Zone
- Proposed Cumulative Wind Farm

Reference	Name
1	Beatrice Demonstrator Site
2	Blyth Offshore Wind Farm
3	Dounreay Tri Floating Wind Demonstration Project Determination
4	Dundee Harbour Expansion
5	Edinburgh Harbour Masterplan
6	European Offshore Wind Deployment Centre
7	Forthwind Offshore Wind Demonstration Array
8	Forthwind Offshore Wind Farm
9	Hywind Floating Wind Farm
10	Kincardine Offshore Floating Wind Farm
11	Moray East (Alternative Design)
12	Moray Offshore East Development
13	Moray West (Alternative Design)
14	ORE Catapult Levenmouth
15	Blyth Array 2
16	Dogger Bank

Coordinate System

UTM Zone 30 North (WGS84)
Projection: Transverse Mercator
Central Meridian: -3° East
Scale Factor: 0.9996
Latitude of Origin: 0° North
False Easting: 500000.0
False Northing: 0.0
Reference Spheroid: WGS84
Semi-major Axis: 6378137.0
Inverse Flattening: 298.2572236

N W E S

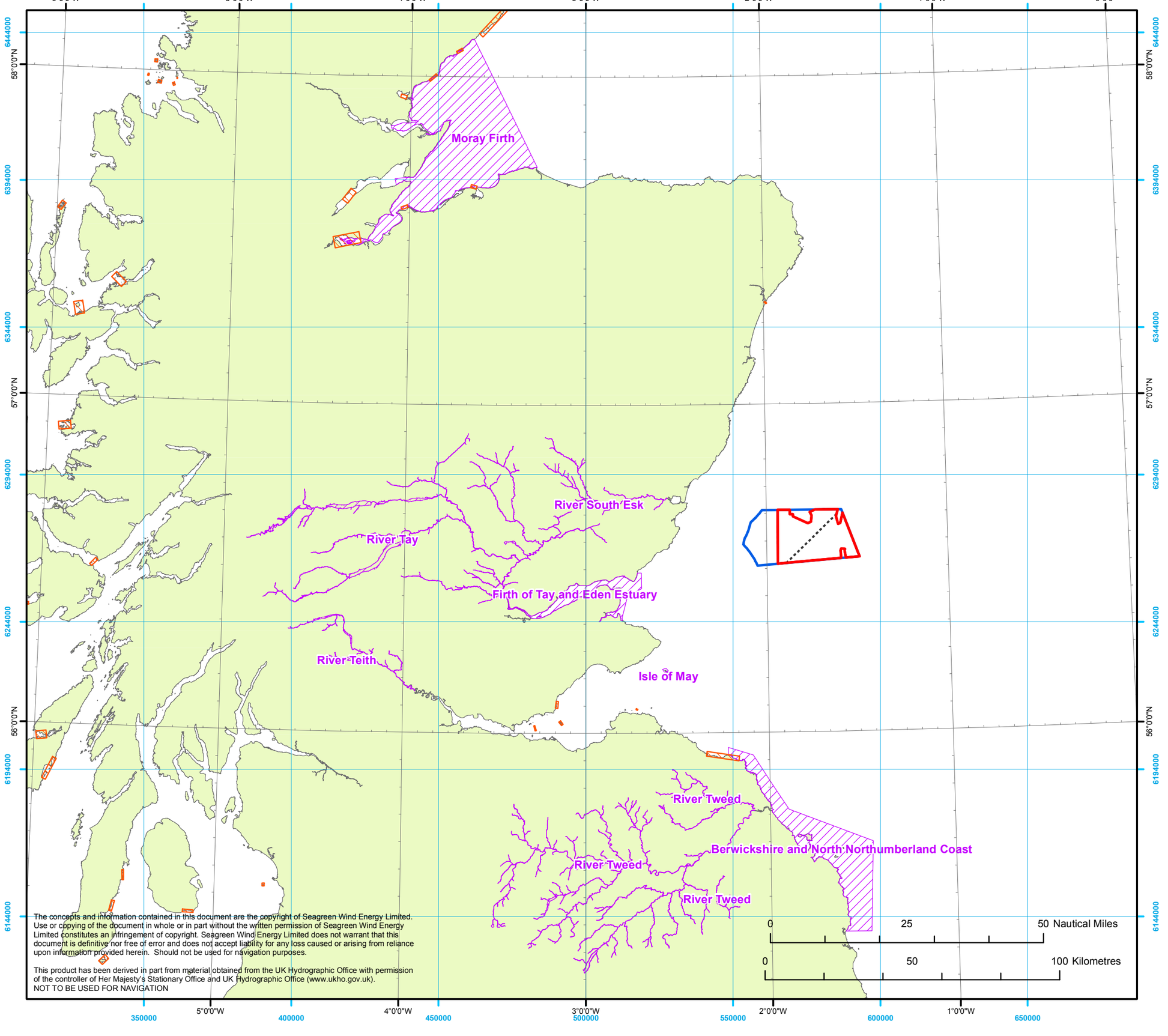
Title:
Firth of Forth Offshore Wind Farm

Figure / Drawing Title:
CUMULATIVE DEVELOPMENTS

Figure/Drawing Number: FIGURE 4.1

UNLESS THE REVISION IS **B** OR HIGHER THE DRAWING IS **NOT TO BE USED FOR DESIGN OR CONSTRUCTION**

REV	DATE	DESCRIPTION	BY	CKD	APPR DEV	APPR ENG
A1	11 MAY 17	FOR FORMAL SUBMISSION	LH	KM	NB	MS
A0	05 MAY 17	DRAFT	LH	KM	NB	MS



Legend

- Seal Haul-Outs
- Special Area of Conservation
- The Site
- Phase 1 Boundary

Coordinate System

UTM Zone 30 North (WGS84)
Projection: Transverse Mercator
Central Meridian: -3° East
Scale Factor: 0.9996
Latitude of Origin: 0° North
False Easting: 500000.0
False Northing: 0.0
Reference Spheroid: WGS84
Semi-major Axis: 6378137.0
Inverse Flattening: 298.2572236

N W E S

Title:
Firth of Forth Offshore Wind Farm

Sea green WIND ENERGY

Figure / Drawing Title:

MARINE MAMMAL PROTECTED AREAS

Figure/Drawing Number: FIGURE 6.1

UNLESS THE REVISION IS **B** OR HIGHER THE DRAWING IS **NOT TO BE USED FOR DESIGN OR CONSTRUCTION**

REV	DATE	DESCRIPTION	BY	CKD	APPR DEV	APPR ENG
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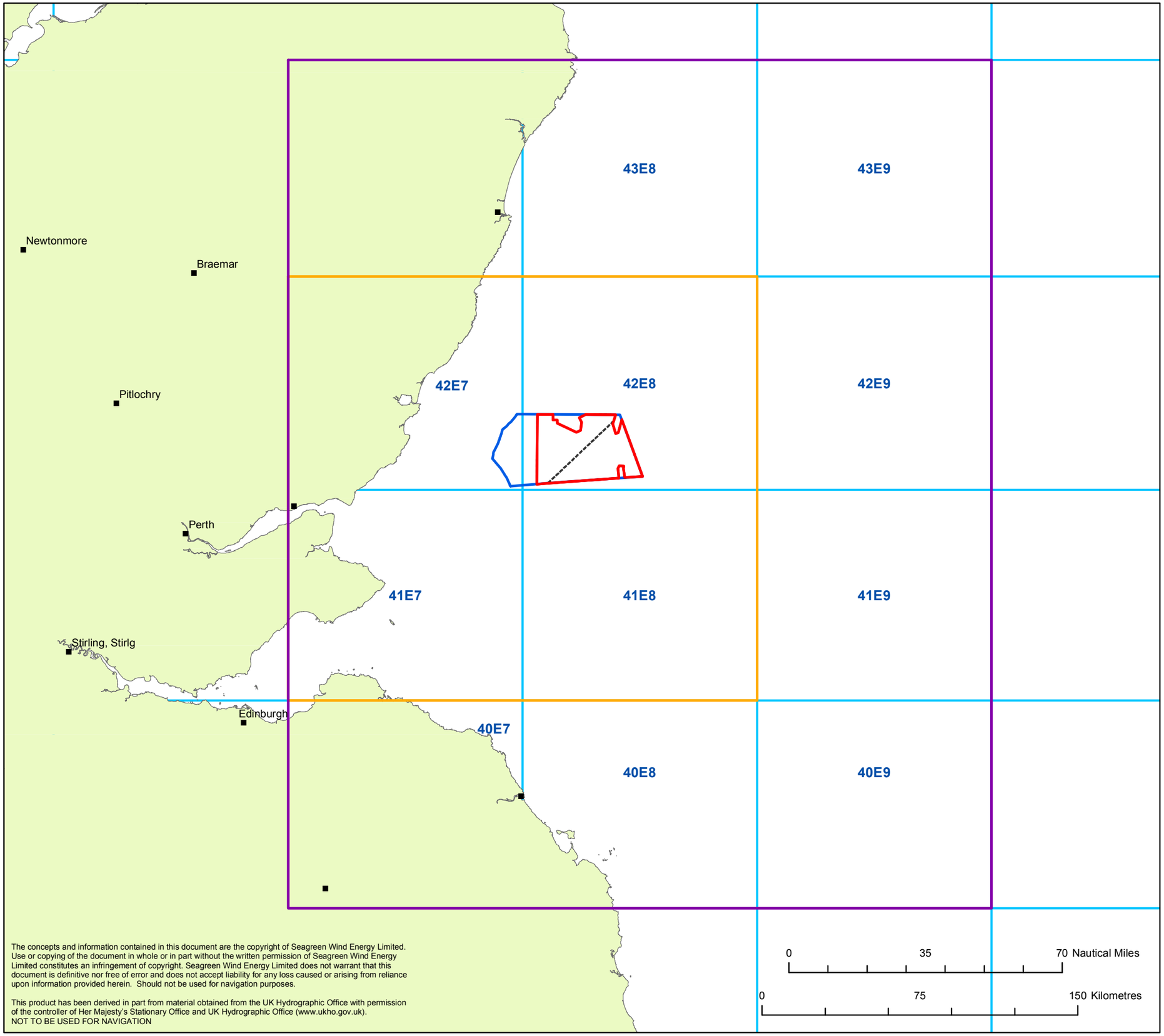
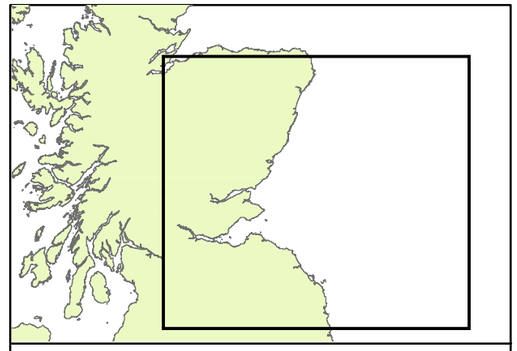
A0	05 MAY 17	DRAFT	LH	KM	NB	MS





Legend

- The Site
- Phase 1 Boundary
- Regional Fish and Shellfish Study Area
- Wider Fish and Shellfish Study Area
- ICES Rectangles

Coordinate System

WGS_1984_PDC_Mercator
Projection: Mercator
False_Easting: 0.0
False_Northing: 0.0
Central_Meridian: -150.0
Standard_Parallel_1: 0.0
Linear Unit: Meter (1.0)
Geographic Coordinate System: GCS_WGS_1984
Angular Unit: Degree (0.0174532925199433)
Prime Meridian: Greenwich (0.0)
Datum: D_WGS_1984
Spheroid: WGS_1984
Semimajor Axis: 6378137.0
Semiminor Axis: 6356752.314245179
Inverse Flattening: 298.257223563

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Title:
Firth of Forth Offshore Wind Farm

Sea green WIND ENERGY

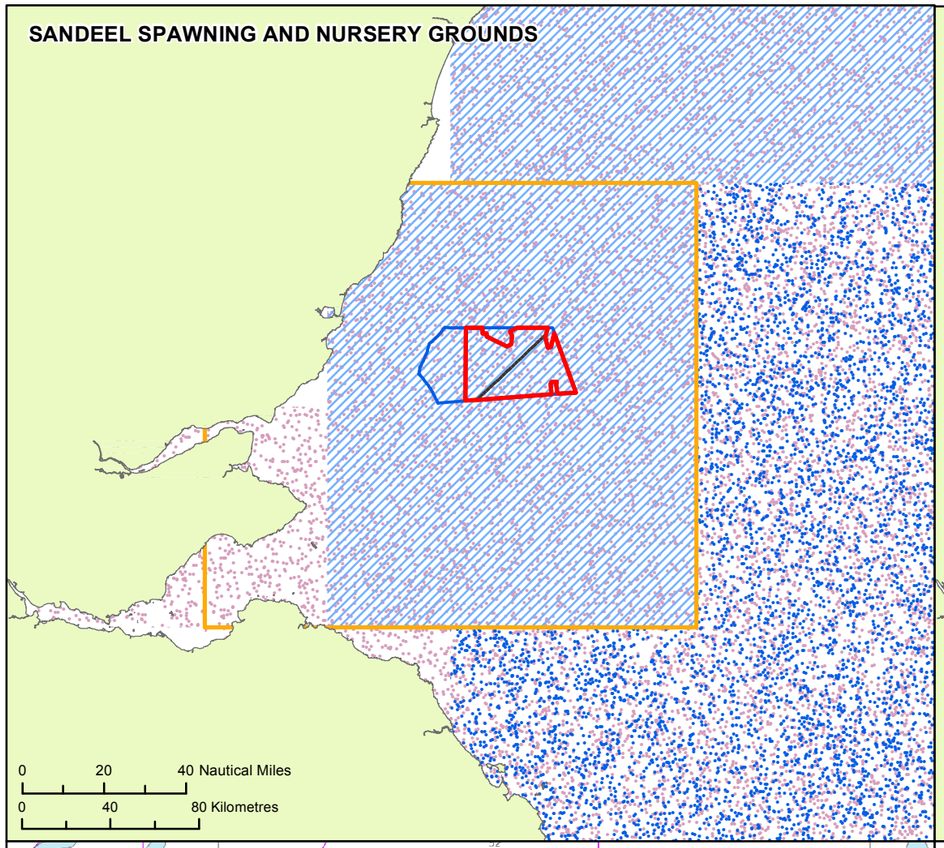
Figure / Drawing Title:
FISH AND SHELLFISH STUDY AREAS

Figure/Drawing Number: FIGURE 7 .1

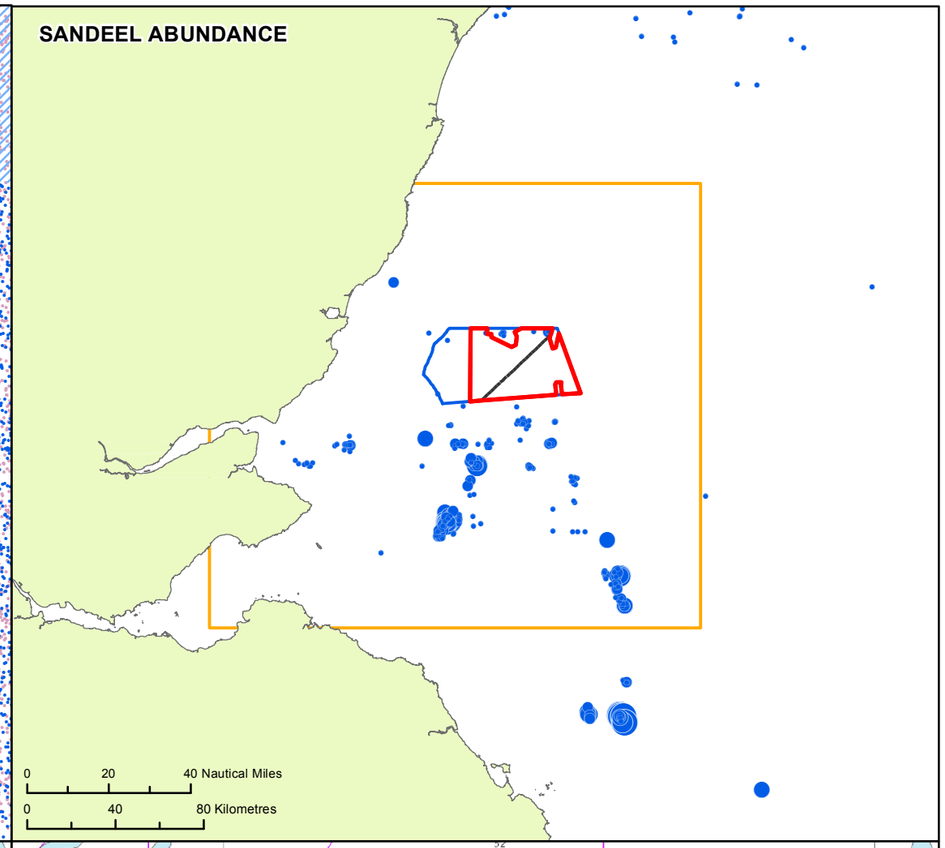
UNLESS THE REVISION IS **B** OR HIGHER THE DRAWING IS **NOT TO BE USED FOR DESIGN OR CONSTRUCTION**

REV	DATE	DESCRIPTION	BY	CKD	APPR DEV	APPR ENG
A1	11 MAY 17	FOR FORMAL SUBMISSION	LH	KM	NB	MS
A0	05 MAY 17	DRAFT	LH	KM	NB	MS

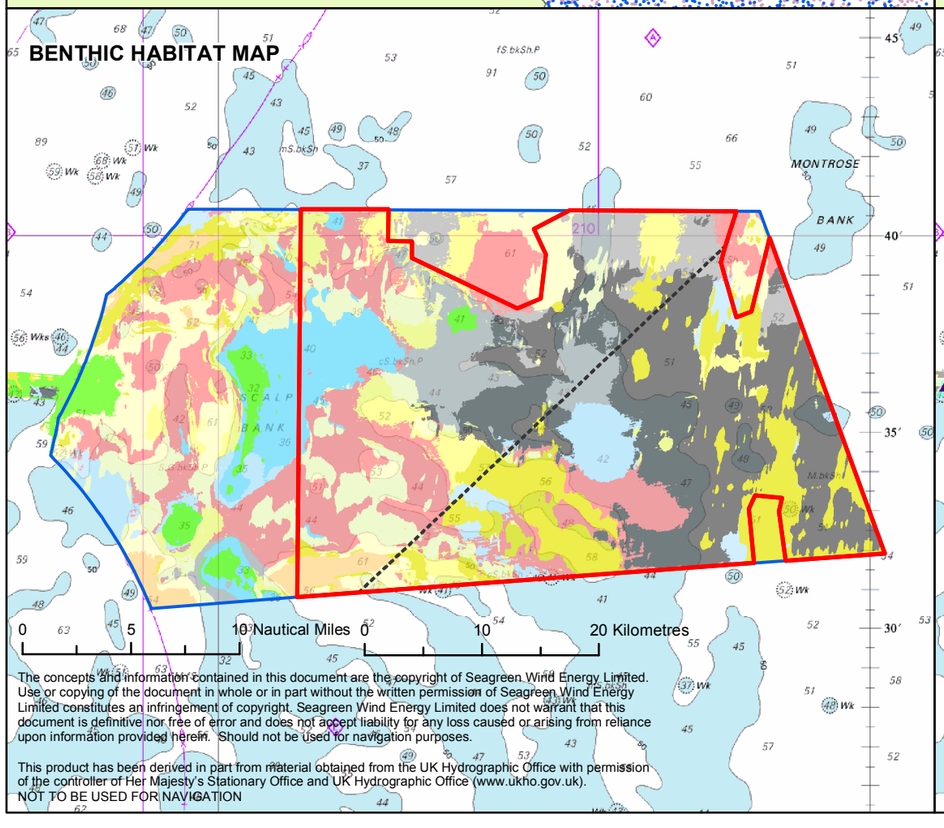
SANDEEL SPAWNING AND NURSERY GROUNDS



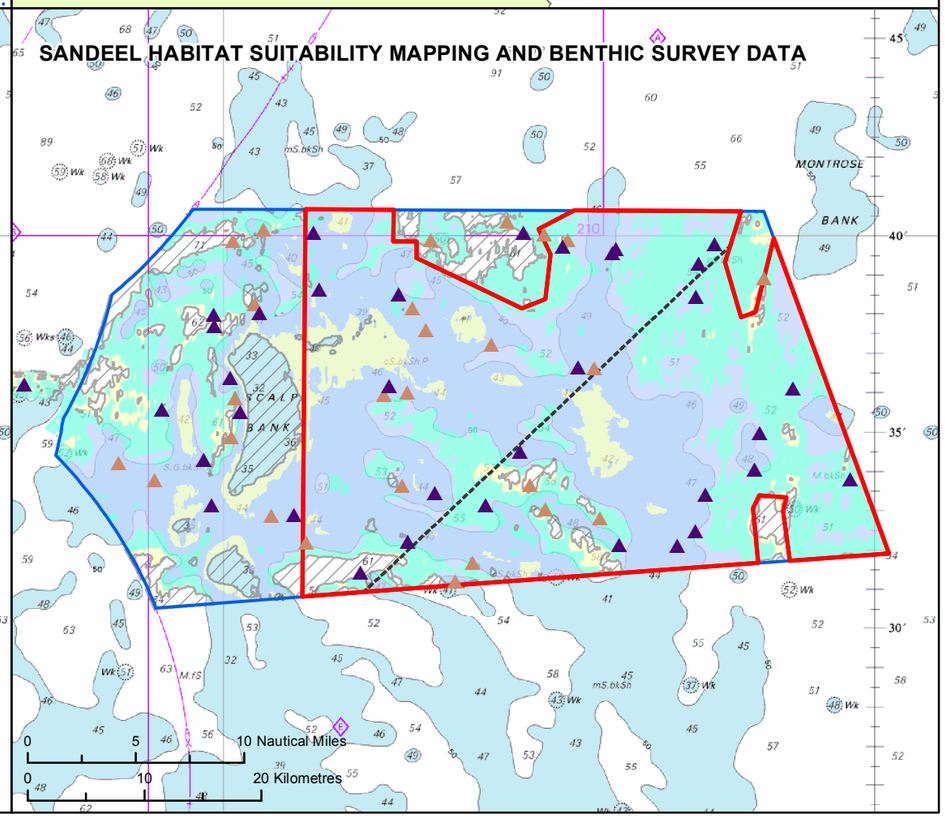
SANDEEL ABUNDANCE



BENTHIC HABITAT MAP



SANDEEL HABITAT SUITABILITY MAPPING AND BENTHIC SURVEY DATA



Legend

- The Site
- Regional Fish and Shellfish Study Area
- Phase 1 Boundary

Sandeel Spawning Ground (Ellis et al., 2010)
- High Intensity
- Low Intensity

Nursery Grounds (Cefas, 2010)
- High Intensity
- Low Intensity

Sandeel Abundance (Marine Scotland, 2009)
- 1 - 500
- 501 - 2000
- 2001 - 5000
- 5001 - 10000
- 10001 - 30000

Sandeel Habitat Suitability Mapping (Envision, 2012)
- Prime
- Subprime
- Suitable
- Unsuitable

Sandeels Recorded During Benthic Survey (IECS, 2011):
- Trawl Surveys
- Grab Surveys
- Video Surveys

Benthic Habitat Map (Envision, 2012)
- Faunal turf
- Amphiura/Phoronis
- Sparse polychaetes/bivalve
- Rich polychaetes
- Polychaetes/bivalves
- Ophiothrix
- Epifauna/polychaetes
- Sparse Chone
- Chone
- Saballaria

Coordinate System
WGS_1984_PDC_Mercator
Authority: Custom
Projection: Mercator
False_Easting: 0.0
False_Northing: 0.0
Central_Meridian: -150.0
Standard_Parallel_1: 0.0
Linear Unit: Meter (1.0)
Geographic Coordinate System: GCS_WGS_1984
Angular Unit: Degree (0.0174532925199433)
Prime Meridian: Greenwich (0.0)
Datum: D_WGS_1984
Spheroid: WGS_1984
Semimajor Axis: 6378137.0
Semiminor Axis: 6356752.314245179
Inverse Flattening: 298.257223563

N W E S

Title:
Firth of Forth Offshore Wind Farm

Sea green WIND ENERGY

Figure / Drawing Title:
SANDEEL SPAWNING, ABUNDANCE AND HABITAT MAP

Figure/Drawing Number: FIGURE 7.2

UNLESS THE REVISION IS **B** OR HIGHER THE DRAWING IS **NOT TO BE USED FOR DESIGN OR CONSTRUCTION**

REV	DATE	DESCRIPTION	BY	CKD	APPR DEV	APPR ENG
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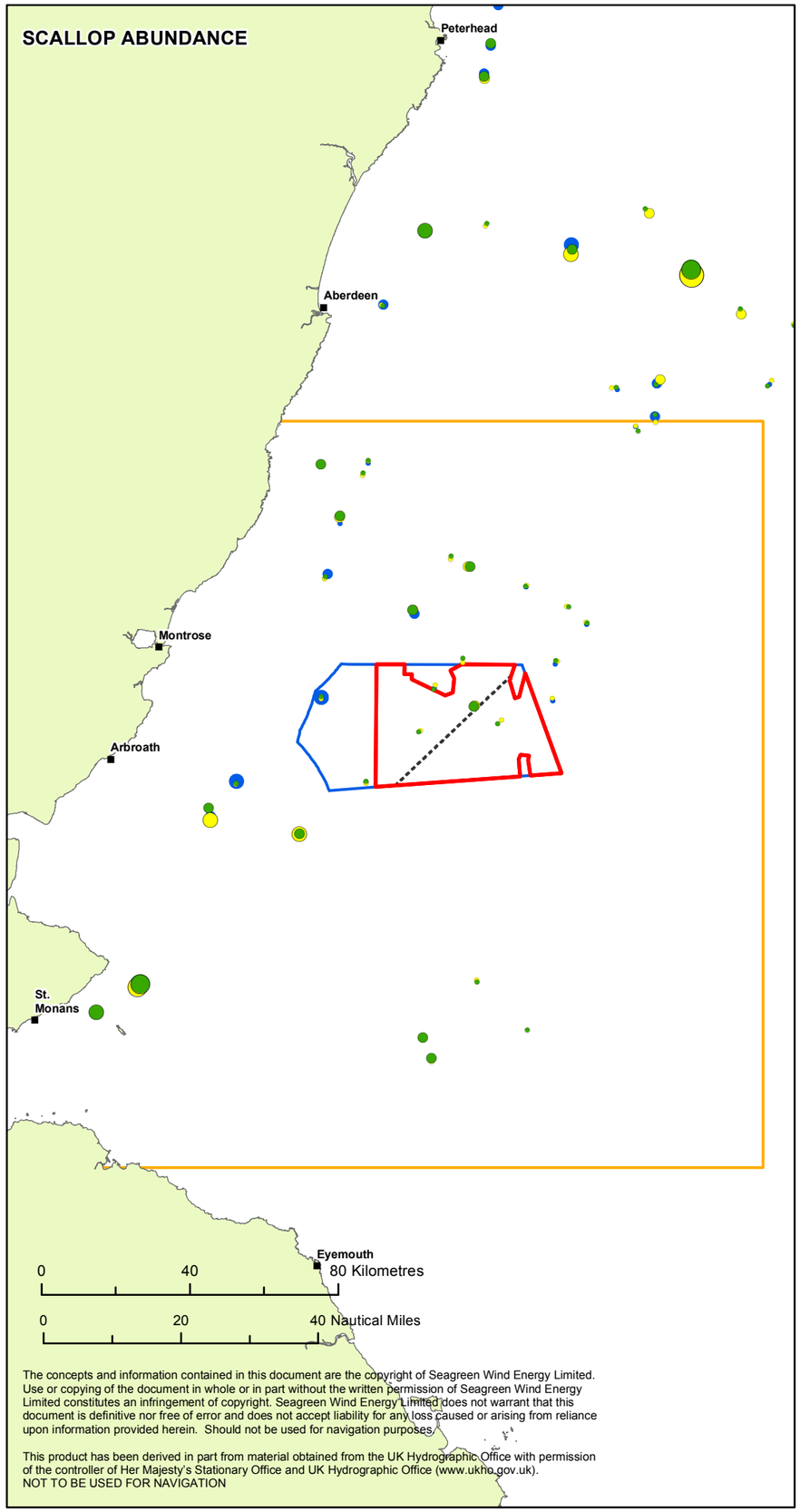
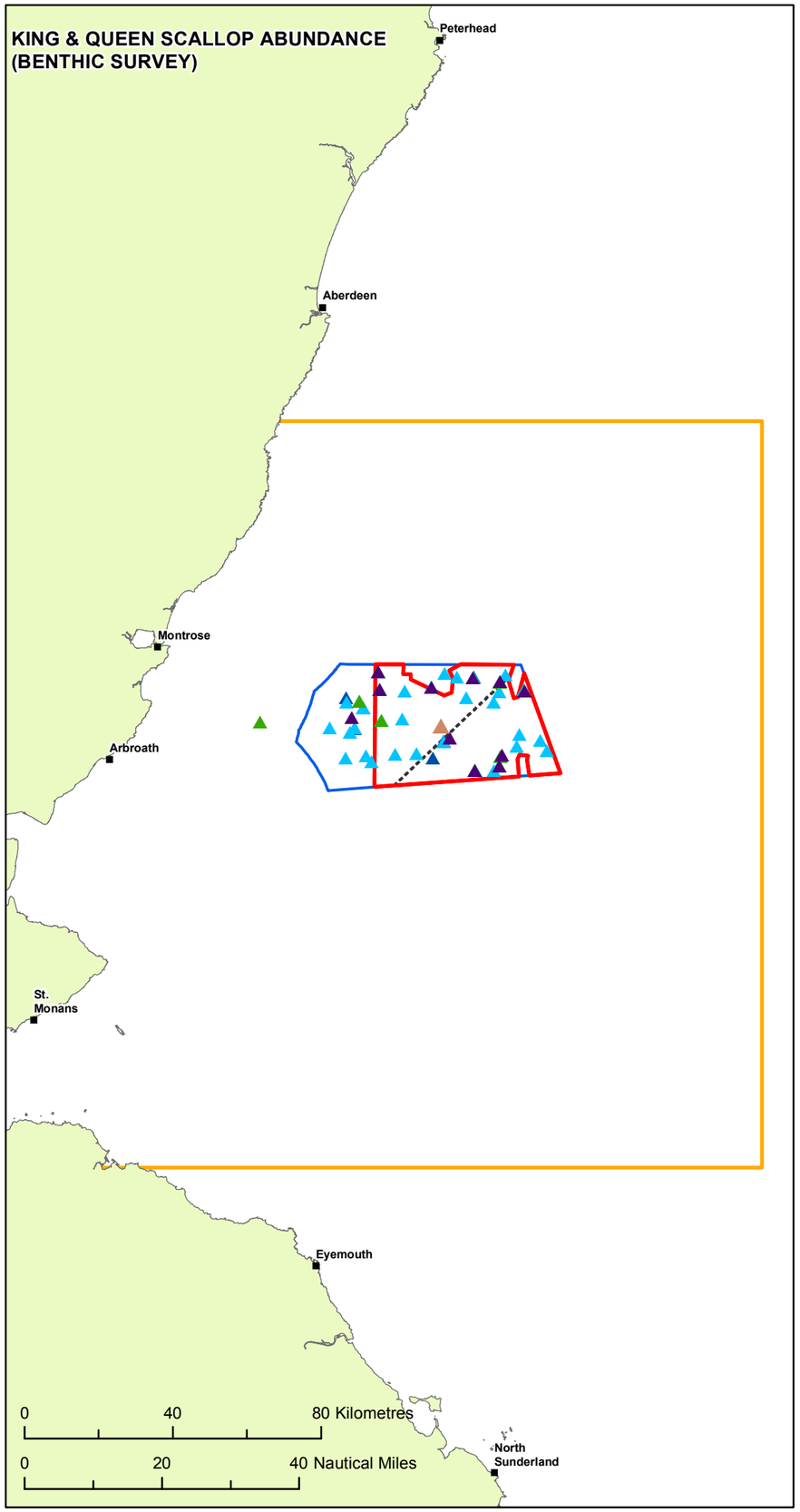
A0	05 MAY 17	DRAFT	LH	KM	NB	MS

SCALLOP ABUNDANCE



KING & QUEEN SCALLOP ABUNDANCE (BENTHIC SURVEY)



Legend

The Site

Regional Fish and Shellfish Study Area

Phase 1 Boundary

Number of Scallops (MIK data)

- 0- 100
- 101- 200
- 201- 300
- 301- 400
- 401 - 500

Year

- 2008
- 2009
- 2010

Benthic Survey Data (IECS, 2011)

- King Scallop Recorded in Benthic Trawl Surveys
- King Scallop Recorded in Grab Survey
- Queen Scallop Recorded in Benthic Trawl Survey
- Queen Scallop Recorded in Video Trawl Survey
- Pectinidae Recorded in Video Trawl Survey

Coordinate System
WGS_1984_PDC_Mercator
Authority: Custom
Projection: Mercator
False_Easting: 0.0
False_Northing: 0.0
Central_Meridian: -150.0
Standard_Parallel_1: 0.0
Linear Unit: Meter (1.0)
Geographic Coordinate System: GCS_WGS_1984
Angular Unit: Degree (0.0174532925199433)
Prime Meridian: Greenwich (0.0)
Datum: D_WGS_1984
Spheroid: WGS_1984
Semimajor Axis: 6378137.0
Semiminor Axis: 6356752.314245179
Inverse Flattening: 298.257223563

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Title:
Firth of Forth Offshore Wind Farm

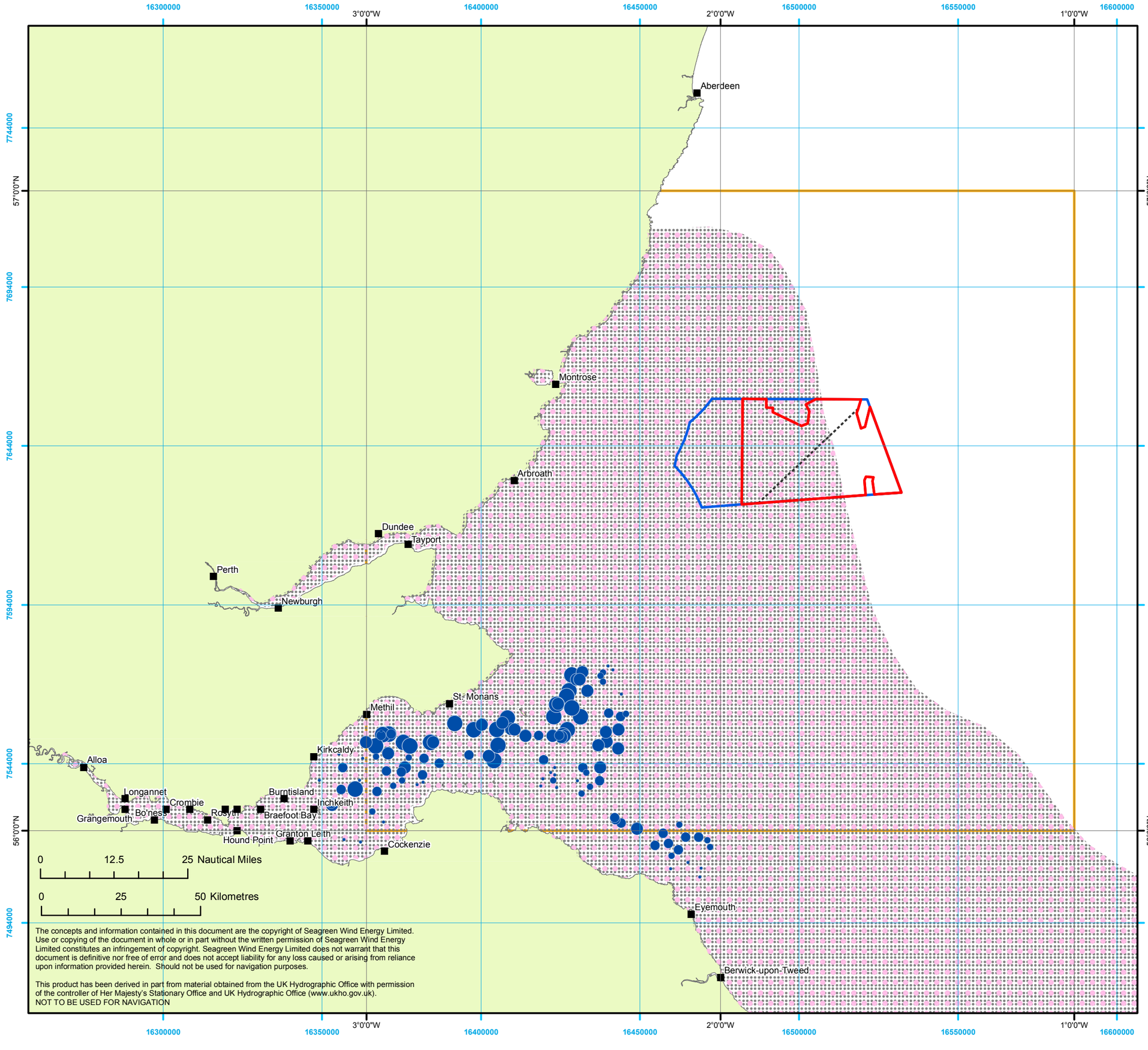
Sea green WIND ENERGY

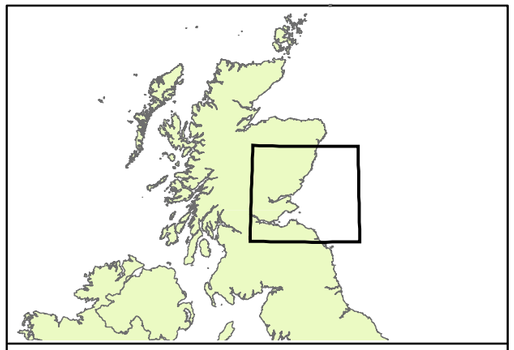
Figure / Drawing Title:
SCALLOP ABUNDANCE

Figure/Drawing Number: FIGURE 7.3

UNLESS THE REVISION IS **B** OR HIGHER THE DRAWING IS **NOT TO BE USED FOR DESIGN OR CONSTRUCTION**

REV	DATE	DESCRIPTION	BY	CKD	APPR DEV	APPR ENG
A1	11 MAY 17	FOR FORMAL SUBMISSION	LH	KM	NB	MS
A0	05 MAY 17	DRAFT	LH	KM	NB	MS





Legend

- The Site
- Phase 1 Boundary
- Regional Fish and Shellfish Study Area

Nephrops Average Abundance (Marine Scotland 2008 - 2010)

- 0.01 - 0.3
- 0.31 - 0.7
- 0.71 - 1.25
- 1.251 - 1.7
- 1.71 - 3

Spawning and Nursery Grounds (Coull et. al., 1998)

- Spawning Ground
- Nursery Grounds

Coordinate System

WGS_1984_PDC_Mercator
Projection: Mercator
False_Easting: 0.0
False_Northing: 0.0
Central_Meridian: -150.0
Standard_Parallel_1: 0.0
Linear Unit: Meter (1.0)
Geographic Coordinate System: GCS_WGS_1984
Angular Unit: Degree (0.0174532925199433)
Prime Meridian: Greenwich (0.0)
Datum: D_WGS_1984
Spheroid: WGS_1984
Semimajor Axis: 6378137.0
Semiminor Axis: 6356752.314245179
Inverse Flattening: 298.257223563

N W E S

Title:

Firth of Forth Offshore Wind Farm

Sea green WIND ENERGY

Figure / Drawing Title:

NEPHROPS SPAWNING, NURSERY GROUNDS AND ABUNDANCE

Figure/Drawing Number: FIGURE 7.4

UNLESS THE REVISION IS **B** OR HIGHER THE DRAWING IS **NOT TO BE USED FOR DESIGN OR CONSTRUCTION**

REV	DATE	DESCRIPTION	BY	CKD	APPR DEV	APPR ENG
A1	11 MAY 17	FOR FORMAL SUBMISSION	LH	KM	NB	MS
A0	05 MAY 17	DRAFT	LH	KM	NB	MS

VELVET CRAB

EDIBLE CRAB

LOBSTER

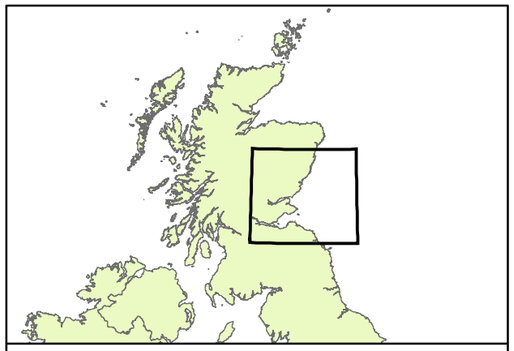
WHELK

0 4.75 9.5 Nautical Miles

0 5 10 Kilometres

0 4.25 8.5 Nautical Miles

0 5 10 Kilometres



Legend

- The Site
- Phase 1 Boundary

Benthic Survey Data (IECS, 2011)

- Species Recorded in Video Trawl
- Species Recorded in Benthic Trawl

Coordinate System

WGS_1984_PDC_Mercator
Projection: Mercator
False_Easting: 0.0
False_Northing: 0.0
Central_Meridian: -150.0
Standard_Parallel_1: 0.0
Linear Unit: Meter (1.0)
Geographic Coordinate System: GCS_WGS_1984
Angular Unit: Degree (0.0174532925199433)
Prime Meridian: Greenwich (0.0)
Datum: D_WGS_1984
Spheroid: WGS_1984
Semimajor Axis: 6378137.0
Seminimor Axis: 6356752.314245179
Inverse Flattening: 298.257223563

N W E S

Title:

Firth of Forth Offshore Wind Farm

Figure / Drawing Title:

CRAB, WHELK AND LOBSTER RECORDED DURING SURVEYS

Figure/Drawing Number: FIGURE 7.5

UNLESS THE REVISION IS **B** OR HIGHER THE DRAWING IS **NOT TO BE USED FOR DESIGN OR CONSTRUCTION**

REV	DATE	DESCRIPTION	BY	CKD	APPR DEV	APPR ENG
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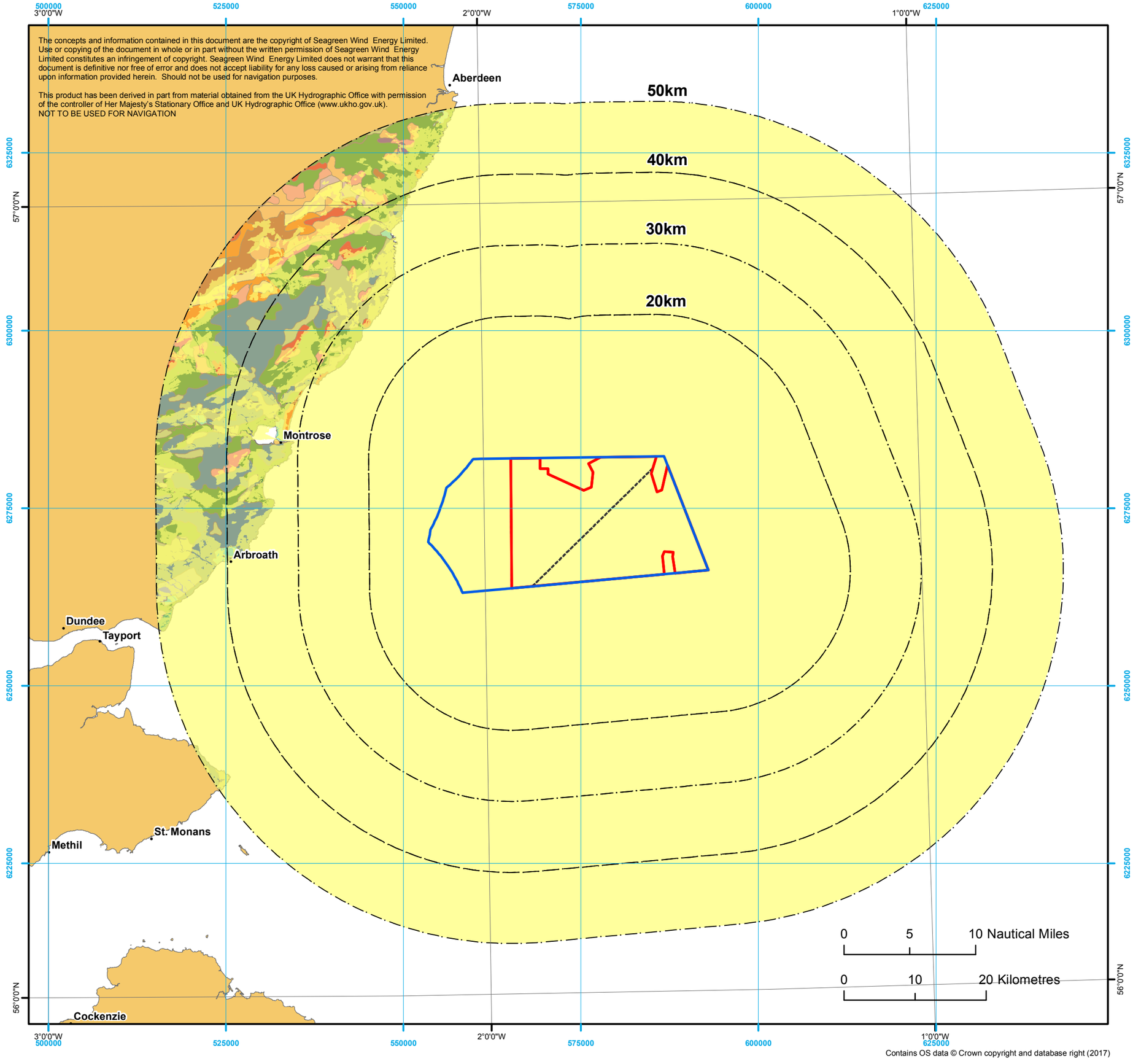
A0	05 MAY 17	DRAFT	LH	KM	NB	MS



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Legend

- The Site
- Phase 1 Boundary

Zone of Theoretical Visibility

- Not Visible
- Visible

Landscape Character Assessment

- LCA1
- LCA2
- LCA31
- LCA32
- LCA41
- LCA42
- LCA51
- LCA52
- LCA53
- LCA61
- LCA62
- LCA63
- LCA7
- Other

ZTV Production Information -
- DTM data used in calculations is OS Terrain 50
- Calculations based on a bare earth survey
- Viewer height set at 1.7m
- Calculations include earth curvature and light refraction
- Tip height set at 280.0m

N.B. This Zone of Theoretical Visibility (ZTV) image illustrates the theoretical extent of where turbines will be visible from, assuming 100% visibiltiy. It is generated using terrain data only and does not account for any screening that vegetation or the built environment may provide. It is, as such, 'a worst case' ZTV and the actual extents of visibiltiy are likely to be much less extensive.

Coordinate System
UTM Zone 30 North (WGS84)
Projection: Transverse Mercator
Central Meridian: -3° East
Scale Factor: 0.9996
Latitude of Origin: 0° North
False Easting: 500000.0
False Northing: 0.0
Reference Spheroid: WGS84
Semi-major Axis: 6378137.0
Inverse Flattening: 298.2572236

N W E S

Project:
Firth of Forth Offshore Wind Farm

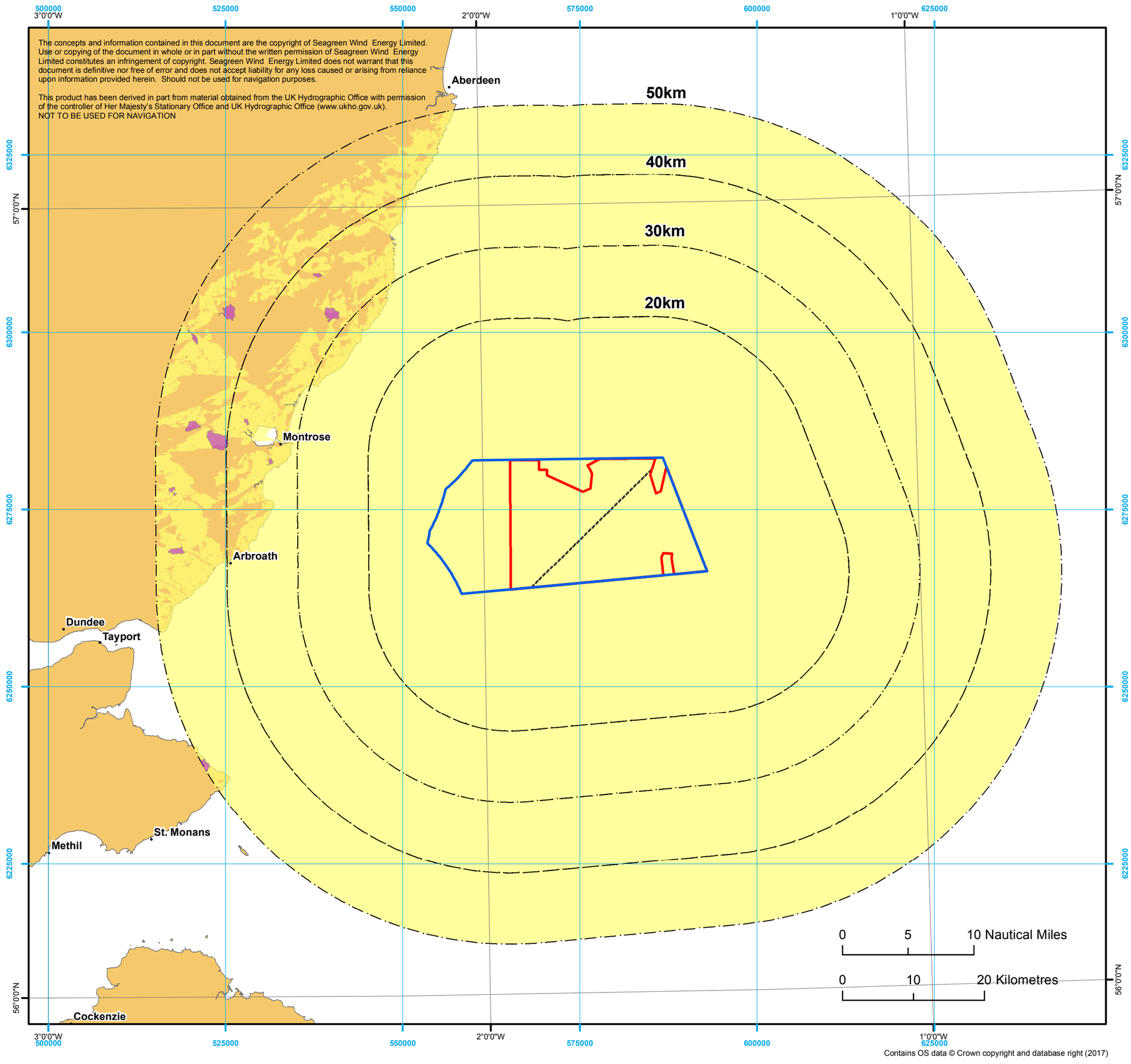
Sea green WIND ENERGY

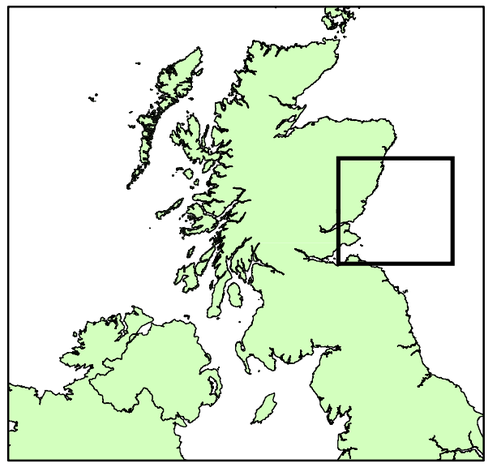
Figure / Drawing Title:
SEASCAPE AND LANDSCAPE CHARACTER AREAS WITH ZTV

Figure/Drawing Number: FIGURE 8 .1

UNLESS THE REVISION IS **B** OR HIGHER THE DRAWING IS **NOT TO BE USED FOR DESIGN OR CONSTRUCTION**

REV	DATE	DESCRIPTION	BY	CKD	APPR DEV	APPR ENG
A1	11 MAY 17	FOR FORMAL SUBMISSION	LH	KM	NB	MS
A0	05 MAY 17	DRAFT	LH	KM	NB	MS





Legend

- The Site
- Phase 1 Boundary
- Gardens and Designed Landscapes

Zone of Theoretical Visibility

- Not Visible
- Visible

ZTV Production Information -
- DTM data used in calculations is OS Terrain 50
- Calculations based on a bare earth survey
- Viewer height set at 1.7m
- Calculations include earth curvature and light refraction
- Tip height set at 280.0m

N.B. This Zone of Theoretical Visibility (ZTV) image illustrates the theoretical extent of where turbines will be visible from, assuming 100% visibiltiy. It is generated using terrain data only and does not account for any screening that vegetation or the built environment may provide. It is, as such, 'a worst case' ZTV and the actual extents of visibiltiy are likely to be much less extensive.

Coordinate System
UTM Zone 30 North (WGS84)
Projection: Transverse Mercator
Central Meridian: -3° East
Scale Factor: 0.9996
Latitude of Origin: 0° North
False Easting: 500000.0
False Northing: 0.0
Reference Spheroid: WGS84
Semi-major Axis: 6378137.0
Inverse Flattening: 298.2572236

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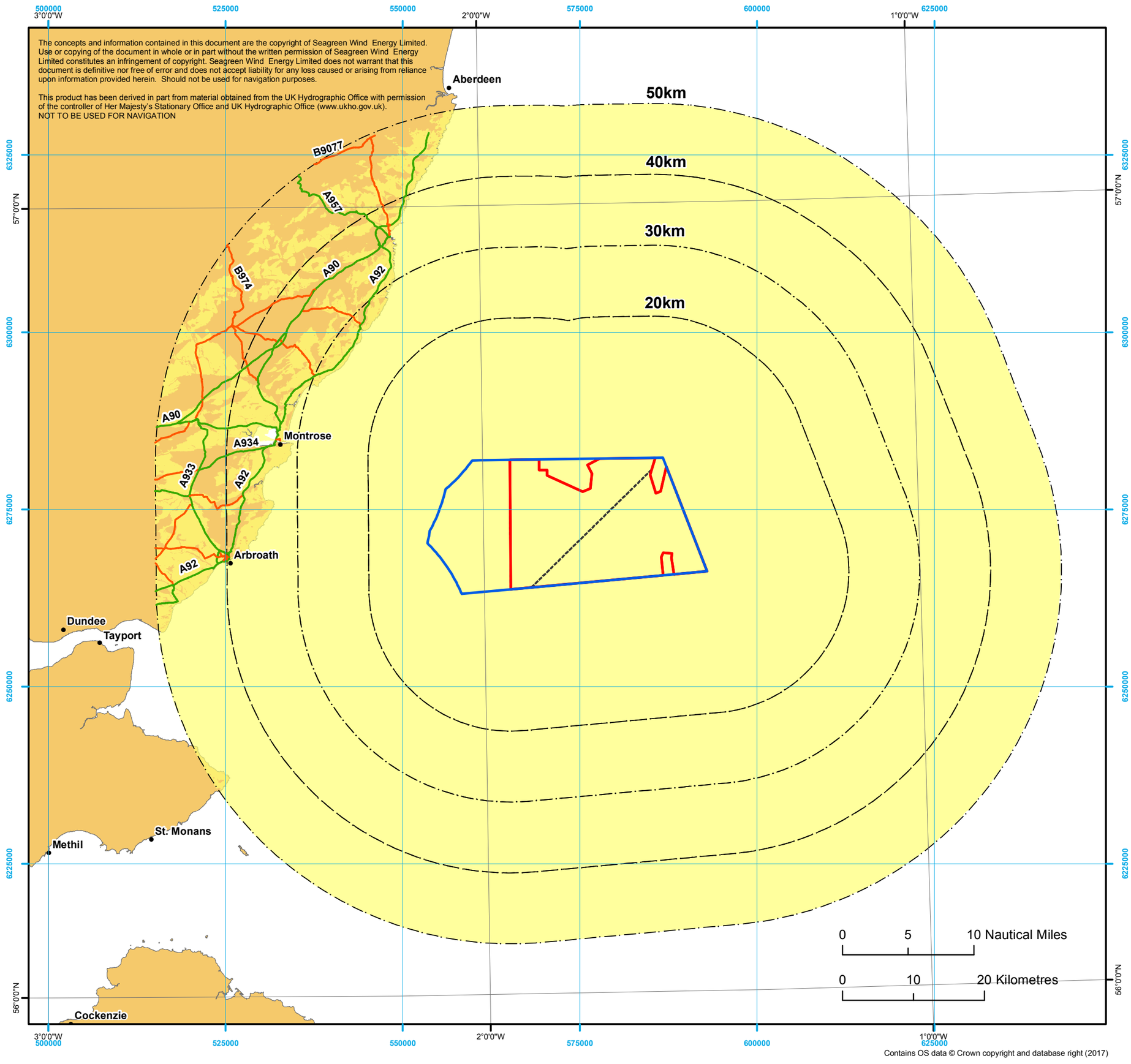
Project:
Firth of Forth Offshore Wind Farm

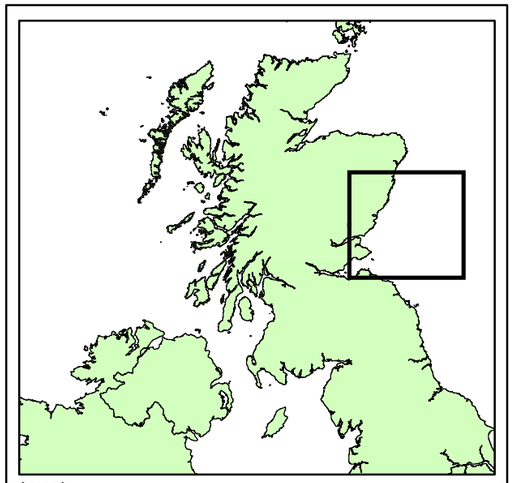
Figure / Drawing Title:
LANDSCAPE DESIGNATIONS WITH ZTV

Figure/Drawing Number: FIGURE 8.2

UNLESS THE REVISION IS **B** OR HIGHER THE DRAWING IS **NOT TO BE USED FOR DESIGN OR CONSTRUCTION**

REV	DATE	DESCRIPTION	BY	CKD	APPR DEV	APPR ENG
A1	11 MAY 17	FOR FORMAL SUBMISSION	LH	KM	NB	MS
A0	05 MAY 17	DRAFT	LH	KM	NB	MS





Legend

- The Site
- Phase 1 Boundary

Zone of Theoretical Visibility

- Not Visible
- Visible

Major Roads

- A Road
- B Road
- Motorway

ZTV Production Information -
- DTM data used in calculations is OS Terrain 50
- Calculations based on a bare earth survey
- Viewer height set at 1.7m
- Calculations include earth curvature and light refraction
- Tip height set at 280.0m

N.B. This Zone of Theoretical Visibility (ZTV) image illustrates the theoretical extent of where turbines will be visible from, assuming 100% visibiltiy. It is generated using terrain data only and does not account for any screening that vegetation or the built environment may provide. It is, as such, 'a worst case' ZTV and the actual extents of visibiltiy are likely to be much less extensive.

Coordinate System
UTM Zone 30 North (WGS84)
Projection: Transverse Mercator
Central Meridian: -3° East
Scale Factor: 0.9996
Latitude of Origin: 0° North
False Easting: 500000.0
False Northing: 0.0
Reference Spheroid: WGS84
Semi-major Axis: 6378137.0
Inverse Flattening: 298.2572236

N W E S

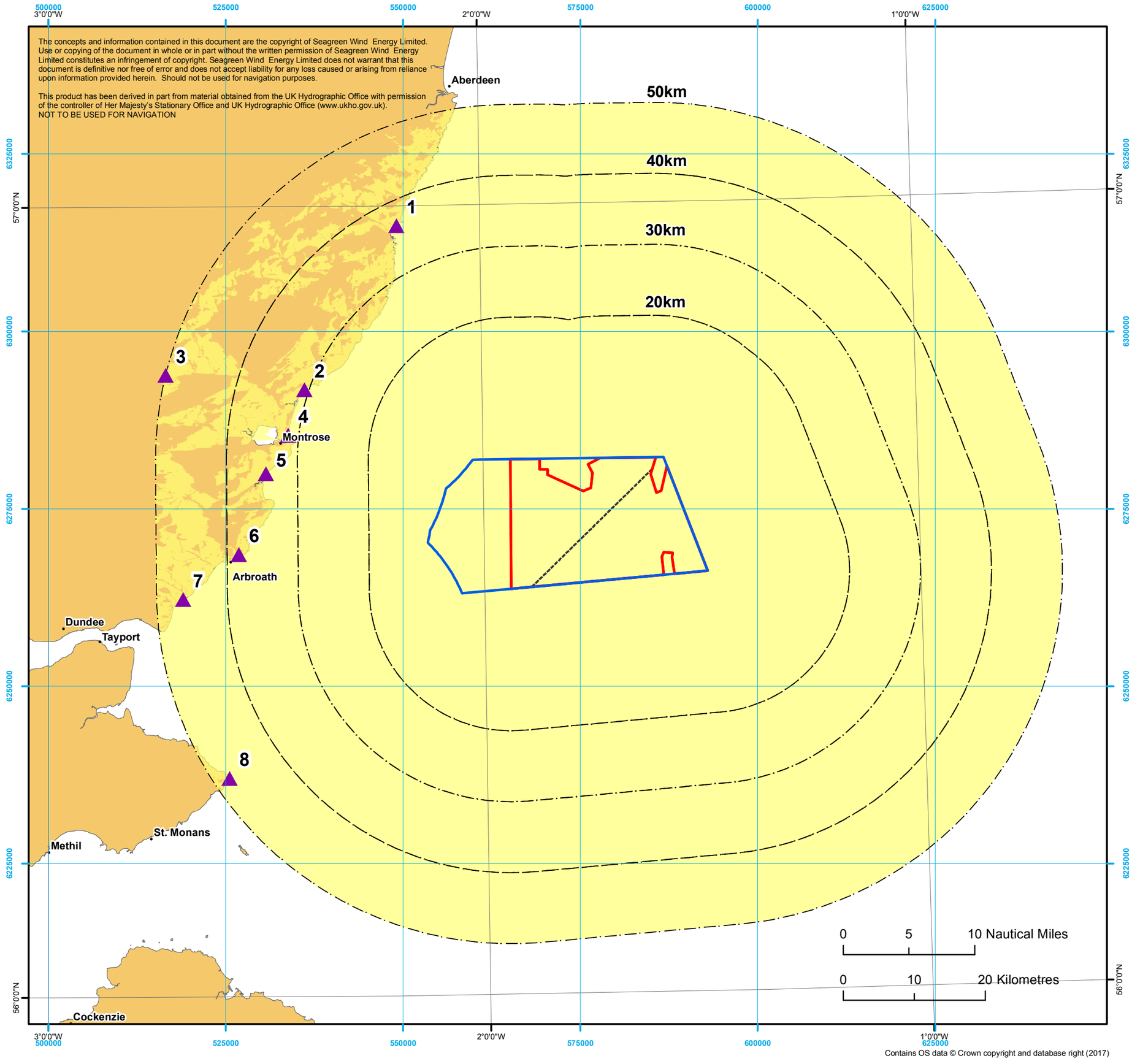
Project:
Firth of Forth Offshore Wind Farm

Figure / Drawing Title:
PRINCIPAL VISUAL RECEPTORS WITH ZTV

Figure/Drawing Number: FIGURE 8.3

UNLESS THE REVISION IS **B** OR HIGHER THE DRAWING IS **NOT TO BE USED FOR DESIGN OR CONSTRUCTION**

REV	DATE	DESCRIPTION	BY	CKD	APPR DEV	APPR ENG
A1	11 MAY 17	FOR FORMAL SUBMISSION	LH	KM	NB	MS
A0	05 MAY 17	DRAFT	LH	KM	NB	MS



Legend

- The Site
- Phase 1 Boundary
- Proposed Viewpoint Locations

Zone of Theoretical Visibility

- Not Visible
- Visible

VP No	Viewpoint
1	Garron Point
2	Beach Road, Kirkton, St Cyrus
3	White Caterthun Hill Fort
4	Montrose
5	Braehead of Lunan
6	Arbroath
7	Carnoustie
8	Fife Ness, Lochaber Rock

ZTV Production Information -
- DTM data used in calculations is OS Terrain 50
- Calculations based on a bare earth survey
- Viewer height set at 1.7m
- Calculations include earth curvature and light refraction
- Tip height set at 280.0m

N.B. This Zone of Theoretical Visibility (ZTV) image illustrates the theoretical extent of where turbines will be visible from, assuming 100% visibiltiy. It is generated using terrain data only and does not account for any screening that vegetation or the built environment may provide. It is, as such, 'a worst case' ZTV and the actual extents of visibiltiy are likely to be much less extensive.

Coordinate System
UTM Zone 30 North (WGS84)
Projection: Transverse Mercator
Central Meridian: -3° East
Scale Factor: 0.9996
Latitude of Origin: 0° North
False Easting: 500000.0
False Northing: 0.0
Reference Spheroid: WGS84
Semi-major Axis: 6378137.0
Inverse Flattening: 298.2572236

N W E S

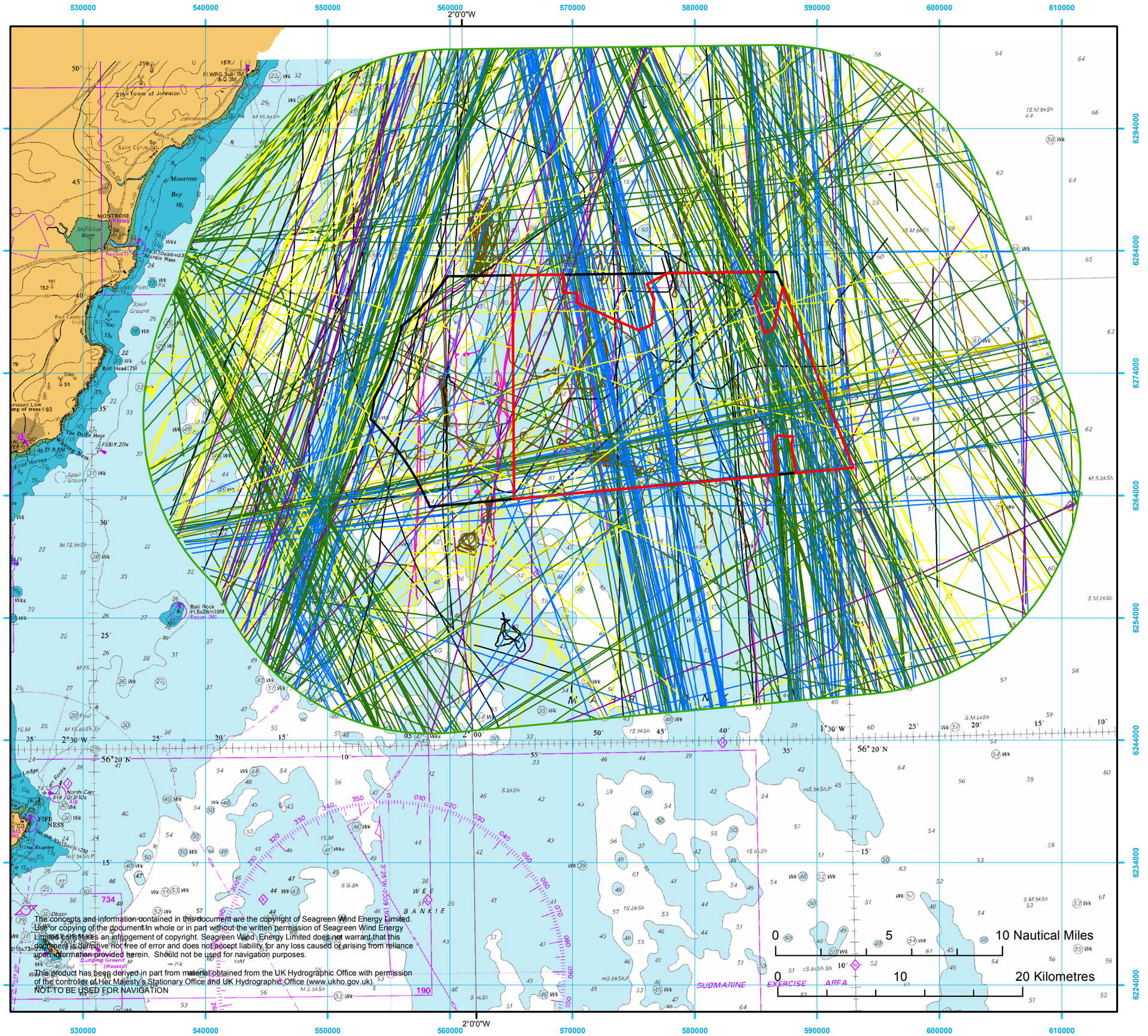
Project:
Firth of Forth Offshore Wind Farm

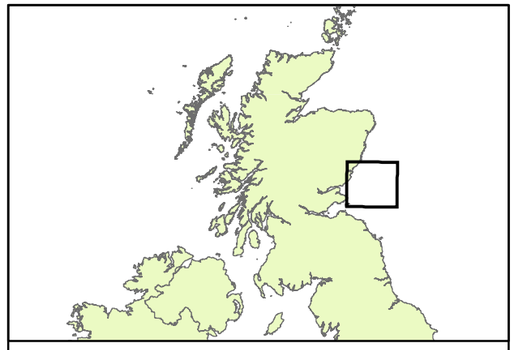
Figure / Drawing Title:
PROPOSED VIEWPOINTS WITH ZTV

Figure/Drawing Number: FIGURE 8.4

UNLESS THE REVISION IS **B** OR HIGHER THE DRAWING IS **NOT TO BE USED FOR DESIGN OR CONSTRUCTION**

REV	DATE	DESCRIPTION	BY	CKD	APPR DEV	APPR ENG
A1	11 MAY 17	FOR FORMAL SUBMISSION	LH	KM	NB	MS
A0	05 MAY 17	DRAFT	LH	KM	NB	MS





Legend

- The Site
- Phase 1 Boundary
- Immediate Study Area

Vessel Type

- Cargo
- Dredging/Underwater Ops
- Fishing
- Other
- Passenger
- Recreation
- Tanker
- Tug
- Unspecified

Coordinate System

UTM Zone 30 North (WGS84)
Projection: Transverse Mercator
Central Meridian: -3° East
Scale Factor: 0.9996
Latitude of Origin: 0° North
False Easting: 500000.0
False Northing: 0.0
Reference Spheroid: WGS84
Semi-major Axis: 6378137.0
Inverse Flattening: 298.2572236

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Title:
Firth of Forth Offshore Wind Farm

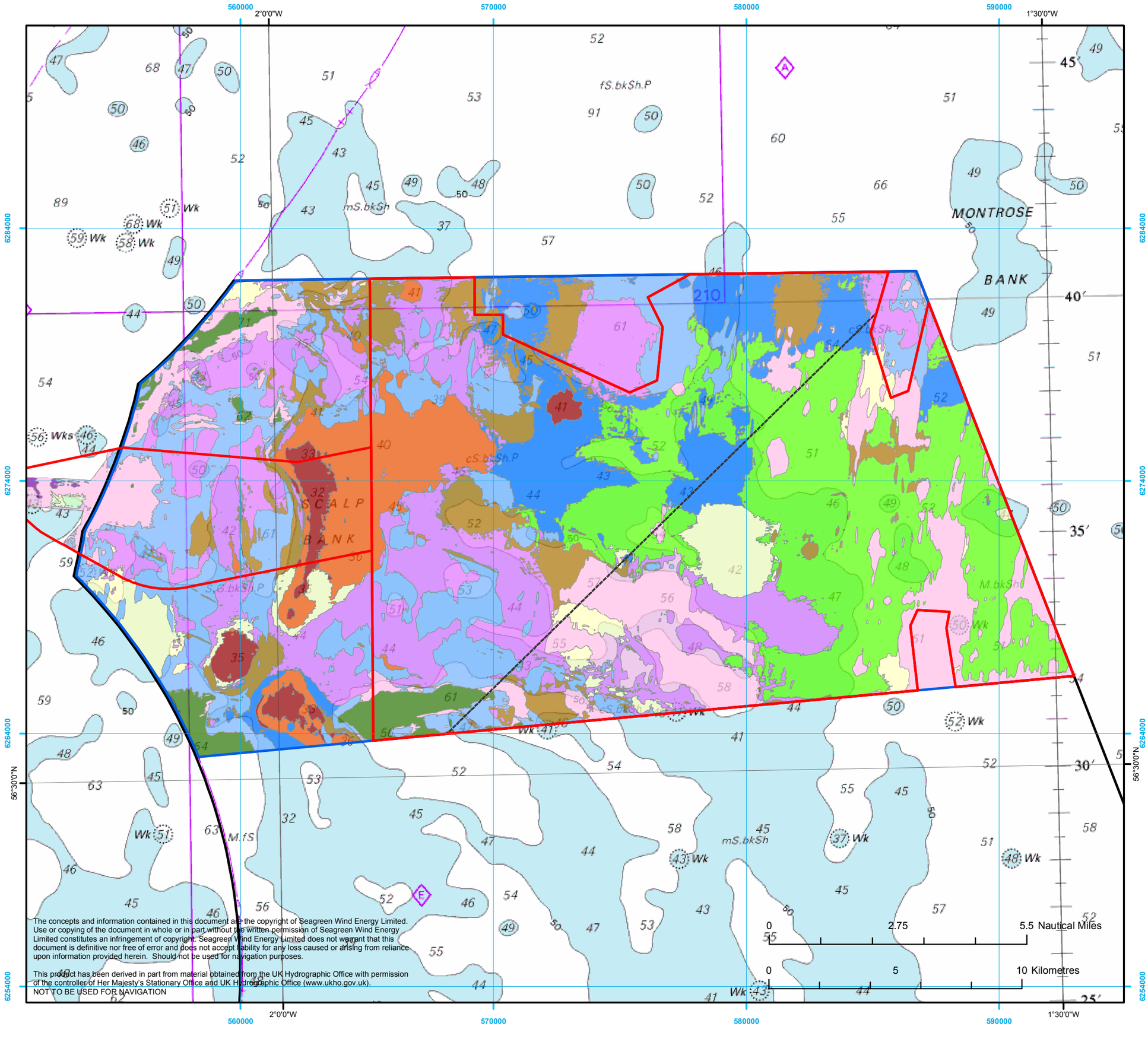
Sea green WIND ENERGY

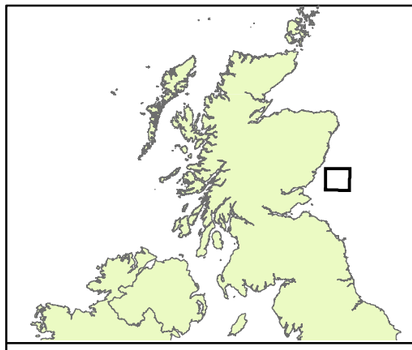
Figure / Drawing Title:
COMBINED (EEMS & HIGHLAND EAGLE) AIS AND RADAR TRACKS BY TYPE WITHIN PHASE 1 IMMEDIATE STUDY AREA – ALL VESSELS (40 DAYS)

Figure/Drawing Number: FIGURE 9.1

UNLESS THE REVISION IS **B** OR HIGHER THE DRAWING IS **NOT TO BE USED FOR DESIGN OR CONSTRUCTION**

REV	DATE	DESCRIPTION	BY	CKD	APPR DEV	APPR ENG
A1	11 MAY 17	FOR FORMAL SUBMISSION	LH	KM	NB	MS
A0	05 MAY 17	DRAFT	LH	KM	NB	MS





Legend

Project

- The Site
- Firth of Forth Round 3 Zone
- Phase 1 Boundary
- Consented Export Cable Route Corridor

Coordinate System

UTM Zone 30 North (WGS84)
Projection: Transverse Mercator
Central Meridian: -3° East
Scale Factor: 0.9996
Latitude of Origin: 0° North
False Easting: 500000.0
False Northing: 0.0
Reference Spheroid: WGS84
Semi-major Axis: 6378137.0
Inverse Flattening: 298.2572236

N
W E
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Title:

Firth of Forth Offshore Wind Farm

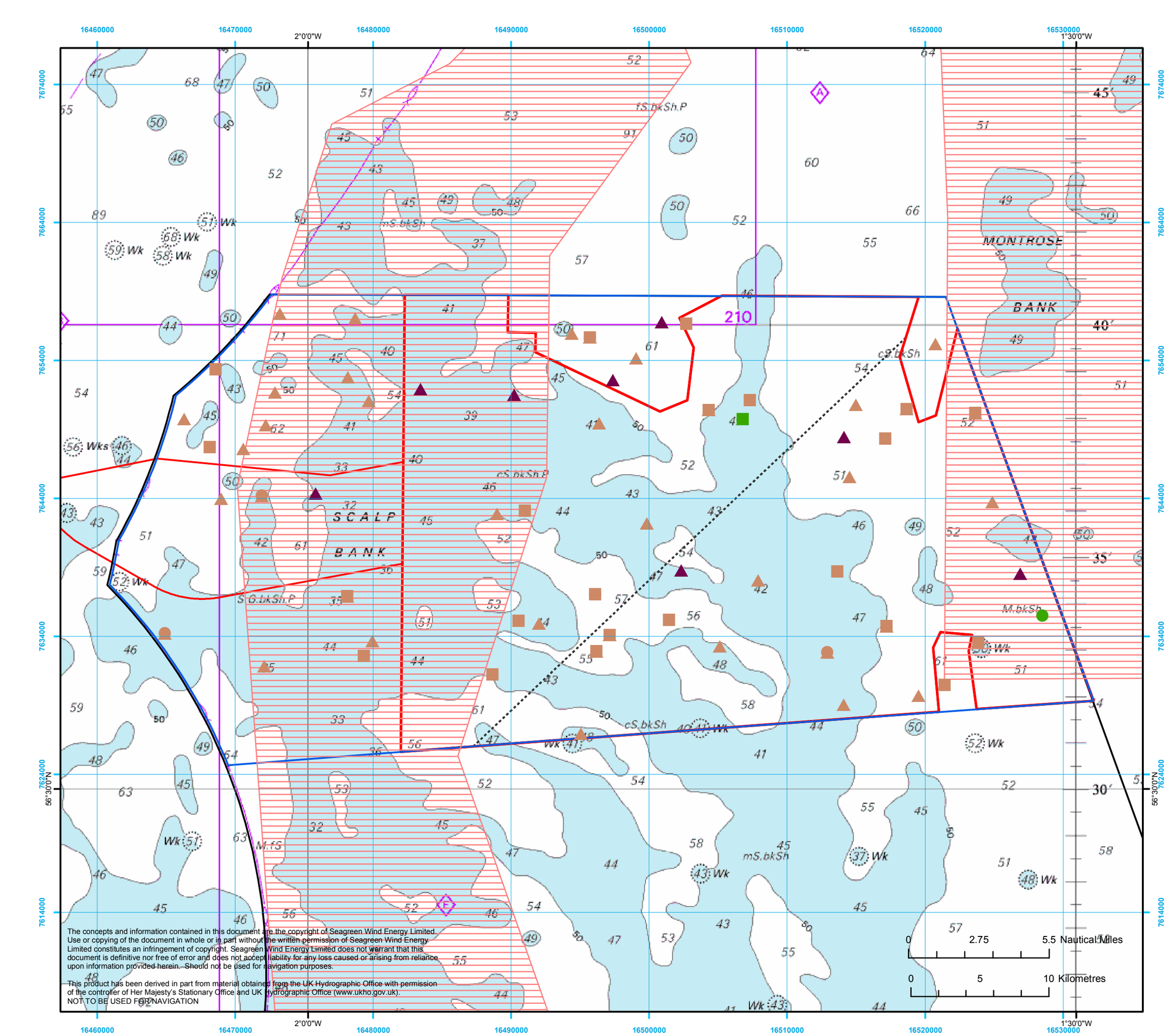
Figure / Drawing Title:

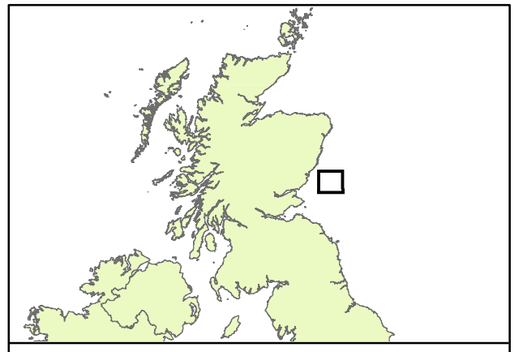
BENTHIC HABITATS

Figure/Drawing Number: FIGURE 13 .1

UNLESS THE REVISION IS **B** OR HIGHER THE DRAWING IS **NOT TO BE USED FOR DESIGN OR CONSTRUCTION**

REV	DATE	DESCRIPTION	BY	CKD	APPR DEV	APPR ENG
A1	11 MAY 17	FOR FORMAL SUBMISSION	LH	KM	NB	MS
A0	05 MAY 17	DRAFT	LH	KM	NB	MS





Legend

- Sabellaria Recorded In Epibenthic Trawl Survey
- Sabellaria Recorded In Video Survey
- Sabellaria Recorded In Grab Survey
- Arctica Islandica Recorded in Benthic Trawl Surveys
- Arctica Islandica Recorded in Grab Surveys
- Modiolus Recorded in Benthic Trawl Survey
- Modiolus Recorded in Grab Survey
- MPA Locations (August 2014)
- Phase 1 Boundary
- The Site
- Firth of Forth Round 3 Zone
- Consented Export Cable Route Corridor

Coordinate System

WGS_1984_PDC_Mercator
Authority: Custom
Projection: Mercator
False_Easting: 0.0
False_Northing: 0.0
Central_Meridian: -150.0
Standard_Parallel_1: 0.0
Linear Unit: Meter (1.0)
Geographic Coordinate System: GCS_WGS_1984
Angular Unit: Degree (0.0174532925199433)
Prime Meridian: Greenwich (0.0)
Datum: D_WGS_1984
Spheroid: WGS_1984
Semimajor Axis: 6378137.0
Semiminor Axis: 6356752.314245179
Inverse Flattening: 298.257223563

N W E S

Title:

Firth of Forth Offshore Wind Farm

Sea green WIND ENERGY

Figure / Drawing Title:

NOTABLE SPECIES RECORDED DURING BENTHIC SURVEY

Figure/Drawing Number: FIGURE 13.2

UNLESS THE REVISION IS **B** OR HIGHER THE DRAWING IS **NOT TO BE USED FOR DESIGN OR CONSTRUCTION**

REV	DATE	DESCRIPTION	BY	CKD	APPR DEV	APPR ENG
A1	11 MAY 17	FOR FORMAL SUBMISSION	LH	KM	NB	MS
A0	05 MAY 17	DRAFT	LH	KM	NB	MS

43E7
£150,749

43E8
£1,789,780

43E9
£2,643,860

42E7
£2,386,723

42E8
£852,029

42E9
£779,857

Phase 2

41E6
£1,184,392

41E7
£6,873,484

41E8
£375,470

41E9
£298,210

40E7
£1,790,217

40E8
£1,810,408

40E9
£772,788

0 5 10 Nautical Miles

0 10 20 Kilometres

Legend

- The Site
- Phase 1 Boundary
- Regional Commercial Fisheries Study Area
- ICES Rectangle

Species

- Scallops
- Nephrops
- Haddock
- Squid
- Lobsters
- Mackerel
- Whiting
- Edible Crabs
- Herring
- Cod
- Monks or Anglers
- Plaice
- Other Species

Brown and May Marine, 2013

Coordinate System
UTM Zone 30 North (WGS84)
Projection: Transverse Mercator
Central Meridian: -3° East
Scale Factor: 0.9996
Latitude of Origin: 0° North
False Easting: 500000.0
False Northing: 0.0
Reference Spheroid: WGS84
Semi-major Axis: 6378137.0
Inverse Flattening: 298.2572236

N W E S

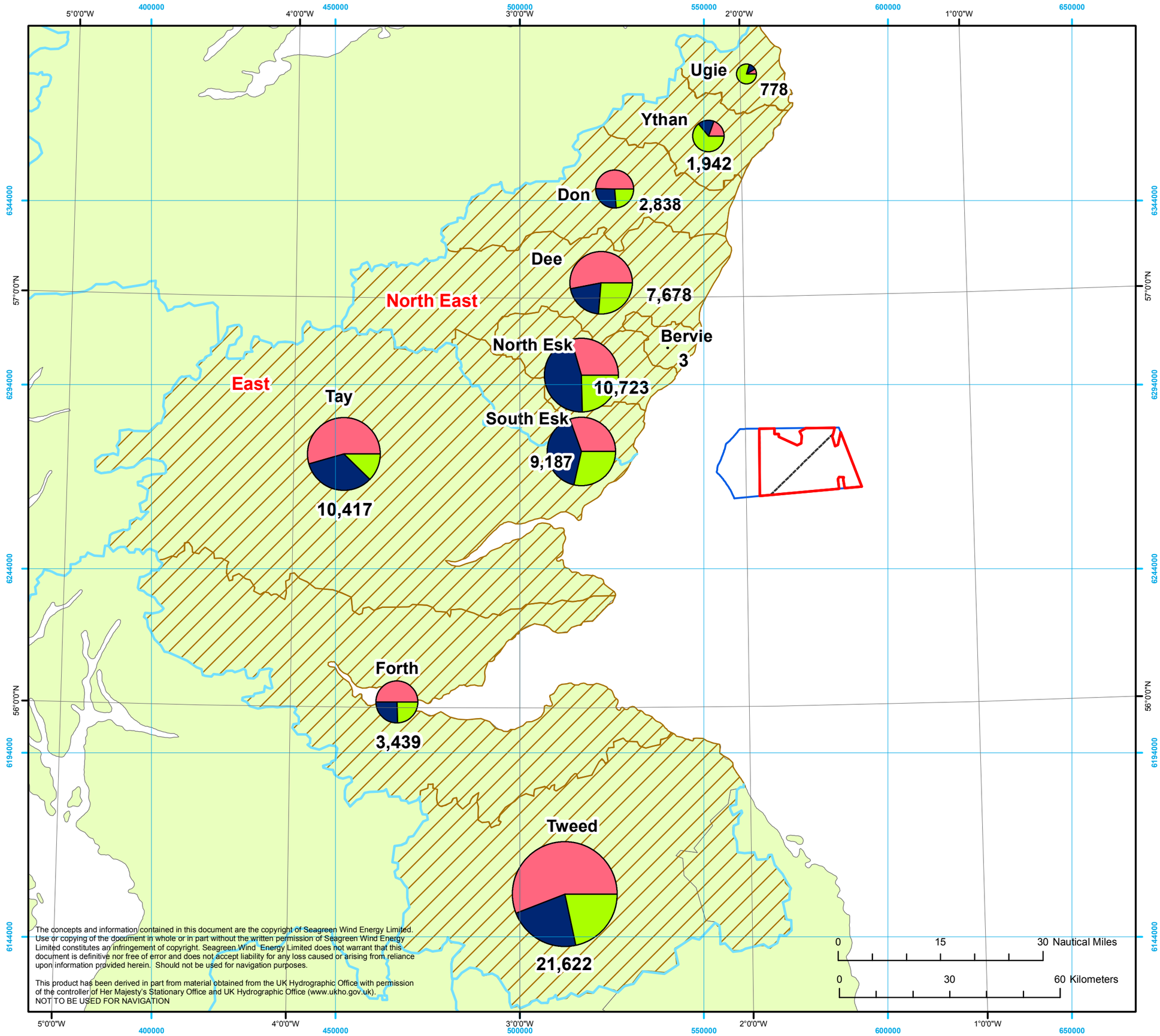
Project:
Firth of Forth Offshore Wind Farm

Figure / Drawing Title:
LANDINGS VALUES BY SPECIES IN THE REGIONAL STUDY AREA (AVERAGE 2008-2012)

Figure/Drawing Number: FIGURE 14.1

UNLESS THE REVISION IS **B** OR HIGHER THE DRAWING IS **NOT TO BE USED FOR DESIGN OR CONSTRUCTION**

REV	DATE	DESCRIPTION	BY	CKD	APPR DEV	APPR ENG
A1	11 MAY 17	FOR FORMAL SUBMISSION	LH	KM	NB	MS
A0	05 MAY 17	DRAFT	LH	KM	NB	MS



Legend

No. of Individuals Caught

3,400

- Salmon
- Grilse
- SeaTrout
- The Site
- Phase 1 Boundary
- Approx. Boundary of Salmon Fishery Regions
- Salmon Fishery Districts within the Regional Study Area

Source: MSS, 2011

Coordinate System

UTM Zone 30 North (WGS84)
Projection: Transverse Mercator
Central Meridian: -3° East
Scale Factor: 0.9996
Latitude of Origin: 0° North
False Easting: 500000.0
False Northing: 0.0
Reference Spheroid: WGS84
Semi-major Axis: 6378137.0
Inverse Flattening: 298.2572236

N W E S

Title:

Firth of Forth Offshore Wind Farm

Sea green WIND ENERGY

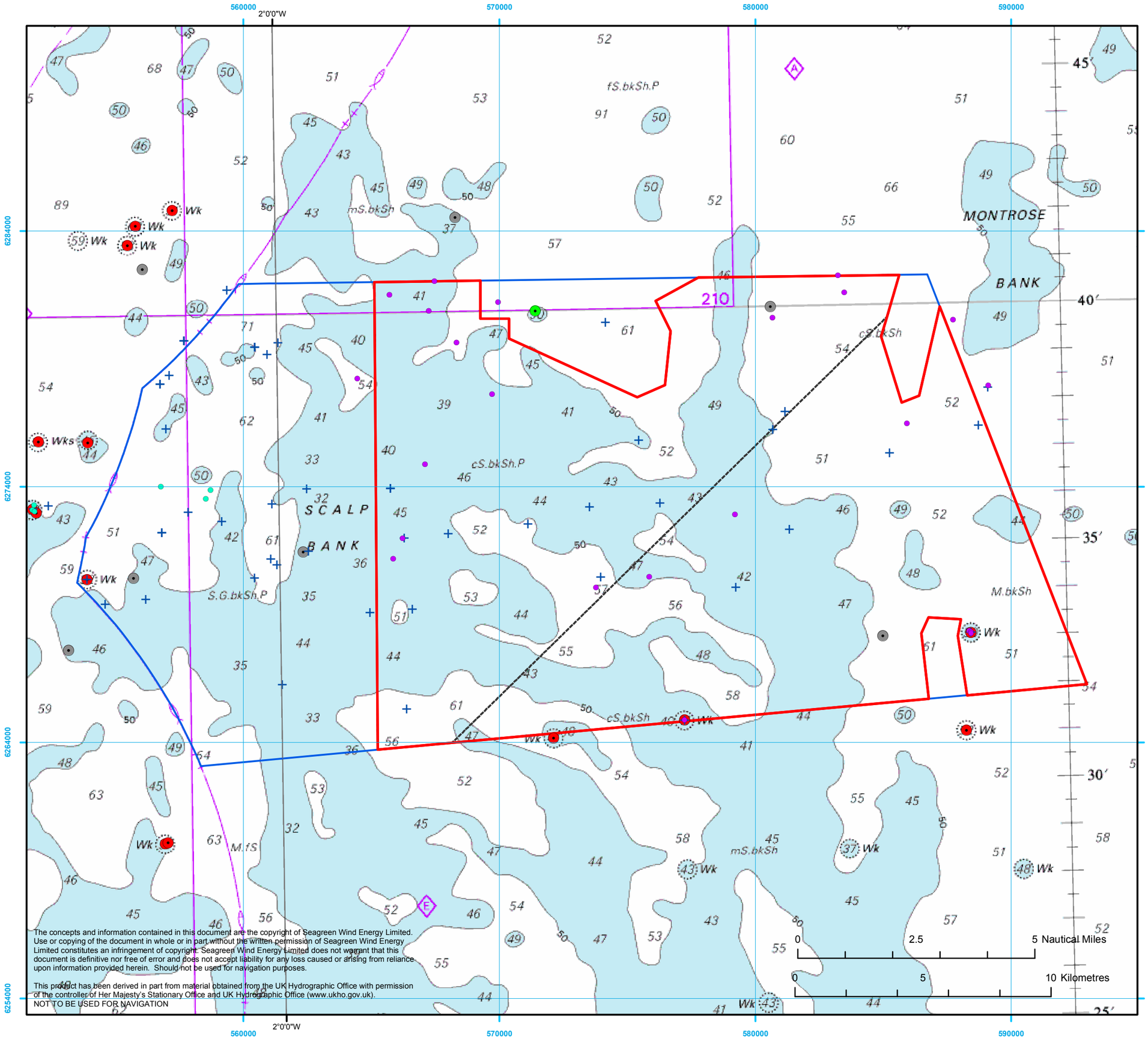
Figure / Drawing Title:

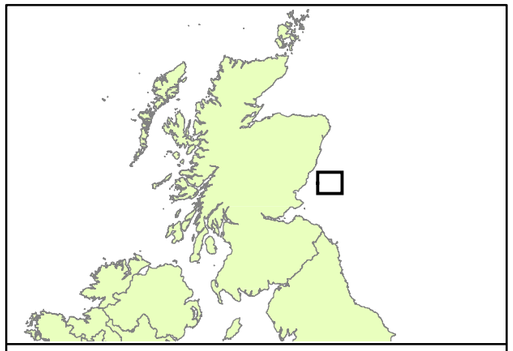
ANNUAL REPORTED CATCH (NO. OF INDIVIDUALS) BY SPECIES IN SALMON FISHERIES DISTRICTS WITHIN REGIONAL STUDY AREAS (AVERAGE 2001-2010)

Figure/Drawing Number: FIGURE 14.2

UNLESS THE REVISION IS **B** OR HIGHER THE DRAWING IS **NOT TO BE USED FOR DESIGN OR CONSTRUCTION**

REV	DATE	DESCRIPTION	BY	CKD	APPR DEV	APPR ENG
A1	11 MAY 17	FOR FORMAL SUBMISSION	LH	KM	NB	MS
A0	05 MAY 17	DRAFT	LH	KM	NB	MS





Legend

- The Site
- Phase 1 Boundary
- HA Targets
- CR Targets
- HA Magnetometer Targets
- Live Wreck
- Dead Wreck
- Lift Wreck

Coordinate System

UTM Zone 30 North (WSG84)
Projection: Transverse Mercator
Central Meridian: -3° East
Scale Factor: 0.9996
Latitude of Origin: 0° North
False Easting: 500000.0
False Northing: 0.0
Reference Spheroid: WGS84
Semi-major Axis: 6378137.0
Inverse Flattening: 298.2572236

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W E
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Title:
Firth of Forth Offshore Wind Farm

Sea green WIND ENERGY

Figure / Drawing Title:
MARINE SITES OF ARCHAEOLOGICAL AND CULTURAL HERITAGE INTEREST

Figure/Drawing Number: FIGURE 15 .1

UNLESS THE REVISION IS **B** OR HIGHER THE DRAWING IS **NOT TO BE USED FOR DESIGN OR CONSTRUCTION**

REV	DATE	DESCRIPTION	BY	CKD	APPR DEV	APPR ENG
A1	11 MAY 17	FOR FORMAL SUBMISSION	LH	KM	NB	MS
A0	05 MAY 17	DRAFT	LH	KM	NB	MS

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RG1 8BU
Company No. 06873902

www.seagreenwindenergy.com